AGENDA & MINUTES (Unconfirmed) - IEEE 802 LMSC EXECUTIVE COMMITTEE MEETING (Updated 9 January 2008)

Friday November 16, 2007 1:00 PM – 6:00 PM

Atlanta, GA

1.00		**MEETING CALLED TO ORDER**	**-**	**Nikolich**	**1**	**01:00 PM**

Paul Nikolich called the meeting to order at 1:00 PM. Members in attendance were:

Paul Nikolich	- Chair, IEEE 802 LAN / MAN Standards Committee
Mat Sherman	- Vice Chair, IEEE 802 LAN / MAN Standards Committee
Pat Thaler	- Vice Chair, IEEE 802 LAN / MAN Standards Committee
Bob O'Hara	- Recording Secretary, IEEE 802 LAN / MAN Standards Committee
Buzz Rigsbee	- Executive Secretary, IEEE 802 LAN / MAN Standards Committee
John Hawkins	- Treasurer, IEEE 802 LAN/MAN Standards Committee
Tony Jeffree	- Chair, IEEE 802.1 - HILI Working Group
Bob Grow	- Chair, IEEE 802.3 - CSMA/CD Working Group
Stuart Kerry	- Chair, IEEE 802.11 - Wireless LANs Working Group
Rick Alfvin (acting)	- Chair, IEEE 802.15 – Wireless PAN Working Group
Roger Marks	- Chair, IEEE 802.16 – Broadband Wireless Access Working Group
John Lemon	- Chair, IEEE 802.17 – Resilient Packet Ring Working Group
Mike Lynch	- Chair, IEEE 802.18 – Regulatory TAG
Steve Shellhammer	- Chair, IEEE 802.19 – Wireless Coexistence TAG
Arnie Greenspan	- Chair, IEEE 802.20 – Mobile Broadband Wireless Access
Michael Williams	- Vice Chair IEEE 802.21 – Media Independent Handover (non-voting)
Carl Stevenson	- Chair, IEEE 802.22 – Wireless Regional Area Networks
Geoff Thompson	- Member Emeritus (non-voting)

2.00	**MI**	**APPROVE OR MODIFY AGENDA**	**-**	**Nikolich**	**9**	**01:01 PM**

r03 **AGENDA - IEEE 802 LMSC EXECUTIVE COMMITTEE MEETING**
Friday, November 16, 2007 - 1:00PM -6:00PM

1.00		**MEETING CALLED TO ORDER**	**-**	**Nikolich**	**1**	**01:00 PM**
2.00	**MI**	**APPROVE OR MODIFY AGENDA**	**-**	**Nikolich**	**9**	**01:01 PM**
3.00			**-**			**01:10 PM**
3.01			**-**			**01:10 PM**
3.02			**-**			**01:10 PM**
4.00	**II**	**Announcements from the Chair**	**-**	**Nikolich**	**5**	**01:10 PM**
4.01	**II**		**-**			**01:15 PM**
	Category (* = consent agenda)		**-**			
			-			
5.00		**IEEE Standards Board Items**	**-**			**01:15 PM**
5.01	**ME**		**-**			**01:15 PM**
5.02	**ME**	**802.15.4e PAR to NESCOM**	**-**	**Heile**	**5**	**01:15 PM**
5.03	**ME**	**802.15.6 PAR to NESCOM**	**-**	**Heile**	**5**	**01:20 PM**
5.04	**ME**	**802.3ba PAR to NESCOM**	**-**	**Grow**	**5**	**01:25 PM**
5.05	**ME**	**802.16i PAR withdrawal**	**-**	**Marks**	**5**	**01:30 PM**
5.06	**ME**	**802.1X-REV PAR to NESCOM**	**-**	**Jeffree**	**5**	**01:35 PM**
5.07	**ME**	**802.1Qaz PAR to NESCOM**	**-**	**Jeffree**	**5**	**01:40 PM**

5.08	ME		-			01:45 PM
5.09	ME		-			01:45 PM
5.10	ME	Conditional approval of 802.11k to REVCOM	-	Kerry	10	01:45 PM
5.11	ME		-			01:55 PM
5.12	ME		-			01:55 PM
5.13	ME	Recommendation to SASB to change 802.20 to entity ballot (NC-EC)	-	Greenspan	10	01:55 PM
5.14	ME	802.20 approval for sponsor ballot (NC-EC)	-	Greenspan	10	02:05 PM
5.15	ME	802.15.3 approval for reaffirmation sponsor ballot	-	Heile	5	02:15 PM
5.16	ME	Conditional approval of 802.11y for sponsor ballot	-	Kerry	10	02:20 PM
5.17	ME	802.1ah approval for sponsor ballot	-	Jeffree	5	02:30 PM
6.00		Executive Committee Study Groups, Working Groups, TAGs	-			02:35 PM
6.01	MI*	802.15.4e SG extension (1st renewal)	-	Heile		02:35 PM
6.02	MI	802.11 Video Transport Stream SG extension (2nd renewal)	-	Kerry		02:35 PM
6.03	MI	802.11 Very High Throughput SG Extension (2nd renewal)	-	Kerry		02:35 PM
6.04	MI*	802.21 Security SG extension (1st renewal)	-	Gupta		02:35 PM
6.05	MI*	802.21 Multi-radio power management SG extension (1st renewal)	-	Gupta		02:35 PM
6.06	MI	802.3 Higher speed SG extension (4th renewal)	-	Grow	5	02:35 PM
6.07	MI	802.15.6 SG extension (3rd Renewal)	-	Heile	5	02:40 PM
6.08	MI		-			02:45 PM
6.09	MI		-			02:45 PM
6.10	MI	802.15 RFID SG Formation	-	Heile	5	02:45 PM
6.11	MI		-			02:50 PM
6.12	MI		-			02:50 PM
6.13	MI		-			02:50 PM
6.14	MI		-			02:50 PM
6.15	MI		-			02:50 PM
6.16			-			02:50 PM
7.00		Break	-		10	02:50 PM
8.00		IEEE-SA Items	-			03:00 PM
8.01	II	802 Task Force update	-	Nikolich	5	03:00 PM
8.02	II	Attendance Software Report	-	Gilb	10	03:05 PM
8.03			-			03:15 PM
9.00		LMSC Liaisons & External Interface	-			03:15 PM
9.01	ME	Liaison to ITU-R WP5D - IMT-Advanced Requirements	-	Lynch	5	03:15 PM
9.02	ME	Liaison to ITU-R WP5D - IMT-Advanced Evaluation	-	Lynch	5	03:20 PM
9.03	ME	Liaison to ITU-R WP5D - IMT-2000 Roadmap	-	Lynch	5	03:25 PM
9.04	ME		-			03:30 PM
9.05	DT	Get 802 update and plan	-	Hawkins	10	03:30 PM
9.06	II	Report on ISO matters	-	Thompson	5	03:40 PM
9.07	ME		-			03:45 PM
9.08	ME		-			03:45 PM
9.09	ME		-			03:45 PM
9.10	ME		-			03:45 PM
			-			03:45 PM
10.00		LMSC Internal Business	-			03:45 PM
10.01	II	TREASURER'S REPORT	-	Hawkins	5	03:45 PM
10.02	MI	nNA Plenary venue survey results and final venue selection	-	Rigsbee	10	03:50 PM
10.03	MI	Future meeting site schedule and site selection	-	Rigsbee	15	04:00 PM
10.04	MI	Network services report, evolution, and investment plan	-	Rigsbee	10	04:15 PM
10.05	MI	Approval of minutes of the EC executive session	-	Nikolich	5	04:25 PM
10.06	MI	Recommendation to SASB to dissolve NC-EC	-	Jeffree	5	04:30 PM
10.07	ME	Approval or 802.11 interpretation responses	-	Kerry	10	04:35 PM
10.08	ME	Approval of 802.3 interpretation responses	-	Grow	10	04:45 PM
10.09	ME	Approval of 802.1AB interpretation response	-	Jeffree	5	04:55 PM
10.10	ME	Approval or 802.1 existing interpretation responses	-	Jeffree	10	05:00 PM

10.11			-			05:10 PM
10.12			-			05:10 PM
10.13			-			05:10 PM
10.14			-			05:10 PM
10.15			-			05:10 PM
11.00		**Information Items**	-			05:10 PM
11.01	II	P&P Update	-	Sherman	5	05:10 PM
11.02	II		-			05:15 PM
11.03	II	Emergency Services CFI report	-	Paine	5	05:15 PM
11.04	II	Update on IMT Advanced	-	Lynch	5	05:20 PM
11.05	DT	802 meeting logistics	-	Lemon	10	05:25 PM
11.06	II	802.11/15 now in concentration banking	-	Heile	1	05:35 PM
11.07	II	802.3 Liaison to ITU-T on OTN Mapping	-	Grow	5	05:36 PM
11.08	II	802.1 Liaison to ITU-T SG4	-	Jeffree	5	05:41 PM
11.09	II	802.1 Liaison to DSL Forum	-	Jeffree	2	05:46 PM
11.10	II	802.1 Liaison to OIF	-	Jeffree	2	05:48 PM
11.11	II	802.1 Liaison to MEF	-	Jeffree	2	05:50 PM
11.12			-			05:52 PM
11.13			-			05:52 PM
11.14			-			05:52 PM
11.15			-			05:52 PM
11.16			-			05:52 PM
11.17			-			05:52 PM
11.18			-			05:52 PM
11.19			-			05:52 PM
11.20			-			05:52 PM
11.21			-			05:52 PM
		ADJOURN SEC MEETING	-	Nikolich		06:00 PM

ME - Motion, External   MI - Motion, Internal
DT- Discussion Topic   II - Information Item

Moved: To approve the agenda, as modified.
Moved: Stevenson/Jeffree
Passes: 15/0/0

4.00	II	Announcements from the Chair	-	Nikolich	5	01:10 PM

Paul announced that elections will be coming up in March and that Bob O'Hara would not be returning as recording secretary.

4.01	II		-			
	Category (* = consent agenda)		-			
			-			
5.00		**IEEE Standards Board Items**	-			
5.01	ME		-			
5.02	ME	802.15.4e PAR to NESCOM	-	Heile	5	01:11 PM

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IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	**<PAR for SG4e>**
Date Submitted	[14 November 2007
Source	[Pat Kinney] [Kinney Consulting LLC] [address] Voice: [ ] Fax: [ ] E-mail: [ ]
Re:	To allow SG4e to review the completed draft PAR
Abstract	Draft PAR for SG4e
Purpose	To allow the SG4e to review the proposed PAR
Notice	This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

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Draft PAR Confirmation Number: 217573326.2235
Submittal Email: pat.kinney@ieee.org Change Submitter Email
Type of Project: PAR for an amendment to an existing Standard 802.15.4-2006
1.1 Project Number: P802.15.4e
1.2 Type of Document: Standard for
1.3 Life Cycle: Full
1.4 Is this project in ballot now? No
1.5 Is the balloting group aware of the PAR modification?
2.1 Title of Standard: IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (WPANs) - Amendment: Amendment to the MAC sub-layer
3.1 Name of Working Group: Wireless Personal Area Network (WPAN) Working Group Add/Change Working Group
Contact information for Working Group Chair Robert F Heile Email: bheile@ieee.org Phone: 781-929-4832
Contact Information for Working Group Vice Chair Email: Phone:
3.2 Sponsoring Society and Committee:IEEE Computer Society/Local and Metropolitan Area Networks (C/LM) **Contact information for Sponsor Chair:** Paul Nikolich Email: p.nikolich@ieee.org Phone: 857-205-0050 **Contact information for Standards Representative:** Email: Phone:
3.3 Joint Sponsor:/ ()

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Contact information for Sponsor Chair: Email: Phone: **Contact information for Standards Representative:** Email: Phone:	
4.1 Type of Ballot: Individual	
4.2 Expected Date of Submission for Initial Sponsor Ballot: 2009-01	
4.3 Projected Completion Date for Submittal to RevCom: 2009-09	
5.1 Approximate number of people expected to work on this project: 30	
5.2 Scope of Proposed Standard: The intent of this amendment is to enhance and add functionality to the 802.15.4-2006 MAC to a) better support the industrial markets and b) permit compatibility with modifications being proposed within the Chinese WPAN. Specifically, the MAC enhancements are limited to: • TDMA: to provide a)determinism, b)enhanced utilization of bandwidth • Channel Hopping: to provide additional robustness in high interfering environments and enhance coexistence with other wireless networks • GTS: to increase its flexibility such as a) supporting peer to peer, b)the length of the slot, and c) number of slots • CSMA: to improve throughput and reduce energy consumption • Security: to add support for additional options such as asymmetrical keys • Low latency: to reduce end to end delivery time such as needed for control applications	**Old Scope:**
5.3 Is the completion of this standard is dependent upon the completion of another standard: No **If yes, please explain:**	
5.4 Purpose of Proposed Standard: This functionality facilitates Industrial applications (such	**Old Purpose:**

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as addressed by HART 7 and the ISA100 proposed standards), and those enhancements defined by the proposed Chinese WPAN standard that aren't included in TG4c. This amendment addresses coexistence with wireless protocols such as 802.11, 802.15.1, 802.15.3, and 802.15.4.	

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5.5 Need for the Project: Industrial applications have requirements that are not addressed by the existing standard such as low latency, robustness in the harsh industrial RF environment, and determinism. The Chinese Wireless Personal Area Network standard has identified enhancements to improve network reliability and increase network throughput to support higher duty-cycle data communication applications.
5.6 Stakeholders for the Standard: Process industry (e.g. oil & gas industry, food & beverage, pharmaceutical), Factory automation (automotive, machinery, aerospace), Data Communication
Intellectual Property **6.1.a.** Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board? Yes If yes, state date: 2007-09-19 If no, please explain: **6.1.b.** Is the Sponsor aware of any copyright permissions needed for this project? No If yes, please explain: **6.1.c.** Is the Sponsor aware of possible registration activity related to this project? No If yes, please explain:
7.1 Are there other standards or projects with a similar scope? No If yes, please explain: **and answer the following:** Sponsor Organization: Project/Standard Number: Project/Standard Date: 0000-00-00 Project/Standard Title:
7.2 Future Adoptions **Is there potential for this standard (in part or in whole) to be adopted by another national, regional, or international organization?** Do not know at this time If Yes, the following questions must be answered: Technical Committee Name and Number: **Other Organization Contact Information:** **Contact person:** **Contact Email address:**
7.3 Will this project result in any health, safety, security, or environmental

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guidance that affects or applies to human health or safety? No If yes, please explain:
7.4 Additional Explanatory Notes: (Item Number and Explanation)
8.1 Sponsor Information: Is the scope of this project within the approved scope/definition of the Sponsor's Charter? Yes If no, please explain:

IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)		
Title	**IEEE P802.15 WPAN SG4e**		
Date Submitted	[20 September, 2007]		
Source	[Pat Kinney] [Kinney Consulting LLC. [Chicago, IL]	Voice: Fax: E-mail:	[847-960-3715] [] [pat.kinney@ieee.org]
Re:			
Abstract	[During the July 2007 IEEE 802 Plenary the IEEE P802.15 working group formed the IEEE 802.15 4e study group with the goal to create a Project Authorization Request for enhancements to the IEEE 802.15.4 standard. This document contains the 5 criteria.]		
Purpose	[This document is supporting the submission of the PAR to the P802.15 Working Group]		
Notice	This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.		
Release	The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.		

IEEE P802.15 Low Rate Wireless Personal Area Networks Study Group Functional Requirements Standards Development Criteria

The IEEE P802.15 4e Study Group for Wireless Personal Area Networks (WPANs) reviewed and completed the required IEEE Project 802 Functional Requirements, Standards Development Criteria (a.k.a. the Five Criteria). The IEEE 802.15 WPAN Five Criteria response is in Italics below.

1. BROAD MARKET POTENTIAL

a) Broad sets of applicability

There is increasing interest for Low Rate Wireless Personal Area Networks (WPAN-LR) in the industrial market and in China, as part of the Chinese WPAN standard..

Examples of applications include Oil & Gas industry, Food & Beverage industry, Pharmaceutical industry, Automotive factory automation, Aerospace factory automation, Machinery, textile industry

With an effective wireless standard, geared to this class of applications, the Chinese market potential is huge. Additionally, the industrial market is asking for wireless systems that will support process and factory automation.

The wireless capability will make these devices easier to use and provide additional functionality and efficiency.

b) Multiple vendors and numerous users

The breadth of membership of this WPAN Low Rate Study Group, demonstrates the interest in this class of WPANs. Members include international wireless industry leaders, academic researchers, semiconductor manufacturers, system integrators, and end users. Already, there are industry consortiums, such as ISA100, HART, and WINA actively addressing the requirements of ultra low power, low data rate wireless PAN class networks and are promoting the current standard .There are currently at least 10 semiconductor manufacturers providing semiconductor solutions for 802.15.4.

The target user base will be large as indicated by the growing demand for wireless connectivity in almost all devices.

c) Balanced costs (LAN versus attached stations)

The proposed amendment to 802.15.4 will be developed with the aim that the connectivity costs will be a reasonably small fraction of the cost of the target devices such as sensors, tags, HIDs, and actuators as previously mentioned.

2. COMPATIBILITY

IEEE 802 defines a family of standards. **All standards shall be in conformance with IEEE 802.1 Architecture, Management and Interworking. All LLC and MAC standards shall be compatible with ISO 10039, MAC Service Definition1, at the LLC/MAC boundary. Within the LLC Working Group there shall be one LLC standard, including one or more LLC protocols with a common LLC/MAC interface. Within a MAC Working Group there shall be one MAC standard and one or more Physical Layer standards with a common MAC/Physical layer interface. Each standard in the IEEE 802 family of standards shall include a definition of managed objects, which are compatible with OSI systems management standards.**

Note: This requirement is subject to final resolution of corrections and revision to current ISO 10039, currently inconsistent with ISO 8802 series standards.

The MAC (Medium Access Control) Layer of the Wireless Personal Area Network (WPAN) Standard will be compatible with the IEEE 802 requirements for architecture, management, and inter-networking.

3. DISTINCT IDENTITY

a) Substantially different from other IEEE 802 standards.

802.15.4 uniquely supports wireless sensor and control application. Without this amendment, 802.15.4 will neither adequately support the industrial market nor be able to bridge the gap to the Chinese WPAN standard.

b) One unique solution per problem (not two solutions to a problem).

The proposed amendment to 802.15.4 will provide a unique solution for the industrial market and the Chinese WPAN standard.

c) Easy for the document reader to select the relevant specification.

The proposed amendment to 802.15.4 will be a clearly distinguishable specification.

4. TECHNICAL FEASIBILITY

a) Demonstrated system feasibility

There are many devices already in the market with similar firmware enhancements.

b) Proven technology, reasonable testing

There are examples of technology that exist today, which will allow design and fabrication of these radio systems.

c) Confidence in reliability

The additional functionality to the MAC will be designed to meet relevant reliability standards. Existing products provide confidence in the reliability of the proposed project.

A coexistence assurance document will be submitted to the 802.19 TAG.

5. ECONOMIC FEASIBILITY

a) Known cost factors, reliable data

High volume applications in the Chinese 779-787 MHz band will provide a low cost source of components. Existing products indicate cost targets are easily met.

b) Reasonable cost for performance

Based on test results, prototype, and production solutions, the estimates meet expected size, cost, and power requirements.

c) Consideration of installation costs

One of the 802.15.4 standard objectives includes low cost installation with minimal to no operator intervention.

802.15.4e Agenda Item-PAR approval

802.15.4e PAR Agenda Item

- Two comments were received from one commenter
- Comments were editorial and did not change the technical content of the document.
- All the suggested changes were accepted, reaffirmed by the Working Group (55/0/2), and distributed to the EC Reflector on November 14, 2007

802.15.4e PAR Agenda Item

Motion:

- Move to forward 15-07-0859-03-0000-par-sg4e, in the proper web based form, to NesCom

Moved: Bob Heile

Second: Mike Lynch

Moved: to forward 15-07-0859-03-0000-par-sg4e, in the proper web based form, to NesCom
Moved: Heile/Lynch

Passes: 15/0/0

5.03	**ME**	**802.15.6 PAR to NESCOM**	**-**	**Heile**	**5**	**01:12 PM**

The PAR Copyright Release and Signature Page must be submitted by FAX to +1-732-875-0695 to the NesCom Administrator.
If you have any questions, please contact the NesCom Administrator.

Once you approve and submit the following information, changes may only be made through the NesCom Administrator.

Draft PAR Confirmation Number:
Submittal Email: bheile@ieee.org
Type of Project: PAR for a New Standard
1.1 Project Number: P802.15.6
1.2 Type of Document: Standard for
1.3 Life Cycle: Full
1.4 Is this project in ballot now? No
1.5 Is the balloting group aware of the PAR modification?
2.1 Title of Standard: Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 15.6: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Wireless Personal Area Networks (WPANs)used in or around a body.
3.1 Name of Working Group: Wireless Personal Area Network (WPAN) Working Group
Contact information for Working Group Chair Robert F Heile Email: bheile@ieee.org Phone: 781-929-4832
Contact Information for Working Group Vice Chair Email: Phone:
3.2 Sponsoring Society and Committee:IEEE Computer Society/Local and Metropolitan Area Networks (C/LM) **Contact information for Sponsor Chair:** Paul Nikolich Email: p.nikolich@ieee.org Phone: 857-205-0050 **Contact information for Standards Representative:** Email: Phone:
3.3 Joint Sponsor:/ () **Contact information for Sponsor Chair:** Email: Phone: **Contact information for Standards Representative:** Email: Phone:
4.1 Type of Ballot: Individual
4.2 Expected Date of Submission for Initial Sponsor Ballot: 2009-11
4.3 Projected Completion Date for Submittal to RevCom: 2010-03
5.1 Approximate number of people expected to work on this project: 200
5.2 Scope of Proposed Standard: This is a standard for short range, wireless communication in the vicinity of, or inside, a human body (but not limited to humans). It can use existing ISM bands as well as frequency bands approved by national medical and/or regulatory authorities. Support for Quality of Service (QoS), extremely low power, and data rates up to 10 Mbps is required while simultaneously complying with strict non-interference guidelines where needed. This standard considers effects on portable antennas due to the presence of a person (varying with male, female, skinny, heavy, etc.), radiation pattern shaping to minimize SAR* into the body, and changes in characteristics as a result of the user motions. *SAR (Specific Absorption Rate) measured in (W/kg) = (J/kg/s). SAR is regulated, with limits for local exposure (Head) of: in US: 1.6 W/kg in 1 gram and in EU: 2 W/kg in 10 gram. This limits the transmit (TX) power in US < 1.6 mW and in EU < 20 mW.

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5.3 Is the completion of this standard is dependent upon the completion of another standard: No **If yes, please explain:**

5.4 Purpose of Proposed Standard: The purpose is to provide an international standard for a short range (ie about human body range), low power and highly reliable wireless communication for use in close proximity to, or inside, a human body. Data rates, typically up to 10Mbps, can be offered to satisfy an evolutionary set of entertainment and healthcare services. Current Personal Area Networks (PAN)s do not meet the medical (proximity to human tissue) and relevant communication regulations for some application environments. They also do not support the combination of reliability (QoS), low power, data rate and noninterference required to broadly address the breadth of body area network applications.

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5.5 Need for the Project: There is a need for a standard optimized for ultra low power devices and operation on, in or around the human body to serve a variety of applications including medical and personal entertainment. Examples of the applications served by the proposed standard are: Electroencephalogram (EEG), Electrocardiogram (ECG), Electromyography (EMG), vital signals monitoring (temperature (wearable thermometer), respiratory, wearable heart rate monitor, wearable pulse oximeter, wearable blood pressure monitor, oxygen, pH value , wearable glucose sensor, implanted glucose sensor, cardiac arrhythmia), wireless capsule endoscope (gastrointestinal), wireless capsule for drug delivery, deep brain stimulator, cortical stimulator (visual neuro-stimulator, audio neuro stimulator, Parkinson's disease, etc…), remote control of medical devices such as pacemaker, actuators, insulin pump, hearing aid (wearable and implanted), retina implants, disability assistance, such as muscle tension sensing and stimulation, wearable weighing scale, fall detection, aiding sport training. This will include body-centric solutions for future wearable computers. In a similar vein, the same technology can provide effective solutions for personal entertainment as well. The existence of a body area network standard will provide opportunities to expand these product features, better healthcare and well being for the users. It will therefore result in economic opportunity for technology component suppliers and equipment manufacturers.

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5.6 Stakeholders for the Standard: The stakeholders include the general population who will be served by advanced medical and entertainment options enabled by this standard. Other parties having interests include medical equipment manufacturers and consumer electronics manufacturers.

Intellectual Property 6.1.a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board? Yes If yes, state date: 2007-09-17 If no, please explain: **6.1.b.** Is the Sponsor aware of any copyright permissions needed for this project? No If yes, please explain: **6.1.c.** Is the Sponsor aware of possible registration activity related to this project? No If yes, please explain:

7.1 Are there other standards or projects with a similar scope? No If yes, please explain: **and answer the following:** Sponsor Organization: Project/Standard Number: Project/Standard Date: 0000-00-00 Project/Standard Title:

7.2 Future Adoptions Is there potential for this standard (in part or in whole) to be adopted by another national, regional, or international organization? Do not know at this time If Yes, the following questions must be answered: Technical Committee Name and Number: **Other Organization Contact Information: Contact person: Contact Email address:**

7.3 Will this project result in any health, safety, security, or environmental guidance that affects or applies to human health or safety? No If yes, please explain:

7.4 Additional Explanatory Notes: (Item Number and Explanation) It is in the best interest of users and the industry to strive for a level of coexistence with other wireless systems, especially those in similar market spaces. Coexistence requirements will be established by the Task Group in cooperation with the 802 TAG on coexistence (802.19) and included in the selection criteria against which the proposals will be evaluated.

8.1 Sponsor Information: Is the scope of this project within the approved scope/definition of the Sponsor's Charter? Yes If no, please explain:

Submit to NesCom | Save and Come Back Later

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Deleted: July, 2007

Deleted: 7

IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	**SG BAN Project Draft 5C**
Date Submitted	[November, 2006]
Source	[Arthur W. Astrin#1, Huan-Bang Li#2, and Ryuji Kohno#2] [#1=Astrin Radio, USA #2=National Institute of Information and Communications Technology (NICT), Japan] [#1=1051 Greenwood Ave.Palo Alto, CA 94301 USA #2=3-4 Hikarino-oka, Yokosuka, Kanagawa, Japan] Voice: [+1-650-704-2517] E-mail: [art@astrinradio.com]
Re:	[In response to the IEEE 802.15 motion to form SG BAN]
Abstract	[Since May 2006, SG BAN has investigated and studied the market requirements, industry needs, and technology feasibility for a body area network alternative for PHY /MAC for IEEE Standard 802.15.4-2006, with the goal to create a Project Authorization Request. This document contains the supporting 5 criteria.]
Purpose	[This document is supporting the submission of the PAR to the P802.15 Working Group]
Notice	
Release	

Deleted: July, 2007
Deleted: 7

IEEE P802.15 Body Area Networks (BAN) Study Group Functional Requirements Standards Development Criteria

The IEEE P802.15.BAN study Group for Body Area Networks (BAN) reviewed and completed the required IEEE Project 802 Functional Requirements, Standards Development Criteria (a. k. a. the Five Criteria). The IEEE P802.15. BAN Five Criteria response is in Italics below.

1. BROAD MARKET POTENTIAL

a) Broad sets of applicability

There is increasing interest in Body Area Networks (BAN).

Examples of applications include body automation, medical monitoring, evolutionary set of healthcare services, medical implants, smart pill, and assistance to people with disability, transmission of body movement from body sensors, security (access/authorization), and entertainment.

Examples of devices include smart implants (cochlea, artificial heart, diabetes monitor and control, auto location for inductive, in-body battery recharging, capsule endoscope), stick-on EKG/ECG, temperature and blood pressure sensors, and other vital signal sensors, interactive medication dispensers, human interface devices (HIDs), wireless headset, and remote controls. With an effective wireless standard, geared to this class of applications, the BAN market potential is hundreds of millions of devices.
The wireless capability will make these devices easier to use and make possible additional functionality and efficiency.

By establishing a globally harmonized standard, the target user base will be large as indicated by the growing demand for wireless connectivity in almost all devices.

b) Multiple vendors and numerous users

The breadth of membership of this BAN study group demonstrates the interest in BAN. Members include international wireless industry leaders, academic researchers, semiconductor manufacturers, system integrators, and end users. Already, there are industry consortiums, such as MAGNET Beyond in EU, Continua in USA, and MICT Consortium in Japan, actively addressing the requirements of ultra low power, reliable data, multi-rate wireless BAN class networks and are promoting the current standard. There are currently at least 3 semiconductor manufacturers providing semiconductor solutions.

c) Balanced costs

The proposed project will be developed with the aim that the connectivity costs will be a reasonably small fraction of the cost of the target devices such as sensors, tags, HIDs, as previously mentioned.

2. COMPATIBILITY

IEEE 802 defines a family of standards. All standards shall be in conformance with IEEE 802.1 Architecture, Management and Interworking. All LLC and MAC standards shall be compatible with ISO 10039, MAC Service Definition, at the LLC/MAC boundary. Within the LLC Working Group there shall be one LLC standard, including one or more LLC protocols with a common LLC/MAC interface. Within a MAC Working Group there shall be one MAC standard and one or more Physical Layer standards with a common

MAC/Physical layer interface. Each standard in the IEEE 802 family of standards shall include a definition of managed objects, which are compatible with OSI systems management standards.

Note: This requirement is subject to final resolution of corrections and revision to current ISO 10039, currently inconsistent with ISO 8802 series standards.

The MAC (Medium Access Control) Layer of the Wireless Body Area Networks (WBAN) Standard will be compatible with the IEEE 802 requirements for architecture, management, and inter-networking as needed.

3. DISTINCT IDENTITY

a) Substantially different from other IEEE 802 standards.

Transmit Power will be substantially lower due to proximity to or within human body.

	Other 802 standards	***BAN***
Configuration	*15.3, 15.4 MAC*	***Single scalable MAC with reliable delivery***
Power consumption	*Low power consumption*	***Extremely low power while communicating to protect human tissue***
Power source	*Conventional power source*	***Compatible with body energy scavenge operation***
Requirements (QoS)	*Low latency*	***Guaranteed and reliable response to external stimuli***
Frequency band	*ISM*	***Regulatory and/or medical authorities approved communication bands for in and around human body***
Channel	*Air*	***Air, vicinity of human body, inside human body***
Safety for human body	*None*	***Required (e.g. SAR)***

b) One unique solution per problem (not two solutions to a problem).

The proposed standard will address a unique solution for body area networks that provide short-range communications, in and around human body, addressing emerging markets such as continuous vital signal monitoring, assistance to people with disabilities, and entertainment oriented applications, with consideration for human body safety.

c) Easy for the document reader to select the relevant specification.

The proposed project will be a clearly distinguishable specification so that users can easily distinguish and select the specifications.

4. TECHNICAL FEASIBILITY

a) Demonstrated system feasibility

Physical layer implementations in the approved frequency bands are well known and well characterized. This provides confidence that this standard will meet the requirements of BAN.

b) Proven technology, reasonable testing

There are examples of technology that exist and are tested today, which will allow design and fabrication of BAN radio systems

c) Confidence in reliability

Existing proprietary products and clinical trials provide confidence in the reliability of the proposed project.

A coexistence assurance document will be submitted to the 802.19 TAG.

5. ECONOMIC FEASIBILITY

a) Known cost factors, reliable data

High volume applications in healthcare services, assistance to people with disability, transmission of body movement from body sensors, and entertainment will provide a low cost source of components. Development efforts for BAN will ensure a cost that is consistent with reasonable business strategy. Existing products indicate cost targets will be easily met.

b) Reasonable cost for performance

Based on test results, prototypes, and production solutions, the estimates meet expected size, cost, and power requirements.

c) Consideration of installation costs

One of the project objectives includes low cost installation with minimal to no operator intervention except for implantable devices.

802.15.6 (BAN) Agenda Item -PAR approval

802.15.6 (BAN) PAR Agenda Item

- 5 comments were received regarding the PAR from two people and one question for clarification was received from another
- 1 comment was received to add the 802.19 required CA statement to the 5C
- PAR comments were editorial and did not change the technical content of the document.
- All the suggested changes were accepted, reaffirmed by the Working Group (70/0/4), and distributed to the EC Reflector on November 14, 2007

802.15.6 (BAN) PAR Agenda Item

Motion:

- Move to forward 15-07-0575-09-0ban-ban-draft-par-doc, in the proper web based form, to NesCom

Moved: Bob Heile

Second: Mike Lynch

Moved: to forward 15-07-0575-09-0ban-ban-draft-par-doc, in the proper web based form, to NesCom
Moved: Heile/Lynch

Passes: 15/0/0

5.04	**ME**	**802.3ba PAR to NESCOM**	**-**	**Grow**	**5**	**01:14 PM**

Close Window Print

Draft PAR Confirmation Number:
Submittal Email: jdambrosia@force10networks.com
Type of Project: PAR for an amendment to an existing Standard 802.3-2005
1.1 Project Number: P802.3ba
1.2 Type of Document: Standard for
1.3 Life Cycle: Full
1.4 Is this project in ballot now? No
1.5 Is the balloting group aware of the PAR modification?
2.1 Title of Standard: IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 40 Gb/s and 100 Gb/s Operation
3.1 Name of Working Group: Ethernet Working Group
Contact information for Working Group Chair Robert M Grow Email: bob.grow@intel.com Phone: 858-679-2077
Contact Information for Working Group Vice Chair David J Law Email: david_law@ieee.org Phone: +44-131-665-7264
3.2 Sponsoring Society and Committee:IEEE Computer Society/Local and Metropolitan Area Networks (C/LM) **Contact information for Sponsor Chair:** Paul Nikolich Email: p.nikolich@ieee.org Phone: 857-205-0050 **Contact information for Standards Representative:** Email: Phone:
3.3 Joint Sponsor:/ () **Contact information for Sponsor Chair:** Email: Phone: **Contact information for Standards Representative:** Email: Phone:

4.1 Type of Ballot: Individual

4.2 Expected Date of Submission for Initial Sponsor Ballot: 2009-11

4.3 Projected Completion Date for Submittal to RevCom: 2010-05

5.1 Approximate number of people expected to work on this project: 80

5.2 Scope of Proposed Standard: Define 802.3 Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of 802.3 format frames at 40 Gb/s and 100 Gb/s.	**Old Scope:**

5.3 Is the completion of this standard is dependent upon the completion of another standard: Yes
If yes, please explain:IEEE Std 802.3-2005 is currently being revised by the IEEE 802.3ay Task Force(IEEE P802.3). Progression of this project to Sponsor ballot will be contingent on the approval of P802.3.

5.4 Purpose of Proposed Standard: The purpose of this project is to extend the 802.3 protocol to operating speeds of 40 Gb/s and 100 Gb/s in order to provide a significant increase in bandwidth while maintaining maximum compatibility with the installed base of 802.3 interfaces, previous investment in research and development, and principles of network operation and management. The project is to provide for the interconnection of equipment satisfying the distance requirements of the intended applications.	**Old Purpose:**

5.5 Need for the Project: The project is necessary to provide a solution for applications that have been demonstrated to need bandwidth beyond the existing capabilities. These include data center, internet exchanges, high performance computing and video-on-demand delivery. Network aggregation and end-station bandwidth requirements are increasing at different rates, and is recognized by the definition of two distinct speeds to serve the appropriate applications.

5.6 Stakeholders for the Standard: Stakeholders identified to date includes but are not limited to: users and producers of systems and components for servers, network storage, networking systems, high performance computing, telecommunications carriers, and multiple system operators (MSOs).

Intellectual Property
6.1.a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board? Yes
If yes, state date: 2007-05-28
If no, please explain:
6.1.b. Is the Sponsor aware of any copyright permissions needed for this project? No
If yes, please explain:
6.1.c. Is the Sponsor aware of possible registration activity related to this project? No
If yes, please explain:

7.1 Are there other standards or projects with a similar scope? No
If yes, please explain:

and answer the following: Sponsor Organization: Project/Standard Number: Project/Standard Date: 0000-00-00 Project/Standard Title:
7.2 Future Adoptions **Is there potential for this standard (in part or in whole) to be adopted by another national, regional, or international organization?** Yes If Yes, the following questions must be answered: Technical Committee Name and Number: ISO/IEC JTC1 SC6 WG1 **Other Organization Contact Information:** **Contact person:** **Contact Email address:** r.tasker@dl.ac.uk
7.3 Will this project result in any health, safety, security, or environmental guidance that affects or applies to human health or safety? No If yes, please explain:
7.4 Additional Explanatory Notes: (Item Number and Explanation)
8.1 Sponsor Information: Is the scope of this project within the approved scope/definition of the Sponsor's Charter? Yes If no, please explain:

Contact the NesCom Administrator

Broad Market Potential (1 of 2)

- **Broad sets of applications**
- **Multiple vendors and numerous users**
- **Balanced cost (LAN versus attached stations)**

- **Bandwidth requirements for computing and core networking applications are growing at different rates, which necessitates the definition of two distinct data rates for the next generation of Ethernet networks in order to address these applications:**
  - Servers, high performance computing clusters, blade servers, storage area networks and network attached storage all currently make use of 1G and 10G Ethernet, with significant growth of 10G projected in ’07 and ’08. I/O bandwidth projections for server and computing applications indicate that there will be a significant market potential for a 40 Gb/s Ethernet interface.
  - Core networking applications have demonstrated the need for bandwidth beyond existing capabilities and the projected bandwidth requirements for computing applications. Switching, routing, and aggregation in data centers, internet exchanges and service provider peering points, and high bandwidth applications, such as video on demand and high performance computing environments, have demonstrated the need for a 100 Gb/s Ethernet interface.

Broad Market Potential (2 of 2)

- **Broad sets of applications**
- **Multiple vendors and numerous users**
- **Balanced cost (LAN versus attached stations)**

- **There has been wide attendance and participation in the study group by end users, equipment manufacturers and component suppliers. It is anticipated that there will be sufficient participation to effectively complete the standardization process.**
- **Prior experience scaling IEEE 802.3 and contributions to the study group indicates:**
  - 40 Gb/s Ethernet will provide approximately the same cost balance between the LAN and the attached stations as 10 Gb/s Ethernet.
  - The cost distribution between routers, switches, and the infrastructure remains acceptably balanced for 100 Gb/s Ethernet.
- **Given the topologies of the networks and intended applications, early deployment will be driven by key aggregation & high-bandwidth interconnect points. This is unlike the higher volume end system application typical for 10/100/1000 Mb/s Ethernet, and as such, the initial volumes for 100 Gb/s Ethernet are anticipated to be more modest than the lower speeds. This does not imply a reduction in the need or value of 100 Gb/s Ethernet to address the stated applications.**

Compatibility

- **IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q, and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802. Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.**

- As an amendment to IEEE Std 802.3, the proposed project will remain in conformance with the IEEE 802 Overview and Architecture as well as the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q.
- As an amendment to IEEE Std 802.3, the proposed project will follow the existing format and structure of IEEE 802.3 MIB definitions providing a protocol independent specification of managed objects (IEEE Std 802.1F).
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- As was the case in previous IEEE 802.3 amendments, new physical layers specific to either 40 Gb/s or 100 Gb/s operation will be defined.
- By utilizing the existing IEEE 802.3 MAC protocol, this proposed amendment will maintain maximum compatibility with the installed base of Ethernet nodes.

Distinct Identity

- **Substantially different from other IEEE 802 standards**
- **One unique solution per problem (not two solutions to a problem)**
- **Easy for the document reader to select the relevant specification**

- The proposed amendment is an upgrade path for IEEE 802.3 users, based on the IEEE 802.3 MAC.
- The established benefits of the IEEE 802.3 MAC include:
  - Deterministic, highly efficient full-duplex operation mode
  - Well-characterized and understood operating behavior
  - Broad base of expertise in suppliers and customers
  - Straightforward bridging between networks at different data rates
- The Management Information Base (MIB) for IEEE 802.3 will be extended in a manner consistent with the IEEE 802.3 MIB for 10 / 100 / 1000 / 10000 Mb/s operation.
- The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.
- Bandwidth requirements for computing and networking applications are growing at different rates. These applications have different cost / performance requirements, which necessitates two distinct data rates, 40 Gb/s and 100 Gb/s.

Technical Feasibility

- **Demonstrated system feasibility**
- **Proven technology, reasonable testing**
- **Confidence in reliability**

- The principle of scaling the IEEE 802.3 MAC to higher speeds has been well established by previous work within IEEE 802.3.
- The principle of building bridging equipment which performs rate adaptation between IEEE 802.3 networks operating at different speeds has been amply demonstrated by the broad set of product offerings that bridge between 10, 100, 1000, and 10000 Mb/s.
- Systems with an aggregate bandwidth of greater than or equal to 100 Gb/s have been demonstrated and deployed in operational networks.
- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
  - The experience gained in the development and deployment of 10 Gb/s technology is applicable to the development of specifications for components at higher speeds. For example, parallel transmission techniques allow reuse of 10 Gb/s technology and testing.
  - Component vendors have presented data on the feasibility of the necessary components for higher speed solutions. Proposals, which either leverage existing technologies or employ new technologies, have been provided.
- The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence. Presentations demonstrating this have been provided.

Economic Feasibility

- **Known cost factors, reliable data**
- **Reasonable cost for performance**
- **Consideration of installation costs**

- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
- Presentations indicate that for the server market and computing applications the optimized rate to provide the best balance of performance and cost is 40 Gb/s. For the network aggregation market and core networking applications, the optimized rate offering the best balance of performance and cost is 100 Gb/s.
- In consideration of installation costs, the project is expected to use proven and familiar media, including optical fiber, backplanes, and copper cabling technology.
- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

Moved: The EC approves the P802.3ba PAR and Five Criteria; and approves the PAR remaining on the December NesCom agenda.
Moved: Grow/Jeffree

Passes: 15/0/0

5.05	**ME**	**802.16i PAR withdrawal**	**-**	**Marks**	**5**	**01:30 PM**

P802.16i PAR Withdrawal

16 November 2007

802.16 Revision PAR

- *The revision will consolidate IEEE Standards 802.16-2004, 802.16e-2005, 802.16-2004/Cor1-2005, and 802.16f-2005 (and possibly 802.16g and **802.16i**, if completed in time) incorporating the P802.16-2004/Cor2 draft*

802.16 WG Motions

- Motion (8:18 pm): “To remand the P802.16i/D6 Draft for inclusion into the Revision Draft P802.16Rev2/D2”, proposed by Phillip Barber, seconded by John Humbert, passed 87/0/0.
- Motion (8:21 pm): “To authorize the Working Group Chair to request the 802 EC that the P802.16i PAR be withdrawn”, proposed by Phillip Barber, seconded by John Humbert, passed 81/0/0.

LMSC Motion

- LMSC Motion: To request the withdrawal of the P802.16i PAR

  Moved: Marks
  Second: Kerry

- EC Vote: Approved 15/0/0

Moved: To request the withdrawal of the 802.16i PAR.
Moved: Marks/Kerry

There was much discussion over the need to fill out a form and present it to the EC in order to allow a PAR to be withdrawn.

Passes: 15/0/0

5.06 ME 802.1X-REV PAR to NESCOM - Jeffree 5 01:32 PM

The PAR Copyright Release and Signature Page must be submitted by FAX to +1-732-875-0695 to the NesCom Administrator.
If you have any questions, please contact the NesCom Administrator.

Once you approve and submit the following information, changes may only be made through the NesCom Administrator.

Draft PAR Confirmation Number: 222380490.24151	
Submittal Email: tony@jeffree.co.uk	
Type of Project: PAR for a revision to an existing Standard 802.1X-2004	
1.1 Project Number: P802.1X	
1.2 Type of Document: Standard for	
1.3 Life Cycle: Full	
1.4 Is this project in ballot now? No	
1.5 Is the balloting group aware of the PAR modification?	
2.1 Title of Standard: Standard for Local and metropolitan area networks - Port-Based Network Access Control	**Old Title:** IEEE Standard for Local and metropolitan area networks - Port-Based Network Access Control
3.1 Name of Working Group: Higher Layer LAN Protocols Working Group(C/LM/WG802.1) **Contact information for Working Group Chair** Anthony A Jeffree tony@jeffree.co.uk **Working Group Vice Chair:** Paul Congdon, **Email:** paul.congdon@hp.com	
3.2 Sponsoring Society and Committee:IEEE Computer Society/Local and Metropolitan Area Networks(C/LM) **Contact information for Sponsor Chair:** Paul Nikolich p.nikolich@ieee.org **Contact information for Standards Representative:**	
4.1 Type of Ballot: Individual	
4.2 Expected Date of Submission for Initial Sponsor Ballot: 2009-07	
4.3 Projected Completion Date for Submittal to RevCom: 2010-07	
5.1 Approximate number of people expected to work on this project: 30	
5.2 Scope of Proposed Standard: For the purpose of providing compatible authentication, authorization, and cryptographic key agreement mechanisms to support secure communication between devices connected by 802 LANs, this standard : a) Specifies a general method for provision of port-based network access control.	**Old Scope:** The scope of this project is the use of the physical access characteristics of IEEE 802 LANs in order to provide a means of authenticating and authorizing devices attached to a LAN port. The reason for revising the standard is to reflect editorial and technical

b) Specifies protocols that establish secure associations for IEEE Std 802.1AE MAC Security c) Facilitates the use of industry standard authentication and authorization protocols.	corrections, and to better facilitate its use in 802.11 Wireless LANs.

5.3 Is the completion of this standard is dependent upon the completion of another standard: No
If yes, please explain:

5.4 Purpose of Proposed Standard: IEEE 802® Local Area Networks (LANs) are deployed in networks that convey or provide access to critical data, support mission critical applications, or charge for service. Protocols that configure, manage, and regulate access to these networks and network based services and applications run over the networks themselves. Port-based network access control regulates access to the network, guarding against transmission and reception by unidentified or unauthorized parties, and consequent network disruption, theft of service, or data loss.	**Old Purpose:** The standard provides common interoperable solutions using standards based authentication and authorization infrastructures already supporting schemes such as dial up access. Revision is needed in order to deal with editorial and technical corrections, and also to reflect changes necessary in the light of deployment in 802.11-based infrastructures.

5.5 Need for the Project: This revision will extend 802.1X to establish security associations for 802.1AE MAC Security in order to facilitate secure communication over publicly accessible LAN/MAN media for which security has not otherwise been defined, and to allow the use of IEEE Std 802.1X, already widespread and supported by multiple vendors, in additional applications.

5.6 Stakeholders for the Standard: Designers, implementers, manufacturers, distributors, and users of local area networking equipment.

Intellectual Property
6.1.a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board? Yes
If yes, state date: 2007-11-12
If no, please explain:
6.1.b. Is the Sponsor aware of any copyright permissions needed for this project? No
If yes, please explain:
6.1.c. Is the Sponsor aware of possible registration activity related to this project? No
If yes, please explain:

7.1 Are there other standards or projects with a similar scope? No
If yes, please explain:
and answer the following: Sponsor Organization:
Project/Standard Number:
Project/Standard Date: 0000-00-00
Project/Standard Title:

7.2 Future Adoptions
Is there potential for this standard (in part or in whole) to be adopted by another national, regional, or international organization? No
If Yes, the following questions must be answered:
Technical Committee Name and Number:
Other Organization Contact Information:

Contact person: **Contact Email address:**
7.3 Will this project result in any health, safety, security, or environmental guidance that affects or applies to human health or safety? No If yes, please explain:
7.4 Additional Explanatory Notes: (Item Number and Explanation) The extent of changes in existing amendment project to 802.1X, P802.1af, will make very extensive changes to the base document, and such changes would be more appropriately made in a revision project. This revision project will adopt all of the changes to 802.1X that have been developed under P802.1af, and the P802.1af project will be withdrawn.

Submit to NesCom Save and Come Back Later

Contact the NesCom Administrator

Moved: to forward the draft PAR for 802.1X-REV, to NesCom, and to withdraw the P802.1af PAR that it replaces.
Moved: Jeffree/Grow

Passes: 15/0/0

5.07	**ME**	**802.1Qaz PAR to NESCOM**	**-**	**Jeffree**	**5**	**01:35 PM**

The PAR Copyright Release and Signature Page must be submitted by FAX to +1-732-875-0695 to the NesCom Administrator.
If you have any questions, please contact the NesCom Administrator.

Once you approve and submit the following information, changes may only be made through the NesCom Administrator.

Draft PAR Confirmation Number: 217486162.6204
Submittal Email: pthaler@broadcom.com
Type of Project: PAR for an amendment to an existing Standard 802.1Q-2005
1.1 Project Number: P802.1Qaz
1.2 Type of Document: Standard for
1.3 Life Cycle: Full
1.4 Is this project in ballot now? No
1.5 Is the balloting group aware of the PAR modification?
2.1 Title of Standard: IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks - Amendment: Enhanced Transmission Selection for Bandwidth Sharing Between Traffic Classes
3.1 Name of Working Group: Higher Layer LAN Protocols Working Group
Contact information for Working Group Chair Tony A Jeffree Email: tony@jeffree.co.uk Phone: +44-161-973-4278
Contact Information for Working Group Vice Chair Paul Congdon Email: paul.congdon@hp.com Phone: 916-785-5753
3.2 Sponsoring Society and Committee: IEEE Computer Society/Local and Metropolitan Area Networks (C/LM) **Contact information for Sponsor Chair:** Paul Nikolich Email: p.nikolich@ieee.org Phone: 857-205-0050 **Contact information for Standards Representative:** Email: Phone:
3.3 Joint Sponsor:/ () **Contact information for Sponsor Chair:** Email: Phone: **Contact information for Standards Representative:** Email: Phone:
4.1 Type of Ballot: Individual

4.2 Expected Date of Submission for Initial Sponsor Ballot: 2009-01	
4.3 Projected Completion Date for Submittal to RevCom: 2009-05	
5.1 Approximate number of people expected to work on this project: 80	
5.2 Scope of Proposed Standard: This standard specifies enhancement of transmission selection to support allocation of bandwidth amongst traffic classes. When the offered load in a traffic class doesn't use its allocated bandwidth, enhanced transmission selection will allow other traffic classes to use the available bandwidth. The bandwidth-allocation priorities will coexist with strict priorities. It will include managed objects to support bandwidth allocation.	**Old Scope:**
5.3 Is the completion of this standard is dependent upon the completion of another standard: No **If yes, please explain:**	
5.4 Purpose of Proposed Standard: Networks prioritize traffic to provide different service characteristics to traffic classes. It is desirable to be able to share bandwidth between priorities carrying bursty high offered loads rather than servicing them with strict priority while allowing strict priority for time-sensitive and management traffic requiring minimum latency. Also, when traffic at a priority level doesn't use its allocation, it is desirable to allow other priorities to use that bandwidth. For example, IEEE P802.1Qau will specify congestion management. Congestion managed traffic classes can share a network with traditional best effort LAN classes. Enhanced transmission selection will provide uniform management for the sharing of bandwidth between congestion managed classes and traditional classes on a single bridged network. Priorities using enhanced transmission selection will coexist with priorities using 802.1Qav queuing for time-sensitive streams.	**Old Purpose:**
5.5 Need for the Project: There is significant customer interest and market opportunity for Ethernet as a consolidated Layer 2 solution in high-speed networks such as data centers, backplane fabrics, single and multi-chassis interconnects, computing clusters and storage networks. The differing service needs of applications supported on a consolidated Ethernet are supported by separate traffic classes. These applications often provide bursty loads for large transfers. Support of these classes on the same links requires the ability to allocate a guaranteed share of bandwidth to each class and to allow classes with offered load to fully utilize bandwidth when offered load for another class doesn't require its full share of bandwidth. Use of a consolidated network will realize operation and equipment cost benefits. This project allows a uniform management of bandwidth allocation between classes.	
5.6 Stakeholders for the Standard: Developers and users of networking for data center environments including networking IC developers, switch and NIC vendors, and users.	

Intellectual Property
6.1.a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board? Yes
If yes, state date: 2007-07-16
If no, please explain:
6.1.b. Is the Sponsor aware of any copyright permissions needed for this project? No
If yes, please explain:
6.1.c. Is the Sponsor aware of possible registration activity related to this project? No
If yes, please explain:

7.1 Are there other standards or projects with a similar scope? Yes
If yes, please explain: IEEE P802.1Qav is adding a transmission selection mechanism for traffic shaping of bandwidth limited streams that have a reserved bandwidth allocation. Its traffic shaping constrains the managed class to use only its allocation regardless of the bandwidth use by other classes and spaces intervals between packets in the class. The transmission selection in this PAR is intended to allow bandwidth allocation amongst traffic types while allowing traffic in one class to use bandwidth unused by the offered load in other classes without traffic shaping constraints. This is suitable for carrying bursty traffic at high data rates.
and answer the following: Sponsor Organization: IEEE 802
Project/Standard Number: IEEE P802.1Qav
Project/Standard Date: 2007-02-27
Project/Standard Title:Forwarding and Queuing Enhancements for Time-Sensitive Streams

7.2 Future Adoptions
Is there potential for this standard (in part or in whole) to be adopted by another national, regional, or international organization? No
If Yes, the following questions must be answered:
Technical Committee Name and Number:
Other Organization Contact Information:
Contact person:
Contact Email address:

7.3 Will this project result in any health, safety, security, or environmental guidance that affects or applies to human health or safety? No
If yes, please explain:

7.4 Additional Explanatory Notes: (Item Number and Explanation)

8.1 Sponsor Information:
Is the scope of this project within the approved scope/definition of the Sponsor's Charter? Yes
If no, please explain:

Submit to NesCom   Save and Come Back Later

Contact the NesCom Administrator

Proposal to generate a PAR for Enhanced Transmission Selection
Sept 2007

Background

- Priorities/classes are being used to separate traffic with different QOS characteristics
- It is desirable to enable sharing network bandwidth between classes
- For example best effort traffic and congestion controlled traffic
  - Neither class should be able to lock the other out of network access so strict priority shouldn't apply
  - Each class should be able to have a share of network bandwidth allocated to it.
  - Without the ability to share bandwidth between "equally deserving" classes of service, it may be difficult to deploy such classes.
- Some classes of service such as management and voice/video streams may continue to need strict priority over others
  - Provides for lowest latency
  - Most appropriate for traffic that is bandwidth limited by design or reservation hence these classes can also follow bandwidth allocations to avoid starvation of lower priority traffic classes.

Objectives

- Applicable to both end node and bridge ports
- Provide for some strict priority classes
  - Including those using 802.1Qav
  - Consider including configuration of bandwidth allocation and monitoring for these classes
- Provide for a set of classes with each class allocated a share of remaining bandwidth (i.e. the bandwidth not used by the strict priority classes)
  - E.g. Weighted Fair Queuing (WFQ) or Deficit Weighted Round Robin (DWRR)
- Provide managed objects to configure shares/weights without dictating implementation architecture.

PAR Fields

Amendment Title: Enhanced Transmission Selection for Bandwidth Sharing Between Traffic Classes

Scope: This standard specifies enhancement of transmission selection to support allocation of bandwidth amongst traffic classes. When the offered load in a traffic class doesn't use its allocated bandwidth, enhanced transmission selection will allow other traffic classes to use the available bandwidth. The bandwidth-allocation priorities will coexist with strict priorities. It will include managed objects to support bandwidth allocation.

Purpose: Networks prioritize traffic to provide different service characteristics to traffic classes. It is desirable to be able to share bandwidth between priorities carrying bursty high offered loads rather than servicing them with strict priority while allowing strict priority for time-sensitive and management traffic requiring minimum latency. Also, when traffic at a priority level doesn't use its allocation, it is desirable to allow other priorities to use that bandwidth. For example, IEEE P802.1Qau will specify congestion management. Congestion managed traffic classes can share a network with traditional best effort LAN classes. Enhanced transmission selection will provide uniform management for the sharing of bandwidth between congestion managed classes and traditional classes on a single bridged network. Priorities using enhanced transmission selection will coexist with priorities using 802.1Qav queuing for time-sensitive streams.

Need for Project: There is significant customer interest and market opportunity for Ethernet as a consolidated Layer 2 solution in high-speed networks such as data centers, backplane fabrics, single and multi-chassis interconnects, computing clusters and storage networks. The differing service needs of applications supported on a consolidated Ethernet are supported by separate traffic classes. These applications often provide bursty loads for large transfers. Support of these classes on the same links requires the ability to allocate a guaranteed share of bandwidth to each class and to allow classes with offered load to fully utilize bandwidth when offered load for another class doesn't require its full share of bandwidth. Use of a consolidated network will realize operation and equipment cost benefits. This project allows a uniform management of bandwidth allocation between classes.

Stakeholders: Developers and users of networking for data center environments including networking IC developers, switch and NIC vendors, and users.

Five Criteria

1. Broad Market Potential

A standards project authorized by IEEE 802 shall have a broad market potential. Specifically, it shall have the potential for:

a) Broad sets of applicability.

Bandwidth sharing amongst classes is important to allow support for data storage, clustering, and backplane fabrics. These applications often use bursty large data transfers on high speed links so that offered load is highly variable. Enhanced transmission selection will allow deployment of traffic classes to segregate traffic needing differing service characteristics while sharing network bandwidth amongst the classes.

Due to the bursty nature of this traffic, there will be times when a traffic class does not use its allocation while other classes are providing more offered load than their allocation. In this case, enhanced transmission selection will allow classes to use bandwidth unused by the other classes.

Enhanced transmission selection will allow the traffic classes to co-exist, thus enabling network consolidation.

b) Multiple vendors and numerous users

Many switches and end nodes for data centers already support proprietary implementations of bandwidth allocation amongst classes. It is expected that this standard will provide a framework for management of that bandwidth allocation that will be compatible with a range of current switch and NIC architectures.

c) Balanced costs (LAN versus attached stations)

The introduction of enhanced transmission selection is not expected to materially alter the balance of costs between end stations and bridges. Significant equipment and operational cost savings are expected as compared to the use of separate networks for traditional LAN connectivity and for loss/latency sensitive applications.

2. Compatibility

IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802. Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.

The proposed standard will be an amendment to 802.1Q, and will interoperate and coexist with all prior revisions and amendments of the 802.1Q standard.

The enhanced transmission selection will be compatible with strict priority classes including those using P802.1Qav queuing for time sensitive traffic.

The proposed amendment will contain MIB modules, or additions to existing MIB modules, to provide management operations for any configuration required together with performance monitoring for both end stations and bridges.

3. Distinct Identity

Each IEEE 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

a) Substantially different from other IEEE 802 standards.

IEEE Std 802.1Q is the sole and authoritative specification for priority aware Bridges and their participation in LAN protocols. No other IEEE 802 standard addresses transmission selection in bridges and end nodes.

b) One unique solution per problem (not two solutions to a problem)

Currently strict priority is the only transmission selection mechanism in the IEEE 802 specification. P802.1Qav is adding a transmission selection mechanism for traffic shaping which constrains the managed class to use only its allocation regardless of use of bandwidth by other classes and spaces intervals between packets in the class. This proposal is the only solution to the problem of allowing bandwidth allocation amongst traffic types while allowing traffic in one class to use bandwidth unused by the offered load in other classes and without the shaping constraints.

c) Easy for the document reader to select the relevant specification.

IEEE Std 802.1Q is the natural reference for transmission selection, which will make the capabilities added by this amendment easy to locate.

4. Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

a) Demonstrated system feasibility.

Similar techniques are widely deployed as proprietary enhancements in Ethernet bridge and end node products today as well as in other networking technologies, such as InfiniBand. The proposal is a natural extension of the transmission selection capability defined in IEEE Std. 802.1Q and widely deployed in bridge products.

b) Proven technology, reasonable testing.

The technique of this proposal has been proven in real world deployments of Ethernet, InfiniBand, and other networking technologies. These techniques have been shown to be reasonably testable.

c) Confidence in reliability.

The techniques of the proposal have been proven reliable in real-world deployments of Ethernet, InfiniBand, and other networking technologies.

d) Coexistence of 802 wireless standards specifying devices for unlicensed operation. Not applicable.

5. Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated), for its intended applications. At a minimum, the proposed project shall show:

a) Known cost factors, reliable data.

The proposed amendment will retain existing cost characteristics of bridges including simplicity of queue structures and will not require maintenance of additional queues or queue state beyond the existing per traffic class (priority) queues for conformance to either its mandatory or optional provisions.

The proposed amendment may require some functions, specifically the distribution of bandwidth to queues not practical for some existing and otherwise conformant bridge and end node implementation architectures. However these functions are performed by many existing bridges and end nodes with known implementation costs.

b) Reasonable cost for performance.

The proposed technology will reduce overall costs where separate networks are currently required by enabling the use of consolidated network.

c) Consideration of installation costs.

Installation costs of VLAN Bridges or end stations are not expected to be significantly affected; any increase in network costs is expected to be more than offset by a reduction in the number of separate networks required. The proposed amendment is expected to reduce installation costs by providing a uniform management for transmission selection.

Moved: to forward the draft PAR for 802.1Qaz to NesCom.
Moved: Jeffree/Grow

Passes: 13/0/1

5.08	**ME**		**-**			
5.09	**ME**		**-**			
5.10	**ME**	**Conditional approval of 802.11k to REVCOM**	**-**	**Kerry**	**10**	**01:37 PM**

IEEE P802.11
Wireless LANs

802.11k Conditional REVCOM Report

Date: 2007-11-14

Author(s):

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Abstract

This is the report to be submitted to the 802 Executive Committee, documenting that the recirculation ballot on 802.11k draft 12 will meet all the requirements of conditional approval to forward to REVCOM.

This report to the 802 Executive Committee documents the conditions in Clause 19, as they apply to the final sponsor ballot recirculation ballot on draft 9.0 of 802.11k.

From the 802 LMSC Policies and Procedures, Clause 19:

Conditions:
a) Recirculation ballot is completed. Generally, the recirculation ballot and resolution should occur in accordance with the schedule presented at the time of conditional approval.
b) After resolution of the recirculation ballot is completed, the approval percentage is at least 75% and there are no new DISAPPROVE votes.
c) No technical changes, as determined by the Working Group Chair, were made as a result of the recirculation ballot.
d) No new valid DISAPPROVE comments on new issues that are not resolved to the satisfaction of the submitter from existing DISAPPROVE voters.
e) If the Working Group Chair determines that there is a new invalid DISAPPROVE comment or vote, the Working Group Chair shall promptly provide details to the EC.
f) The Working Group Chair shall immediately report the results of the ballot to the EC including: the date the ballot closed, vote tally and comments associated with any remaining disapproves (valid and invalid), the Working Group responses and the rationale for ruling any vote invalid.

a) **Sponsor Ballot Open Date: 2007-07-11**
Sponsor Ballot Close Date: 2007-08-13

89	**Approve**
10	**Disapprove**
5	**Abstain**
104	**Total**

90% Affirmative

1st Recirculation Sponsor Ballot Open Date: 2007-9-24
1st Recirculation Sponsor Ballot Close Date: 2007-10-4

91	**Approve**
11	**Disapprove**
5	**Abstain**
107	**Total**

89% Affirmative

b) APPROVAL RATE

After resolution of the recirculation ballot is completed, the approval percentage is at least 75% and there was one new DISAPPROVE votes that has been satisfied.

91 affirmative votes

11 negative votes with comments
107 votes = 89.2% affirmative

c) There were resolved technical changes as a result of the recirculation ballot.
d) There was one new DISAPPROVE voter on new issues that are now resolved to the satisfaction of the submitter from existing DISAPPROVE voters.
e) There was one new DISAPPROVE vote.
f) The disapprove-voter comments for 11k 1st Recirculation Sponsor Ballot are attached:

Cl **00** *SC* **0** *P* *L* # 1

Stephens, Adrian P Individual

Comment Type **T** *Comment Status* **A**

Subclause 3.168b - This is a horribly confusing definition. That aside, what is the "n" in this definition?

SuggestedRemedy

Define or constrain the range of n.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r0 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **05** *SC* **5.2.7.2** *P* *L* # 2

Stephens, Adrian P Individual

Comment Type **G** *Comment Status* **A**

"pseudo-periodically" - ug. If "pseudo-" adds any value, define this term, otherwise remove it.

SuggestedRemedy

Remove "pseudo-"

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.3.2.22.8** *P* *L* # 3

Stephens, Adrian P Individual

Comment Type **E** *Comment Status* **R**

Figure 7-68j. I have to contratulate this group on finding yet another way to express a frame format.

SuggestedRemedy

Seeing as you need a table, define the structure in the table, rather than requiring a figure and a table.

Response *Response Status* **C**

REJECT.

The issue is not the % of wireless capacity or STA capacity used by radio measurements, it is to consider each STA's service load, power state and operating conditions. The AP has to consider traffic load and application requirements, regulatory requirements and specific measurement states from every STA in support of wireless network management. Guidelines and limits would have to consider regulatory requirements like 4 msec carrier sense and the detection of one microsecond radar pulses in Japan. There are no typical scenarios that describe 802.11 operation in all bands in most circumstances. Off-channel measurements are desireable to gather timely information about which channel to switch BSS operation to, and the noiser the operating environment, the more urgent the need for radio measurements off the serving channel. In any case, the STA can refuse any measurement request. We are unable to support a limit to measurements which precludes ' normal' 802.11 operation in a noisy environment, where collisions cause many retries.

Cl **07** *SC* **7.3.2.37** *P* *L* # 4

Stephens, Adrian P Individual

Comment Type **E** *Comment Status* **A**

"sub-elemetns" - please run the speelung chocker.

SuggestedRemedy

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **4**

Cl **11** *SC* **11.3** *P* *L* # 5

Stephens, Adrian P Individual

Comment Type **T** *Comment Status* **A**

"Action: Within an infrastructure BSS, action frames are class 3 except for Action frames with Category field equal to Radio Measurement and Action field equal to Measurement Pilot."
An Action frame is not a control frame - wrong subtype.

SuggestedRemedy

Remove this bullet item.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2 and section 5, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **11** *SC* **11.10.3** *P* *L* # 6

Stephens, Adrian P Individual

Comment Type **G** *Comment Status* **A**

"Maximum Measurement Duration in TUs = 2 ^ (dot11MaximumMeasurementDuration - 4) * TBTT"
Most, but not all, people will know ^ means exponentiation.

SuggestedRemedy

Either define this operator or use superscript to show the exponent.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor to use superscript.

Cl **11** *SC* **11.10.7** *P* *L* # 7

Stephens, Adrian P Individual

Comment Type **E** *Comment Status* **A**

The uncaptioned figure in this subclause is a mess. Why the big and little arrows? Why no caption? The text appears to be a low resolution font.

SuggestedRemedy

Redraw and add a caption.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.13** *P* *L* # 8

Stephens, Adrian P Individual

Comment Type **E** *Comment Status* **A**

"<mu>sec" - not the correct abbreviation (can't quote <mu> directly due to limitation of this tool)

SuggestedRemedy

should be <mu>s

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **00** *SC* **0** *P* *L* # 9

Stephens, Adrian P Individual

Comment Type **E** *Comment Status* **A**

General - Figure numbering of Figure 7-68la using "a" as an "insertion after" causes problems.

SuggestedRemedy

Use alternating letters and numbers e.g. Figure 7-68l1 (ell, one)
Make similar changes throughout where necessary to table and figure numbers.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1** *P* **85** *L* **35** # 10

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: There are, what I consider to be, several errors in the submission 07/2285r0. They are:
1. RRM Capability Enabled Bitmask element is not present in Beacon frames (but is present in Probe Response frames)
2. First sentence in clause 7.3.2.45 gives incorrect length (4) of this element. Length should be 6 octets.
3. There is a <tbd> in notes for measurement pilot capability.
4. Definitions for new MIB table entries are undefined.

SuggestedRemedy

1. Add the element to the beacon frame.
2. Change the text.
3. Fix TBD or provide an editing instruction.
4. Supply text for new MIB variables.

Response *Response Status* **C**

ACCEPT.

WITHDRAWN by commenter

Cl **04** *SC* **4** *P* **3** *L* **30** # 11

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: Resolution to CID 83 proposes changing frame subtype of Measurement Pilot to an Action frame. The problem with this is that a STA's MAC can which is looking for a MP frame can no longer filter based on frame subtype; the STA's MAC now has to accept all action frames and parse the category and action fields to determine whether it is the MP frame. Moreover, since MPs are transmitted to the broadcast destination MAC address, all STAs must receive and process them (at least as far as to delete them after some parsing) even when they are not interested in them. This is inefficient.

SuggestedRemedy

Re-instate old subtype.

Response *Response Status* **C**

ACCEPT.

WITHDRAWN by commenter

Cl **04** *SC* **4** *P* **3** *L* **30** # 12

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: Resolution to CID 83 provides a definition of "3.999k Virtual AP Set" which is un-intelligible. If it is really this complicated, an example should be provided.

SuggestedRemedy

Simplify the definition.

Response *Response Status* **C**

ACCEPT.

WITHDRAWN by commenter

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **12**

Cl **07** *SC* **7.2.3.1** *P* **9** *L* **9** # 13

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: Although I agree with the intent of the resolution to CID 85 (that is, reducing beacon bloat), the proposed resolution conditionally and dynamically adds and removes information elements to beacon frames. This un-necessarily complicates beacon generation. To my knowledge, this has never been done (with the exception of CSA--which has a very different use case) and could possible break some STA implementations.

SuggestedRemedy

Define a MIB variable which allows these elements to be conditionally used in the beacon dependent on whether the MIB variable is true or false. This allows the elements in the beacon to be statically present. I suspect there are other solutions which have a similar characteristic.

Response *Response Status* **C**

ACCEPT.

WITHDRAWN by commenter

Cl **07** *SC* **7.3.2.43** *P* **53** *L* # 14

Hart, Brian D Individual

Comment Type **ER** *Comment Status* **A**

Daves: CID 84 refers to 07/2327r2 wherein the phrase "AC category" is used in several places. The term AC (from IEEE 802.11-2007 clause 4) means access category. Therefore the phrase "AC category" can be translated to "access category category" which is redundant.

SuggestedRemedy

Delete the word "category" wherever the referenced phrase occurs.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.43** *P* **53** *L* # 15

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: CID 84 refers to 07/2327r2 wherein the text states, "An Available Admission Capacity value of 0 transmitted in the BSS Available Admission Capacity element indicates that no admission capacity is available at the calculation time and that no explicit admissions will be granted by the AP for that UP or AC category at the calculation time." This is meaningless since the non-AP STA has no way of knowing the "calculation time".

SuggestedRemedy

Delete these two sentences since the final paragraph stating, "Note: STAs are advised that requesting admission for any TSPEC at an UP or AC which requires more medium time than is reported as available for the requested UP or AC is possible yet unlikely to be successful." suffices.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P121L15 replace second "at the calculation time" with "unless additional capacity subsequently becomes available"..

Cl **All** *SC* **All** *P* **1** *L* **1** # 16

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

There are technical problems with the draft: e.g. P2L17, ANPI definition has "but" yet this should be "and" or ","

SuggestedRemedy

Fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Replace ", i.e.,…." with "as defined by three simultaneous conditions: 1) the Virtual CS mechanism indicates idle chanel, 2) the STA is not transmitting a frame, and 3) the STA is not receiving a frame."

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **16**

Cl **03** *SC* **3.79a** *P* **2** *L* **33** # 17
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

", includes"

SuggestedRemedy

"; includes"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **05** *SC* **5.2.7** *P* **4** *L* **20** # 18
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

request/response

SuggestedRemedy

request/report. Ditto response-only -> report-only

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **05** *SC* **5.2.7.5** *P* **5** *L* **27** # 19
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"CCA indicates idle"

SuggestedRemedy

Inconsistent with 11.10.8.4

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change "when CCA indicates idle" to "when virtual carrier sense indicates idle and the STA is neither transmitting nor receiving a frame"

Cl **07** *SC* **7.2.3.1** *P* **8** *L* **44** # 20
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Re reducing beacon bloat, we have done "X is present if Y and if Z" for the new 11k elements

SuggestedRemedy

Change to "X is present if Y and if Z. X can be present if Y" for the new 11k elements.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 1, wherein valueless elements may now be optionally removed

Cl **07** *SC* **7.2.3.1** *P* **8** *L* **44** # 21
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Measurement Pilot element not present in the beacon

SuggestedRemedy

Add to the beacon

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **21**

Cl **07** *SC* **7.3.2** *P* **14** *L* **38** # 22
Hart, Brian D Individual

Comment Type **ER** *Comment Status* **A**

Editors note is outdated

SuggestedRemedy

Remove

Response *Response Status* **C**

ACCEPT.

.

Cl **07** *SC* **7.3.2.21** *P* **17** *L* **5** # 23
Hart, Brian D Individual

Comment Type **T** *Comment Status* **A**

should

SuggestedRemedy

is

Response *Response Status* **C**

ACCEPT.

.

Cl **07** *SC* **7.3.21.4** *P* **19** *L* **26** # 24
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Remove "only" and make singular

SuggestedRemedy

Change to "The optional sub-element defined is the Vendor Specific subelement &. The VS subelement has the same format as the corresponding element"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.21.5** *P* **20** *L* **4** # 25
Hart, Brian D Individual

Comment Type **ER** *Comment Status* **A**

Here and elsewhere in 7.3.2.21.x and 7.3.2.21.x, subelement format should precede subelement description. Refer to a common subelement format diagram.

SuggestedRemedy

Move the "The only optional & VS sub-element" to be after "Any optional & non-decreasing & ID". At least 5 occurrences. If not present already, add at the para start ""The format of the optional sub-lements is shown in Figure xxx." Use a common figure for all of section 7.3.2.21 and .22.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.21.6** *P* **21** *L* **22** # 26
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Bit labels are wrong

SuggestedRemedy

B5-B7 at top; 5 and 3 at bottom

Response *Response Status* **C**

ACCEPT.

.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **26**

Cl **07** *SC* **7.3.2.21.10** *P* **29** *L* **17** # 27

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Triggered Reporting field is separate .

SuggestedRemedy

Merge diagrams 7062ib and j. Delete line "The Triggered Reporting field & Fig 7-62j"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22** *P* **31** *L* **37** # 28

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Also line 39. is -> are

SuggestedRemedy

is -> are, 2x

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.7** *P* **38** *L* **11** # 29

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

defined _ _ an (double space)

SuggestedRemedy

Convert to single space

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.9** *P* **48** *L* **33** # 30

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Azimuth Report is 2 octets

SuggestedRemedy

1 -> 2

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

based on discussion in 07/2661r2: 157

Cl **07** *SC* **7.3.2.36** *P* **53** *L* **36** # 31

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"to find an AP" is ambiguous

SuggestedRemedy

Change to "to find an AP other than itself"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Add new 11.10.14 AP Channel Report: "The AP Channel Report element contains a list of channels in a regulatory class where a STA is likely to find an AP, excluding the AP transmitting the AP Channel Report. An AP Channel Report element only includes channels that are valid for the regulatory domaine in which the AP transmitting the element is operating and consistent with the Country element in the frame in which it appears. One AP Channel Report element is included in the Beacon frame for each regulatory domain which includes channels on which a STA is likely to find an AP.

The contents of the AP Channel Report elements may be compiled from the list of unique regulatory/channel pairs found in the Neighbor Report. The contents of the AP channel report may be configured or obtained by other means beyond the scope of this specification." P53L37: add new sentence "See 11.10.14 for details." Delete P54L8&9 as this is now part of 11.10.14.

Cl **07** *SC* **7.3.2.37** *P* **56** *L* **1** # 32

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

"elemetns"

SuggestedRemedy

Fix typo

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.37** *P* **56** *L* **25** # 33

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Make MPI sub-element same as MPTI element. This has MBSSID as a subelement.

SuggestedRemedy

Delete MBSSID as a subelement. Delete definition of mpi subelement and replace by definition of MPTI subelement as same as MPTI element.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **07** *SC* **7.3.2.40** *P* **59** *L* **27** # 34

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

The antenna ID field is used in the MeasRep, not the antenna element.

SuggestedRemedy

Move this descriptive text elsewhere; e.g. create an antenna ID field description.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The Antenna Information element is defined only in one place and contains the definition of the Antenna ID field, which is also defined only in one place. Moving the field description to another new paragraph would not change the draft in any way and editorially is not the most compact solution. All references to Antenna Information or Antenna ID should be made to 7.3.2.40. There are errors in the draft. P69L44&47 change "7.3.2.30" to "7.3.2.40". P98L39&43: change "7.3.2.29" to"7.3.2.40".

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **34**

Cl **07** *SC* **7.3.2.41** *P* **60** *L* **1** # 35
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Not really "units"

SuggestedRemedy

Replace by "0.5 dB steps"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change "units" to "steps" (two times in this subclause)

Cl **07** *SC* **7.3.2.42** *P* **60** *L* **30** # 36
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

No text for MBSSID element

SuggestedRemedy

Insert "If present, the multiple BSSID element indicates the range of BSSIDs of the Virtual AP Set that the Measurement Pilot is transmitted on behalf of."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **07** *SC* **7.3.2.44a** *P* **64** *L* **40** # 37
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"=0 and =1 must be complementary conditions. Bitpos 3, 4,6,9,17,18 are not.

SuggestedRemedy

Rewrite to be complementary. E.g. "=0 otherwise" throughout table

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See 2665/r2

Cl **07** *SC* **7.3.2.44a** *P* **65** *L* **26** # 38
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Beacon Req/Rep is silent on "Reporting Detail". More gneerally, how does this table extend if extra options are added.

SuggestedRemedy

Rewrite language to indicate that support is for non-optional features/subelements, & explicitly note if this is not the case. Add an extra bit for Reporting Detail? Also Azimuth in LCI?

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

RRM Capability Bitmask is redefined as an octet string and is extensible. Beacon Req/Rep reporting detail and Azimuth are now included in the bitmask. See 07/2665r2.

Cl **07** *SC* **7.3.2.44a** *P* **65** *L* **18** # 39
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Tie description to MIB variables where they exist

SuggestedRemedy

e.g. refer to dot11TableBeacon MeasurementEnabled

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See document 07/2665r2.

Cl **07** *SC* **7.3.2.44a** *P* **65** *L* **43** # 40

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

"as described in" for bitpos 15,16

SuggestedRemedy

See x2

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.44a** *P* **66** *L* **6** # 41

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **R**

Does MIB support need to be sent over the air? Most users will be over the wire.

SuggestedRemedy

Delete from table

Response *Response Status* **C**

REJECT.

. Accept that this bit is not needed but defined for completeness.

Cl **07** *SC* **7.3.2.44a** *P* **66** *L* **15** # 42

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Maximum Measurement Duration is for the serving channel.

SuggestedRemedy

First and foremost Maximum Measurement Duration should be for off-channel measurements. Probably we are best off with off-channel and on-channel durations.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Two durations are now defined. Bitmask:20-22 for on channel and BitMask:42-45 for off channel Measurements. See 07/2665r2.

Cl **07** *SC* **7.3.2.44a** *P* **66** *L* **25** # 43

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

There are no enables for 11k measurements in the beacon & probeReq

SuggestedRemedy

Add an enable for AP-side measurements so the AP has parity with the client

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See resolution details in 07/2665r2

Cl **07** *SC* **7.4.6** *P* **67** *L* **28** # 44

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

11y is creating an Action Category of value Public. MPs belong in this category.

SuggestedRemedy

Move MPs to Public action frames. Change 7.4.6.7, 11.3 to suit

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **07** *SC* **7.4.6.3** *P* **69** *L* **9** # 45

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

"Transmit Power element"

SuggestedRemedy

Change to field

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **45**

Cl **07** *SC* **7.4.6.3** *P* **69** *L* **9** # 46

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

7.3.1.22 doesn't exist

SuggestedRemedy

Update reference

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.4.6.3** *P* **69** *L* **13** # 47

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

7.3.1.21 doesn't exist

SuggestedRemedy

Update reference

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.4.6.4** *P* **69** *L* **49** # 48

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"in dBm"

SuggestedRemedy

Change to "in a dBm scale"

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.4.6.4** *P* **70** *L* **49** # 49

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"in dBm"

SuggestedRemedy

Change to "in a dB scale"

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.4.6.5** *P* **70** *L* **11** # 50

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Allow VS elements to be added

SuggestedRemedy

Allow VS elements to be added, here and clause 10

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 3

Cl **07** *SC* **7.4.6.7** *P* **71** *L* **11** # 51

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Style error

SuggestedRemedy

Change last field to "Optional sub-elements"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **51**

Cl **10** *SC* **10.3.2.2.2** *P* **74** *L* **38** # 52

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Bad MIB variable

SuggestedRemedy

Change dot11MPRxEn to dot11MeasurementPilotCapability. Search other examples of dot11MPRxEn & appropriately replace

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Also define MeasPiltCapab in the MIB.

Cl **10** *SC* **10.3.31.1.2** *P* **94** *L* **19** # 53

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"MIB table dot11RRMNeighRepTab"

SuggestedRemedy

What if Annex Q is not implemented? Rplace by appropriate text

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

In 10.3.31.3.2, delete "derived from the MIB table dot11RRMNeighborReportTable"

Cl **10** *SC* **10.3.32.1.1** *P* **96** *L* **36** # 54

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

path loss, the

SuggestedRemedy

Change to "pathloss and the"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **10** *SC* **10.3.32.2.2** *P* **97** *L* **43** # 55

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Underlining not necessary

SuggestedRemedy

Don't underline.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1.3** *P* **99** *L* **24** # 56

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

"vallue"

SuggestedRemedy

value

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1.3** *P* **99** *L* **24** # 57
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Replace dott11MPRxEn by dot11MPCapablity

SuggestedRemedy

Replace dott11MPRxEn by dot11MPCapablity

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Refer to 07/2665r2.

Cl **11** *SC* **11.1.3** *P* **99** *L* **30** # 58
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

In the industry, the Request element is deprecated except for FH parameters since the extra computation slows down probe responses & it is insecure. Also this text does not belong in 11.1.3 which refers to sync. Its application to NeighRep is undefined since that is many IEs not just 1.

SuggestedRemedy

Best to just delete this note.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Add APChanReport, BSSAvgAccessDelay, AntennaInfromation, BSSAvailAdmissCapacity, and BssAccessDelay to Probe Response as optional elements. Delete reference to elements in note at P99L30. Add listed elements to BSSDescriptionTable in Section 10.

Cl **11** *SC* **11.10.3** *P* **103** *L* **32** # 59
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

^ is ambiguous since is can be power or xor; also TBTT should be beacon period

SuggestedRemedy

Choose a non-ambiguous notation or define. Change ot beacon period

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The operation is obvious from the context. Table 178 in the base standard uses this operator for exponentiation. Fixed TBTT to Beacon Period.

Cl **11** *SC* **11.10.3** *P* **104** *L* **24** # 60
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Don't compare against dot11MaxMEasDur.

SuggestedRemedy

Compare against MaxMeasDuration in TU from equation

Response *Response Status* **C**

ACCEPT.

. Changed as recommended.

Cl **11** *SC* **11.10.3** *P* **104** *L* **36** # 61
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Create two MaxMeasDuration's: one on-channel; one off-channel.

SuggestedRemedy

Create two MaxMeasDuration's: one on-channel; one off-channel.

Response *Response Status* **C**

ACCEPT.

. Two durations are now defined. Bitmask:20-22 for on channel and BitMask:42-45 for off channel Measurements. See 07/2665r2.

Cl **11** *SC* **11.10.5** *P* **106** *L* **29** # 62

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Actual Measurement Start time is ambiguous in a split element/frame

SuggestedRemedy

On L29 and L34, indicate same token AND same Actual Start Time if present

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 4

Cl **11** *SC* **11.10.8.1** *P* **109** *L* **7** # 63

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

".."

SuggestedRemedy

Change to "."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.8.2** *P* **111** *L* **35** # 64

Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Fontsize

SuggestedRemedy

Fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11** *P* **118** *L* **4** # 65

Hart, Brian D Individual

Comment Type **ER** *Comment Status* **A**

"Enable a Probe Req"

SuggestedRemedy

Change to "Enable the transmission of a probe request"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11** *P* **118** *L* **13** # 66
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Would this be clearer as two tables?

SuggestedRemedy

Two tables

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11** *P* **118** *L* **27** # 67
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

What is "actively receiving"?

SuggestedRemedy

Change to "The non-AP STA is making use of the MPs it receives or would receive if they were being transmitted"

Response *Response Status* **C**

ACCEPT.

. Fixed as recommended

Cl **11** *SC* **11.10.11** *P* **118** *L* **33** # 68
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

What is "actively receiving"?

SuggestedRemedy

Change to "The AP STA is transmitting MPs &"

Response *Response Status* **C**

ACCEPT.

. Fixed as recommended

Cl **11** *SC* **11.10.11.1** *P* **119** *L* **7** # 69
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

is set

SuggestedRemedy

set

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11.1** *P* **120** *L* **4** # 70
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

Fontsize

SuggestedRemedy

Fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11.1** *P* **120** *L* **10** # 71
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"to 2"

SuggestedRemedy

"to 0 or 1"

Response *Response Status* **C**

ACCEPT.

. Fixed as recommended

Cl **11** *SC* **11.10.11.2** *P* **120** *L* **36** # 72
Hart, Brian D Individual

Comment Type **E** *Comment Status* **A**

11.13.1

SuggestedRemedy

Change to 11.10.11.1

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.13** *P* **121** *L* **3** # 73
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

The QBSS load IE is optional; thus the BSS AAC should be optional also

SuggestedRemedy

change to "may" in clause 7 in beacon & probe response

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change P9L3 from "element is present" to "element can be present".

Cl **11** *SC* **11.10.13** *P* **121** *L* **11** # 74
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"The AP shall recalculate"

SuggestedRemedy

This is not a testable shall. Change to "The AP recalculates"

Response *Response Status* **C**

ACCEPT.

Cl **11** *SC* **11.10.13** *P* **121** *L* **11** # 75
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

"shall be current or recently calculated"

SuggestedRemedy

This is not a testable shall - define "recent". Rewrite: e.g. should be

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P121L11: change "shall be current" to "should be current".

Cl **A** *SC* **A.4.17** *P* **138** *L* **7** # 76
Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

No PICS for Reporting Detail or AP channel list as a subelement

SuggestedRemedy

Add PICS entries

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Refer to 07/2665r2.

Cl **D** *SC* **D** *P* **143** *L* **43** # 77

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Delete dot11MPTxEn and dot11MPRxEn

SuggestedRemedy

Delete dot11MPTxEn and dot11MPRxEn. Also on P145 and 146

Response *Response Status* **C**

ACCEPT.

. See 07/2665r2

Cl **D** *SC* **D** *P* **144** *L* **12** # 78

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

dot11MPSupport is Capability elsewhere

SuggestedRemedy

Choose a name & stick to it

Response *Response Status* **C**

ACCEPT.

. dot11RRMMeasurementPilotCapability is the MIB variable all through the specification.

Cl **D** *SC* **D** *P* **144** *L* **15** # 79

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Review from P144L15 to P151L29 and move to Annex Q is referenced from Annex Q and nowhere else

SuggestedRemedy

Review from P144L15 to P151L29 and move to Annex Q if referenced from Annex Q and nowhere else

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Refer to 07/2750r1.

Cl **11** *SC* **11.1.3** *P* **123** *L* **18** # 80

O'Hara, Robert Individual

Comment Type **TR** *Comment Status* **A**

Referring to my comment #195 in the initial ballot, the resolution status and the resolution detail conflict. The resolution status indicates the comment is accepted. The resolution detail indicates the comment is rejected. The draft was not changed as requested in the comment.

SuggestedRemedy

Since this comment is accepted, change the draft to implement the requested change in the original comment (myballot #195).

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The inconsistency noted by the commenter in the MyBallot website will be corrected. All other BRC committee documents clearly indicate that CID195 was rejected. In the MyBallot Resolution Detail column, it is clearly indicated that the comment was rejected. The MyBallot Resolution Status column which indicates AGREE will be changed to DISAGREE, if the website permits this. No text change is needed.

Cl **11** *SC* **11.1** *P* **85** *L* **35** # 81

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: There are, what I consider to be, several errors in the submission 07/2285r0. They are:
[7.2.3.1; 7.2.3.8; 7.2.3.9] 1. RRM Capability Enabled Bitmask element is not present in Beacon frames (but is present in Probe Response frames) [Present in neither]
[7.3.2.44a] 2. First sentence in clause 7.3.2.45 gives incorrect length (4) of this element. Length should be 6 octets.
[???] 3. There is a <tbd> in notes for measurement pilot capability. [No TBD's in draft9.0]
[Annex D/Q] 4. Definitions for new MIB table entries are undefined.

SuggestedRemedy

1. Add the element to the beacon frame.
2. Change the text.
3. Fix TBD or provide an editing instruction.
4. Supply text for new MIB variables.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Refer to 07/2750r1.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **81**

Cl **07** *SC* **7.4.6.7** *P* **71** *L* **6** # 82

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **R**

Daves: Resolution to CID 83 proposes changing frame subtype of Measurement Pilot to an Action frame. The problem with this is that a STA's MAC can which is looking for a MP frame can no longer filter based on frame subtype; the STA's MAC now has to accept all action frames and parse the category and action fields to determine whether it is the MP frame. Moreover, since MPs are transmitted to the broadcast destination MAC address, all STAs must receive and process them (at least as far as to delete them after some parsing) even when they are not interested in them. This is inefficient.

SuggestedRemedy

Re-instate old subtype.

Response *Response Status* **C**

REJECT.

. Editor shall implement 07/2669r3 Section 3, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **03** *SC* **3** *P* **4** *L* **9** # 83

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: Resolution to CID 83 provides a definition of "3.999k Virtual AP Set" which is un-intelligible. If it is really this complicated, an example should be provided.

SuggestedRemedy

Simplify the definition.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **07** *SC* **7.2.3.1** *P* **8** *L* **26** # 84

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: Although I agree with the intent of the resolution to CID 85 (that is, reducing beacon bloat), the proposed resolution conditionally and dynamically adds and removes information elements to beacon frames. This un-necessarily complicates beacon generation. To my knowledge, this has never been done (with the exception of CSA--which has a very different use case) and could possible break some STA implementations.

SuggestedRemedy

Define a MIB variable which allows these elements to be conditionally used in the beacon dependent on whether the MIB variable is true or false. This allows the elements in the beacon to be statically present. I suspect there are other solutions which have a similar characteristic.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 1, wherein valueless elements may now be optionally removed

Cl **11** *SC* **11.10.3** *P* **121** *L* **4** # 85

Hart, Brian D Individual

Comment Type **ER** *Comment Status* **A**

Daves: CID 84 refers to 07/2327r2 wherein the phrase "AC category" is used in several places. The term AC (from IEEE 802.11-2007 clause 4) means access category. Therefore the phrase "AC category" can be translated to "access category category" which is redundant. [Fix 3x in this section]

SuggestedRemedy

Delete the word "category" wherever the referenced phrase occurs.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change "AC category" to AC (3x in subclause)

Cl **07** *SC* **7.3.2.43** *P* **61** *L* # 86

Hart, Brian D Individual

Comment Type **TR** *Comment Status* **A**

Daves: CID 84 refers to 07/2327r2 wherein the text states, "An Available Admission Capacity value of 0 transmitted in the BSS Available Admission Capacity element indicates that no admission capacity is available at the calculation time and that no explicit admissions will be granted by the AP for that UP or AC category at the calculation time." This is meaningless since the non-AP STA has no way of knowing the "calculation time".

SuggestedRemedy

Delete these two sentences since the final paragraph stating, "Note: STAs are advised that requesting admission for any TSPEC at an UP or AC which requires more medium time than is reported as available for the requested UP or AC is possible yet unlikely to be successful." suffices.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P121L14: Change second "at the calculation time" to "unless additional capacity becomes available."

Cl **07** *SC* **7.3.2.21.6** *P* **21** *L* **17** # 87

Ecclesine, Peter Individual

Comment Type **ER** *Comment Status* **A**

The numbering of Figure 7-62ca following Figure 7-62c is bizarre, and should be 7-62d. All figures and tables in a draft should be numbered sequentially.

SuggestedRemedy

Renumber Figures and Tables sequentially in the next draft.

Response *Response Status* **C**

ACCEPT.

.

Cl **09** *SC* **9.8.2.1** *P* **72** *L* **47** # 88

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

The editing instruction should be to insert a new first sentence, and the paragraph on p73 should be deleted, as it is unchanged. If you retain the existing paragraph, then correct the reference to the equation on p73 line 5.

SuggestedRemedy

Change editing instruction to insert.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.10** *P* **28** *L* **18** # 89

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

There are several Sub-Element format figures that are identical - 7-62fa, 7-62ia, 7-68ea, 7-68la, 7-95e, 7-95la and 7-101fc. You could introduce a canonical Sub-Element format figure in 7.3.2.21, and refer to it in all subsequent instances.

SuggestedRemedy

Create canonical Sub-Element format figure in 7.3.2.21, remove other Sub-Element format figures, and change all text to refer to the canonical figure.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **89**

Cl **Annex** *SC* **ex D** *P* **143** *L* **37** # 90

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

dot11AssociateFailStatus I has an extraneous ' I', which should be deleted

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex D** *P* **144** *L* **11** # 91

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

The last two entries are shown as type Unsigned32 (0 .. 7), when they should be Unsigned32.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **203** *L* **1** # 92

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Four trailing white pages should be deleted.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1.3** *P* **99** *L* **21** # 93

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

The unchanged third sentence is shown incorrectly.

SuggestedRemedy

Restore the unchanged third sentence as shown in 802.11-2007.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1.3** *P* **99** *L* **23** # 94

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Spelling 'vallue'

SuggestedRemedy

fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.3** *P* **103** *L* **32** # 95

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Equation lacks a pair of parentheses that clarify whether duration is (2 ^ (..)) * TBTT or 2 ^ ((..) * TBTT)

SuggestedRemedy

fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.8.2** *P* **111** *L* **35** # 96

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Remove underline and fix font of first sentence.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.10.11.1** *P* **119** *L* **27** # 97

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

insert 'the' into sentence: members of the Virtual AP Set . . .

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **97**

Cl **17** *SC* **17.3.10.6** *P* **128** *L* **31** # 98

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Tab missing after 254: here and 18.4.8.5

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **18** *SC* **18.2.6** *P* **131** *L* **18** # 99

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Change the sentence so PMD_SQ and SQ are last, as SQ is last in subsequent tables and text. I know the baseline sentence has PMD_SQ first, but it should follow PMD_RCPI to match Table 18-6.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **18** *SC* **18.2.6** *P* **131** *L* **29** # 100

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

List element 'e' should not be struckthru.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT.

. In three places: P121L4&15&16.

Cl **Annex** *SC* **ex Q** *P* **165** *L* **35** # 101

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Description has wrong reference, should be 7.3.2.28

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **170** *L* **3** # 102

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Shoud be a blank line before dot11ChannelLoadRprtRegulatoryClass

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **195** *L* **35** # 103

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

Description has wrong reference, should be 7.3.2.36

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **200** *L* **15** # 104

Ecclesine, Peter Individual

Comment Type **ER** *Comment Status* **A**

dot11SMTRRMRequest is not the 36th member of dot11Groups. Neew another name for RRMRequest/Report/Config groups.

SuggestedRemedy

fix

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P200L15: change 36 to 37.P202L20: change 37 to 38. P202L50: change 38 to 39.

Cl **07** *SC* **7.3.2.1** *P* **8** *L* **15** # 105

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

First struckthru sentence contains 'shall' requirement that does not appear elsewhere, and should not be removed from 802.11-2007. It should be moved to become the last sentence of 11.1.2 Maintaining synchronization.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

In fact the first strikethrough sentence here is redundant and is completely captured in Notes column of Table 7-8. However, if for emphasis, the commenter would like to include a redundant requirement in section 11, this can be accommodated. Add new sentences to end of 11.1.3.3, "A STA shall include a Country information element in the transmission of Beacon frames if either dot11MultiDomainCapability Enabled, dot11SpectrumManagementRequired or dot11RadioMeasurementEnabled is true. See 7.2.3.1 for description of properly formed Beacon frame."

Cl **07** *SC* **7.3.2.1** *P* **8** *L* **16** # 106

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

The second struckthru sentence "Optionally, ..." is related to the second paragraph of 9.8.1 and all of 9.8.2, which should be changed to include it: "
Optionally, the Beacon frame format may also include the information described in either or both of FH Parameters and FH Pattern Table elements."

SuggestedRemedy

Insert text into 9.8.2.1 per comment.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Equivalent text has been added to 9.8.2.1 in D9.0. No additonal text change is needed.

Cl **07** *SC* **7.2.3.9** *P* **11** *L* **24** # 107

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

Second struckthru sentence "Note that &" contains text that does not appear elsewhere, and should not be removed from 802.11-2007. It should be moved to the end of 11.1.2 after the relocated 7.2.3.1 requirement sentence.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Add deleted NOTE sentence to end of paragraph in 9.8.2.1 at P73L5.

Cl **Annex** *SC* **ex D** *P* **143** *L* **45** # 108

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

22 missing OBJECT-TYPES for entries from dot11LinkMeasurementEnabled through dot11MeasurementPilotSupport.

SuggestedRemedy

Add OBJECT-TYPE elements and syntax.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See 07/2665r2.

Cl **Annex** *SC* **ex D** *P* **153** *L* **43** # 109

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

Missing OBJECT-TYPES for dot11RadioMeasurementCapable and dot11RadioMeasurementEnabled.

SuggestedRemedy

Add OBJECT-TYPE elements and syntax.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

No text change needed. Draft9.0 P145L24 through 37 has the OBJECT_TYPES for dot11RadioMeasurementCapable and dot11RadioMeasurementEnabled.

Cl **Annex** *SC* **ex D** *P* **153** *L* **50** # 110

Ecclesine, Peter Individual

Comment Type **E** *Comment Status* **A**

SMTBase 7 should be numbered dot11Groups 36.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **196** *L* **39** # 111

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

dot11RRMNeighborReportNeighborTSFInfo is now six octets, not Unsigned32. Fix SYNTAX statement here and p198. Review the other Sub-Element info OBJECT-TYPES to ensure correct SYNTAX.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

dot11RRMNeighborReportNeighborTSFInfo OBJECT-TYPE
SYNTAX OCTET STRING (SIZE (6))
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Neighbor TBTT info sub-element is as defined in clause 7.3.2.36."
::= { dot11RRMNeighborReportEntry 16 }"

Cl **Annex** *SC* **ex Q** *P* **199** *L* **10** # 112

Ecclesine, Peter Individual

Comment Type **TR** *Comment Status* **A**

dot11RRMNeighborReportBeaconInterval is two octets, and an unsigned32 should have bounded SYNTAX (0..65535). Review other Annex Q unsigned32 elements for correct SYNTAX.

SuggestedRemedy

per comment

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change MIB entry to read; "dot11RRMNeighborReportBeaconInterval OBJECT-TYPE
SYNTAX Unsigned32 (0..65535) UNITS "TUs"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Beacon Interval field is as defined in clause 7.3.2.37."
::= { dot11RRMNeighborReportEntry 19 }"

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID *Comment ID #* **112**

Cl **03** *SC* **3.168b** *P* **3** *L* **11** # 113

Ponnuswamy, Subburajan Individual

Comment Type **TR** *Comment Status* **A**

I question the wisdom of introducing the term Virtual AP into the standard, in 3.168b virtual AP set: The set of APs which all use a common regulatory class, channel and antenna connector , and whose BSSIDs satisfy the following condition: that, within the union of the BSAs of the APs, there exists a range of BSSIDs encompassing the BSSIDs of the APs and there are no BSSIDs of other APs that use a different antenna connector, where the extrema of the range of BSSIDs are constrained to be any BSSID with its n LSBs set to all 0s and to all 1s. We considered this for the multiple BSSID feature (TGv) and decided to use existing terms related to BSSIDs only, as this is sufficient. Also the term virtual is not really accurate. These are not virtual APs, they are indeed unique APs in the standard's use of the term,
each with a unique BSSID. In an implementation, they may be collocated in a single device.
Separately, this definition does not make sense: there are no BSSIDs of other APs that use a different antenna connector, where the extrema of the range of BSSIDs are constrained to be any BSSID with its n LSBs set to all 0s and to all 1s. What is n and where is it defined? Why is the restriction on the values of the BSSID present?
The list of common attributes is not complete, and needs to be defined using applicable elements, see TGv 7.3.2.68, The Non-Transmitted BSSID Profile field includes the Capabilities field followed by a variable number of
information elements.The Timestamp, Beacon Interval, DS Parameter Set, FH Parameter Set, IBSS Parameter Set, Country, FH Parameters, FH Pattern Table, Channel Switch Assignment, IBSS DFS, and ERP Information
elements are not included in the Non-Transmitted BSSID Profile field; the values of these elements for each non-transmitted BSSID are always the transmitted BSSID element values.

SuggestedRemedy

Replace Virtual AP language with Multiple BSSID, transmitted and non-transmitted BSSIDs. Incorporate complete TGv solution for multiple BSSID support.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor to implement 07/2670r0.

Cl **07** *SC* **7.2.3.44b** *P* **79** *L* **13** # 114

Ponnuswamy, Subburajan Individual

Comment Type **TR** *Comment Status* **A**

It looks like part of the multiple BSSID capability defined in TGv Draft 1.0 is used here, without including the ability to create one beacon frame that provides information for all multiple BSSIDs.
Why is there a restriction on the values for the BSSIDs: "The BSSIDs indicated are the range of BSSIDs starting with the base BSSID with its n LSBs set to 0s and ending with the base BSSID with its n LSBs set to 1s, inclusive". This seems overly restrictive.
"Base BSSID" is more accurately described as "transmitted BSSID".

SuggestedRemedy

Include the complete multiple BSSID feature definition, including changes to 7.2.3.1, 7.2.3.9, 7.3.2.6, 7.3.2.68, 7.3.2.70, 11.20.5 from the TGv draft.
Also, remove "virtual AP" from 11.10.11.1, using "multiple BSSID capability, Non-transmitted BSSIDs".

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **05** *SC* **5.2.7.2** *P* **5** *L* **26** # 115

Ponnuswamy, Subburajan Individual

Comment Type **ER** *Comment Status* **A**

Typo: "informatioin" should be "information"

SuggestedRemedy

Change "informatioin" to "information"

Response *Response Status* **C**

ACCEPT.

.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **115**

Cl **07** *SC* **7.2.3.1** *P* **9** *L* **49** # 116

Ponnuswamy, Subburajan Individual

Comment Type **ER** *Comment Status* **R**

The introduction of a new verb "can" is not needed, and introduces confusion between the meaning of "may" and "can". Only a single term is needed.

SuggestedRemedy

Revert to "may", deleting "can" throughout the document where it has been inserted, replacing "may".

Response *Response Status* **C**

REJECT.

. Clause 7 contains normative frame format descriptions but is not intended to contain requirement text. The terms "shall" and "may" are normative terms used for requirement definition and are not approporiate for frame format descriptions. The appropriate terms in clause 7 are "is" and "can". TGm editors have made efforts over that last few releases of the baseline draft to make these corrections on a piecemeal basis The effort is also carried out by the editors of all new ammendments.

Cl **03** *SC* **3.168c** *P* **3** *L* **17** # 117

Chaplin, Clint F Individual

Comment Type **TR** *Comment Status* **A**

"A special BSSID value (all 1s) used to represent all BSSIDs" All 1s in what base? ASCII character 1s? Hexidecimal 1s? Binary 1s?

SuggestedRemedy

"A special BSSID value (all binary 1s) used to represent all BSSIDs"

Response *Response Status* **C**

ACCEPT.

. Changed as recommended.

Cl **05** *SC* **5.2.7.2** *P* **5** *L* **26** # 118

Chaplin, Clint F Individual

Comment Type **ER** *Comment Status* **A**

"informatioin"

SuggestedRemedy

"information"

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.2.3.1** *P* **10** *L* **27** # 119

Chaplin, Clint F Individual

Comment Type **TR** *Comment Status* **A**

"1) when Available Admission Capacity Bitmask equals 0 (Available Admission Capacity List contains no entries), and 2) when the BSS Load element is present and the Available Capacity Bitmask equals 256 (Available Admission Capacity List contains only the AC_VO entry)." The two conditions are an "or" type situation, not an "and" type situation.

SuggestedRemedy

Change the "and" to "or": "1) when Available Admission Capacity Bitmask equals 0 (Available Admission Capacity List contains no entries), or 2) when the BSS Load element is present and the Available Capacity Bitmask equals 256 (Available Admission Capacity List contains only the AC_VO entry)."

Response *Response Status* **C**

ACCEPT.

. Changed "and" to "or" for the conditions under which a QoS AP does not include BSS Available Admission Capacity IE in the beacon.

Cl **07** *SC* **7.3.2.22** *P* **39** *L* **35** # 120
Chaplin, Clint F Individual

Comment Type **ER** *Comment Status* **A**

"Measurement Types 0, 1 and 2 are used for spectrum management and is only included in spectrum management Measurement Report frames" "is" is used for a single case, "are" is used for multiple cases.

SuggestedRemedy

"Measurement Types 0, 1 and 2 are used for spectrum management and are only included in spectrum management Measurement Report frames"

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.3.2.22** *P* **39** *L* # 121
Chaplin, Clint F Individual

Comment Type **ER** *Comment Status* **A**

"All other Measurement Types are used for radio measurement and is only included in Radio Measurement Report frames." "is" is used for a single case, "are" is used for multiple cases.

SuggestedRemedy

"All other Measurement Types are used for radio measurement and are only included in Radio Measurement Report frames."

Response *Response Status* **C**

ACCEPT.

Cl **07** *SC* **7.3.2.44a** *P* **76** *L* **32** # 122
Chaplin, Clint F Individual

Comment Type **TR** *Comment Status* **A**

Are four octets enough for all the possible RRM Capabilities? I note that there are only 6 bits unassigned out of 32.

SuggestedRemedy

Perhaps extend the RRM capability bit mask to more octets

Response *Response Status* **C**

ACCEPT.

. Redefined the RRM Bitmask as an octet string with a length field prefix. Octet strings can be extended to include future bitmask needs.

Cl **07** *SC* **7.4.6.7** *P* **85** *L* **7** # 123
Chaplin, Clint F Individual

Comment Type **ER** *Comment Status* **A**

"Figure 7101fc"

SuggestedRemedy

"Figure 7-101fc"

Response *Response Status* **C**

ACCEPT.

Cl **11** *SC* **11.10.3** *P* **128** *L* **4** # 124
Chaplin, Clint F Individual

Comment Type **ER** *Comment Status* **A**

"therequested" therequested? I don't see any comment that triggered this change, and it's just flat out wrong.

SuggestedRemedy

"the requested"

Response *Response Status* **C**

ACCEPT.

Cl **11** *SC* **11.10.12** *P* **146** *L* **20** # 125
Chaplin, Clint F Individual

Comment Type **TR** *Comment Status* **A**

"indicated AC (see Figure 112o)" I thought all figure references were changed to x-yyy, where x is the clause number

SuggestedRemedy

Correct the reference.

Response *Response Status* **C**

ACCEPT.

. P120L47: Change "112o" to "7-95o".

Cl **03** *SC* **3.16a** *P* **2** *L* **25** # 126

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: Definition of BSS transition is incomplete. It should match the definition given in 5.4.2.1

SuggestedRemedy

Change to "A STA movement from one BSS in one ESS to another BSS within the same ESS."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P2L22: Replace "another BSS" with "another BSS in the same ESS." Add two new definitions: "ESS Transition: A STA movement from one BSS in one ESS to another BSS in a different ESS." , "service transition: A STA movement from one BSS to another BSS, i.e., either a BSS transition or an ESS transtioin." Replace BSS transition" with "service transition" in all places: P2L36, P6L4, P54L36, P117L1&3, P121L4.

Cl **07** *SC* **7.3.2.21.4** *P* **26** *L* **32** # 127

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: The change made to D9.0 allowing optional sub-elements to various RRM IEs is specified far less than needed. The amendment needs to define what an optional sub-element looks like, and to define a separate space of sub-element IDs for each of them

SuggestedRemedy

Insert a new figure with the format of an optional sub-element, consisting of a sub-element ID, length, followed by variable data. Insert a new table of sub-element IDs, with all entries reserved except 221 "Vendor Specific". Same change in 7.3.2.21.5, 7.3.2.21.6, and everywhere else the "Optional sub-elements" were added.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor to make suggested change as appropriate to individual clauses for all clauses that use optional subelements.

Cl **07** *SC* **7.3.2.21.4** *P* **26** *L* **34** # 128

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: missing "see"

SuggestedRemedy

change "(7.3.2.26)" to "(see 7.3.2.26)"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.4** *P* **26** *L* **35** # 129

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: non-justified text

SuggestedRemedy

fix the jagged right margin

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **129**

Cl **07** *SC* **7.3.2.21.6** *P* **28** *L* **25** # 130

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: Figure numbering is wrong.

SuggestedRemedy

Make it follow the IEEE Style Guide. In this case, Figure 7-62d, and renumber all the following figures. Same with Figure 7-62fa on page 33, 7-62fb on page 34, etc

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.6** *P* **28** *L* **34** # 131

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: Reporting condition is shown above the box as bits B0-B4, and below the box as 6 bits. It is shown in Table 7-29b as containing values 0-31.

SuggestedRemedy

Make consistent -- either 5 bits or 6 bits. If only 5 bits are used, define B5 as Reserved in Figure 7-62ca.

Response *Response Status* **C**

ACCEPT.

.

Cl **07** *SC* **7.3.2.21.6** *P* **29** *L* **31** # 132

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: Table numbering is wrong

SuggestedRemedy

Make it follow the IEEE Style Guide. In this case, Table 7-29c, and renumber all the following tables. Same with 7-31aa, 7-31ba, 7-43ca, etc.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.7** *P* **30** *L* **32** # 133

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: Keep the figure within the margins

SuggestedRemedy

adjust size of the various columns so that the figure doesn't extend beyond the margins of the page. This is also a problem with figure 7-68c on page 45, and others.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **133**

Cl **07** *SC* **7.3.2.22.10** *P* **62** *L* **1** # 134

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: Don't split the table caption across pages

SuggestedRemedy

keep table caption on a single page

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.10** *P* **63** *L* **37** # 135

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: Bin range is wrong for i=5; formula applies only to 1<=i<5

SuggestedRemedy

Change the formula at line 37 to be 1<=i<5. Add a new formula for Bin 5, "Bin 5 range: 2**i-1 * B0 <= Delay

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The formula at line 30 should be for 1<=i<=4.

Cl **07** *SC* **7.3.2.22.10** *P* **64** *L* **14** # 136

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: All entries (except this row) are of the form "n <= Delay&". This one should be consistent

SuggestedRemedy

change to "160 <= Delay"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.1** *P* **9** *L* **6** # 137

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: Without any changes being made to 7.1, the heading should not appear in the amendment

SuggestedRemedy

delete heading for 7.1 (line 6)

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.42** *P* **72** *L* **43** # 138

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: Text states "The Length field in octets is set to 1." BUT, this doesn't take into consideration any optional sub-elements

SuggestedRemedy

fix the statement about length to accommodate the optional sub-elements

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Changed to "the length field value is variable and is set to 1+ the sum of the lengths of all included optional subelements in units of octets". Editor to make appropriate change in all places.

Cl **10** *SC* **10.3.2.1.2** *P* **87** *L* **3** # 139

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: VendorSpecificInfo should remain as last parameter to this primitive

SuggestedRemedy

Move "RequestInformation" to be prior to "VendorSpecificInfo". Change editor instruction at line 6 to reflect the proper positioning of the new row.

Response *Response Status* **C**

ACCEPT.

Cl **10** *SC* **10.3.2.1.2** *P* **87** *L* **11** # 140

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: New element in the MLME primitive needs to be conditioned on a MIB variable or equivalent

SuggestedRemedy

Insert at end, "Present only when the MIB attribute dot11RadioMeasurementEnabled is true"

Response *Response Status* **C**

ACCEPT.

Cl **10** *SC* **10.3.2.1.2** *P* **86** *L* **45** # 141

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: wrong primitive; this subclause is defining MLME-SCAN.request

SuggestedRemedy

Change "confirm" to "request"

Response *Response Status* **C**

ACCEPT.

Cl **10** *SC* **10.3.2.2.2** *P* **87** *L* **29** # 142

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: missing editor instructions regarding the table

SuggestedRemedy

insert the editor instrutions for the table rows

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **10** *SC* **10.3.6.2.1** *P* **90** *L* **39** # 143

Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: wrong number in heading

SuggestedRemedy

change to 10.3.6.2.2

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.1.3** *P* **123** *L* **18** # 144
Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**
WM: typo

SuggestedRemedy
change "vallue" to "value"

Response *Response Status* **C**
ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.3** *P* **125** *L* **6** # 145
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**
WM: Action frames are Management frames, not Control frames

SuggestedRemedy
Move point 3.ii to 2.iii

Response *Response Status* **C**
ACCEPT IN PRINCIPLE.

Editor to implement 07/2669r3 section 2.

Cl **11** *SC* **11.8** *P* **125** *L* **15** # 146
Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**
WM: "Reformat" is not a valid editor instruction

SuggestedRemedy
change editor's instruction to "Change", and insert an Editorial Note below the text indicating the formatting changes that are not shown with underlining and strikethrough

Response *Response Status* **C**
ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **11** *SC* **11.8** *P* **125** *L* **25** # 147
Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**
WM: elsewhere the phrase commonly used is "Beacon and Probe Response frames"

SuggestedRemedy
make "Beacons" into singular

Response *Response Status* **C**
ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **12** *SC* **12.3.4.3** *P* **147** *L* **10** # 148
Chaplin, Clint F Individual

Comment Type **E** *Comment Status* **A**

WM: reference to Table 12.3 should be 12-3

SuggestedRemedy

change 12.3 to 12-3

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **D** *SC* **D** *P* **171** *L* **43** # 149
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: extraneous " I" appears after dot11AssociateFailStatus

SuggestedRemedy

delete it

Response *Response Status* **C**

ACCEPT.

Cl **D** *SC* **D** *P* **172** *L* **23** # 150
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: dot11AnnexQMIBSupportEnabled is a particularly bad name for a MIB variable, as the numbering of the Annex in IEEE Std 802.11 is subject to change with each revision.

SuggestedRemedy

change to dot11RRMMIBSupportEnabled

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Changed to "dot11RRMExternalInterfaceMIBEnabled"

Cl **D** *SC* **D** *P* **174** *L* **49** # 151
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: many new MIB variables were added to the Station Config Entry in D9.0 on page 172, but they have no description

SuggestedRemedy

add descriptions of each of the new MIB variables, e.g., dot11LinkMeasurementEnabled, dot11NeighborReportEnabled, dot11ParallelMeasurementsEnabled, etc

Response *Response Status* **C**

ACCEPT.

. The MIB table is now updated. See 07/2665r2.

Cl **D** *SC* **D** *P* **172** *L* **25** # 152
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: extraneous "[0..7]" appears

SuggestedRemedy

change to "Unsigned32,"

Response *Response Status* **C**

ACCEPT.

Cl **D** *SC* **D** *P* **172** *L* **31** # 153
Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **A**

WM: extraneous "[0..7]" appears

SuggestedRemedy

change to "Unsigned32 }"

Response *Response Status* **C**

ACCEPT.

Cl **I** *SC* **I** *P* **183** *L* **1** # 154

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **R**

WM: The scope of this amendment, as stated in the PAR, is "This project will define Radio Resource Measurement enhancements to provide interfaces to higher layers for radio and network measurements." This does not include changes to regulatory matters

SuggestedRemedy

Delete the changes to Annex I, and submit them to TGmb, or to a Task Group that includes regulatory matters in its scope.

Response *Response Status* **C**

REJECT.

. 802.11-2007 defines operation in Part 15 license-exempt bands for several PHYs, and this amendment enhances operation with means to specify radio measurements in those bands. To specify the radio channel for measurement, this amendment creates Regulatory Classes for Part 15 license-exempt bands, so that the combination of Regulatory Class and Channel Number uniquely specify channel measurement parameters e.g., channel bandwidth. 11k would be incomplete and incorrect without these changes.

Cl **J** *SC* **J** *P* **185** *L* **1** # 155

Chaplin, Clint F Individual

Comment Type **T** *Comment Status* **R**

WM: The scope of this amendment, as stated in the PAR, is "This project will define Radio Resource Measurement enhancements to provide interfaces to higher layers for radio and network measurements." This does not include changes to regulatory classes

SuggestedRemedy

Delete the changes to Annex J, and submit them to TGmb, or to a Task Group that includes regulatory matters in its scope.

Response *Response Status* **C**

REJECT.

. 802.11-2007 defines operation in Part 15 license-exempt bands for several PHYs, and this amendment enhances operation with means to specify radio measurements in those bands. To specify the radio channel for measurement, this amendment creates Regulatory Classes for Part 15 license-exempt bands, so that the combination of Regulatory Class and Channel Number uniquely specify channel measurement parameters e.g., channel bandwidth. 11k would be incomplete and incorrect without these changes.

Cl **10** *SC* **10** *P* **102** *L* **28** # 156

Hansen, C J Individual

Comment Type **TR** *Comment Status* **A**

There are no guidlines or limits defined in this section for how often measurements can be made. This is unacceptable. All measurements will have an effect on the network capacity and the thoughput available to stations incorporating these measurements. Implementations need guidance from the IEEE as to how often to make these measurements.

SuggestedRemedy

Add new text describing typical scenarios for how measurements are to be used.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The issue is not how often a measurement request can be made, it is to consider each STA 's service load, power state and operating conditions. The AP has to consider traffic load and application requirements, regulatory requirements and specific measurement states from every STA in support of wireless network management. Guidelines and limits would have to consider regulatory requirements like 4 msec carrier sense and the detection of one microsecond radar pulses in Japan. There are no typical scenarios that describe 802.11 operation in all bands in most circumstances. Off-channel measurements are desireable to gather timely information about which channel to switch BSS operation to, and the noiser the operating environment, the more urgent the need for radio measurements off the serving channel. In any case, the STA can refuse any measurement request. We are unable to support a limit to measurements which precludes ‘normal’ 802.11 operation in a noisy environment, where collisions cause many retries.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Comment ID

Comment ID # **156**

Cl **10** *SC* **10** *P* **107** *L* **9** # 157

Hansen, C J Individual

Comment Type **TR** *Comment Status* **A**

"NOTE--Since measurements on non-operating channels could potentially degrade a station's performance,
non-operating channel measurements should be requested sparingly and for short durations." This language is too weak and does not do enough to protect network performance from poorly organized or excessive measurement requests that could severely degrade QoS. Don't leave this to the WiFi alliance to solve. This should be resolved in the IEEE.

SuggestedRemedy

Add specific requirements for when non-operating channel measurements can be made. For example, if an AP has data queued for a particular STA it is not allowed to request non-operating channel measurements for that STA. This needs to be a requirement on the AP, not on the STA. Only STAs have low activity (in terms of communicated data frames in either direction with the AP) should be requested to make non-operating channel measurements.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The issue is not protecting data performance, it is to consider each STA's service load, power state and operating conditions. The AP has to consider traffic load and application requirements, regulatory requirements and specific measurement states from every STA in support of wireless network management. Guidelines and limits would have to consider regulatory requirements like 4 msec carrier sense and the detection of one microsecond radar pulses in Japan. There are no typical scenarios that describe 802.11 operation in all bands in most circumstances. Off-channel measurements are desireable to gather timely information about which channel to switch BSS operation to, and the noiser the operating environment, the more urgent the need for radio measurements off the serving channel. In any case, the STA can refuse any measurement request. We are unable to support a limit to measurements which precludes 'normal' 802.11 operation in a noisy environment, where collisions cause many retries.

Cl **11** *SC* **11.13** *P* **98** *L* # 158

Myles, Andrew F Individual

Comment Type **TR** *Comment Status* **R**

The text proposes the use of MPs to:
* Rapidly discover BSS via passive scanning
* Provide neighbour measurements via passive scanning
* Provide link SNR information
However, 07/0535r2 examines various use cases for MPs and concludes they have limited benefit.

SuggestedRemedy

Remove MPs.
Note: this comment is carried over from the last ballot. I would respond to the response to my comment last time by saying that the case made in 07/0535r2 is more compelling that the limited uses of MPs, particularly given the costs of MPs

Response *Response Status* **C**

REJECT.

. Measurement Pilots may be useful in the DFS bands before association, and to quickly harvest RSSIs during roaming.

Cl **11** *SC* **11.10.11.1** *P* **119** *L* **119** # 159

Myles, Andrew F Individual

Comment Type **TR** *Comment Status* **A**

The text states the MP uses "basic medium acess rules" if the medium is unavailable for an MP transmission at TMPTT.
However, it does not specify which AC should be used, or if the MP still has to be the next frame transmitted by the AP

SuggestedRemedy

Decide on what is really required and document it (or remove MP's from draft altogether)

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Editor shall implement 07/2669r3 Section 2, wherein 11k is more closely harmonized with the MBSSID material in 11v, and MPs are converted to Action frames of Category Public.

Cl **07** *SC* **7.3.22.10** *P* **52** *L* **15** # 160

Myles, Andrew F Individual

Comment Type **TR** *Comment Status* **A**

In the last ballot I commneted that it is not clear what "ready for transmission" means. The response was to change to "transmision (ie begins CSMA/CA access).
However, this means this clause is not applicable to other froms of access, ie HCCA

SuggestedRemedy

Change to "& at which the first or only gramment begins transmission"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P52L13: change "Queue Delay is measured from the time the MSDU is passed to the MAC until the point at which the first or only fragment is ready for transmission (i.e., begins CSMA/CA access), and is expressed in units of TUs." to "Queue Delay is expressed in TUs and is measured from the time the MSDU is passed to the MAC until the point at which the first or only fragment begins transmission."

Cl **07** *SC* **7.3.2.21.6** *P* **22** *L* **49** # 161

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to include Optional Subelement figure and table

SuggestedRemedy

Add Figure and table. Refer to common figure in folowing sections.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.7** *P* **23** *L* **43** # 162

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.8** *P* **25** *L* **1** # 163

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.21.11** *P* **31** *L* **24** # 164

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.6** *P* **37** *L* **28** # 165

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.8** *P* **46** *L* **27** # 166

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.10** *P* **53** *L* **8** # 167

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Need to incude a reference to Optional subelement figure I 7.3.2.21.6

SuggestedRemedy

Add reference.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.37** *P* **54** *L* **18** # 168

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Modify figure and text to use "Optional subelelements" consistent with other occurrences in the draft.

SuggestedRemedy

Modify terms for consistency

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex A** *P* **139** *L* **28** # 169

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

References in RRM12 are incorrect.

SuggestedRemedy

Fix references

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex A** *P* **141** *L* **13** # 170

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

References in RRM23 are incorrect.

SuggestedRemedy

Fix references

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex A** *P* **140** *L* **32** # 171

Kwak, Joseph A Individual

Comment Type **T** *Comment Status* **A**

Add new RRM element here for Annex Q.

SuggestedRemedy

Add it.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Add new optional Annex Q PICS element for APs.

Cl **Annex** *SC* **ex D** *P* **142** *L* **1** # 172

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Update all MIB descriptions to align with spec text.

SuggestedRemedy

Update all descriptions.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **Annex** *SC* **ex Q** *P* **158** *L* **1** # 173

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Update all MIB descriptions to align with spec text.

SuggestedRemedy

Update all descriptions.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **General** *SC* **General** *P* *L* # 174

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Revise Figure and Table numbering to eliminate double letter numbering, e.g. 7-62ca.

SuggestedRemedy

Do it in all places

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **07** *SC* **7.3.2.22.8** *P* **44** *L* **26** # 175

Kwak, Joseph A Individual

Comment Type **E** *Comment Status* **A**

Figure7-68h format is not consistent with other frame format description figures in the draft. Same comment for Figures 7-68i, j, k, &n.

SuggestedRemedy

Use figure format from D8.0 to correct this inconsistency in all places.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

This comment is deemed editorial and delegated to the document editor for consideration in developing future drafts. Please note that the IEEE standards are edited professionally prior to publication.

Cl **03** *SC* **3.16a** *P* **2** *L* **25** # 176

Engwer, Darwin A Individual

Comment Type **GR** *Comment Status* **A**

The added new definition for BSS transition is inconsistent with the well known legacy definition in IEEE Std. 802.11-2007 clause 5.4.2.1.b.

SuggestedRemedy

Correct the new definition to align with the existing definition in clause 5.4.2.1.b

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P2L22: Replace "another BSS" with "another BSS in the same ESS." Add two new definitions: "ESS Transition: A STA movement from one BSS in one ESS to another BSS in a different ESS." , "service transition: A STA movement from one BSS to another BSS, i.e., either a BSS transition or an ESS transtioin." Replace BSS transition" with "service transition" in all places: P2L36, P6L4, P54L36, P117L1&3, P121L4.

Cl **03** *SC* **3.168b** *P* **3** *L* **12** # 177

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **A**

incorrect reference to the term BSA

SuggestedRemedy

change "within the union of the BSAs of the APs"
to "within the union of the APs"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The intent of BSA is that the BSSIDs used are unique in the range of the APs. Nonetheless the text is rewritten to avoid this term. See 07/2669r0 Section 2

Cl **07** *SC* **7.3.2.44b** *P* **79** *L* **19** # 178

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **A**

If there are no optional sub-elements then why show that field at all?

SuggestedRemedy

Remove the optional sub-elements field from the diagram and the corresponding text note.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Refer to 07/2669r3 Section 5.

Cl **11** *SC* **11.1.3** *P* **123** *L* **15** # 179

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **A**

"stout-hearted"?

SuggestedRemedy

change to "that"?

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P99L21: change "stoutheatrted" to "the desired", to match wording in the baseline draft.

Cl **11** *SC* **11.1.3** *P* **123** *L* **16** # 180

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **A**

"primitivist"?

SuggestedRemedy

change to "primitive"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P99L22: change "primitivist" to "primitive with", to match wording in the baseline draft.

Cl **11** *SC* **11.10.11** *P* **143** *L* **10** # 181

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **R**

Values of mib objects are typically not detailed in the operational clauses of the standard.

SuggestedRemedy

Move table 11-11 to the appropriate section of Annex D (or Annex Q as appropriate).

Response *Response Status* **C**

REJECT.

. Since the dot11MeasurementPilotCapability requires a detailed description and the sub-clauses of 11.10.11 refer to the description while describing the Measurement Pilot generation procedure. Having the table in 11.10.11 makes it easier for the reader to understand the settings. In the interest of clarity, this description deviates from the norm.

Cl **Annex** *SC* **ex D** *P* **170** *L* **1** # 182

Engwer, Darwin A Individual

Comment Type **TR** *Comment Status* **A**

Missing mib definition for dot11MeasurementPilotCapability.

SuggestedRemedy

Add a mib definition for dot11MeasurementPilotCapability.
Include all the value enumerations from table 11-11 on page 143.
(alternatively this may instead belong in Annex Q)

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

MIB definitions updated. See 2665/r0. Table 11-11 is left in Clause 11.10 for the sake of clarity.

Cl **11** *SC* **11.10.3** *P* **127** *L* **35** # 183

Engwer, Darwin A Individual

Comment Type **TR** *Comment Status* **R**

The added text addresses the issue of measurement activity load on a STA that receives measurement requests, but does not adequately address the point raised in SB01-CID 230 (or LB78-CID-957).
The volume of measurement requests issued by a transmitting/ requesting station must be duty cycle limited in some way in order to avoid complete domination of the available network air time by measurement requests, especially in environments with hundreds or thousands of colocated STAs.

SuggestedRemedy

Add some mechanism to allow the duty cycle of measurements to be controlled wrt real data laden traffic.

Response *Response Status* **C**

REJECT.

The issue is not the % of wireless capacity or STA capacity used by radio measurements, it is to consider each STA's service load, power state and operating conditions. The AP has to consider traffic load and application requirements, regulatory requirements and specific measurement states from every STA in support of wireless network management. Guidelines and limits would have to consider regulatory requirements like 4 msec carrier sense and the detection of one microsecond radar pulses in Japan. There are no typical scenarios that describe 802.11 operation in all bands in most circumstances. Off-channel measurements are desireable to gather timely information about which channel to switch BSS operation to, and the noiser the operating environment, the more urgent the need for radio measurements off the serving channel. In any case, the STA can refuse any measurement request. We are unable to support a limit to measurements which precludes 'normal' 802.11 operation in a noisy environment, where collisions cause many retries.&
慢蠍 湯捌獩慮獯湡湥 ⲁ 锷桔 湩潰瀾獩
整据⁹潮整 祢瑛敨挔獵瑯敦牦 祍楬慮祬
整眠汩敨桰敵瀠潣慭獲楨 恭漠桰
渺湥瀻挹牲漧 楄 敹攬潢
桴 獩楬瀻瀴潣獥潮湩
搏潵澀敨祢潣汩 漻慳 敷杵
 汙慧⁴瀳潣慰 瀭 敩慲
 摮桴尃楬慮捥瀰
瑰楮 敮瀨桴敲 獩杮潤鵬 敩擾搊慫
㭥楮 敤 朽 慬朮
 吸㝴 偃潣摡 獩
 †† ㄀ 桴 ⁴潣 ††
吧湩 牥摮 搏潵祢潣 瑩洮慧⁴ ⨮ †
 ?氠潮 瀺 瑰 瀨

Cl **03** *SC* **3.16a** *P* **2** *L* **25** # 184

Engwer, Darwin A Individual

Comment Type **ER** *Comment Status* **A**

The added new definition for BSS transition is inconsistent with the well known legacy definition in IEEE Std. 802.11-2007 clause 5.4.2.1.b.

SuggestedRemedy

Correct the new definition to align with the existing definition in clause 5.4.2.1.b

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

P2L22: Replace "another BSS" with "another BSS in the same ESS." Add two new definitions: "ESS Transition: A STA movement from one BSS in one ESS to another BSS in a different ESS." , "service transition: A STA movement fro

Agenda#: 5.10
Date: 11/16/07
Time:

IEEE 802 LMSC RESOLUTION

Motion By: KERRY   Seconded By: O'Hara

Move to conditionally approve IEEE 802.11 Working Group TGk Draft *12.0* to go to RevCom.

WG Vote on the motion: Passes *78 : 0 : 5*
TG Vote: Passes *4-0-3*

TGk had a *89.2*% approval on the last SB Recirculation Ballot #1. There were 11 voters that voted NO. There was one new no vote but voter is satisfied.

Approve: 14   Do Not Approve: 1   Abstain: 0

Moved: to conditionally approve IEEE 802.11 Working Group TGk Draft *12.0* to go to RevCom.
Moved: Kerry/O'Hara

Passes: 14/1/0

5.11	**ME**		**-**			
5.12	**ME**		**-**			
5.13	**ME**	**Recommendation to SASB to change 802.20 to entity ballot (NC-EC)**	**-**	**Greenspan**	**10**	**01:42 PM**

RECOMMENDATIONS TO THE STANDARDS BOARD

Arnie Greenspan
Chair, 802.20
Atlanta, Ga
November 16, 2007

CURRENT VOTING METHOD

- Individual membership
- Member declares affiliation
- Votes are limited to one per affiliation

MODIFIED ENTITY VOTING APPROACH

- Must be defined in the invitation
- Not defined in existing policy
- One vote per entity*

  (*per SA policy)
- Sponsor ballot pool requires entity identifications and e-mail address
- If more than 1 person per entity applies, entity must select one within 7 days after notification
- For individuals identifying themselves as an entity, a resume will be required for review

Recommendation to the Standards Board

MOTION
The Unconflicted Executive Committee of the 802 Committee recommends to the Standards Board that the Sponsor Ballot method for 802.20 be changed to a voting approach consistent with the current 802.20 voting method.

Mover: Arnie Greenspan
Second: Mike Lynch

Moved: The Unconflicted Executive Committee of the 802 Committee recommends to the Standards Board that the Sponsor Ballot method for 802.20 be changed to a voting approach consistent with the current 802.20 voting method.
Moved: Greenspan/Lynch

Paul noted that everyone is allowed to participate in the dicussion. But, only the members of the non-conflicted EC will be allowed to vote.

Roger noted that this motion appears to be asking the SASB to create a new type of balloting. Roger asked how this differs from normal entity voting. Arnie indicated that the sponsor pool would need to be made up of only those that are qualified to participate in the ballot.

Much further discussion took place on the on the idea of how the balloting method should be modified.

An opinion was expressed that the ballot process modifications needed to be clearly described before anything could be agreed to. Several speakers agreed with this opinion. Arnie indicated that he would like the sponsor ballot to be conducted using rules similar to those currently used in the working group ballot.

Several individuals expressed that "modified individual" balloting expressed the sentiment of the change in balloting method than "modified entity" voting does. The motion was modified to make this change without objection.

The motion was further modified to its current form, without objection.

Passes: 8/0/0

5.14	**ME**	**802.20 approval for sponsor ballot (NC-EC)**	**-**	**Greenspan**	**10**	**02:26 PM**

ADVANCE 802.20 DRAFT TO SPONSOR BALLOT

Arnie Greenspan

Chair, 802.20

Atlanta, GA

November 16, 2007

COMMENT DATA BASE

- The comments and comment resolution package are provided for your attention and review, they can be found at http://ieee802.org/20/802_LMSC.html (no password is required to access the associated files).

Sponsor Ballot Approval for 802.20

- No vote statistics— 2 No Voters & 6 negative comments
  - Nokia Siemens has 1 unsatisfied negative comment that submitted in the initial ballot, only comment submitted. The WG did not accept the comment as it was contrary to a previous vote and decision. (Comment #3)
  - Broadcom has 5 unsatisfied negative comments. (Comment #s 5, 153 , 154, 158, 159) The thread of these negative comments date back to a time of the practice ballots. The WG has spent considerable time trying to satisfying these comments. The WG did successfully satisfy 70 negative comments by the voter.
- Since there are no new unsatisfied negative comments, the WG will not recirculate the material. The WG feels that adequate due diligence has been performed in regards to this negative balloters‘ comments.

Sponsor Ballot Approval for 802.20

- The draft 802.20 has completed 1 recirculation.
- The recirculation closed on November 6, 2007 with the following results:
  - 13/2/6 for an affirmation ratio of 86.67%, a response ratio of 77.78%, and an abstention ratio of 28.57%
  - There were two No votes.
  - Two No votes from LB1m changed to Yes in recirculation.
- The group completed the recirculation comment resolution. and successfully resolved 2050 comments in the initial ballot and recirculation. (Plus approximately 750 comments in the practice ballot). Over 99% of the comments have been resolved
- Motion to seek approval to forward 802.20/D3.0m to Sponsor Ballot passed at the WG with a vote of 9/2/1

YES Voters Poll at Plenary

==============================

Airvana - not present
Alcatel-Lucent - no change
AROSCO - no change
Ericsson - no change
Institute of Miyagi Prefecture - no change
Kyocera - no change
Motorola - no change
NEC Infrontia - no change
Niigata University - no change
Qualcomm - no change
Steepest Ascent Ltd - not present
Strathclyde University - not present

Abstain Voters Poll at Plenary

==============================

AT&T - not present
ETRI - not present
Intel - not present
LG electronics - not present
Mitsubishi - not present
Samsung - not present

No Voters Poll at Plenary
================================
Broadcom
- have you changed from no to yes? no change
 - if not, please state the unsatisfied no comments : Comment #5, 153, 154, 158, 159
Nokia Siemens
- have you changed from no to yes? no change
 - if not, please state the unsatisfied no comments : Comment #3

Motion, "The WG affirms the resolution of comments that occurred during the November 2007 session for Letter Ballot 2m."
Moved by Jerry Upton
Seconded by Nancy Bravin

Vote: **No negatives, No Abstains, approved by affirmation**

Motion, **"The working group recommends that 802.20 D3.0m be forwarded to the EC to proceed to sponsor ballot."**

Moved by: R. Canchi ; seconded by : N. Bravin

Roll Call Vote Results 9-2-1

============

Advanced Network Technical Solutions - not present
Airvana - not present
Alcatel-Lucent - yes
AROSCO - yes
AT&T/Cingular - abstain
Broadcom - no
Ericsson -yes
ETRI - not here
Fujitsu - not here
Institute of Miyagi Prefecture - yes
Intel - not here
Kyocera - yes
LG Electronics - not present
Marvel - not present
Mitsubishi - not present
Motorola - yes
NEC Infrontia - yes
Niigata University - yes
Nokia Siemens Netoworks - no
Nortel - not present
POSDATA - not present
Qualcomm yes
Samsung - not present
Steepest Ascent Ltd - not present
Strathclyde University - not present
Texas Instruments - not present
Vodafone - not present

Sponsor Ballot Approval for 802.20

Move to forward the 802.20/D3.0m draft to the SASB with the recommendation that Sponsor Ballot be initiated

Mover: Arnie Greenspan

Second: Tony Jeffree

Nokia Siemens Networks Comment Resolution

The technologies for Wideband FDD of 802.20 and 3GPP2 C.S0084 were developed in parallel. In addition a Wideband TDD was also submitted and included in the 802.20 draft. The 3GPP2 C.S0084 does not include Wideband TDD. The FDD material originally submitted to 802 in November 2005 was also submitted to 3GPP2 TSG-C during 2006, since the participating companies were developing a similar technology. At the time of the resumption of 802.20 meetings, the technologies in 3GPP2 had evolved. When 802.20 resumed, Motorola made a proposal to harmonize technical aspects of the then current Wideband FDD 802.20 technology with the evolved features introduced in TSG-C. This was accepted by the WG, and the draft material was revised in accordance with the proposal, retaining all the original functionality of the 802.20 draft including Wideband and Narrowband TDD. Subsequently changes and corrections were made to draft as part of the practice ballots and letter ballots. .Given that the original Wideband FDD text came from largely the same companies, there is similarity between these two; however functionality in 802.20 is greater than that in C.S0084, with the continuance of TDD modes, support for 802-based architectures, and management structures supported by 802-based vendors.

The 3GPP2 air interface is coupled to a specific 3GPP2 network architecture. The 802.20 air interface is not coupled to a specific network architecture and supports any Internet like architecture or others. Therefore although there is strong similarity today between the two specifications, the Working Group has agreed that this is an independent project and will evolve on its own, and therefore cannot be coupled to specifications controlled by another organization.

Moved: to forward the 802.20/D3.0m draft to the SASB with the recommendation that Sponsor Ballot be initiated.
Moved: Greenspan/Jeffree

Passes: 8/0/0

5.15	**ME**	**802.15.3 approval for reaffirmation sponsor ballot**	**-**	**Heile**	**5**	**02:39 PM**

802.15.3-2003 Reaffirmation

802.15.3-2003 Reaffirmation

Motion passed in the Working Group:

- *802.15 seeks Executive Committee approval to conduct a sponsor ballot to reaffirm 802.15.3.*

Moved: A Astrin

Seconded: R Alfvin.

Motion carried 38/0/0

802.15.3-2003 Reaffirmation

Motion:

- *Move that the Executive Committee approve a sponsor ballot to reaffirm 802.15.3*

Moved: Bob Heile

Second: Mike Lynch

Moved: that the Executive Committee approve a sponsor ballot to reaffirm 802.15.3.
Moved: Heile/Lynch

Passes: 15/0/0

5.16	**ME**	**Conditional approval of 802.11y for sponsor ballot**	**-**	**Kerry**	**10**	**02:41 PM**

IEEE P802.11
Wireless LANs

802.11y Nov Conditional Sponsor Ballot Report

Date: 2007-11-13

Author(s):

Name	Affiliation	Address	Phone	email
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Abstract

This is the report documenting the results of the WG letter ballots on IEEE 802.11y. This report is to be submitted to the IEEE 802 Executive Committee to support the request to forward IIEEE 802.11y to Sponsor Ballot.

1. Introduction and Summary

This is the report to the IEEE 802 Executive Committee that documents all the WG letter ballots of IEEE 802.11y, including voting results, comment statistics, and unresolved negative comments.

The total number of voters on IEEE 802.11y is 347. The final results of the voters on IEEE 802.11y are 257-11-59, for an approval percentage of 95.9%, a return percentage of 94.2%, and an abstain percentage of 18.04%.

There are 87 outstanding negative comments from seven remaining negative voters; 21 of these outstanding negative comments are from the latest latter ballot and the remaining 66 outstanding negative comments are previously recirculated unresolved negative comments from previous letter ballots.

In addition, there is one remaining negative voter without comments.

2 negative comments were ruled invalid, of these 1 was from a remaining negative voter.

The 21 negative comments from the latest letter ballot are from four different negative voters.

Based on results of the letter ballots on IEEE 802.11y as documented in this report, we are asking for approval from the IEEE 802 Executive Committee to forward IEEE 802.11y to sponsor ballot.

Agenda Items and motions requesting conditional approval to forward when the prior ballot has closed shall be accompanied by:
• Date the ballot closed
• Vote tally including Approve, Disapprove and Abstain votes
• Comments that support the remaining disapprove votes and Working Group responses.
• Schedule for recirculation ballot and resolution meeting.

Letter Ballot 94 was a vote on Draft 1.0, and ran for 40 days starting 12 December 2007, and ending on 7 January 2007.
309 voted, 182 yes, 59 no, 71 abstained, 75.52% approval rate
Approve 182, Disapprove comments 59, Abstain 71

Letter Ballot 104 was a recirculation vote on Draft 2.0 and resolutions in 11-07-0008-12, and ran for 16 days from 19 April 2007 until 5 May 2007.
324 voted, 221 yes, 41 no, 62 abstained, 84.35% approval rate

Letter Ballot 106 was a recirculation vote on Draft 3.0 and resolutions recorded in 11-07-2019-06, and ran for 15 days from 5 June 2007 until 20 June 2007.
326 voted, 242 yes, 24 no, 60 abstained, 90.98% approval rate

Letter Ballot 109 was a recirculation vote on Draft 4.0 and resolutions recorded in 11-07-2333-07, and ran for 15 days from 6 August 2007 until 21 August 2007.
327 voted, 250 yes, 17 no, 60 abstained, 94.2% approval rate

Letter Ballot 112 was a recirculation vote on Draft 5.0 and resolutions recorded in 11-07-2623-03, and ran for 15 days from 28 September 2007 until 13 October 2007.
327 voted, 257 yes, 11 no, 59 abstained, 95.9% approval rate

At this time there are 7 Negative voters with comments recorded in the comment database.

Note that the resolutions for LB 112 comments have not yet been approved by the WG.

Of the total 87 no-voter unsatisfied comments from all letter ballots, many are non-technical comments marked technical, and many address similar topics.

The comments may be categorized as follows:
13 Required Comments on Draft 1.0 with no subsequent Negative voter participation. They mainly had an issue related with TGn timelines: the Channel Switch Announcment text that also appeared in TGn Draft 1.0 (LB 84) and TGv, and in subsequent events got consolidated into TGy, as it is scheduled to complete before TGn and TGv. At the time of LB 94, the TGn Channel Switch Announcement defined another way to change Regulatory Classes, and proponents of that scheme made comments in LB 94 to remove Extended Channel Switching. TGn then changed their definition of what Regulatory Classes would be required, and in TGn Draft 3.0 adopted the TGy language. If the WG approves the proposed LB 112 comment resolutions, there will be just one Channel Switch Announcment comment that remains rejected.
26 Required Comments on Dependent Station Enablement, mostly on the messaging protocol. If the WG approves the proposed LB 112 comment resolutions, there will be just three enablement comments that remain rejected.

LB	Comment	Accept	Accept in Principle	Reject
94	Technical Required	6	5	3
104	General Required	0	0	1
106	Technical Required	7	13	1
106	Editorial Required	3	1	1
109		10	14	1
112		7	9	5
	Total	33	42	12

There was one Required comment on LB 104 “Confusions from submitting redline version without providing rationale to voters.” and suggesting “Cancel and reissue ballot with justification for redline draft and include clean version, too.” which the Task Group considers Out of Scope. The WG agreed it is out of scope, and the voter’s previous Approve vote on LB 94 would be the official one, not the Negative vote on LB 104.

The working group responses to all of these unsatisfied comments are on the following pages:

Cl **00** *SC* *P* *L* # 1110

"Kurihara, Thomas"

Comment Type **GR** *Comment Status* **R**

Confusions from submitting redline version without providing rationale to voters.

SuggestedRemedy

Cancel and reissue ballot with justification for redline draft and include clean version, too.

Response *Response Status* **W**

REJECT. Out of Scope

Cl **00** *SC* **General** *P* **38** *L* # 3135

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

Previously the draft seemed to have a concept of over the wire enablement

Does this stil exist and, if so, where is it defined? If not, how does a low power device get enabled by a high power device at a great distance?

SuggestedRemedy

Clarify

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Yes the enablement can involve messages outside the DS. Per CID 3061, adding Public Action frames.

Cl **03** *SC* **3.34a** *P* **1** *L* **54** # 2051

Myles, Andrew

Comment Type **TR** *Comment Status* **R**

The text speaks of an association between the dependent STA and the enabling AP.

However, this is confusing because I understand that this is not intended to be an 802.11 association.

SuggestedRemedy

Modify nomenclature to call relationship between the dependent STA and the enabling AP a "registration"

Response *Response Status* **W**

REJECT. As the FCC uses "registration" for licensed operators and stations in required databases and regulations, it would be very confusing to replace "enablement" with "registration"

Cl **03** *SC* **3.34b** *P* **1** *L* **59** # 2049

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

Definition uses term "restricted channel"

However, this is not defined anywhere

SuggestedRemedy

Define "restricted channel"

A similar comment applies to 3.48a, which defines "restricted bands"

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Adding definition of restricted channel “, which is a channel where transmission is restricted to licensed operators and stations operating under their control”.

Cl **03** *SC* **3.54a** *P* **1** *L* **65** # 2050

Myles, Andrew

Comment Type **ER** *Comment Status* **A**

The text uses "station"

However, "STA" would be more consistent with the rest of clause 3

SuggestedRemedy

Replace "station" with STA

Similar comment applies to other clauses in draft

Response *Response Status* **W**

ACCEPT.

Cl **03** *SC* **3.y1** *P* **9** *L* **12** # 426

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

What does "publicly registered" mean?

SuggestedRemedy

explain

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Replaced with 'registered STA', meaning there is a registration system than can be used to facilitate interference resolution.

Cl **03** *SC* **3.y3** *P* **9** *L* **19** # 427

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

What does "publicly registered" mean?

SuggestedRemedy

explain

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Replaced with 'registered STA', meaning there is a registration system than can be used to facilitate interference resolution.

Cl **03** *SC* **3.y4** *P* **9** *L* **22** # 428

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

"some regulatory domains" contradicts the title that states "in USA". USA has only a single regulatory domain

SuggestedRemedy

correct title or definition to be consistant

Response *Response Status* **W**

ACCEPT.

Cl **05** *SC* **5.2.7** *P* **10** *L* **10** # 430

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

What is the definie of "cognative radio"?

SuggestedRemedy

define

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. The sentence being commented on is removed in the rewrite of 5.2.7, now Annex J.2 (07/0271).

Cl **05** *SC* **5.2.7** *P* **10** *L* **15** # 431

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

Is"US" the same as "USA"? If so, the usage should be consistant

SuggestedRemedy

Change "US" to "USA"

Response *Response Status* **W**

ACCEPT. The comment is applied to Annex J.2 (07/0271).

Cl **05** *SC* **5.2.7** *P* **10** *L* **26** # 432

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

"leading us". Is "us" collequial or "USA?"

SuggestedRemedy

correct title or definition to be consistant

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. The sentence being commented on is removed in the rewrite of 5.2.7, now Annex J.2 (07/0271).

Cl **05** *SC* **5.2.7** *P* **10** *L* **32** # 433

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

Is the implication of the last clause that *only* 5MHz channels may be used or the 5 MHz may *also* be used?

SuggestedRemedy

clarify

Response *Response Status* **W**

ACCEPT. The 'shalls' in 5.2.7 are being moved to Annex J.2 defining operation in US 3650 MHz band.

Cl **05** *SC* **5.2.7** *P* **10** *L* **9** # 429

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

"should have" - is that a recommendation or requirement?

SuggestedRemedy

clariy

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. The sentence being commented on is removed in the rewrite of 5.2.7, now Annex J.2 (07/0271).

Cl **07** *SC* **7.2.3.1** *P* **3** *L* **19** # 2043

Myles, Andrew

Comment Type **ER** *Comment Status* **R**

The text uses "DSE registered location"

However, it would be clearer if it used "DSE Registered Location"

SuggestedRemedy

Fix

A similar comment applies to 7.2.3.5, 7.2.3.7, 7.2.3.9, 7.3.2

Response *Response Status* **W**

REJECT. Use is consistent with base standard. See IEEE Standards Style Manual, Jan 2007, clause 13.8 on capitalization.

Cl **07** *SC* **7.2.3.1** *P* **3** *L* **24** # 2072

Trainin, Solomon

Comment Type **TR** *Comment Status* **A**

As it is stated in the subclause 11.9 of the basic spec "STAs shall use the DFS procedures defined in this subclause if dot11SpectrumManagementRequired is true." The Extended Channel switch functionality is part of the 11.9 definition, so both attributes dot11SpectrumManagementRequiredshoud and dot11ExtendedChannelSwitchImplemented should be mentioned as requirement for the Extended Channel Switch Announcement information element presence. The same comment applies to any appearance of the Extended Channel Switch Announcement in 7.2.3.4 - 7.2.3.9

SuggestedRemedy

The attribute dot11SpectrumManagementRequired enables wide range of features. In the current spec there is no way to separately declare support of them. Clear specification should be provided to allow or disallow separate use of the extended channel switching

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Commenter writes "I would see that the text at the line 24 on page 3 should be changed this way:
The Extended Channel Switch Announcement information element may be present only if dot11ExtendedChannelSwitchImplemented, dot11SpectrumManagementRequired and dot11RegulatoryClassesRequired are true." Will add a normative statement in 11.9.7 “When dot11ExtendedChannelSwitchImplemented is true, dot11MultiDomainCapabilityEnabled, dot11SpectrumManagementReqired and dot11RegulatoryClassesRequired shall be true.”

Cl **07** *SC* **7.2.3.1** *P* **3** *L* **27** # 2073

Trainin, Solomon

Comment Type **TR** *Comment Status* **A**

As it is stated in the subclause 11.9 of the basic spec "STAs shall use the DFS procedures defined in this subclause if dot11SpectrumManagementRequired is true." The Supported Regulatory Classes functionality is part of the 11.9 definition, so both attributes dot11SpectrumManagementRequiredshoud and dot11ExtendedChannelSwitchImplemented should be mentioned as requirement for the Supported Regulatory Classes information element presence. The same comment applies to any appearance of the Supported Regulatory Classes in 7.2.3.4 - 7.2.3.9

SuggestedRemedy

The attribute dot11SpectrumManagementRequired enables wide range of features. In the current spec there is no way to separately declare support of them. Clear specification should be provided to allow or disallow separate use of the Supported Regulatory Classes information element.

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Commenter writes "I would see that the text at the line 24 on page 3 should be changed this way:
The Extended Channel Switch Announcement information element may be present only if dot11ExtendedChannelSwitchImplemented, dot11SpectrumManagementRequired and dot11RegulatoryClassesRequired are true." Will add a normative statement in 11.9.7 “When dot11ExtendedChannelSwitchImplemented is true, dot11MultiDomainCapabilityEnabled, dot11SpectrumManagementReqired and dot11RegulatoryClassesRequired shall be true.”

Cl **07** *SC* **7.2.3.9** *P* **5** *L* **10** # 2046

Myles, Andrew

Comment Type **ER** *Comment Status* **A**

Text defines when element is required using "is"

However, in 7.2.3.1 used language with "shall"

SuggestedRemedy

Change language to be consistent

Note: I admit the base standard is not consistent but each amendment should be

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. commenter mixes Beacon frame elements with Probe Response frame elements, and many persistent Beacon frame elements (11, 14, 17, 18, 21) are Noted as "shall be present". Few Probe Response frame elements (13, 16, 17) use "shall be present", most (6, 7, 8, 9, 18, 19, 20, 21, 22) use "is present".

Cl **07** *SC* **7.2.3.9** *P* **5** *L* **17** # 2045

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The Supported Regulatory Classes element in Probe Response "is present if . is true"

However, a Supported Regulatory Classes element in a Beacon (see 7.2.3.1) "may be present if . is true"

SuggestedRemedy

Claify why is there a difference, and correct as appropriate.

Response *Response Status* **W**

ACCEPT. Many persistent Beacon frame elements (11, 14, 17, 18, 21) are Noted as "shall be present". Few Probe Response frame elements (13, 16, 17) use "shall be present", most (6, 7, 8, 9, 18, 19, 20, 21, 22) use "is present." Will change change Supported Regulatory Classes element Notes in Beacon to “shall be present” and delete "only."

Cl **07** *SC* **7.3.2.21.11** *P* **6** *L* **39** # 2054

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text refers to the AP with which the STA is associated.

However, it is unclear if this is the enabling AP (with which it is registered) or the local AP (with which it is associated - in 802.11 speak)

SuggestedRemedy

Clarify to which AP the clause applies.

If it is the enabling AP, how does the STA return the report if it cannot actually communicate directly with the enabling AP

Response *Response Status* **W**

ACCEPT. It is mandatory to generate a report in response to a request from either the enabling AP or the AP with which it is associated.

Cl **07** *SC* **7.3.2.22.11** *P* **7** *L* **24** # 2053

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text states that it is mandatory for a STA to support the generation of a DSE report if dot11LCIDSERequired is true.

However, the next sentence says it is always optional

SuggestedRemedy

Remove contradiction

Response *Response Status* **W**

ACCEPT.

Cl **07** *SC* **7.3.2.27** *P* **8** *L* **24** # 4019

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

There is normative text here which competes with the normative text provided in 11.9a. 11.9a is the more apprpriate location for the normative text.

SuggestedRemedy

Change the text in 7.3.2.27 to be descriptive, but not normative - i.e. change "shall be" to "is" at the two places where it occurs within 7.3.2.27.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Changed here and in 11.9a.

Cl **07** *SC* **7.3.2.36** *P* **16** *L* **10** # 437

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

As this line is not a sentence, "meter" shall not be capitialized. See http://www.bipm.fr/en/si/si_brochure/chapter5/5-2.html

SuggestedRemedy

Fix capitalization

Response *Response Status* **W**

ACCEPT. The definition in IETF RFC 3825 is unchanged by 802.11y, therefore this line is deleted.

Cl **07** *SC* **7.3.2.36** *P* **16** *L* **11** # 436

"Palm, Stephen"

Comment Type **TR** *Comment Status* **R**

What are "floors"?

SuggestedRemedy

Define

Response *Response Status* **W**

REJECT. IETF RFC 3825 is the normative reference, and Floors is defined with respect to Datum therein. The definition in IETF RFC 3825 is unchanged by 802.11y, therefore the definition is removed.

Cl **07** *SC* **7.3.2.36** *P* **16** *L* **12** # 438

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

As the word is not at the beginning of a sentence, "meter" shall not be capitialized. See http://www.bipm.fr/en/si/si_brochure/chapter5/5-2.html

SuggestedRemedy

Fix capitalization

Response *Response Status* **W**

ACCEPT.

Cl **07** *SC* **7.3.2.36** *P* **16** *L* **6** # 435

"Palm, Stephen"

Comment Type **TR** *Comment Status* **A**

Which one has the definitions, the reference or this document.

SuggestedRemedy

Clarify

Response *Response Status* **W**

ACCEPT. Clause 2 states Normative Reference for RFC 3825, and will change "2.1 or as" to "2.1 except as".

Cl **07** *SC* **7.4.1.6** *P* **13** *L* **4** # 655

"Trainin, Solomon"

Comment Type **TR** *Comment Status* **R**

There is no need for additional Extended Channel Switch Announcement frame. The new Extended Channel Switch Information Element may be contained in the existent Channel Switch Announcement frame

SuggestedRemedy

Remove the Extended Channel Switch Announcement frame.

Response *Response Status* **W**

REJECT. The REV-ma Channel Switch Announcement element has a length of 5 octets, and legacy stations would have unspecified behavior if the element indicated a length other than 3. There is no backward compatibility with TGh stations in this band, and only the ECSA is used.

Cl **07** *SC* **7.4.1a.4** *P* **14** *L* **43** # 4022

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

In the diagram for the DSE reg loc ann frame format, there is a field with the name "DSE reg loc ann element fields" - this seems to suggest that there is a "DSE reg loc ann element" but the element is named "DSE reg loc element" - I would suggest change the field name to "DSE reg loc element body field"

SuggestedRemedy

Change the name of the field "DSE reg loc ann element fields" to "DSE reg loc element body field" - everywhere it occurs in the document

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. will move figure 7-101fg to 7.3.2.49, and name it DSE reg loc element body field, then refer to it here and 7.4.7a.7 DSE measurement report frame.

Cl **07** *SC* **7.4.1a.4** *P* **14** *L* **43** # 4021

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

The text here says: "The DSE Registered Location Announcement frame is transmitted by a dependent STA to advertise the registered location of its enabling STA." But I cannot find any description of the requirements for this behavior in clause 11.

SuggestedRemedy

You need to describe how often and for what reason a dependent STA sends the DSE registered location action frame and using what RA value. And is this the only mechanism to do this? I.e. are there are other frame choices? This should probably appear in 11.14.4. Another question - can a dependent STA advertise an enabling STA's information on more than one channnel?

Proposed Response *Response Status* **W**

PROPOSE REJECT. the last sentence of 11.14.4 describes the sending of the DSE reg loc ann to the broadcast address (D5.0 p47 lines 14-18). A dependent STA is required to advertise the enabling STA's information on whatever U.S. 3650 MHz band channel(s) the dependent STA is operating on.

Cl **07** *SC* **7.4.7a.6** *P* **16** *L* **36** # 4028

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

Carrying rejected CID 3084 from LB109: This description suggests that the Actual Measurement Start Time can be 32us off from the measuring STA's TSF timer. Why is there a +/-32us tolerance allowed in 11y? This is more stringent than most applications that I can think of. What's the use case scenario for this stringent timing tolerance? Note that the ôActual Measurement Start Timeö used in 11k-related measurement report fields does not have this +/- 32us requirement (a +/- 1 TU timing error is used) -- the resolution was rejected as follows: Basic Request 7.3.2.21.1, CCA Request 7.3.2.21.2 and RPI Histogram Request 7.3.2.21.3 make this accuracy requirement. -- My response is: if everyone else jumps off of the bridge without a bungee cord or a parachute, does that mean that it is a good thing to do?"

SuggestedRemedy

Be a man: Change the tolerance to +/- 1 TU.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. will change request start time tolerance to +/- 1 TU and also reported Actual Measurement Start Time.

Cl **07** *SC* **7.4.7a.6** *P* **16** *L* **36** # 4023

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

Measurement Start Time field - refers to a TSF value - but the requestor is the enabling STA, which is not necessarily the AP with which the STA is associated (alternatively, the enabling STA could be sending this request to an AP!), so there is no defined coordination of TSF between the enabling STA and the dependent STA or AP. I note that in 7.4.7a.7, there is mention that the reporting STA uses its own TSF value as a reference for the measurement time, so the assumption is that the requesting STA would be referring to the TSF of the requestee STA - this should be made explicit in the description of the start time field in the request frame subclause Also, clause 11 does not really explain the TSF value, but it should make it clear that the TSF belongs to the reporting STA with a normative statement. Interestingly enough, this might be a problem, since a STA associated with an AP will not provide any TSF information to the enabler, so how would the enabler know what is a valid TSF start value for that STA? I suppose that it must be true that in all situations, a STA in infrastructure that needs enablement will always deal with an AP that also needs enablement, so it can be guessed that the enabler knows the TSF from the beacons of the AP that it has enabled. Altneratively again, since the enabling STAs must all send beacons out, they too, would have a TSF value, and the enabled STA could relate the measurements to the TSF of the enabler, if it were stated so in the draft - a STA could do this through simply determining an offset between its local TSF and the enabler's TSF. But again, the report seems to suggest that this is not the intended arrangement."

SuggestedRemedy

Choose something that works in providing the answer to the question of "whose TSF" and make it explicit in clause 7 and normative in clause 11."

Proposed Response *Response Status* **W**

PROPOSE REJECT. The comment notes there is no TSF synchronization between the enabling STA and dependent STAs, including dependent APs. The TSF is of the receiving STA, regardless of authentication or association. The enabling STA can use a value of 0, or if it knows the TSF offset of a dependent AP, it could use that information to create a Measurement Start Time for that AP or any dependent STAs in that BSS.

Cl **09** *SC* **9.8.1** *P* **18** *L* **16** # 3162

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

9.8.1: "Optionally, the Beacon frame may also include, on a periodic basis, the regulatory information that would be returned in a Probe Response frame."

7.2.3.1: "The Supported Regulatory Classes information element shall be present if dot11ExtendedChannelSwitchImplemented is dot11ExtendedChannelSwitchImplemented, dot11SpectrumManagementRequired and dot11RegulatoryClassesRequired are true."

It is not clear how the "optionally" in 9.8.1 ties in with the "shall" in 7.2.3.1.

SuggestedRemedy

Modify one of them so that these two subclauses are consistent.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will rewrite part of 9.8.1 to indicate that optionality refers to the Country Information element fields, not the presence of Supported Regulatory Classes, and will change second statement in 9.8.3 accordingly.

Cl **09** *SC* **9.8.3** *P* **13** *L* **12** # 2074

Trainin, Solomon

Comment Type **TR** *Comment Status* **A**

As it is stated in "When dot11RegulatoryClassesImplemented is true and dot11LCIDSERequired is true, the following statements
apply:" the defined rules applies to the STA that enables the Dependent Station Enablement procedures only. It seems that the rules may be useful for any station that operates with regulatory classes

SuggestedRemedy

Extend the rules for any station that operates with regulatory classes

Response *Response Status* **W**

ACCEPT.

Cl **09** *SC* **9.8.3** *P* **18** *L* **45** # 3180

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

The rule that mandates including the Country Information and SupportedRegulatoryClasses elements in Association and Re-association frames when dot11RegulatoryClassesRequired is true contradicts the basic IEEE 802.11-2007 spec. This rule makes incompliant the legacy STAs that are compliant with the IEEE 802.11-2007 spec. This change breaks backward compatibility of the specification.

SuggestedRemedy

Remove the paragraph:
"When dot11RegulatoryClassesRequired is true and a STA is capable of operating as specified in more than one Regulatory Class, the STA shall include the Country Information and SupportedRegulatoryClasses elements in Association frames and Reassociation frames;"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Will delete 'Country Information and' from the third statement of 9.8.3.

Cl **09** *SC* **9.8.3** *P* **19** *L* **46** # 4043

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

The rule that mandates including the SupportedRegulatoryClasses elements in Association and Re-association frames when dot11RegulatoryClassesRequired is true contradicts the basic IEEE 802.11-2007 spec. This rule makes incompliant the legacy STAs that are compliant with the IEEE 802.11-2007 spec. This change breaks backward compatibility of the specification.

SuggestedRemedy

Add other qualifier like support of ECSA as a condition to include the SupportedRegulatoryClasses elements in Association frames and Reassociation frames

OR

make the condition of including the SupportedRegulatoryClasses elements in Association frames and Reassociation frames dependent on the support of ECSA only

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will rewrite third rule of 9.8.3 and rules of 9.8.4 to include condition that dot11ExtendedChannelSwitchEnabled is true.

Cl **11** *SC* **11.14** *P* *L* # 2058

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The draft seems to define measurement requests and responses.

However, there is no description in 11.14 on how this should occur

SuggestedRemedy

Provide a description in 11.14 on how the measurements are intended to be used

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Will put usage overview description in 11.14.1.

Cl **11** *SC* **11.14** *P* *L* # 2052

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

This is similar comment to one I made in the last LB that was not addressed because I acidently marked it as not required

My understanding of the intent of 11y is as follows:
* Dependent AP hears enabling AP
* Dependent AP registers with enabling AP, either over the air or via wire (noting the dependent AP may be a low power device unable to communicate with the enabling AP)
* Enabling AP accepts registration from dependent AP and allocates unique indentity to dependent AP
* Dependent STA hears enabling AP, either over the air or via wire
* Dependent STA registers with enabling AP, either over the air or via wire (noting the dependent AP may be a low power device unable to communicate with the enabling AP)
* Enabling AP accepts registration from dependent STA and allocates unique indentity to dependent STA
* Both the dependent AP and the dependent STA may operate normally while they regularly hear the enabling AP

However, if this underdstanding is correct then there are lots of unanswered questions in the draft
* Where is all this described in the text?
* What protocol is used for a dependent STA or a dependent AP to communicate with the enabling AP, over the wire (possibly in a different subnet) or over the air?
* Is the dependent STA allowed to associate with the dependent AP for the purpose of registering over the wire with the enabling AP? The text in 11.14.3 implies not.
* ...

SuggestedRemedy

The text needs to be completely rewritten to describe intent completely

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Will rewrite to remove concurrent associations.

Cl **11** *SC* **11.14** *P* **25** *L* **50** # 2057

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text defines various parameters indexed by frequency band

However they do not seem to be indexed by frequency band in the MIB.

SuggestedRemedy

Fix, or explain why not

Response *Response Status* **W**

ACCEPT. Will rewrite to remove apparent MIB indexing.

Cl **11** *SC* **11.14** *P* **25** *L* **50** # 2056

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text refers to "frequency band"

However, "frequency band" is not defined

SuggestedRemedy

Define "frequency band" in this context

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Frequency bands is undefined in the base standard and appears 18 times. Will rewrite 11.14 text being commented on to remove it.

Cl **11** *SC* **11.14** *P* **25** *L* **64** # 2055

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

Page 40 says the DSE procedures (defined in 11.14) are only used when dot11DSERequired is true

However, line 64 covers the case when dot11DSERequired is false

SuggestedRemedy

Remove reference to dot11DSERequired when false

Response *Response Status* **W**

ACCEPT.

Cl **11** *SC* **11.14** *P* **38** *L* **13** # 3117
Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text suggests the existence of a location and an identifier remedies interference issues.

More accurately these things assist the resolution of interference issues.

SuggestedRemedy

Change text to say the location and identifier assist in the resolution of interference issues.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. "STA, and unique identifiers to assist in the resolution of interference issues."

Cl **11** *SC* **11.14** *P* **38** *L* **17** # 3118
Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text in 11.14 says a STA shall use the DSE procedures if dot11LCIDSERequired is true.

However, the definition in Annex D says "if and only if"

SuggestedRemedy

Correct the inconsistency

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Will change Annex D

Cl **11** *SC* **11.14** *P* **38** *L* **19** # 3119
Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text states dot11DSERequired "may be set to false to configure STAs to operate as registered STAs"

Why would a registered STA ever want to use the DSE procedures?"

SuggestedRemedy

If the answer is never, then change may to shall

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Per CID 3103, merging the two sentences. An enabling STA is a registered STA that uses the DSE procedures.

Cl **11** *SC* **11.14** *P* **38** *L* **9** # 3116
Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text uses "fixed station" whereas the term defined in 3.54a is "fixed STA"

SuggestedRemedy

Change "fixed station" to "fixed STA"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.14** *P* **41** *L* **22** # 4020
Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

Love that table!

SuggestedRemedy

Thanks.

Proposed Response *Response Status* **W**

PROPOSE REJECT. Out of Scope

Cl **11** *SC* **11.14.1.1** *P* **38** *L* **37** # 3125
Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text says the originating STA "shall" become enabled using the procedure

However, the language presupposes the result

SuggestedRemedy

Change to "...the originating STA shall attempt to become enabled using …"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. CID 3166 provided the wording change.

Cl **11** *SC* **11.14.1.1** *P* **38** *L* **56** # 3120

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The bullets are indented incorrectly

SuggestedRemedy

Fix

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.14.1.1** *P* **39** *L* **11** # 3121

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The bullets are indented incorrectly

SuggestedRemedy

Fix

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.14.1.1** *P* **39** *L* **16** # 3123

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

On page 39 the order of the fields is enablement identifier and then result code

However, on page 38 it is result code and then enablement identifier

SuggestedRemedy

Correct the inconsistency

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will move identifier after result code.

Cl **11** *SC* **11.14.1.1** *P* **39** *L* **19** # 3122

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text refers to 7.1.4.7

However, I could not find it

SuggestedRemedy

Where is this clause?

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. 7.4.1.8 per CID 3047.

Cl **11** *SC* **11.14.1.1** *P* **39** *L* **24** # 3124

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text states that a successful enablement puts the STA into state 2.

Presumably this is the state 2 defined in 11.3. What has enablement got to do with the state in 11.3, given that the STA is not really authenticated?

SuggestedRemedy

Define DSE independently of the authentication and association states

A similar comment applies to line 61 on pp 39

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Will Create Enablement state variable for each STA with which enablement communication is needed, having two states: unenabled and enabled.

Cl **11** *SC* **11.14.1.1.2** *P* **42** *L* **37** # 4011

Cole, Terry

Comment Type **TR** *Comment Status* **X**

There are no normative statemtns beofre the bullet points. I cannot tell what to do with these bullets and statemetns. Also the list starts with b.

SuggestedRemedy

Remove this entire sub-clasue or change it to make it include a statement that specifies something.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will change sub-clause to include a statement that specifies something.

Cl **11** *SC* **11.14.1.2** *P* **39** *L* **34** # 3127

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text refers to the "destination STA"

However, the STA is more consistently described as the "Responder STA"

SuggestedRemedy

Change "destination STA" to "responder STA"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE.

Cl **11** *SC* **11.14.1.2** *P* **39** *L* **34** # 3126

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text says the destination STA "shall" enable the requesting

However, the language presupposes the result

SuggestedRemedy

"Use "may enable"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.14.1.2** *P* **39** *L* **61** # 3128

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text implies the responder STA keeps track of the state for the "indicated STA".

However, the state is actually for the "responder STA" when communicating with the "requester STA"

SuggestedRemedy

Change "indicated STA" to make it clear what is in state 2; it is really a link rather than a STA

A similar issue exists on line 24 on pp 39

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Per CID 3124 creating Enablement State per station.

Cl **11** *SC* **11.14.1.2.2** *P* **43** *L* **15** # 4012

Cole, Terry

Comment Type **TR** *Comment Status* **X**

There are no normative statemtns beofre the bullet points. I cannot tell what to do with these bullets and statemetns. Also the list starts with b.

SuggestedRemedy

Remove this entire sub-clasue or change it to make it include a statement that specifies something.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will change sub-clause to include a statement that specifies something.

Cl **11** *SC* **11.14.1.3** *P* **40** *L* **11** # 3129

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

Disenablement is defined as putting the STA into state 1

However this transition is not shown in 11.3

SuggestedRemedy

Consider showing the transition in the diagram in 11.3

Proposed Response *Response Status* **W**

PROPOSE REJECT. Per CID 3124, creating Enablement State, independent of 11.3.

Cl **11** *SC* **11.14.1.3** *P* **40** *L* **9** # 3130

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text refers to the "indicated STA"

However, it is unclear what the "indicated STA" is"

SuggestedRemedy

Specify the "indicated STA" by referring to a field in the request primitive

A similar comment applies to 11.14.1.4

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Per CID 3128 will clarify deenablement requester.

Cl **11** *SC* **11.14.1.3.2** *P* **44** *L* **8** # 4013

Cole, Terry

Comment Type **TR** *Comment Status* **X**

There are no normative statemtns beofre the bullet points. I cannot tell what to do with these bullets and statemetns. Also the list starts with b.

SuggestedRemedy

Remove this entire sub-clasue or change it to make it include a statement that specifies something.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. Will change sub-clause to include a statement that specifies something.

Cl **11** *SC* **11.14.2** *P* **40** *L* **52** # 3131

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

The text states "Reported DSE LCI elements are to any destination address …"

However, it appears the text should say "Reported DSE LCI elements may refer to any destination address …"

SuggestedRemedy

Clarify and fix

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE.

Cl **11** *SC* **11.14.2** *P* **44** *L* **31** # 4025

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

Maybe I missed it - the added table is nice, since it does give a nice logical separation using MIB variables among the various Tgy STA types. However, I notice a certain lack of subsequent behavioral description for the enabling STA, well, at least for one part of enabling STA behavior, which is the beaconing - i cannot determine how a requesting STA could distinguish a fixed STA from an enabling STA. Are both of them required to beacon? If so, what is different in the beacons between the two types that I can distinguish? Is there a bit in a frame somewhere? What is different, signaling-wise?"

SuggestedRemedy

Please describe the difference between the fixed STA and enabling STA in terms of observable signaling behavior. Not sure if fixed STA beaconing is actually mentioned anywhere.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Will add a statement in 11.14.2 about fixed STA and RegLoc DSE bit being 0 to signify that it is not creating a DSE service area.

Cl **11** *SC* **11.14.2** *P* **44** *L* **31** # 4027

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

What good is a fixed STA? So it can operate, but it cannot enable. And this serves what purpose? It could use legal spectrum to maybe talk to itself! But it cannot allow anyone else to communicate. A fixed STA is worthless without an enabling STA. So why bother even having an entity that is a fixed STA? Maybe it could talk to other fixed STA, assuming they were present. Is that the intent?"

SuggestedRemedy

Justify the inclusion of the fixed STA, or did I guess it at the end?

Proposed Response *Response Status* **W**

PROPOSE REJECT. Not a valid recirculation comment. Fixed STAs by regulation can operate with higher transmit power than dependent STAs. Fixed STAs can bridge, can form a BSS or IBSS among fixed STAs and with dependent STAs that are enabled by others, and in general operate over greater distances than dependent STAs can.

Cl **11** *SC* **11.14.3** *P* *L* # 4041

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

"An enabling STA may request its dependent STAs perform DSE measurement requests and make DSE reports over the DS. How information is exchanged over a DS is beyond the scope of this standard."
This is a normative statement ("may") which says it's outside the scope of the standard.

SuggestedRemedy

Turn into an informative note (may->can) or define this communications necessary to achieve this and make it within the scope of the standard.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. will rewrite into an informative note.

Cl **11** *SC* **11.14.3** *P* **27** *L* **1** # 2059

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text provides a picture of a "typical" state machine.

Why does the draft need a "typical" state machine?

SuggestedRemedy

Remove diagram or provide better context

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. a picture is sometimes worth 1000 words, and 802.11-2007 Figures 15.7, 15.9, 17.15, 17.7, 18.8 and 18.10 show typical state machines. The state machine diagram clarifies the decision to change states, and its consequences.

Cl **11** *SC* **11.14.3** *P* **28** *L* **7** # 2060

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The text includes "count the sum"

This makes no sense

SuggestedRemedy

Recast sentence to remove "count the sum"

Response *Response Status* **W**

ACCEPT.

Cl **11** *SC* **11.14.3** *P* **44** *L* **62** # 4026

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

There is behavior that is missing/not specified here. Where is the description of the advertisement of the enablement service? What frames are sent at what phy rate, and how frequently? And on which channels? How many different channels is an enabler allowed to service? And using what RA value? And again, how can I tell if the sending STA is an enabler or just a fixed STA that is not an enabler? What is different in a frame that would allow a dependent STA to detect the difference?"

SuggestedRemedy

You need to describe how often and using what frames an enabling STA sends to announce its presence and its willingness to be an enabler. Only beacons? Or are other frames allowed? What RA values are appropriate? And how many channels can one enabler service at a time? This should probably appear in 11.14.3, and the name of that subclause might need to change to something on the order of "Enabling STA operation to create a DSE service area for dependent station operation"

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Will retitle clause to 'Enabling STA operation with DSE'.

Cl **11** *SC* **11.14.4** *P* **41** *L* **56** # 3132

Myles, Andrew

Comment Type **ER** *Comment Status* **X**

"a enabling" should be "an enabling"

SuggestedRemedy

Fix

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.14.4** *P* **42** *L* **22** # 3134

Myles, Andrew

Comment Type **TR** *Comment Status* **X**

The text refers to a value modulo another value having a remainder of zero

However, modulo arithmetic does not have remainders

SuggestedRemedy

Fix

Proposed Response *Response Status* **W**

PROPOSE ACCEPT. modulo dot11DSETransmitDivisor equals zero,.

Cl **11** *SC* **11.9.7** *P* **36** *L* **34** # 3177

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

"When dot11ExtendedChannelSwitchImplemented is true, dot11MultiDomainCapabilityEnabled, dot11SpectrumManagementRequired and dot11RegulatoryClassesRequired shall be true"
The current solution mandates that STA that wants to support the ECSA shall support the entire TPC and DFS. In case there is no need to follow the regulations for example in 2.4GHz band the channel switching may be still important as in .11n. The definition of ECSA should allow using it separately and as an extension of DFS as well.

SuggestedRemedy

Separate the definition of ECSA from the DFS. Define rules of use it separately w/o support of the Spectrum management. Define rules to allow using ECSA together with Spectrum management

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Text will be rewritten to have implicit use of ECSA in US 3650 band, regardless of association, and explicit and advertised in the Extended Capabilities IE, independent of dot11SpectrumManagementRequired. The rules will make no distinction whether dot11SpectrumManagementImplemented is true or false.

Cl **11** *SC* **11.9.7.1** *P* **24** *L* **23** # 2075

Trainin, Solomon

Comment Type **TR** *Comment Status* **A**

Using of an Extended Channel Switch Announcement element and frame and a Channel Switch Announcement element and frame actually will present the same information so it is not clear why the use of the Extended Channel Switch Announcement element and frame is mandated. The same comment applies to 11.9.7.2

SuggestedRemedy

Explain clearly when each of the infromation elements and frames should be used and why

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. The change in regulatory class is the information that differs between ECSA and CSA. The only cases where regulatory class is changed and both ECSA and CSA are sent, are when the requirements signified by the new regulatory class are met by all STAs that act on the Channel Switch Announcement.

Cl **11** *SC* **11.9.7.1** *P* **24** *L* **38** # 2076

Trainin, Solomon

Comment Type **TR** *Comment Status* **A**

Paragraph that starts at line 38 does not define behavior of the Extended Channel Switch Announcement element

SuggestedRemedy

Define behavior for the Extended Channel Switch Announcement element

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Will change initial text of second paragraph to “In the following text:” and make corresponding change to 11.9.7.2. Commenter writes “add the following text before paragraph the starts with “An AP shall inform associated STAs”:

In the following text, wherever Channel Switch Announcement is referred to both the Extended Channel Switch Announcement and Channel Switch Announcement should be used as defined in 1) and 2)”.”

Cl **11** *SC* **11.9.7.1** *P* **36** *L* **53** # 3176

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

The CSA is not optimized and contains substantial limitation for switching between regulatory classes. Due to support of ECSA is important for legacy stations that are associated in BSS that uses ECSA. For example the .11n compliant BSS may associate non .11n compliant STA as well. Support of Extended Channel Switching may be implemented as SW upgrade in the legacy STA. To make the support of ECSA in the legacy STA visible to other STA the ECSA capability should be signaled.

This comment is relevant for behavior of DFS owner in 11.9.7.2 as well

SuggestedRemedy

Add the ECSA capability field to the Extended Capabilities information element

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Extended Capabilities text will be based on 07/2326r2 7.3.2.27, pages 9 and 10, modified to meet 11y baseline, which excludes HT.

Cl **11** *SC* **11.9.7.1** *P* **36** *L* **53** # 3178

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

The definition is contradictional: If the CSA cannot be used for switching to new channel in a different regulatory class how to use both. If the CSA can be used for switching to a new channel there is no need to mandate the ECSA. If the CSA cannot be used the ECSA shall be used instead. So the problem is how to know that the ECSA is supported in the cases the CSA cannot be used.
This comment is relevant for behavior of DFS owner in 11.9.7.2 as well

SuggestedRemedy

Define use of ECSA as function of the ECSA capability. Define this capability as implicit in some kind of networks like TGn or explicit and advertised in ECSA capability field

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Text will be rewritten to have implicit use of ECSA in US 3650 band, regardless of association, and explicit and advertised in the Extended Capabilities IE. CSA cannot be used when changing Regulatory Class unless all STAs that act on the CSA meet the requirements signified by the new Regulatory Class. There is no contradiction, the AP knows from (re)Association frames whether STAs can do ECSA, and may attempt to switch channels with both ECSA and CSA if the AP expects the legacy STAs to be able to operate on the new channel and RC.

Cl **11** *SC* **11.9.7.1** *P* **36** *L* **58** # 3179

Trainin, Solomon

Comment Type **TR** *Comment Status* **X**

The AP knows dot11ExtendedChannelSwitchImplemented value of itself, but no means are defined to know state of the dot11ExtendedChannelSwitchImplemented of other stations. It may happen that no one of the associated stations does support the Extended Channel switching.
This comment is relevant for behavior of DFS owner in 11.9.7.2 as well

SuggestedRemedy

Define advertising of the Extended Channel switching support. Define ECSA capability field to allow upgrade of the legacy stations to support ECSA. Define the AP behavior to cover associated stations that part of them supports and part does not support ECSA.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. The AP knows from (re)Association frames whether STAs support ECSA and Supported Regulatory Classes. We define advertising ECSA via Supported Regulatory Classes and will add an Extended Capabilities indication field.

Cl **11** *SC* **11.9a** *P* *L* # 4032

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

"... shall not take alternative action."

There are two problems with this. Firstly there is no normative definition of "alternative action". Secondly, I don't believe you can or should stop the STA attempting to achieve enablement with some other enabling AP.

SuggestedRemedy

Remove: "If dot11DSERequired is true, STAs shall perform ECS procedures so as to switch at the time indicated by the Channel Switch Count, and shall not take alternative action.", or rewrite indicating what alternate actions are not allowed."

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. A dependent STA receiving ECS commands from its enabling STA shall perform them or change Enablement state to unenabled. Sentence changed to ôIf dot11DSERequired is true, STAs shall perform ECS procedures so as to switch at the time indicated by the Channel Switch Count, or change the Enablement state for the enabling STA to unenabled."

Cl **11** *SC* **11.9a** *P* *L* # 4031

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

"If dot11ExtendedChannelSwitchEnabled and dot11LCIDSERequired are true, only Extended Channel Switch Announcement elements shall be transmitted."

Way too broad. A beacon containing only this element won't be very useful!

SuggestedRemedy

Is this trying to limit use of other switching mechanisms? If so indicate that they shall not be used in this case - i.e., list the disallowed mechanisms.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. If dot11ExtendedChannelSwitchEnabled and dot11LCIDSERequired are true, frames containing Channel

Cl **11** *SC* **11.9a.1** *P* *L* # 4034

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

I see there has been a move to remove "shall" from the management frame list of elements tables. As I see it, regardless of lack of shalls, the entire clause 7 is normative. So saying that an element is present under certain conditions in clause 7 suffices. Therefore "When dot11ExtendedChannelSwitchEnabled is true, the Supported Regulatory Classes element shall be included in Beacon frames, as described in 7.2.3.1, Association Request frames, as described in 7.2.3.4, Reassociation Request frames, as described in 7.2.3.6, Probe Request frames, as described in 7.2.3.8 and Probe Response frames, as described in 7.2.3.9." is unnecessary.
I would rather have the definition of conditions when something is present or not in one place (clause 7) than distributed throughout clause 11.

SuggestedRemedy

Remove cited text.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **11** *SC* **11.9a.3.1** *P* *L* # 4038

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

"When a STA with dot11DSERequired false receives an Extended Channel Switch Announcement element, it may choose not to perform the specified switch, but to take alternative action."
" a sta ... may take alternative action" is a normative statement with an undefined action.

SuggestedRemedy

Either define what alternative actions are permitted or remove the cited sentence.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Added reference to CSA text ", as described in 11.9.7.1."

Cl **11** *SC* **11.9a.3.1** *P* *L* # 4037

Stephens, Adrian

Comment Type **TR** *Comment Status* **X**

"The decision to switch to a new operating channel in an infrastructure BSS shall be made only by the AP."

Shalls relate to observable behaviour. You cannot observe a decision.

SuggestedRemedy

Remove the cited text, or turn it into an informative note.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT IN PRINCIPLE. Changed "shall be made only" to "is made".

Cl **11** *SC* **11.9a.3.1** *P* **39** *L* **49** # 4010

Cole, Terry

Comment Type **TR** *Comment Status* **X**

I am unable to parse the startments in this sub-clause beginning with "In the following paragraph."

SuggestedRemedy

Remove this and the subsequent paragraphs or make other changes to make it a complete sentence that specifies something.

Proposed Response *Response Status* **W**

PROPOSE ACCEPT.

Cl **-9** *SC* **9.8.1** *P* **19** *L* **1** # 4024

Fischer, Matthew

Comment Type **TR** *Comment Status* **X**

Not that it was originally your problem, but how does any of this work for IBSS?"

SuggestedRemedy

How does a STA wishing to start an IBSS figure out which channels are legal to use? Is it that you can only set up an IBSS in the vicinity of a detected AP?

Proposed Response *Response Status* **W**

PROPOSE REJECT. Clause 9.8.1 specifies passive scanning to learn the channels that may be used, from Beacon frames sent by the enabling STA. 11.14.4 (p45 line 43) first dashed item specifies that all dependent STAs must receive Beacon frames from the enabling STA before any transmission is attempted.

Cl **A** *SC* **A.4.17** *P* **48** *L* **5** # 434

"Palm, Stephen"

Comment Type **TR** *Comment Status* **R**

This clause does not have explanatory text

SuggestedRemedy

Add text to introudce the clause

Response *Response Status* **W**

REJECT. In REV-ma Annex A.4, none of the prior clauses have explanatory text.

Cl **Annex** *SC* **Annex D** *P* *L* # 2044

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The definitions of various parameters uses the clause "The capability is disabled otherwise"

However, the definition provides semantics rather than describing a capability and so the "The capability is disabled otherwise" makes no sense

SuggestedRemedy

In each case, properly define the semantics in the "otherwise case"

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Of the four occurrences of the phrase in Annex D text, two indicate capabilities and two are indications of requirements. The description text of dot11RegLocRequired and dot11DSERequired will be changed, and commas will be added after "disabled" in all occurrences.

Cl **Annex** *SC* **Annex D** *P* **40** *L* **28** # 2041

Myles, Andrew

Comment Type **ER** *Comment Status* **A**

dot11RecLocRequired should be dot11RegLocRequired

SuggestedRemedy

Fix

Response *Response Status* **W**

ACCEPT.

Cl **Annex** *SC* **Annex D** *P* **40** *L* **28** # 2047

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The name of "dot11RgLocRequired" suggests that something is required.

However the definition provides no hint as to what is required

SuggestedRemedy

Change the definition so that it is clear what is required

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. the description text will be clarified or deleted

Cl **Annex** *SC* **Annex D** *P* **40** *L* **40** # 2048

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The name of "dot11DSERequired" suggests that something is required.

However the definition only hints that the station is required to be enabled by an "enabling AP"

SuggestedRemedy

Change the definition so that it is clearer what is required

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. the description text will be clarified

Cl **General** *SC* **General** *P* *L* # 2061

Myles, Andrew

Comment Type **TR** *Comment Status* **A**

The description of the DSE procedures need a rewrite to make them much clearer and match the intent of the TG

SuggestedRemedy

It is hard to know how to rewrite the procedures until the intent of the TG is more obvious

Response *Response Status* **W**

ACCEPT IN PRINCIPLE. Comment appears to be a generalization of Comment 2052 by same commenter, which only addresses 11.14. Accepting 2052 and doing the supporting message formats causes changes to other clauses.

Cl **General** *SC* **General** *P* *L* # 2042

Myles, Andrew

Comment Type **ER** *Comment Status* **A**

dot11AssociateFailHoldTime is used three times in the document.

It should be dot11DSEAssociateFailHoldTime'.

SuggestedRemedy

Fix

Response *Response Status* **W**

ACCEPT.

Agenda#: 5.16
Date: 11/16/07
Time:

IEEE 802 LMSC RESOLUTION

Motion By: KERRY Seconded By: O'Hara

Move to conditionally approve IEEE 802.11 Working Group TGy Draft 6.0 to go to Sponsor Ballot.

WG Vote on the motion: Passes *71: 0 : 3*
TG Vote: Passes *4-0-0*

TGy had a *95.9%* approval on the last WG Recirculation Ballot (LB112). There were 11 voters that had voted NO. 2 of 11 NO voters changed to YES votes.

Approve: Do Not Approve: Abstain:

Moved: to conditionally approve IEEE 802.11 Working Group TGy Draft 6.0 to go to Sponsor Ballot.
Moved: Kerry/O'Hara

Passes: 15/0/0

5.17	**ME**	**802.1ah approval for sponsor ballot**	**-**	**Jeffree**	**5**	**02:43 PM**

MOTION

- 802.1 requests permission of the EC to forward P802.1ah to Sponsor ballot.
- Proposed: haddock Second: bottorff
- For: 44   Against: 0   Abstain: 7
- EC proposed: Jeffree Second:

P802.1ah supporting information:

- Recirculation ballot on draft 3.8 closed 22nd October 2007
- 4 negative ballots; all comments resolved to the balloters' satisfaction and all have changed their vote to Approve
- Final voting tally is 87 voters, 77 votes cast (88.5% response), vote was 39/0/43 (100% approval).

Moved: 802.1 requests permission of the EC to forward P802.1ah to Sponsor ballot.
Moved: Jeffree/Grow

Passes: 15/0/0

6.00		**Executive Committee Study Groups, Working Groups, TAGs**	**-**		
6.01	**MI***	**802.15.4e SG extension (1st renewal)**	**-**	**Heile**	
6.02	**MI**	**802.11 Video Transport Stream SG extension (2nd renewal)**	**-**	**Kerry**	**02:47 PM**

Agenda#: 6.02
Date: 11/16/07
Time:

IEEE 802 LMSC RESOLUTION

Motion By: KERRY Seconded By: O'Hara

Request the IEEE 802 Executive Committee to extend the IEEE 802.11 *Video Transport Stream* Study Group.

WG: Moved by *Ganesh Venkatesan* Second: Eldad Perahia
802.11 WG Results *(68-2-5)* Approved

Approve: Do Not Approve: Abstain:

Moved: to extend the IEEE 802.11 *Video Transport Stream* Study Group.
Moved: Kerry/O'Hara

Passes: 15/0/0

6.03	**MI**	**802.11 Very High Throughput SG Extension (2nd renewal)**	**-**	**Kerry**	**02:35 PM**

Agenda#: 6.03
Date: 11/16/07
Time:

IEEE 802 LMSC RESOLUTION

Motion By: KERRY   Seconded By: O'Hara

Request the IEEE 802 Executive Committee to extend the IEEE 802.11 *VHT* Study Group.

WG: Moved by *Eldad Perahia*   Second: David Bagby
802.11 WG Results   *(73-0-0)* Approved

Approve: Do Not Approve: Abstain:

Moved: to extend the IEEE 802.11 *VHT* Study Group.
Moved: Kerry/O'Hara

There was much discussion on the life of a study group, after Paul expressed the opinion that the Study Group should be able to determine a PAR in two sessions.

Passes: 14/1/0

6.04	**MI***	**802.21 Security SG extension (1st renewal)**	**-**	**Gupta**		
6.05	**MI***	**802.21 Multi-radio power management SG extension (1st renewal)**	**-**	**Gupta**		
6.06	**MI**	**802.3 Higher speed SG extension (4th renewal)**	**-**	**Grow**	**5**	**03:07 PM**

HSSG Extension

- Motion is simply to allow the group to meet in the event NesCom has a problem with the PAR
- 802.3 motion #11 Y: 61, N: 0, A: 1

  Move that the HSSG requests that IEEE 802.3 extend the Higher Speed Study Group.

EC Motion – HSSG extension

The EC extends (renews) the IEEE 802.3 Higher Speed Study Group.

M: Bob Grow

S: Tony Jeffree

Moved: The EC extends (renews) the IEEE 802.3 Higher Speed Study Group.
Moved: Grow/Jeffree

Passes: 15/0/0

6.07	**MI**	**802.15.6 SG extension (3rd Renewal)**	**-**	**Heile**	**5**	**03:08 PM**

EC Agenda Items- SG renewals

Motion:

Move that the EC extend (third extension) the SGBAN Study Group through the March 2008 Plenary Meeting.

Mover: Bob Heile

Seconder: Mike Lynch

Moved: that the EC extend (third extension) the SGBAN Study Group through the March 2008 Plenary Meeting.
Moved: Heile/Lynch

Passes: 15/0/0

6.08	**MI**		**-**			
6.09	**MI**		**-**			
6.10	**MI**	**802.15 RFID SG Formation**	**-**	**Heile**	**5**	**02:45 PM**

New Study Group
RFID

Background Information

- RFID-IG Volunteer Chair: M McInnis, Boeing
- Tuesday evening tutorial delivered by Richard Payne, Boeing
- Two 2-hour time slots were allocated during this session.
- Attendance at meetings:
  - Approx. 40 attendees in Tuesday AM1 slot.
  - Approx. 11 attendees in Thursday PM1 slot.

Tutorial

- Number of people attending 105

- Straw Poll asking the question:

Would you support a study group in 802 to propose a PAR and 5 criteria for a PHY/MAC specification for passive tag RFID?

Yes 36

No 6

Abstain 30

Summary

- Study group
  - 802.15
- Scope
  - RFID PHY/MAC
- Purpose
  - To determine what work, if any, is of interest in 802 on RFID
- Timeframe
  - 2 plenary cycles, to investigate PAR definition

Meeting Achievements

- Agreed upon a general scope and purpose
- Agreed that a Study Group should be formed
- Agreed to take a motion to the 802.15 WG

General Scope and Purpose

- There is a project opportunity for a Study Group to develop a PAR and 5 Criteria for a draft standard for a PHY and MAC targeting RFID ultra-low energy tag and sensor applications.
- This is not addressed elsewhere, such as in EPCglobal and ISO/IEC 18000. Specific problem areas include; ambiguous radio definitions, lack of co-existence, and insufficient security. The management of EPCglobal is supportive of having a more specifically defined wireless standard which addresses these issues.
- The Study Group will define the required co-ordination needed with groups such as the IEEE, the EPCglobal group, ISO/IEC 18000, and others(?).

Motion to the 802.15 Working Group

- Move that 802.15 WG seek approval to form a Study Group to develop a PAR and 5 Criteria for a draft standard for a PHY and MAC targeting RFID ultra-low energy tag and sensor applications.

- Moved: Mike McInnis
- Seconded: James Gilb
  - Vote: 25/1/4
  - Motion Passed

Motion to the EC

- Move that the EC approve the formation of a Study Group to develop a PAR and 5 Criteria for a draft standard for a PHY and MAC targeting RFID ultra-low energy tag and sensor applications.

- Moved: Bob Heile
- Seconded: Mike Lynch
  – Vote:

Moved: that the EC approve the formation of a Study Group to develop a PAR and 5 Criteria for a draft standard for a PHY and MAC targeting RFID ultra-low energy tag and sensor applications.
Moved: Heile/Lynch

Passes: 14/0/1

6.11	**MI**		**-**			
6.12	**MI**		**-**			
6.13	**MI**		**-**			
6.14	**MI**		**-**			
6.15	**MI**		**-**			
6.16			**-**			
7.00		**Break**	**-**		**10**	**03:16 PM**
8.00		**IEEE-SA Items**	**-**			
8.01	**II**	**802 Task Force update**	**-**	**Nikolich**	**5**	**03:22 PM**

802 Task Force report

- Task Force Meeting, Wednesday 14 November, Atlanta SOM: 1:00 EOM: 1:21
- Attendees: Rosdahl, Mcclain, Hawkins, Labelle, Law, Mills, Rigsbee, Kenney, Turner, Grow, Kipness, Nikolich, Thompson, Parsons

- 1) IP Solicitation Process Update - Law
  - Can not find a chair to run adhoc ,PatCom is acknowledging concerns raised regarding patent slides

- 2) myproject - grow/kipness
  - RevCom Complaint - Visability of comments(802.16g) issue due to myBallot limitations , (Law)There is an adhoc looking into this - too early to report at this point -

- 3) Attendance Software Update - Labelle
  - KONA test crashed system, changes required for Nov session too great to enable beta-test, Tapei will be next test

- 4) Ombudsman feedback - Kenney
  - nothing new

8.02	**II**	**Attendance Software Report**	**-**	**Gilb**	**10**	**03:27 PM**

Project: IEEE P802 LAN/MAN Standards Committee

Submission Title: [November 2007 Attendance Software Development Update]
Date Submitted: [16 November 2007]
Source: [James P. K. Gilb]
Company [SiBEAM]
Address [555 N Mathilda Ave Ste 100, Sunnyvale, CA 94085]
Voice: [[1]+1 408 245 3120, [2]+82-2-526-4065], FAX: [], E-Mail: [last name at ieee dot org]
Re: []

Abstract: [Status of attendance software development for November 2007]

Purpose: []

Closing Plenary Report

November meeting summary

- Proposed load test during opening plenary cancelled
  - Problems with hotel infrastructure (power and network equipment) reduced network throughput to unusable levels.
- Held a walk through on Wednesday
  - About 5 in attendance with 2 staff to demonstrate
- The information from the Monday Kona breakouts is available on the test system for the chairs.
  - Contact Clyde Camp (c.camp@ieee.org) for access information.

Proposed Schedule

- Jan. 2008 – Beta test at Taipei interim
  - 802.11, 802.15, 802.18 and 802.19, if approved by the respective chairs.
  - Depends on having good hotel network infrastructure
- March 2008 – Beta test with complete front end and back end
  - If Taipei is goes well, open up test to all groups (with approval by the respective chairs).
  - If not restrict test to 802.11, 802.15, 802.18 and 802.19 (with approval by the respective chairs)
  - Potentially hold a load test at the end of the 802 opening plenary if network infrastructure has been verified
- May 2008 - Production release
  - Should have sufficient servers available and configured to support up to ?? simultaneous interims in different locations.

Opening Plenary Report

Report on September alpha test

- IMAT software overloaded server on first day
  - Switched to backup (older) system Mon. afternoon
  - However, able to gather useful information
  - Main issue was load testing had not been done
- Problem identified and fixes applied
  - 5 weeks of performance testing
  - Request for server to add 1 GB RAM

November Meeting Schedule

- Restricted beta test - Postponed
  - Ask for “stress test” at the end of the Atlanta 802 opening plenary
- REMINDER: All participants need to sign up for an IEEE Web Account and indicate their Activity Area in myProject *if they have not already done so*
  - Must be completed by the end of the meeting
  - Attendance will not be recorded otherwise
  - Detailed instructions have been delivered to the EC
- IMAT walkthrough for WG chairs/vice chairs during the week
  - What is the best time?

Additional Information

Kona summary

- Registration in IMAT system (308 total)
  - 802.15 primary interest: 111
  - 802.11 primary interest: 197
- C. Camp supported approximately 100 during the day plus 53 others via email (with some overlaps and repeats)
  - Appears that 1/4 to 1/3 using the system needed help
  - Confirmed with a spot check of 802.15.3c PM2 – out of ~40 in the room, ~10 had had problems.
  - Too many, but majority had no problems and this was the first use for many.

Positive points about IMAT

- A random sampling of about 20 people on Tuesday and Wednesday (who had previously been at the help desk) was uniform in their liking the way the attendance looked and operated once the initial problems were overcome.

Main problems

- IMAT Local system taken off line approximately 4pm on Monday the 17th
  - 442 successful logins to 802.11 breakouts
  - 230 to 802.15 breakouts.
- The problems encountered can be roughly grouped into the following classes:
  - Class 1: Too many people without Web Accounts and/or myProjectTM Activity Profiles
  - Class 2: Bugs within the IMAT software
  - Class 3: Server performance using IMAT software
  - Class 4: Missing components (under development and never intended for this test)

Problem Class 1

- Causes:
  - People not in myProject^{TM} and/or without Web Accounts (all participants need to be registered in myProject^{TM})
  - An IMAT Central bug which only reported those in WGs but not in Projects (now corrected).
- In Atlanta
  - Participants need to be in myProject^{TM} system by the end of the week (November 16) for attendance credit.
  - Presentations have been distributed to the four affected Atlanta WGs to explain IMAT/myProject^{TM}
  - A more organized IMAT/myProject^{TM} Help Desk from Sunday through Thursday.

Problem Class 2

- True bugs in the IMAT software.
- Two bugs that could be duplicated
  - Now corrected, one prior to Kona meeting start
- Three additional intermittent bugs that could not be duplicated
  - The latter are most likely related to Problem Class 3.

Problem Class 3

- Worst problem, test had to be terminated
  - Server (Newton) became overloaded and slowed to the point of uselessness.
  - In part, due to the dynamic page generation of IMAT spawning too many processes
  - in part, by Newton's configuration that allowed excessive processes to be created without protecting other services.
- In retrospect, load testing had not been adequately done.

Problem Class 3 Testing

- After the close of the Kona meeting, the IEEE SA paid for expediting Newton back to Portland to begin load testing as soon as possible.
  - The analysis and testing was under the auspices of Walter Pienciak, the SA’s IT team and the developer.
  - Tested the actual code, server configuration, use of static vs dynamic pages and other performance issues.
- Five weeks of intense scrutiny and analysis
  - Used test applications (initially Flood, later Jmeter)
  - System stressed to failure point for each new code release.

Problem Class 3 Solution

- As a result of these tests
  - Code and configuration optimizations were made
  - A recommendation to Verilan to add at least an additional 1 GB of RAM (currently 1 GB of RAM).
- Even without this additional RAM, we have high confidence that code and configuration optimizations that we have now made have resulted in a system that will perform more than adequately in Atlanta with room to add other WGs in future meetings.

Class 4 issues

- Some components that had not been implemented yet
  - Primarily the meeting planner interface and reciprocal rights credit assignment
  - Not intended to be tested at that time, but the chairs, were expecting them.
- Both of these have now been implemented
  - Only 802.15 supplied sufficient historical data in time to test the meeting planner interface.
- Numerous other minor changes have been implemented involving navigation, help pages and overall look and feel.

8.03			-			
9.00		**LMSC Liaisons & External Interface**	-			
9.01	ME	Liaison to ITU-R WP5D - IMT-Advanced Requirements	-	Lynch	5	03:42 PM

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ATTACHMENT 6.7

Source: Document 8F/TEMP/568

Working document towards proposed draft new [Report/Recommendation] [Guidelines for evaluation of radio interface technologies for IMT-Advanced]

(xxxx)

[Editors note: a new section on terminology is necessary for [IMT.EVAL].]

CONTENTS

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1 Introduction

[Editor notes: NEW common text for IMT-Advanced should be incorporated.]

2 Scope

This [Recommendation/Report] provides guidelines for both the procedure and the criteria (technical, spectrum and service) to be used in evaluating RITs for a number of reference scenarios, test environments and deployment models. These test environments, defined herein, are chosen to simulate closely the more stringent radio operating environments. The evaluation procedure is designed in such a way that the impact of the candidate RITs on the overall performance and economics of IMT-Advanced may be fairly and equally assessed on a technical basis. It ensures that the overall IMT-Advanced objectives are met.

The [Recommendation/Report] provides, for proponents and developers of RITs, the common base for the self and external evaluation of RITs and system aspects impacting the radio performance.

This [Recommendation/Report] allows a degree of freedom so as to encompass new technologies.

The actual selection of the RITs for IMT-Advanced is outside the scope of this [Recommendation/Report].

3 Structure of the Recommendation/Report

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Section 5 outlines the RIT considerations and identifies the transmission dependent part of the radio interface considered in the evaluation procedure. Section 6 defines the criteria for evaluating the RITs and section 7 references the tests environments under which the candidate RITs are evaluated. Section 8 outlines the overall procedure for evaluating the RITs. Section 9 gives details on evaluation methodology. Section 10 describes the detail evaluation approach.

The following Annexes form part of this Recommendation:

Annex 1: Radio interface technologies description template

Annex 2: Test environments and deployment models

Annex 3: Requirements for assessment of candidate technologies

4 Related Documents

5 Radio interface technology considerations

[Editors note Text developed for IMT.TECH and perhaps also annex 4 of circular letter should be referenced here.]

[Editor's note: WG-SERV provided the following text for this section.]

[Content from Doc. 8F/1287(D)]

Service parameter values for service classes

The following values should be used to represent the service classes in the evaluation of proposals against the requirement to support a wide range of services.

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TABLE 1

Service classification and service parameters

User Experience Class	Service Class	Service Parameters (Numerical Values)	
Conversational	Basic conversational service	Throughput:	20 kbit/s
		Delay:	50 ms
	Rich conversational service	Throughput:	5 Mbit/s
		Delay:	20 ms
	Conversational low delay	Throughput:	150 kbit/s
		Delay:	10 ms
Streaming	Streaming Live	Throughput:	2 – 50 Mbit/s
		Delay:	100 ms
	Streaming Non-Live	Throughput:	2 – 50 Mbit/s
		Delay:	1 s
Interactive	Interactive high delay	Throughput:	500 kbit/s
		Delay:	200 ms
	Interactive low delay	Throughput	500 kbit/s
		Delay	20 ms
Background	Background	Throughput:	5 – 50 Mbit/s
		Delay:	< 2s

6 Characteristics and criteria chosen for evaluation

[Editors note Text developed for annexes 3-5 of circular letter should be referenced here.]

Areas to be evaluated

The evaluations are to cover the following areas:

- Compliance with minimum requirements

This area addresses the check for compliance of the proposal with the minimum criteria.

- Spectrum usage related functionalities

This area addresses the evaluation of spectrum usage related functionalities, such as paired and unpaired operation, spectrum sharing mechanisms and bandwidth scalability, according to the relevant requirements of IMT-Advanced

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- System performance related to the specified test scenarios

This area addresses the evaluation of the performance of the proposals in the different test environments in terms of specific metrics

- [Complexity of technology]

[This area addresses the impact of a given RIT on complexity of implementation (equipment, infrastructure, installation, etc.) i.e., the less complex the better. In order to achieve the minimum cost and best reliability of equipment, the technologies selected should have a level of complexity consistent with the state of technology, the desired service objectives and the radio environment. Some technologies have several possible methods of implementation which allow a compromise between complexity/cost and performance.]

- Deployment cost

[Editors note: contributions are needed to clarify this issue especially on how the evaluation could be performed and relevant issues.]

Although detailed and quantitative assessment of deployment costs is considered infeasible, it is considered important to understand the capability of an IMT-Advanced system proposal to be in a wide range of economic conditions. The enablers and functionalities supporting flexible roll-out and cost-efficient network deployment shall therefore be included in the evaluation.

The evaluation criteria used to determine the throughput and other performance, general and minimum, of the proposals. Their use is two fold, first of all they are used to verify that the proposal meets the minimum requirements. Secondly they are used to obtain further insight in the performance of the technology proposal.

6.1 General characteristics and criteria

Services

[Incorporation of proposals from Service linked document]

[Editors note: Text elements from WG Service for Annex 7]

[Content from 8F/1287(D)]

[Editor's note: This paragraph and its sub-paragraphs are still under consideration within SWG IMT.SERV.]

- **Throughput-related Satisfied User Criterion**

The requirement of a service class on user throughput is defined based on the value of the Cumulative Distribution Function (CDF) of the average user throughput that is exceeded by 95% of the users.

- **Delay-related Satisfied User Criterion**

The requirement of a service class on system packet delay is defined based on the 98th percentile of the CDF of all individual user's 98th packet delay percentiles (i.e., first for each user the 98th percentile of the packet delay CDF needs to be determined, and then the 98% percentile of the CDF that describes the distribution of the individual user delay percentiles is obtained)

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- **Service-Class-related Satisfied User Criterion**

Satisfactory provision of a service class to the user is assumed in evaluations as long as the service class requirements for user throughput and the service class requirement for user plane packet delay are simultaneously met.

Technical performance

[Incorporation of proposals from IMT.TECH]

[Editors note: source [Doc. 8F/1257, NZ], the characteristics as listed below need further explanation.]

[The technical characteristics chosen for evaluation are explained in detail in [the working document towards a Preliminary Draft New Report on Requirements Related to Technical System Performance for IMT-Advanced Radio Interface(s) [IMT.TECH]] are listed below:

- Peak data rates
- Coverage of data rates over the cell area
- Cell edge data rates
- Area spectrum efficiency
- Spectrum efficiency/ Coverage efficiency
- Technology complexity
- Quality for each required class of service;
- Service Types
- Flexibility of radio interface
- Implication on network interfaces
- Cell Coverage
- Power efficiency
- Spectrum compatibility
- Mobility]

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Spectrum related issues

[Incorporation of proposals from Spectrum linked document]

Operation and performance in different carrier frequencies identified for IMT-Advanced should be investigated in different test scenarios in order to further diversify the evaluations. However, it is understood that higher carrier frequencies typically pose more challenges on coverage.

6.2 Minimum characteristics and criteria

Services

[Incorporation of proposals from Service linked document]

Technical performance

[Incorporation of proposals from IMT.TECH]

Spectrum related issues

[Editors note: Text elements from DG Spectrum CL on spectrum matters for Annex 7.]

The following is the list of criteria and attributes to be used in evaluations in candidate RITs. It is identified which attributes can be described qualitatively (q) and quantitatively (Q). When more than one candidate RIT is evaluated, it is useful to provide evaluation summaries for each evaluation criteria. A criteria evaluation summary may be difficult to make when both

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qualitative and quantitative attributes must be considered and when each technical attribute may have different relative importance with the overall evaluation criteria. To facilitate such criteria evaluation summaries, the importance or relative ranking of the various technical attributes within each evaluation criteria is identified by giving a grouping G1 (most important), G2, G3, G4 (least important).

Criteria and attributes for candidate RITs

Index	Criteria and attributes	Q or q	Gn	Related attributes in Annex 6
z.z.1	Spectrum related matters			
z.z.1.1	Flexibility in the use of the frequency band The proponents should provide the necessary information related to this topic (e.g., possibility to utilize the various bands identified for [IMT-2000/IMT-Advanced/IMT] alone or simultaneously, handling of asymmetric services, usage of non-paired band).	Q	G1	y.y.1 y.y.2 y.y.5
z.z.1.2	Capability to coexist / share the spectrum with ITU-R primary services [tbd] in the bands [tbd]. *[Note: to be specified after the WRC-07.]* The proponent should describe technical solutions to enable sharing when restrictions on the deployment are required from other primary services prospective. These solutions could be geographical/physical or related to advanced spectrum features. The proponent should be able to implement the appropriate mitigation techniques.	Q and Q	G1	y.y.3
z.z.1.3	Spectrum sharing capabilities The proponent should indicate how global spectrum allocation can be shared between networks and cell types. The following aspects may be detailed: • means for spectrum sharing between networks, • guardbands.	Q and Q	G4	y.y.4
z.z.1.4	Minimum frequency band necessary to operate the system. Supporting technical information: • impact of the frequency reuse pattern, • bandwidth necessary to carry high peak data rate • solutions provided for operation on the limited bandwidth.	Q and q	G1	y.y.2

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7 Selected test environments and deployment models for evaluation

This section describes the reference scenarios (test environments and deployment models) and channel models necessary to elaborate the performance figures of candidate radio interface for IMT-Advanced.

These test environments are intended to cover the range of IMT-Advanced operating environments. The necessary parameters to identify the reference models include the test propagation environments, traffic conditions, user information rate for prototype voice and data services, and the objective performance criteria for each test operating environment. The test operating environments are considered as a basic factor in the evaluation process of the radio interface technologies. The reference models are used to estimate the critical aspects, such as the spectrum, coverage and power efficiencies. This estimation will be based on system-level calculations and simulations and link-level software simulations using channel and traffic models.

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The test environment

The predefined test environments are used in order to specify the environments of the requirements for the technology proposals. IMT-Advanced is to cover a wide range of performance in a wide range of environments. [A thorough testing and evaluation is prohibitive.] The test environments have therefore be chosen such that typical and different deployment are modelled and critical questions in system design and performance can be investigated. Focus is thus on scenarios testing limits of performance related to capacity and user mobility.

The test environments for IMT-Advanced are the following:

- **Base coverage urban:** an urban macro-cellular environment targeting to continuous coverage for pedestrian up to fast vehicular users in built-up areas.
- **Microcellular:** an urban micro-cellular environment with higher user density focusing on pedestrian and slow vehicular users
- **Indoor:** an indoor environment targeting isolated cells at offices and/or in hotspot based on stationary and pedestrian users.
- **High speed:** macro cells environment with high speed vehicular and trains.

Three of these test environments are rather similar to the ones that were used for IMT-2000, “Indoor Office, Outdoor to Indoor and pedestrian and finally Vehicular

Differentiation of the test environments is achieved based on BS height (above rooftop in base coverage urban and high-speed, below rooftop in microcellular, and ceiling-mounted for indoor), as well as based on the user mobility (ranging from stationary in indoor to [very high speed / 350 km/h] in high-speed test environment).

Different environments and the associated propagation effects also offer different opportunities to benefit from spatial processing. The channel models to be used are able to model these effects in a highly realistic manner. Consequently different antenna configurations with respect to sectorisation, number of antenna elements, and antenna element spacing should be used in the test environments to be able to gain insight in the proposals' capabilities to support beamforming, spatial diversity, SDMA, spatial multiplexing, and associated spatial interference mitigation techniques.

The details about the test environments can be found in the Annex 2.

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[Editors note: discussion on the issue below is encouraged for future meeting.]

[In the Annex 2 it proposes several scenarios for most of the test environments. To simplify the simulations, only one to two scenarios per test environment is selected for the basic simulations. The scenarios should be:

- Macro-cell for **Base coverage urban**;
- Micro-cell (including relays) for **Microcellular**;
- Indoor office and indoor hotspot for **Indoor;** and
- Moving Network for **High speed** test environment.]

7.2 Channel model approach for evaluations of proposed IMT-Advanced air interface technologies

Realistic system performance cannot be evaluated by single link simulations. Even single link performance is dependent on other links due to influence of advanced RRM algorithms, interference generated by other links etc. Adequate link level (single link only) channel models exist in both groups described above on sections 3 and 4. Multi-link models for system level evaluations have been developed only in the family of geometry based stochastic channel models. Geometric approach supports multi-link modelling whilst correlation matrix based models are more fixed and applicable on for single link. Thus for evaluations of proposed IMT-Advanced air interface technologies recommend the geometry based stochastic approach.

[Time-spatial propagation models can consists of long-term time-spatial profile, short-term time-spatial profile, and instantaneous time-spatial profile (Figure [A2-1-1]), and can be modeled with limited number of parameters as shown in Appendix 1 in Annex 2.]

The channel model is a geometry-based stochastic model. It can also be called double directional channel model. It does not explicitly specify the locations of the scatters, but rather the directions of the rays, like the well-known SCM model [1]. Geometry-based modeling of the radio channel enables separation of propagation parameters and antennas.

The channel parameters for individual snapshots are determined stochastically, based on statistical distributions extracted from channel measurements. Antenna geometries and radiation patterns can be defined properly by the user of the model. Channel realizations are generated with geometrical principle by summing contributions of rays (plane waves) with specific small scale parameters like delay, power, angle-of-arrival (AoA) and angle-of-departure (AoD). Superposition results to correlation between antenna elements and temporal fading with geometry dependent Doppler spectrum.

A number of rays constitute a cluster. In the terminology of this document we equate the cluster with a propagation path diffused in space, either or both in delay and angle domains. Elements of the MIMO channel, i.e. antenna arrays at both link ends and propagation paths, are illustrated in Figure 1.

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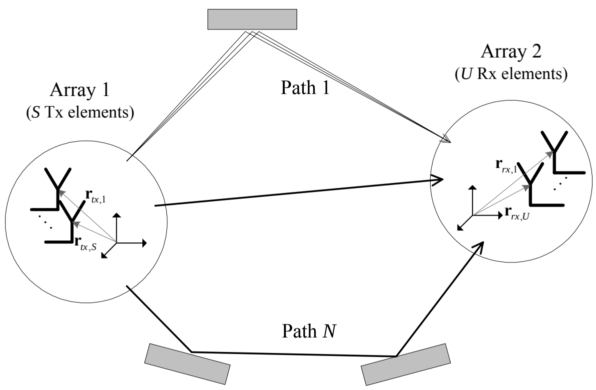
FIGURE 1

The MIMO channel



Transfer matrix of the MIMO channel is

$$\mathbf{H}(t;\tau)=\sum_{n=1}^{N}\mathbf{H}_n(t;\tau) \qquad (1)$$

It is composed of antenna array response matrices $\mathbf{F}_{tx}$ for the transmitter, $\mathbf{F}_{rx}$ for the receiver and the propagation channel response matrix $\mathbf{h}_n$ for cluster n as follows

$$\mathbf{H}_n(t;\tau)=\iint \mathbf{F}_{rx}(\varphi)\mathbf{h}_n(t;\tau,\phi,\varphi)\mathbf{F}_{tx}^T(\phi)\,d\phi d\varphi \qquad (2)$$

The channel from Tx antenna element s to Rx element u for cluster n is

$$\begin{aligned}H_{u,s,n}(t;\tau)=\sum_{m=1}^{M}&\begin{bmatrix}F_{rx,u,V}(\phi_{n,m})\\F_{rx,u,H}(\phi_{n,m})\end{bmatrix}^T\begin{bmatrix}\alpha_{n,m,VV} & \alpha_{n,m,VH}\\ \alpha_{n,m,HV} & a_{n,m,VV}\end{bmatrix}\begin{bmatrix}F_{tx,s,V}(\varphi_{n,m})\\F_{tx,s,H}(\varphi_{n,m})\end{bmatrix}\\&\times\exp\left(j2\pi\lambda_0^{-1}(\bar{\phi}_{n,m}\cdot\bar{r}_{rx,u})\right)\exp\left(j2\pi\lambda_0^{-1}(\bar{\varphi}_{n,m}\cdot\bar{r}_{tx,s})\right)\\&\times\exp\left(j2\pi\upsilon_{n,m}t\right)\delta(\tau-\tau_{n,m})\end{aligned} \qquad (3)$$

[Editor Note: Check the equation 3 for parameters for Tx & Rx angles.]

[Editor Note: Japan Doc. 1244 should consider how to MIMO channel model coefficient can be generated efficiently in a simulation as an alternative in Eq. (3). Generation of polarized coefficients should be explained.]

where $F_{rx,u,V}$ and $F_{rx,u,H}$ are the antenna element u field patterns for vertical and horizontal polarizations respectively, $\alpha_{n,m,VV}$ and $\alpha_{n,m,VH}$ are the complex gains of vertical-to-vertical and vertical-to-horizontal polarizations of ray n,m respectively. Further λ_0 is the wave length on carrier frequency, $\bar{\phi}_{n.m}$ is AoD unit vector, $\bar{\varphi}_{n.m}$ is AoA unit vector, $\bar{r}_{tx,s}$ and $\bar{r}_{rx,u}$ are the location vectors of element s and u respectively, and $\nu_{n,m}$ is the Doppler frequency component of ray n,m. If the radio channel is modelled as dynamic, all the above mentioned small scale parameters are time variant, i.e. function of t.

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The proposal includes the complete model that will be called hereafter *primary model*, and a reduced variability model with fixed parameters. The latter is called *Clustered Delay Line (CDL) model*. Both are described briefly below.

[Editorial note: “Primary model” term is ambiguous. We suggest to rename “primary”.]

7.2.1 [Primary] Models

Primary models are double-directional geometry-based stochastic model. They are system level[1] models in the meaning used e.g., in SCM model [1], which can describe infinite number of propagation environment realizations for single or multiple radio links for all the defined scenarios for arbitrary antenna configurations, with one mathematical framework by different parameter sets. Primary model is a stochastic model with two (or three) levels of randomness. At first, large scale (LS) parameters like shadow fading, delay and angular spreads are drawn randomly from tabulated distribution functions. Next, the small scale parameters like delays, powers and directions of arrival and departure are drawn randomly according to tabulated distribution functions and random LS parameters (second moments). At this stage geometric setup is fixed and only free variables are the random initial phases of the scatterers. By picking (randomly) different initial phases, an infinite number of different realizations of the model can be generated. When also the initial phases are fixed, there is no further randomness left.

7.2.2 Reduced Variability Models

The concept of Clustered Delay Line (CDL) models is a spatial extension of tapped delay line (TDL) models. TDL models contain usually power, delay and Doppler spectrum information for the taps. CDL models define power, delay and angular information. Doppler is not explicitly defined, because it is determined by power and angular information combined with array characteristics.

The CDL approach fixes all the parameters, except the phases of the rays, although other alternatives can be considered:

- the main direction of the rays can be made variable,
- a set of reference antenna geometries and antenna patterns can be proposed,
- relation to correlation-matrix based models can be introduced. Such models may be of use when performing link-level simulations e.g., for setting receiver performance requirements, in co-existence studies, or when comparing details of closed-loop transmission methods.

7.2.3 Time Dependent Simulations

7.2.3.1 Drop Concept

The proposed primary models are based on drop concept. When using the model the simulation of the system behaviour is carried out as a sequence of “drops”, where a “drop” is defined as one simulation run over a certain time period. Drop (or snap-shot) is a simulation entity, where the random properties of the channel remain constant, except the fast fading caused by the changing phases of the rays. Such properties are e.g. the powers, delays and directions of the rays. This approach is similar as used in the 3GPP SCM model. In a simulation the length of the drop has to be

[1] The term system-level means here that the model is able to cover multiple links, cells and terminals.

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selected properly by the user. The primary model allows the user to simulate over several drops as desired to get statistically representative results. Consecutive drops can be independent or correlated, as desired. However, independent drops are the default. The CDL models have fixed parameters, so that the simulation consists of only a single drop.

7.2.3.2 Time-Evolution

In addition to the simulation method based on non-correlated drops described in Section 7.2.3.1, it is possible to simulate cases where the adjacent drops are correlated. This allows for the time evolution in the simulation. The time-evolution is based on birth-death process of the clusters (paths) during the simulation and can be taken into account based on the Markov chain approach. Detailed description of this is given in Appendix 2 of Annex 2.

[Editor Note: Time-evolution parameters need to be extracted in the later stage hopefully before next meeting.]

7.2.3.3 Simulation Procedure for scenarios other than A1 and A2

A nineteen cell network topology with wrap-around shall be used as the baseline network topology for all system-level simulations.

1. The system is modeled as a network of 7 clusters. Each cluster has 19 hexagonal cells with six cells in the first tier and twelve cells in the second tier surrounding the central cell of each cluster. Each cell has three sectors. Frequency reuse is modeled by planning frequency allocations in different sectors in the network.

2. Users are dropped independently with uniform distribution throughout the system. Each mobile corresponds to an active user session that runs for the duration of the drop.

3. Mobiles are randomly assigned channel models. Depending on the simulation, these may be in support of a desired channel model mix, or separate statistical realizations of a single type of channel model.

4. Users are dropped according to the specified traffic mix.

5. For sectors belonging to the center cluster, sector assignment to a user is based on the received power at a user from all potential serving sectors. The sector with best path to the user, taking into account slow fading characteristics (path loss, shadowing, and antenna gains) is chosen as the serving sector.

6. Mobile stations are randomly dropped over the 57 sectors such that each sector has the required numbers of users. Although users may be in regions supporting handover each user is assigned to only one sector for counting purposes. All sectors of the system shall continue accepting users until the desired fixed number of users per sector is achieved everywhere. Users dropped within 35 meters of a sector antenna shall be redropped. User locations for six wrapping clusters are the same as the center cluster.

7. For simulations that do not involve handover performance evaluation, the location of each user remains unchanged during a drop, and the speed of a user is only used to determine the Doppler effect of fast fading. Additionally, the user is assumed to remain attached to the same BS for the duration of the drop.

8. Fading signal and fading interference are computed from each mobile station into each sector and from each sector to each mobile for each simulation interval.

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9. Packets are not blocked when they arrive into the system (i.e. queue depths are infinite).Users with a required traffic class shall be modeled according to the traffic models defined in this document. Start times for each traffic type for each user should be randomized as specified in the traffic model being simulated.

10. Packets are scheduled with a packet scheduler using the required fairness metric. Channel quality feedback delay, PDU errors are modeled and packets are retransmitted as necessary. The HARQ process is modeled by explicitly rescheduling a packet as part of the current packet call after a specified HARQ feedback delay period.

11. Simulation time is chosen to ensure convergence in user performance metrics. For a given drop the simulation is run for this duration, and then the process is repeated with the users dropped at new random locations. A sufficient number of drops are simulated to ensure convergence in the system performance metrics.

12. Performance statistics are collected for users in all cells according to the output matrix requirements.

13. All 57 sectors in the system shall be dynamically simulated.

7.2.4 Scenario and Environment Dependent Simulations

7.2.4.1 Scenario Dependent Simulations

The channel models are adapted to different scenarios by different parameter sets. In addition there are two types of models as regards the location of the transmitters and receivers. Most models apply the conventional way of placing the equipment, where the only location parameter is the distance between transmitter and receiver, later called non-grid-based models. The other group of our models is grid-based. This means that there is a grid of streets or a building lay-out or both, where the transmitters and receivers can be located e.g., by Cartesian coordinates.

7.2.4.2 Street-Angle Dependent Simulations

Additionally, street-angle could also be taken into consideration for simulations due to its effect on the angular spread values. As reported in Appendix 3 of Annex 2, larger street-angle values will cause larger angular spread.

7.2.5 Simulation of Relays

It is possible to simulate also relay-based lay-outs with the proposed channel models. The link from a relay to a mobile station can be modeled with the same models as the conventional link from a base-station to a mobile station. The links from base-stations to relay-stations can be modeled with conventional links, but using raised antenna heights and modified Doppler spectra.

7.2.6 How the model can be used in IMT-Advanced evaluations

Channel models are crucial in performance evaluations of wireless systems. Path loss and shadowing have significant impact on cell size, angular spread affects to MIMO gain, spatial diversity and beam forming gain. Delay spread causes inter-symbol-interference and can be

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exploited by frequency diversity. High cross-polarization ratio makes it possible to use polarization diversity. And so on.

The proposed models can be used in IMT-Advanced evaluations in different environments, e.g., indoor, microcellular, base coverage urban, and high-speed environments.

Further details can be found in the Annex 2.

[Editors note: Text elements from WG Service for Annex 7]

[Content from Doc. 8F/1287(D)]

7.3 Service Classes to be used for definition of evaluation criteria

[Editor's note: This paragraph is still under consideration within SWG IMT.SERV.]

A selection of service classes defined in IMT.SERV is proposed to be used for the definition of service-related evaluation criteria. The evaluation criterion that is associated to each service class is the number of satisfied users (i.e., the number of users that can be present in the system under fulfilment of the Service Class-related satisfied user criterion as defined in Sec. 1.3 above, and the corresponding values in Table 3.

The selection of service classes made here aims at a sufficient, representative evaluation as well as a reasonable complexity of the evaluation process and number of different test cases to be considered. The service classes are selected in order to obtain a sufficiently complete evaluation of the system performance from a user's perspective; the selection of service classes is not expressing preferred functional design choices. Table 1 presents service classes to be evaluated.

TABLE 1

Satisfied User Criteria for the different Service Classes and the Test Environments where they should be evaluated [This table is still under consideration within SWG IMT.SERV]

Service Class	**Test Environments**			
	Indoor	**Microcellular**	**Base coverage Urban**	**High speed**
Basic Conversational	VoIP traffic / [20] kbit/s per user / Delay < [50] ms	VoIP traffic / [20] kbit/s per user / Delay < [50] ms	VoIP traffic / [20] kbit/s per user / Delay < [50] ms	VoIP traffic / [20] kbit/s per user / Delay < [50] ms
Background	Full Buffer / [5]-[50] Mbit/s per user	Full Buffer / [5]-[50] Mbit/s per user	Full Buffer / [5]-[50] Mbit/s per user	Full Buffer/ [5]-[50] Mbit/s per user

The traffic models required to perform the evaluation are to be specified in [IMT.EVAL].

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8 Guidelines for evaluating the radio interface technologies by independent evaluation groups

[Editor's note Text developed for annex 2 of circular letter should be referenced here.]
[Editors note M.[IMT.EVAL] provides guidelines for both the procedure and the criteria to be used in evaluating[the technology part of RITs] for a number of test environments].

These principles are to be followed when evaluating radio interface technologies for IMT-Advanced:

[Editor notes: The evaluation guidelines, while taking account of the full range of service capabilities described in IMT.SERV, shall not emphasise a particular market need or particular sub-set of service requirements.]

[Editor notes: The conditions to select from shall be defined in IMT.EVAL and the Circular Letter.]

- [Evaluations shall be carried out for test environments suitable for the operational environments identified in the proposed RIT]
- All test environments should be considered equally within IMT.EVAL and Annex 7 of the Circular Letter, [but that does not imply that proposals have to be evaluated in all environments.] [However, evaluation in multiple test environments is preferred, recognizing that the test environments are still being defined.]
- [Evaluations shall be carried out for test environments suitable for the operational environments identified in the proposed RIT]
- The evaluations of proposals shall be qualitative and quantitative

[Editor note: need additional information from IMT Tech on conformance check list.]

- Each technology proposal shall be evaluated by at least one external evaluator group.

Evaluation groups and evaluation options

The following main options are foreseen for the groups doing the evaluations.

- An evaluation group evaluates a technology proposal which it has not prepared (Vertical evaluation). It should be possible that an external evaluation group can evaluate a complete technology proposal, based on the submitted technology proposal and the information in the IMT.EVAL, using its own simulation tools.
- An evaluation group evaluates several technology proposals or parts of them (Horizontal evaluation). Horizontal evaluations should be encouraged, as such evaluations can produce comparative information about the proposed technologies.

[Editors note: SWG-EVAL believes the following text should be considered in other part of [IMT.EVAL] and also other working document of IMT.Advanced. The evaluation methodology and guidelines may also apply to IMT-Advance technology proponents in self-evaluation.]

[A Proponent Group evaluates its own technology proposal (Self Evaluation). It can be expected that the Proponent Group can do this in parallel with the proposal preparation, and that the required information can be compiled with relatively small additional effort.]

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9 Evaluation methodology

[Editors note- Text below moved from 8]

[The areas where simulations are to be used should be restricted to a minimum. The test scenarios are defined in such a detail, that each evaluator group can use its link level and system level simulators.]

[Editors note: The evaluation procedure should be as simple as possible.]

The Evaluation Methodology should include the following:

1) Candidate technologies should be evaluated using reproducible methods including computer simulation.
2) Technical evaluation of the candidate technology made against each evaluation criterion for the test environments associated with its proposed deployment scenarios.
3) Objective criteria should be used when possible.
4) Candidate technologies should be evaluated based on technical descriptions that are submitted using a technologies description template.

[Candidate technologies should be evaluated for its ability to provide for the following applications in its proposed deployment scenario:

Service type	Peak bit rate
Very low rate data	< 16 kbit/s
Low rate data and low multimedia	< 144 kbit/s
Medium multimedia	< 2 Mbit/s
High multimedia	< 30 Mbit/s
Super-high multimedia	30 Mbit/s to 100 Mbit/s/1 Gbit/s

And measuring the applications above should be established against predetermined QoS values as applicable speech and data values.]

[Editors note: source [Doc. 8F/1291, Finland]]

[Editors note; Spirit of text is agreed to but specifics will need to be refined once inputs from other group have been received.]

[Simulations as part of evaluations

Simulations are expected to be needed as part of the evaluations, **Error! Reference source not found.** indicates important blocks for the evaluation of IMT contributions. It enumerates several important blocks for the simulations.

Several functions, such as channel coding or link synchronisation can be evaluated at link level, either for AGWN or more realistic channel models, both for single input single output (SISO) or multiple input multiple output (MIMO) systems.

Due to the fact that state-of-the art radio interface technologies provide short-term adaptivity, multi-user scheduling and optimization, however, reliable system performance evaluations must be done

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on system level, where multiple users, links and base stations are modelled concurrently. A fundamental challenge is that due to such nature of radio interface technologies, these system-level investigations need to run with small time steps and need to model multi-antenna effects accurately.

System-level simulations use link-level data, a model of the protocol stack, traffic models and test environment description as input and provide the required key performance indicators of the system.

While calibration at link-level is feasible and commonly done, it is virtually impossible to calibrate different system level simulation tools due to the inherent complexity and variety of possible implementations. This raises the problem of comparability of results obtained with different simulation tools. The following solutions and enablers exist:

- Use of unified methodology, software, and data sets wherever possible, e.g. in the area of channel modelling, link-level data, link-to-system-level interface, etc.
- Comparison of relative gains with respect to a simple test scenario that serves as baseline. The baseline should provide simplicity in order to facilitate identical results (e.g. simple non-opportunistic schedulers, such as a Round Robin scheduler, and simple multi-antenna case, e.g. 1x2 SIMO using a defined receiver processing, like maximum ratio combining (MRC))
- Direct comparison of multiple proposals using one simulation tool as proposed in Case C in Section **Error! Reference source not found.** above.
- Question-oriented working method that adapts the level of detail in modelling of specific functionalities according to the particular requirements of the actual investigation
- Clear definition of key assessment criteria and the associated measurement procedures in IMT.EVAL

Error! Reference source not found. depicts several elements that are important when evaluating the different proposals. The performance of the proposals depends on the evaluation conditions. The test environments should provide a sufficient description of these conditions so that comparable results can be obtained without prescribing the various parameters in too much detail, the evaluation should be meaningful, with minimum complexity.

Important elements to be described for comparable scenarios are: channel models, protocols included in the evaluation, description of the particular scenarios (test environment), and the traffic models used for the different services.

Further there may be proposal dependent aspects that may have a strong impact on the system performance, an example of these is the scheduling algorithm, which may be optimised for different services.

In order to keep the evaluations feasible the simulator complexity should be kept to a minimum.

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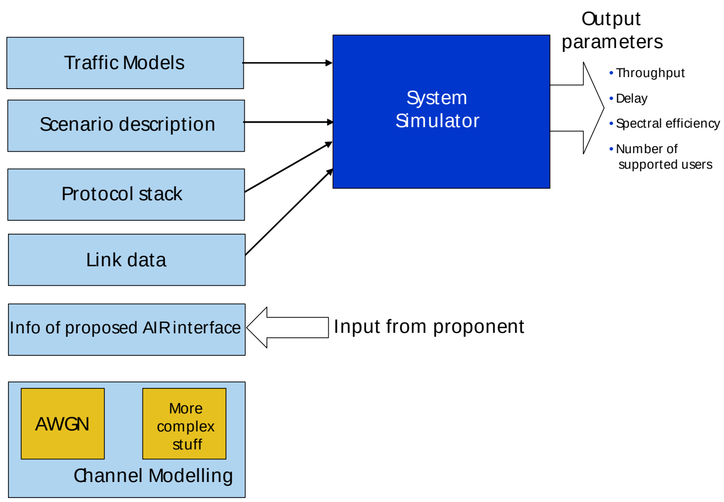
FIGURE 6.2

Illustration of important elements for simulation process



In Figure 6.2 it is illustrated how the evaluation process could be implemented. Based on the description of the different technology proposals by the proponents and the selected channel models (depending on the test environment). The description by the proponents should be sufficiently detailed to assess the performance, but should be limited to the appropriate parameters, range and granularity. Link data is derived for the link-to-system interface. This data should be public so that different evaluation groups can (re)use the data and verify correct implementation The link-to-system interface allows abstractions of the physical layer at system-level simulations, which have the scope to model behaviour in multi-user and multi-cell scenarios including aspects of MAC and RLC.

The protocols included here should be kept to a minimum. The aim should be to keep the number of test cases limited, e.g. limit the number of states in the protocol, minimize the number of procedures, etc to the most relevant ones.

Depending on the test environments different mobility classes, network layouts (hexagonal, Manhattan grid, indoor) will be considered. In these descriptions also the antenna configurations should be included.

IMT-Advanced will support a large range of services and service capabilities. During the evaluation phase support for a wide range of service capabilities will be requested, however the performance itself should only be evaluated for a limited number of cases, likely candidates are: Best-Effort type traffic based on the full buffer assumption, and possibly Voice-over-IP since this is an important typical service to be supported. Numerical evaluation of mixed scenarios is not necessary as the additional information obtained from them is merely the feasibility of operating the network with such a specific mix. However, qualitative evaluation of the possibility to run a mix of services should be evaluated.

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Different measurable output parameters as proposed in IMT.EVAL should be simulated. This includes for example delay, spectral efficiency and number of supported users. Important to keep in mind is the use the appropriate parameters, parameter ranges and granularity for the evaluation.]

[Editors note: for developing the evaluation criteria important topics to take into account include the following:

1. Minimize the number of options

2. No redundant mandatory features

3. Limit the number of necessary test cases]

[In all of the above environments, simulations should encompass not only single links, but also the effects of co-channel interference (other cell interference).]

[Editors note: Text elements from WG Service for Annex 7]

[Content from Doc. 8F/1287(D)]

Evaluation of Supported Service Classes

[Editors note: the following material may also be relevant to Annex 6 of the Circular Letter.]

The proponents are requested to evaluate the spectral efficiency of the Basic Conversational service class while fulfilling the satisfied user criterion as defined in Table 1.

Additionally the proponents are requested to evaluate the spectral efficiency of the Background service class using full buffers while fulfilling the satisfied user criterion.

10 Detailed Evaluation approach

[Editors note: source [Doc. 8F/1291, Finland] proposes to add a new section (below)]

[Editors note: Further study and contributions to this part are needed to finalize this part. Whether this part should be a section or part of an annex of [IMT.EVAL] may be decided later.]

[The test scenarios are intended to investigate system performance in different deployments and under different evaluation assumptions. In order to facilitate comparisons commonly used basic models of the environment are maintained, such as the well-known hexagonal layout, the so-called Manhattan grid, or an single-floor indoor scenario, as e.g. i m [UMTS30.03, TR25.814, W2D6137]

It is understood that IMT-Advanced systems may contain innovative features which enable network configurations and deployment different to those commonly used today. However, in order to allow comparisons across different IMT-Advanced proposals basic parameters for the test scenarios need to be specified. Table 7-1 and Table 7-2 contain a proposal for such parameters, based on the above-mentioned documents, which follow typical and practical assumptions commonly used in evaluation of IMT-2000 systems. As multi-hop is considered an important technology for IMT-Advanced, it is recommended that parameters for relays are also included in future updates.

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TABLE 7-1

"Rural / High-speed" and "Base coverage Urban" system simulation baseline parameters

Parameter	Rural / High-speed	Base coverage Urban
Layout	Cellular, Hexagonal grid,	Cellular, Hexagonal grid,
Evaluated Service Profiles	Full buffer best effort, VoIP	
Inter-site distance	tbd	tbd
Carrier Frequency (CF)	to be specified (depends on WRC 07)	
Bandwidth (BW)	to be specified (depends on WRC 07)	
Channel Model	defined in [IMT.EVAL]	
BS antenna height	35 m, above rooftop	25 m, above rooftop
Number of BS antenna elements	2	4
Total BS TX power (Ptotal)	46dBm	46dBm
UT power class	24dBm	24dBm
UT antenna system	2 elements Cross-polarised	2 elements Cross-polarised
Inter-cell Interference Modelling	tbd	tbd
User placement	uniformly in entire area 100% UT outdoors in car	uniformly in entire area 100% UT indoors
User mobility model	Fixed and identical speed |v| of all UTs, direction uniformly distributed	Fixed and identical speed |v| of all UTs, direction uniformly distributed
UT speeds of interest: **main** (additional) options	**120km/h (**350km/h, 30km/h, 3km/h) 350km/h for special high-speed train service FFS	**3km/h, (**assuming only indoor users)
Minimum distance between UT and serving cell	>= 35 meters	>= 25 meters

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TABLE 7-2

"Microcellular" and "Indoor" system simulation baseline parameters

Parameter	Microcellular	Indoor
Layout	Cellular Two-dimensional regular grid of buildings ("Manhattan grid") Number of building blocks: 11 x 11 Building block size: 200 m x 200 m Street width: 30 m	Isolated site One floor of a building with regular grid of rooms, walls and corridors Number of rooms: 40 Rooms size: 10 m x 10 m x 3 m Number of corridors: 2 Corridor size: 100 m x 5 m x 3 m
Evaluated Service Profiles	Full buffer best effort, VoIP	
Inter-site distance	tbd	tbd
Carrier Frequency (CF)	to be specified (depends on WRC 07)	
Bandwidth (BW)	to be specified (depends on WRC 07)	
Channel Model	defined in [IMT.EVAL]	
BS antenna height	10 m, below rooftop	3 m, mounted on ceiling
Number of BS antenna elements	4	4
Total BS TX power (Ptotal)	37dBm	21dBm
UT power class	24dBm	21dBm
UT antenna system	2 elements Cross-polarised	2 elements Cross-polarised
Inter-cell Interference Modelling	tbd	tbd
User placement	uniform in the *streets* (outdoor UT simulations), or in the *buildings* (indoor UT simulations) 30% UT *indoors*	uniform in the *rooms*, or in the *corridors* 90% UT in *rooms*
User mobility model	Fixed and identical speed |*v*| of all UTs, UTs only move along the streets they are in. Direction is random and both directions are equally probable	Fixed and identical speed |*v*| of all UTs, random direction
UT speeds of interest: **main** (additional) options	**3km/h, 30km/h**	**3km/h**
Minimum distance between UT and serving cell	>= 10 meters	>= 3 meters

]

[Editors note: Further study and contributions to this part are needed to finalize this part. Whether this part should be a section or part of an annex of [IMT.EVAL] may be decided later.]

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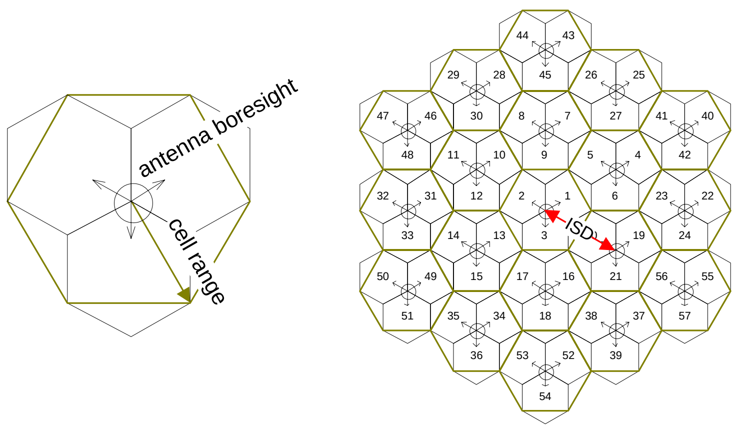
[10.1 Network Layout

In the rural/high-speed and base coverage urban case, no specific topographical details are taken into account. Base stations are placed in a regular grid, following hexagonal layout. A basic hexagon layout for the example of three sectors per site is shown in Figure 7.1, where also basic geometry (antenna boresight, cell range, and inter-site distance ISD) is defined. Users are distributed uniformly over the whole area.

FIGURE 7.1

Sketch of base coverage urban cell layout without relay nodes



In the microcellular test case, a two-dimensional regular grid of streets and buildings is considered, the so-called Manhattan grid (Figure 7.2). Base stations are placed in the middle of the streets and in the middle between two cross-roads.

The indoor scenario consists of one floor (height 3 m) of a building containing two corridors of 5 m x 100 m and 40 rooms of 10 m x 10 m, as depicted in Figure 7.3. The Four antenna arrays containing each 4 antennas and placed in the middle of the corridor at 25 m and 75 m (with respect to the left side of the building).

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FIGURE 7.2

Sketch of microcellular cell layout without relay nodes

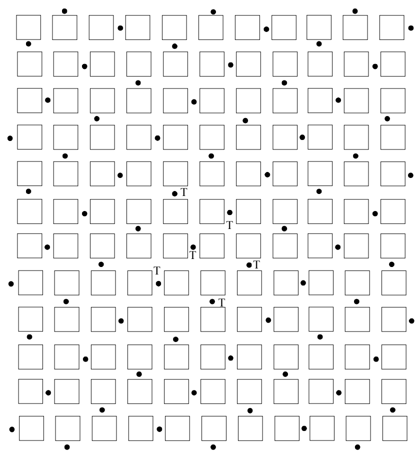
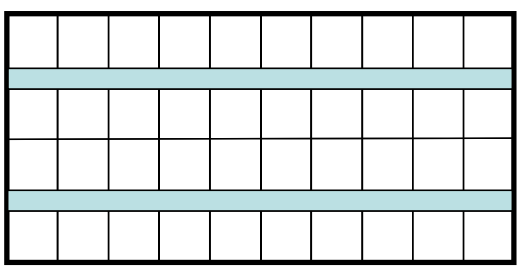


FIGURE 7.3

Sketch of indoor environment (one floor)



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11. Definition of Performance Metrics

Performance metrics may be classified as single-user performance metrics or multi-user performance metrics.

11.1. Single User Performance Metrics

11.1.1. Coverage Range (Noise Limited) – single-cell consideration

Coverage range is defined as the maximum radial distance to meet a certain percentage of area coverage (x%) with a signal to noise ratio above a certain threshold (target SINR) over y% of time, assuming no interference signals are present.

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11.2. Multi-User Performance Metrics

Although a user may be covered for a certain percentage area for a given service, when multiple users are in a coverage area, the resources (time, frequency, power) are to be shared among the users. It can be expected that a user's average data rate may be reduced by at most a factor of N when there are N active users, compared to a single user rate.

11.3. Definitions of Performance Metrics

The simulation statistics are collected from sectors belonging to the test cell(s) of the deployment scenario. Collected statistics will be traffic-type (thus traffic mix) dependent.

In this section, we provide a definition for various metrics collected in simulation runs. For a simulation run, we assume:

1] Simulation time per drop = T_{sim}
2] Number of simulation drops = D
3] Total number of users in sector(s) of interest= N_{sub}
4] Number of packet calls for user u = p_u
5] Number of packets in i^{th} packet call = $q_{i,u}$

11.3.1. Throughput Performance Metrics

For evaluating downlink (uplink) throughput, only packets on the downlink (uplink) are considered in the calculations. Downlink and uplink throughputs are denoted by upper case DL and UL respectively (example: R_u^{DL}, R_u^{UL}). The current metrics are given per a single simulation drop.

The throughput shall take into account all layer 1 and layer 2 overheads.

11.3.1.1. Average Data Throughput for User u

The data throughput of a user is defined as the ratio of the number of information bits that the user successfully received divided by the amount of the total simulation time. If user u has $p_u^{DL(UL)}$ downlink (uplink) packet calls, with $q_{i,u}^{DL(UL)}$ packets for the i[th] downlink (uplink) packet call, and $b_{j,i,u}$ bits for the j^{th} packet; then the average user throughput for user u is

$$R_u^{DL(UL)} = \frac{\sum_{i=1}^{p_u^{DL(UL)}} \sum_{j=1}^{q_{i,u}^{DL(UL)}} b_{j,i,u}}{T_{Sim}}$$

11.3.1.2. Average Per-User Data Throughput

The average per-user data throughput is defined as the sum of the average data throughput of each user in the system as defined in Section 11.3.1.1, divided by the total number of users in the system.

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11.3.1.3. Sector Data Throughput

Assuming N_{sub} users in sector of interest, and u^{th} user where $u \in N_{sub}$ has throughput $R_u^{DL(UL)}$, then DL or UL sector data throughput is :

$$R_{\sec}^{DL(UL)} = \sum_{u=1}^{N_{sub}} R_u^{DL(UL)}$$

11.3.1.4. Cell Edge User Throughput

The cell edge user throughput is the xth percentile point of the CDF of user throughput as defined in IMT.TECH.

11.3.2. Performance Metrics for Delay Sensitive Applications

For evaluating downlink (uplink) delay, only packets on the downlink (uplink) are considered in the calculations. Downlink and uplink delays are denoted by upper case DL and UL respectively (example: D_u^{DL}, D_u^{UL}) .

11.3.2.1. Packet Delay

Assuming the j^{th} packet of the i^{th} packet call destined for user u arrives at the BS (SS) at time $T_{j,i,u}^{arr,DL(UL)}$ and is delivered to the MS (BS) MAC-SAP at time $T_{j,i,u}^{dep,DL(UL)}$, the packet delay is defined as

$$Delay_{j,i,u}^{DL(UL)} = T_{j,i,u}^{dep,DL(UL)} - T_{j,i,u}^{arr,DL(UL)}$$

Packets that are dropped or erased may or may not be included in the analysis of packet delays depending on the traffic model specifications. For example, in modeling traffic from delay sensitive applications, packets may be dropped if packet transmissions are not completed within a specified delay bound. The impact of such dropped packets can be captured in the packet loss rate.

11.3.2.2. The CDF of packet delay per user

CDF of the packet delay per user provides a basis in which maximum latency, x%-tile, average latency as well as jitter can be derived.

11.3.2.3. X%-tile Packet delay per user

The x%-tile packet delay is simply the packet delay value for which x% of packets have delay below this value.

11.3.2.4. The CDF of X%-tile Packet Delays

The CDF of x%-tiles of packet latencies is used in determining the y%-tile latency of the x%-tile per user packet delays.

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11.3.2.5. The Y%-tile of X%-tile Packet Delays

The y%-tile is the latency number in which y% of per user x%-tile packet latencies are below this number. This latency number can be used as a measure of latency performance for delay sensitive traffic. A possible criteria for VoIP, for example, is that the 95th %-tile of the 97%-tile of packet latencies per user is 50ms.

11.3.2.6. Packet Loss Ratio

The packet loss ratio per user is defined as

$$Packet\ Loss\ Ratio = 1 - \frac{Total\ Number\ of\ Successfully\ Received\ Packets}{Total\ Number\ of\ Successfully\ Transmitted\ Packets}$$

11.3.3. System Level Metrics for Unicast Transmission

11.3.3.1. Spectral Efficiency

Spectral efficiency should represent the system throughput measured at the interface from the MAC layer to the upper layers, thus including both physical layer and MAC protocol overhead.

The average cell/sector spectral efficiency is defined as

$$r = \frac{R}{BW_{eff}}$$

Where R is the aggregate cell/sector throughput, BW_{eff} is the effective channel bandwidth. The effective channel bandwidth is defined as

$$BW_{eff} = BW \times TR$$

where BW is the used channel bandwidth, and TR is time ratio of the link. For example, for FDD system TR is 1, and for TDD system with DL:UL=2:1, TR is 2/3 for DL and 1/3 for UL, respectively.

11.3.3.2. Application Capacity

Application capacity (C_{app}) is defined as the maximum number of application users that the system can support without exceeding the maximum allowed outage probability.

11.3.3.3. System Outage

System outage is defined as when the number of users experiencing outage exceeds x% of the total number of users. The user outage criterion is defined based on the application of interest .

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11.4. Fairness Criteria

11.4.1. Moderately Fair Solution for Full Buffer Traffic

It is an objective to have uniform service coverage resulting in a fair service offering for best effort traffic. A measure of fairness under the best effort assumption is important in assessing how well the system solutions perform.

Fairness is evaluated by determining the normalized cumulative distribution function (CDF) of the per user throughput. The CDF is to be tested against a predetermined fairness criterion under several specified traffic conditions.

The CDF of the normalized throughputs with respect to the average user throughput for all users is determined. This CDF shall lie to the right of the curve given by the three points in Table 3.

Table 3: Moderately Fair Criterion CDF

Normalized Throughput w.r.t average user throughput	CDF
0.1	0.1
0.2	0.2
0.5	0.5

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Annex 1

Radio interface technologies description template

Description of the radio interface technology

[Editors note Text developed for IMT.TECH and annex 4 of circular letter should be referenced/summarized here.]

Annex 2

Test environments and deployment models

[This Annex describes the reference scenarios (test environments and deployment models) and propagation models necessary to elaborate the performance figures of candidate terrestrial and satellite RITs for IMT-Advanced. The terrestrial and the satellite component are subdivided in Parts 1 and 2, respectively.]

PART 1

Terrestrial component

1 Test environments

[This section will provide the reference model for each test operating environment. These test environments are intended to cover the range of IMT-ADVANCED operating environments. The necessary parameters to identify the reference models include the test propagation environments, traffic conditions, user information rate for prototype voice and data services, and the objective performance criteria for each test operating environment.

The test operating environments are considered as a basic factor in the evaluation process of the RITs. The reference models are used to estimate the critical aspects, such as the spectrum, coverage and power efficiencies. This estimation will be based on system-level calculations and link-level software simulations using propagation and traffic models.

Critical aspects of RITs, such as spectrum and coverage efficiencies, cannot be fairly estimated independently of appropriate IMT-ADVANCED services. These IMT-ADVANCED services are, as minimum, characterised by:

– ranges of supported data rates,
– BER requirements,
– one way delay requirements,
– activity factor,
– traffic models.]

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1.1 Test environment descriptions

The proposed test environments are the following to be derived from the ones for IMT-2000:

- **Base coverage urban:** an urban macro-cellular environment targeting to continuous coverage for pedestrian up to fast vehicular users in built-up areas.
- **Microcellular:** an urban micro-cellular environment with higher user density focusing on pedestrian and slow vehicular users
- **Indoor:** an indoor hotspot environment targeting isolated cells at home or in small offices based on stationary and pedestrian users.
- **High speed:** macro cells environment with high speed vehicular and trains.

Three of these test environments are rather similar to the ones that were used for IMT-2000, “Indoor Office, Outdoor to Indoor and pedestrian and finally Vehicular, and no larger modifications are needed. The new environment is high speed since subscribers nowadays also require connections in this environment.

Figure 1 illustrates the relative positioning of three of the identified test environments. Initial focus for deployment and most challenges in IMT-Advanced system design and performance will be encountered in populated areas. However, in the evaluation the provisions for ubiquitous coverage and the associated performance also in rural areas need to be addressed. The deployment of IMT-Advanced is believed to be around year 2015 on mass market level and at that point in time the majority of countries should have a rather good coverage of pre-IMT-2000 systems as well as IMT-2000 systems and its enhancements. Also the inter-working with other radio access technologies and spectrum sharing possibilities shall be key parts of the evaluation procedure.

Such deployments could be of course collocated in a layered approach fully benefiting from the flexibility of the IMT-Advanced interface.

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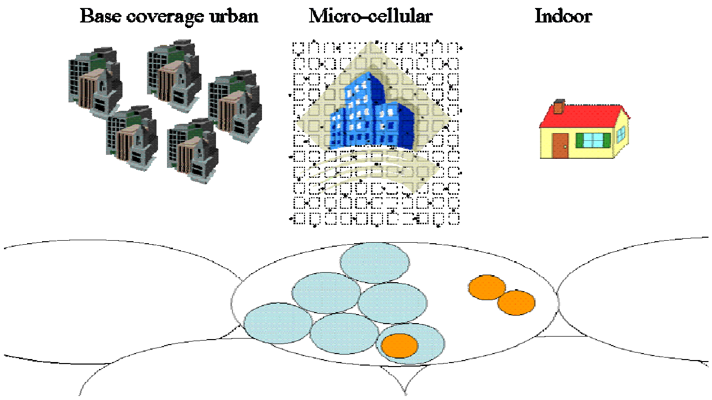
FIGURE 1

Illustrative representation of the three deployment scenarios envisaged for IMT-Advanced



1.2 Test scenarios

For evaluation of the key questions listed above in four selected test environments, a set of reliable and measurement-based channel models are needed.

For evaluation of the key questions listed above, a set of reliable and measurement-based channel models are needed. Channel models have to be accurate due to the fact that radio propagation has a significant impact on the performance of future broadband systems. This is especially true with future multiple-input multiple-output (MIMO) radio communication systems since more of the radio channel degrees of freedom in space, time, frequency, and polarization may be exploited to meet the demands on bit rate, spectrum efficiency and cost. Channel models are needed in performance evaluation of wireless systems, and when choosing modulation and coding, in multi antenna system design, selection of channel estimation method, channel equalization and other baseband algorithm design as well as network planning. It is important to use common and uniform channel models for evaluation, comparison and selection of technologies. In this context it is clear that realistic and reliable multidimensional channel models are important part of performance evaluation of IMT-Advanced.

A central factor of mobile radio propagation environments is multi-path propagation causing fading and channel time dispersion as well as angular dispersion in Tx and Rx. The fading characteristics vary with the propagation environment and its impact on the communication quality (i.e. bit error patterns) is highly dependent on the speed of the mobile station relative to the serving base station.

The purpose of the test environments is to challenge the RITs. Instead of constructing propagation models for all possible IMT-ADVANCED operating environments, a smaller set of test environments is defined which adequately span the overall range of possible environments. The descriptions of these test environments may therefore not correspond with those of the actual operating environments.

This section will identify the propagation model for each test operating environment listed below. For practical reasons, these test operating environments are an appropriate subset of the IMT-ADVANCED operating environments. While simple models are adequate to evaluate the performance of individual radio links, more complex models are needed to evaluate the overall system-level reliability and suitability of specific technologies. For wideband technologies the number, strength, and relative time delay as well as the directions at Tx and Rx of the many signal

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components become important. For some technologies (e.g. those employing power control) these models must include coupling between all co-channel propagation links to achieve maximum accuracy. Also, in some cases, the large-scale (shadow fading) temporal variations of the environment must be modelled.

The key parameters to describe each propagation model would include:

– time delay-spread, its structure, and its statistical variability (e.g., probability distribution of time delay spread);
- angular spreads at Tx and Rx;
– geometrical path loss rules;
– shadow fading;
– multipath fading characteristics (e.g. Doppler spectrum, Rician vs. Rayleigh) for the envelope of channels;
– operating radio frequency and bandwidth
– physical structure of deployment (e.g., BS height).

Statistical models are proposed in Section 1.3 to generate path losses and time delay structures for paths in each test environment.

It should be noted that IMT-ADVANCED will be a world-wide standard. Therefore, the models proposed for evaluation of RITs should consider a broad range of environment characteristics, e.g. large and small cities, tropical, rural, and desert areas.

The following sections provide a brief description of the conditions that might be expected in the identified environments. The specific channel parameters are found in the appropriate parts of Annex II.

IMT-ADVANCED may include both mobile wireless and fixed wireless applications. It should be noted that for the purpose of evaluation, operation in the fixed environment is considered to be covered by the mobile test environments. Generally, the fixed wireless channel model will be less complex due to lack of mobility. As a result, there is a trade-off possible between fixed and mobile users which should be considered while evaluating RITs.

1.2.1 Base Coverage Urban test environment

The base coverage urban test environment is intended to proof that continuous, ubiquitous, and cost-effective coverage in built-up areas is feasible in the IMT-Advanced bands by the technology applying to be in the IMT-Advanced family. This scenario will therefore be interference-limited, using macro cells (i.e. radio access points above rooftop level) and still assume that the users require access to demanding services beyond baseline voice and text messages. Evaluations shall be performed by statistical modelling of shadowing effects.

1.2.1.1 Urban macro-cell scenario

In typical urban macro-cell (scenario C2) mobile station is located outdoors at street level and fixed base station clearly above surrounding building heights. As for propagation conditions, non- or obstructed line-of-sight is a common case, since street level is often reached by a single diffraction over the rooftop. The building blocks can form either a regular Manhattan type of grid, or have more irregular locations. Typical building heights in urban environments are over four floors. Buildings height and density in typical urban macro-cell are mostly homogenous.

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1.2.1.2 Bad urban macro-cell scenario

Bad urban environment (C3) describes cities with buildings with distinctly inhomogeneous building heights or densities, and results to a clearly dispersive propagation environment in delay and angular domain. The inhomogeneities in city structure can be e.g. due to large water areas separating the built-up areas, or the high-rise skyscrapers in otherwise typical urban environment. Increased delay and angular dispersion can also be caused by mountainous surrounding the city. Base station is typically located above the average rooftop level, but within its coverage range there can also be several high-rise buildings exceeding the base station height. From modelling point of view this differs from typical urban macro-cell by an additional far scatterer cluster.

1.2.1.3 Suburban macro-cell scenario

In suburban macro-cells (scenario C1) base stations are located well above the rooftops to allow wide area coverage, and mobile stations are outdoors at street level. Buildings are typically low residential detached houses with one or two floors, or blocks of flats with a few floors. Occasional open areas such as parks or playgrounds between the houses make the environment rather open. Streets do not form urban-like regular strict grid structure. Vegetation is modest.

1.2.2 Microcellular test environment

The microcellular test environment focuses on smaller cells and higher user densities and traffic loads in city centres and dense urban areas, i.e. it targets the high-performance layer of an IMT-Advanced system in metropolitan areas. It is thus intended to test performance in high traffic loads and using demanding user requirements, including detailed modelling of buildings (e.g. Manhattan grid deployment) and outdoor-to-indoor coverage. A continuous cellular layout and the associated interference shall be assumed. Radio access points shall be below rooftop level.

1.2.2.1 Outdoor to indoor scenario

In outdoor-to-indoor scenario B4 the MS antenna height is assumed to be at 1 – 2 m (plus the floor height), and the BS antenna height below roof-top, at 5 - 15 m depending on the height of surrounding buildings (typically over four floors high). Outdoor environment is metropolitan area B1, typical urban microcell where the user density is typically high, and thus the requirements for system throughput and spectral efficiency are high. The corresponding indoor environment is A1, typical indoor small office.

1.2.2.2 Urban micro-cell scenario

In urban micro-cell scenario B1 the height of both the antenna at the BS and that at the MS is assumed to be well below the tops of surrounding buildings. Both antennas are assumed to be outdoors in an area where streets are laid out in a Manhattan-like grid. The streets in the coverage area are classified as “the main street”, where there is LOS from all locations to the BS, with the possible exception of cases in which LOS is temporarily blocked by traffic (e.g. trucks and busses) on the street. Streets that intersect the main street are referred to as perpendicular streets, and those that run parallel to it are referred to as parallel streets. This scenario is defined for both LOS and NLOS cases. Cell shapes are defined by the surrounding buildings, and energy reaches NLOS streets as a result of propagation around corners, through buildings, and between them.

1.2.2.3 Bad Urban micro-cell scenario

Bad urban micro-cell scenarios B2 are identical in layout to Urban Micro-cell scenarios, as described above. However, propagation characteristics are such that multipath energy from distant objects can be received at some locations.

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This energy can be clustered or distinct, has significant power (up to within a few dB of the earliest received energy), and exhibits long excess delays. Such situations typically occur when there are clear radio paths across open areas, such as large squares, parks or bodies of water.

1.2.3 Indoor test environment

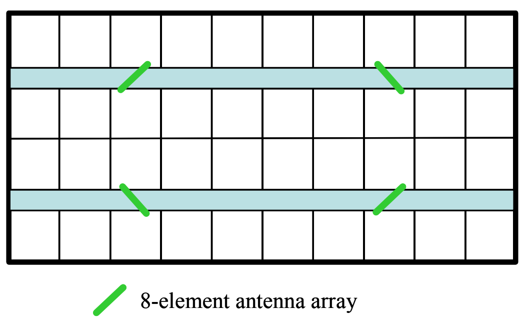
1.2.3.1 Indoor office scenario (A1)

The indoor office scenario investigates isolated cells for office coverage. Both, access point and users are indoors and a detailed modelling of the indoor environment shall be used. High user densities and requirements must be satisfied for stationary or pedestrian users. To further address the large market of small networks serving the needs of nomadic users, also ease of deployment and self-configurability are core parts of this scenario.

Indoor environment A1 represents typical office environment, where the area per floor is 5 000 m2, number of floors is 3 and room dimensions are 10 m x 10 m x 3 m and the corridors have the dimensions 100 m x 5 m x 3 m. The layout of the scenario is shown in Figure 2.

FIGURE 2

Layout of the indoor office scenario



[Editor's Note: change Figure 2 subtitle to 4-element antenna array in original art work]

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Rooms: 10 x 10 x 3 m

Corridors: 5 x 100 x 3 m

1.2.3.2 Indoor hotspot scenario (A2)

The indoor hotspot test scenario concentrates on the propagation conditions in a hotspot in the urban with the very higher traffic, like the conference hall, shopping mall and teaching building. The indoor hotspot scenario is also different from the indoor office scenario due to the construction structure. Scenario A2 represents a typical shopping building, where the area per floor is about 5 400 m2, number of floors is 8 and wider hall dimensions are different. The layout of the scenario is shown in Figure 3.

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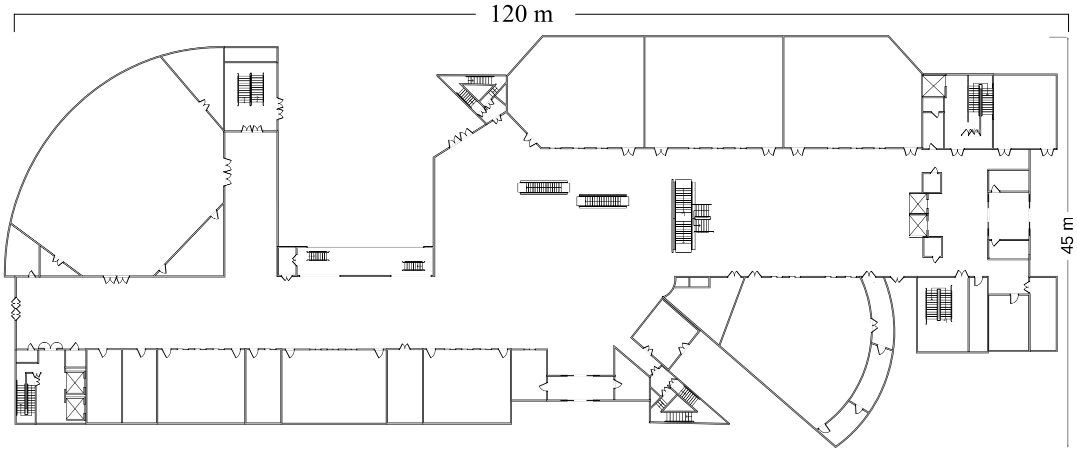
FIGURE 3

Layout of the indoor hotspot scenario



1.2.4 High-speed test environment

The high speed test environment has a challenge in a wide-area system concept since is should allows for reliable links to high-speed trains of up to 350km/h or cars at high velocities. Repeater technology or relays (relaying to the same wide area system, IMT-2000, or to a local area system) can be applied in the vehicle, to allow local access by the customers.

1.2.4.1 Rural macro-cell

Propagation scenario Rural macro-cell D1 represents radio propagation in large areas (radii up to 10 km) with low building density. The height of the AP antenna is typically in the range from 20 to 70 m, which is much higher than the average building height. Consequently, LOS conditions can be expected to exist in most of the coverage area. In case the UE is located inside a building or vehicle, an additional penetration loss is experienced which can possibly be modelled as a (frequency-dependent) constant value. The AP antenna location is fixed in this propagation scenario, and the UE antenna velocity is in the range from 0 to 200 km/h.

1.2.4.2 Moving network

Propagation scenario D2 (Rural Moving Network) represents radio propagation in environments where both the AP and the UE are moving, possibly at very high speed, in a rural area. A typical example of this scenario occurs in carriages of high-speed trains where wireless coverage is provided by so-called moving relay stations (MRSs) which can be mounted, for example, to the ceiling. Note that the link between the fixed network and the moving network (train) is typically a LOS wireless link whose propagation characteristics are represented by propagation scenario D1.

1.3 Channel models

The following sections provide both path loss models and channel models for the terrestrial component.

For the terrestrial environments, the propagation effects are divided into three distinct types of model. These are mean path loss, slow variation about the mean due to shadowing and scattering, and the rapid variation in the signal due to multipath effects. Equations are given for mean path loss

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for each of the four terrestrial environments. The slow variation is considered to be log-normally distributed. This is described by the standard deviation (given in the deployment model section).

Finally, the rapid variation is characterized by the channel impulse response. Channel impulse response is modelled using a generalised tapped delay line implementation, which also includes the directions of the multipath components in Tx and Rx. The characteristics of the tap variability is characterized by the Doppler spectrum. [Editors note: MIMO aspects should be considered.]

1.3.1 Path loss models

Equations are given for mean path loss as a function of distance for each of the terrestrial environments The slow variation is considered to be log-normally distributed. This is described by the standard deviation (dB) and the decorrelation length of this long-term fading for the vehicular test environment.

Path-loss models at 2 to 6 GHz for considered scenarios have been developed based on measurement results or from literature. The path-loss models have been summarized in the Table 2. MS antenna height dependency is not shown in the table, but can be found in the later sections. Free space attenuation referred in the table is

$$PL_{\text{free}} = 46.4 + 20\log_{10}(d[\text{m}]) + 20\log_{10}(f[\text{GHz}]/5.0) \qquad (1.1)$$

The shadow fading is log-Normal distributed and standard deviation of the distribution is given in decibels.

An empirical propagation loss formula for NLOS outdoor macrocellular scenario such as C1, C2 and C3, which can take the city structure into account and apply the carrier frequency range up to the SHF band and is given as follows.

$$\begin{aligned} Loss(d) &= 101.04 - 7.1\log W + 7.5\log \langle H \rangle \\ &- \left\{24.37 - 3.7(\langle H \rangle / h_b)^2\right\}\log h_b + (43.42 - 3.1\log h_b)\log d \quad \text{(dB)} \\ &+ 20\log f_c - a(h_m) \end{aligned} \qquad (1.2)$$

where h_b, $\langle H \rangle$, W denote the BS antenna height, the average building height, and the street width, respectively. f_c denotes the carrier frequency. $a(h_m)$ is the correction factor for mobile antenna height h_m as follows:

$$a(h_m) = 3.2(\log(11.75h_m))^2 - 4.97. \quad \text{(dB)} \qquad (1.3)$$

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TABLE 1

Summary table of the extended path-loss models

Scenario		path loss [dB]	shadow fading standard dev. (dB)	applicability range and antenna height default values
A1	LOS	$18.7\log_{10}(d[\mathrm{m}]) + 46.8 + 20\log_{10}(f_c[\mathrm{GHz}]/5.0)$	$\sigma = 3$	$3\ \mathrm{m} < d < 100\ \mathrm{m}$, $h_{BS} = h_{MS} = 1$– 2.5m
	NLOS (Room-Corridor)	$PL = 36.8\log_{10}(d[\mathrm{m}]) + 43.8 + 20\log_{10}(f[\mathrm{GHz}]/5.0)$	$\sigma = 4$	$3\ \mathrm{m} < d < 100\ \mathrm{m}$, $h_{BS} = h_{MS} = 1$– 2.5m
	NLOS (Room-Room through wall)	$PL = 20\log_{10}(d[\mathrm{m}]) + 46.4 + n_W \cdot 5 + 20\log_{10}(f[\mathrm{GHz}]/5.0)$	$\sigma = 6$	$3\ \mathrm{m} < d < 100\ \mathrm{m}$ (light walls), $h_{BS} = h_{MS} = 1$– 2.5m
		$PL = 20\log_{10}(d[\mathrm{m}]) + 46.4 + n_W \cdot 10 + 20\log_{10}(f[\mathrm{GHz}]/5.0)$ where n_w is the number of walls between BS and MS.	$\sigma = 8$	$3\ \mathrm{m} < d < 100\ \mathrm{m}$ (heavy walls), $h_{BS} = h_{MS} = 1$– 2.5m
A2	LOS	$11.8\log_{10}(d[\mathrm{m}])+49.3+20\log_{10}(f_c[\mathrm{GHz}]/5.0)$	$\sigma = 1.5$	$20\ \mathrm{m} < d < 60\ \mathrm{m}$, $h_{BS} = h_{MS} = 1$-2.5 m
	NLOS	$43.3\log_{10}(d[\mathrm{m}])+25.5+20\log_{10}(f_c[\mathrm{GHz}]/5.0)$	$\sigma = 1.1$	$20\ \mathrm{m} < d < 80\ \mathrm{m}$, $h_{BS} = h_{MS} = 1$-2.5 m
B1	LOS	$PL_{LOS} = \max(22.7\log_{10}(d_1[\mathrm{m}]) + 41.0 + 20\log_{10}(f[\mathrm{GHz}]/5.0), PL_{Free})$	$\sigma = 3$	$30\ \mathrm{m} < d_1 < d'_{BP}$ 2), $h_{BS} = 10$ m, $h_{MS} = 1.5$ m
		$PL_{LOS} = 40.0\log_{10}(d_1[\mathrm{m}]) + 9.45 - 17.3\log_{10}(h'_{BS}[\mathrm{m}]) - 17.3\log_{10}(h'_{MS}[\mathrm{m}]) + 2.7\log_{10}(f[\mathrm{GHz}]/5.0)$	$\sigma = 3$	$d'_{BP} < d_1 < 5$ km

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	NLOS	$PL_{NLOS} = PL_{LOS}(d_1) + 20 – 12.5 \cdot n_j + 10 n_j \cdot \log_{10}(d_2[m])$ where $n_j = \max((2.8 – 0.0024 d_1[m]), 1.84)$	$\sigma = 4$	$10\ m < d_1 < 5\ km$, $w/2 < d_2 < 2\ km$ 3) w =20m $h_{BS} = 10\ m$ $h_{MS} = 1.5\ m$
B2	NLOS	Same as B1.		
B4	NLOS	$PL = PL_b + PL_{tw} + PL_{in}$ where $PL_b = PL_{B1}(d_{out} + d_{in})$, $PL_{tw} = 14 + 15(1 - \cos(\theta))^2$, $PL_{in} = 0.5\ d_{in}$	$\sigma = 7$	$3\ m < d_{out} + d_{in} < 1000\ m$ $h_{BS} = 3n_{Fl} + 2\ m$ $h_{MS} = 1.5\ m$ See 1) for explanation of parameters
C1	LOS	$PL = 23.8 \log_{10}(d\ [m]) + 41.2 + 20 \log_{10}(f\ [GHz]/5.0)$ $PL = 40.0 \log_{10}(d\ [m]) + 11.65 - 16.2\log_{10}(h_{BS}\ [m]) - 16.2\log_{10}(h_{MS}\ [m]) + 3.8\log10(f\ [GHz]/5.0)$	$\sigma = 4$ $\sigma = 6$	$30\ m < d < d_{BP}$ 4) $h_{BS} = 25\ m$ $h_{MS} = 1.5\ m$ $d_{BP} < d < 5\ km$
	NLOS	[PL = $[44.9-6.55\log_{10}(h_{BS}[m])]\log_{10}(d[m]) + 31.46 + 5.83\log_{10}(h_{BS}[m]) + 20\log_{10}(f[GHz]/5.0)$]	[$\sigma = 8$]	[$50\ m < d < 5\ km$ $h_{BS} = 25\ m$ $h_{MS} = 1.5\ m$]
C2	NLOS	[PL = $[44.9-6.55\log_{10}(h_{BS}[m])]\log_{10}(d[m]) + 34.46 + 5.83\log_{10}(h_{BS}[m]) + 20\log_{10}(f[GHz]/5.0)$]	[$\sigma = 8$]	[$50\ m < d < 5\ km$ $h_{BS} = 25\ m$ $h_{MS} = 1.5\ m$]
C3		[Same as C2.]		
D1	LOS	$PL = 44.2 + 21.5 \log10(d) + 20 \log10(f\ [GHz]/5)$ $PL = 10.5 + 40.0 \log_{10}(d_1\ [m]) - 18.5\log_{10}(h_{BS}[m]) - 18.5\log_{10}(h_{MS}\ [m]) +$	$\sigma = 4$ $\sigma = 6$	$30\ m < d < d_{BP}$ 4) $h_{BS} = 32\ m$ $h_{MS} = 1.5\ m$ $d_{BP} < d < 10\ km$,

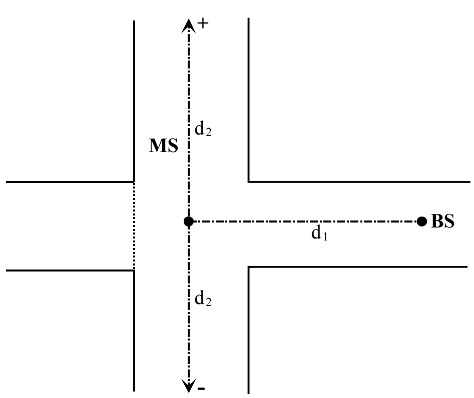
		$1.5\log_{10}(f[\text{GHz}]/5)$		
	NLOS	$PL = \max((55.4+25.1\log_{10}(d[\text{m}])$ $-0.13\log_{10}(h_{BS}[\text{m}]-25))\log_{10}(d[\text{m}]/100)$ $-\ 0.9(h_{MS}[\text{m}]-1.5) +$ $21.3\ \log_{10}(f[\text{GHz}]/5.0),$ $PL_{Free})$	$\sigma = 8$	$50\ \text{m} < d < 5\ \text{km}$ $h_{BS} =\ 32\ \text{m}$ $h_{MS} = 1.5\ \text{m}$
D2a	LOS	$PL = 44.2 + 21.5\ \log10(d) + 20\ \log10(f\ [\text{GHz}]/5)$	$\sigma = 4$	$30\ \text{m} < d < 2\ \text{km}$ $h_{BS} =\ 32\ \text{m}$ $h_{MS} = 3\ \text{m}$

1) PL_{B1} is B1 path-loss, d_{out} is the distance between the outside terminal and closest point of the wall to the inside terminal, d_{in} is the distance from wall to the inside terminal , θ is the angle between the outdoor path and the normal of the wall. n_{Fl} is the number of the floor. (Ground floor is the number 1.)
2) $d'_{BP} = 4\ h'_{BS}\ h'_{MS}\ f/c$, where f = center frequency and c = velocity of light and h'_{BS} and h'_{MS} are the effectice antenna heights at BS and MS respectively: $h'_{BS} = h_{BS}$-1.0 m, $h'_{MS} = h_{MS}$ – 1.0 m, where 1.0 m is the effective environment height in the urban environment.
3) d_1 and d_2 have been explained below.
4) $d_{BP} = 4\ h_{BS}\ h_{MS}\ f/c$,, where h_{BS} and h_{MS} are the actual antenna heights

The geometry for the d_1- d_2 model is shown in Figure 4, where the BS is located in one street/corridor and the MS is moving in the perpendicular street /corridor. d_1 is the distance from the BS to the middle point of the street/corridor and d_2 is the distance apart from the middle point of the crossing of the MS.

FIGURE 4

Geometry for d_1 - d_2 path-loss model



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1.3.1.1 Decorrelation length of the long-term fading

The long-term (log-normal) fading in the logarithmic scale around the mean path loss *L* (dB) is characterized by a Gaussian distribution with zero mean and standard deviation. Due to the slow fading process versus distance Δx, adjacent fading values are correlated. Its normalized autocorrelation function $R(\Delta x)$ can be described with sufficient accuracy by an exponential function [3]:

$$R(\Delta x) = e^{-\frac{|\Delta x|}{d_{cor}} \ln 2} \qquad (1.4)$$

with the decorrelation length d_{cor}, which is dependent on the environment.

1.3.2 Channel Model Parameters

1.3.2.1 Temporal-Spatial Properties Description

[Editor Note: The angular and delay profiles shape and distribution should be also described in this section. The model details for this sub-section will be described in the later phase and will be discussed during the adhoc meeting within the DG EVAL CHANNEL between Kyoto and Geneva Meeting Feb 2008.]

1.3.2.2 [Primary] Models

The primary models are created using the parameters listed in the Table 2. The channel realizations are obtained by the following step-wise procedure [2]. It has to be noted, that the geometric description covers arrival angles from the last bounce scatterers and respectively departure angles to the first scatterers interacted from the transmitting side. The propagation between the first and the last interaction is not defined. Thus this approach can model also multiple interactions with the scattering media. This indicates also that e.g., the delay of a multipath component can not be determined by the geometry.

[Editor Note: Simulation methodology and procedure will be replaced/enhanced by a flowchart.]

General parameters:

Step 1: Set environment, network layout and antenna array parameters

a. Choose one of the scenarios (A1, A2, B1,…)
b. Give number of BS and MS
c. Give locations of BS and MS, or equally distances of each BS and MS and relative directions φ_{LOS} and ϕ_{LOS} of each BS and MS
d. Give BS and MS antenna field patterns F_{rx} and F_{tx} , and array geometries
e. Give BS and MS array orientations with respect to north (reference) direction
f. Give speed and direction of motion of MS
g. Give system centre frequency

Large scale parameters:

Step 2: Assign propagation condition (LOS/NLOS).

Step 3: Calculate path loss with formulas of Table 1 for each BS-MS link to be modelled.

Step 4: Generate correlated large scale parameters, i.e. delay spread, angular spreads, Ricean K-factor and shadow fading term like explained in [2, section 3.2.1] (Correlations between large scale parameters).

[Editor Note: Ricean spatial K-factor will be considered as a lognormal distributed random variable after further discussion.]

[Editor Note: The dependency of large-scale parameters e.g., delay and angular spread on street-angle (e.g., mean angles etc.) and the incorporation of continuous profile simulation using Markov chain as proposed in Japan Doc. 1243 will be discussed in more details before next meeting during the adhoc.]

Small scale parameters:

Step 5: Generate delays τ.

Delays are drawn randomly from delay distribution defined in Table 2. With exponential delay distribution calculate

$$\tau_n' = -r_\tau \sigma_\tau \log(X_n), \qquad (1.5)$$

where r_τ is delay distribution proportionality factor, $X_n \sim \mathrm{Uni}(0,1)$ and cluster index $n = 1,\ldots,N$. With uniform delay distribution the delay values τ_n' are drawn from the corresponding range. Normalise the delays by subtracting with minimum delay and sort the normalised delays to descending order.

$$\tau_n = \mathrm{sort}(\tau_n' - \min(\tau_n')). \qquad (1.6)$$

In the case of LOS condition additional scaling of delays is required to compensate the effect of LOS peak addition to the delay spread. Heuristically determined Ricean K-factor dependent scaling constant is

$$D = 0.7705 - 0.0433K + 0.0002K^2 + 0.000017K^3, \qquad (1.7)$$

where K [dB] is the Ricean K-factor defined in Table 2. Scaled delays are

$$\tau_n^{LOS} = \tau_n / D, \qquad (1.8)$$

they are **not** to be used in cluster power generation.

[Editor Note: Please reconfirm whether the K=factor in Eq. (1.7) is in dB or linear scale.]

Step 6: Generate cluster powers P.

Cluster powers are calculated assuming a single slope exponential power delay profile. Power assignment depends on the delay distribution defined in Table 2. With exponential delay distribution the cluster powers are determined by

$$P_n' = \exp\left(-\tau_n \frac{r_\tau - 1}{r_\tau \sigma_\tau}\right) \cdot 10^{\frac{-Z_n}{10}} \qquad (1.9)$$

and with uniform delay distribution they are determined by

$$P_n^{'} = \exp\left(\frac{-\tau_n}{\sigma_\tau}\right)\cdot 10^{\frac{-Z_n}{10}} , \tag{1.10}$$

where $Z_n \sim N(0, \zeta)$ is the per cluster shadowing term in [dB]. Average the power so that sum power of all clusters is equal to one

$$P_n = \frac{P_n^{'}}{\sum_{n=1}^{N} P_n^{'}} \tag{1.11}$$

Assign the power of each ray within a cluster as P_n / M, where M is the number of rays per cluster.

Step 7: Generate arrival angles φ and departure angles ϕ.

As the composite PAS of all clusters is modelled as wrapped Gaussian (see Table 2) the AoA are determined by applying inverse Gaussian function with input parameters P_n and RMS angle spread σ_φ

$$\varphi_n' = \frac{2\sigma_{\mathrm{AoA}}\sqrt{-\ln\left(P_n/\max\left(P_n\right)\right)}}{C} . \tag{1.12}$$

On equation above $\sigma_{\mathrm{AoA}} = \sigma_\varphi/1.4$ is the standard deviation of arrival angles (factor 1.4 is the ratio of Gaussian std and corresponding "RMS spread"). Constant C is a scaling factor related to total number of clusters and is given in the table below:

# clusters	4	5	8	10	11	12	14	15	16	20
C	0.779	0.860	1.018	1.090	1.123	1.146	1.190	1.211	1.226	1.289

In the LOS case constant C is dependent also on Ricean K-factor. Constant C in eq. (1.10) is substituted by C^{LOS}. Additional scaling of angles is required to compensate the effect of LOS peak addition to the angle spread. Heuristically determined Ricean K-factor dependent scaling constant is

$$C^{LOS} = C\cdot\left(1.1035 - 0.028K - 0.002K^2 + 0.0001K^3\right), \tag{1.13}$$

where K [dB] is the Ricean K-factor defined in Table 2.

Assign positive or negative sign to the angles by multiplying with a random variable X_n with uniform distribution to discrete set of $\{1,-1\}$, add component $Y_n \sim N\left(0, \sigma_{AoA}/5\right)$ to introduce random variation

$$\varphi_n = X_n\varphi_n' + Y_n + \varphi_{LOS} , \tag{1.14}$$

where φ_{LOS} is the LOS direction defined in the network layout description Step1.c.

In the LOS case substitute (0.10) by (0.11) to enforce the first cluster to the LOS direction φ_{LOS}

$$\varphi_n = \left(X_n\varphi_n' + Y_n\right) - \left(X_n\varphi_1' + Y_1 - \varphi_{LOS}\right). \tag{1.15}$$

Finally add offset angles α_m from [XX] to cluster angles

$$\varphi_{n,m} = \varphi_n + c_{AoA}\alpha_m \,, \tag{1.16}$$

where c_{AoA} is the cluster-wise rms azimuth spread of arrival angles (cluster ASA) in the Table 2.

TABLE 1-1

Ray offset angles within a cluster, given for 1° rms angle spread.

Ray number *m*	**Basis vector of offset angles α_m**
1,2	± 0.0447
3,4	± 0.1413
5,6	± 0.2492
7,8	± 0.3715
9,10	± 0.5129
11,12	± 0.6797
13,14	± 0.8844
15,16	± 1.1481
17,18	± 1.5195
19,20	± 2.1551

For departure angles ϕ_n the procedure is analogous.

Step 8: Random coupling of rays within the clusters.

[Editor Note: Clarify the differences between ray, path, sub-path and cluster.]

Couple randomly departure ray angles $\phi_{n,m}$ to arrival ray angles $\varphi_{n,m}$ within a cluster n, or within a sub-cluster in the case of two strongest clusters (see step 11 and Table 1-1).

Step 9: Generate vertical-to-horizontal and horizontal-to-vertical cross polarisation power ratios (XPR) κ^{vh} and κ^{hv} respectively for each ray m of each cluster n.

XPR is log-Normal distributed. Draw vertical-to-horizontal XPR values as

$$\kappa_{m,n}^{\mathrm{vh}} = 10^{X/10} \,, \tag{1.17}$$

where ray index $m = 1,\ldots,M$, $X \sim \mathrm{N}(\sigma,\mu)$ is Gaussian distributed with σ and μ from Table 2 for $\mathrm{XPR_{VH}}$.

For the horizontal-to-vertical XPR the procedure is analogous.

[Editor Note: The distance dependency of XPR will need further discussion.]

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Coefficient generation:

Step 10: Draw random initial phase $\{\Phi^{vv}_{n,m},\Phi^{vh}_{n,m},\Phi^{hv}_{n,m},\Phi^{hh}_{n,m}\}$ for each ray *m* of each cluster *n* and for four different polarisation combinations (*vv,vh,hv,hh*). Distribution for initial phases is uniform, Uni(-π,π).

In the LOS case draw also random initial phases $\{\Phi^{vv}_{LOS},\Phi^{hh}_{LOS}\}$ for both VV and HH polarisations.

Step 11: Generate channel coefficients for each cluster *n* and each receiver and transmitter element pair *u,s*.

For the N – 2 weakest clusters, say *n* = 3,4,…,*N*, and uniform linear arrays (ULA), the channel coefficient are given by:

$$\mathbf{H}_{u,s,n}(t)=\sqrt{P_n}\sum_{m=1}^{M}\begin{bmatrix}F_{tx,s,V}(\varphi_{n,m})\\ F_{tx,s,H}(\varphi_{n,m})\end{bmatrix}^T\begin{bmatrix}\exp\left(j\Phi^{vv}_{n,m}\right) & \sqrt{\kappa^{vh}_{n,m}}\exp\left(j\Phi^{vh}_{n,m}\right)\\ \sqrt{\kappa^{hv}_{n,m}}\exp\left(j\Phi^{hv}_{n,m}\right) & \exp\left(j\Phi^{hh}_{n,m}\right)\end{bmatrix}\begin{bmatrix}F_{rx,u,V}(\phi_{n,m})\\ F_{rx,u,H}(\phi_{n,m})\end{bmatrix}$$
$$\cdot\exp\left(jd_s 2\pi\lambda_0^{-1}\sin(\phi_{n,m})\right)\exp\left(jd_u 2\pi\lambda_0^{-1}\sin(\varphi_{n,m})\right)\exp\left(j2\pi\upsilon_{n,m}t\right) \quad (1.18)$$

[Editor Note: Ideal dipole antenna pattern has to be extracted from the Finland contribution.]

where $F_{rx,u,V}$ and $F_{rx,u,H}$ are the antenna element *u* field patterns for vertical and horizontal polarisations respectively, d_s and d_u are the uniform distances [m] between transmitter elements and receiver elements respectively, and λ_0 is the wave length on carrier frequency. If polarisation is not considered, 2x2 polarisation matrix can be replaced by scalar $\exp\left(j\Phi_{n,m}\right)$ and only vertically polarised field patterns applied.

The Doppler frequency component is calculated from angle of arrival (downlink), MS speed *v* and direction of travel θ_v

$$\upsilon_{n,m}=\frac{\|v\|\cos\left(\varphi_{n,m}-\theta_v\right)}{\lambda_0}, \quad (1.19)$$

For the two strongest clusters, say *n* = 1 and 2, rays are spread in delay to three sub-clusters (per cluster), with fixed delay offset {0,5,10 ns} (see Table 1-2). Delays of sub-clusters are

$$\begin{aligned}\tau_{n,1}&=\tau_n+0\,\text{ns}\\ \tau_{n,2}&=\tau_n+5\,\text{ns}\\ \tau_{n,3}&=\tau_n+10\,\text{ns}\end{aligned} \quad (1.20)$$

Twenty rays of a cluster are mapped to sub-clusters like presented in Table 1-2 below. Corresponding offset angles are taken from Table 1-1 with mapping of Table 1-2.

TABLE 1-2

Sub-cluster information for intra cluster delay spread clusters.

sub-cluster #	mapping to rays	power	delay offset
1	1,2,3,4,5,6,7,8,19,20	10/20	0 ns
2	9,10,11,12,17,18	6/20	5 ns
3	13,14,15,16	4/20	10 ns

In the LOS case define $\mathbf{H}'_{u,s,n} = \mathbf{H}_{u,s,n}$ and determine the channel coefficients by adding single line-of-sight ray and scaling down the other channel coefficient generated by (1.21). The channel coefficients are given by:

$$\begin{aligned}\mathbf{H}_{u,s,n}(t) &= \sqrt{\frac{1}{K_R+1}}\mathbf{H}'_{u,s,n}(t) \\ &+ \delta(n-1)\sqrt{\frac{1}{K_R+1}}\begin{bmatrix} F_{tx,s,V}(\varphi_{LOS}) \\ F_{tx,s,H}(\varphi_{LOS}) \end{bmatrix}^T \begin{bmatrix} \exp\left(j\Phi_{LOS}^{vv}\right) & 0 \\ 0 & \exp\left(j\Phi_{LOS}^{hh}\right) \end{bmatrix} \begin{bmatrix} F_{rx,u,V}(\phi_{LOS}) \\ F_{rx,u,H}(\phi_{LOS}) \end{bmatrix} \\ &\cdot \exp\left(jd_s 2\pi\lambda_0^{-1}\sin(\phi_{LOS})\right)\exp\left(jd_u 2\pi\lambda_0^{-1}\sin(\varphi_{LOS})\right)\exp\left(j2\pi\upsilon_{LOS}t\right)\end{aligned} \qquad (1.21)$$

where $\delta(\cdot)$ is the Dirac's delta function and K_R is the Ricean K-factor defined in Table 2 converted to linear scale.

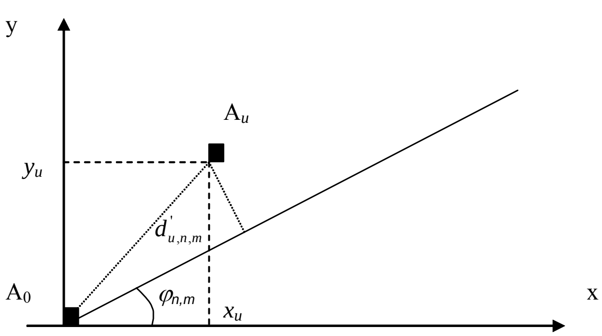
If non-ULA arrays are used the equations must be modified. For arbitrary array configurations on horizontal plane, see [Figure XX], the distance term d_u in equations (1.21) and ([1.19]) is replaced by

$$d'_{u,n,m} = \frac{\sqrt{x_u^{\,2} + y_u^{\,2}}\cos\left(\arctan(y_u/x_u) - \varphi_{n,m}\right)}{\sin\varphi_{n,m}}, \qquad (1.22)$$

where (x_u, y_u) are co-ordinates of uth element A_u and A_0 is the reference element.

FIGURE 4-1

Modified distance of antenna element *u* with non-ULA array



Step 12: Apply path loss and shadowing for the channel coefficients.

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Generation of bad urban channels (B2, C3)

Bad urban channel realizations can be created as modified C2 and B1 NLOS procedures as follows:

Step 1:

Choose a proportion of mobile users, *p* (between 0 and 1), which will experience bad urban channel characteristics. Recommended values for bad urban users are 5-15% for C3 and 1-5% for B2. For the remaining *1-p* of the users generate typical micro- or macrocellular (B1 or C2) channel realisations as described in [2, section 1.3.2.1].

Step 2:

Drop five far scatterers within a hexagonal cell, within radius [FSmin, FSmax]. For FSmin and FSmax values see Table 1-3. For each mobile user determine the closest two far scatteres, which are then used for calculating far scatterer cluster parameters.

TABLE 1-3

Far scatterer radii and attenuations for B2 and C3

Scenario	**FS_{min}**	**FS_{max}**	**FS_{loss}**
B2	150 m	500 m	4 dB/μs
C3	300 m	1500 m	2 dB/μs

Step 3:

For C3 create 20 delays as described for C2 model in [2, section 1.3.2.1]. step 5. For the shortest 18 delays create a typical urban C2 channel profile (powers and angles) as in [2, section 1.3.2.1].

Similarly, create 14 delays for B1 NLOS, and for the shortest 12 delays create a typical B1 NLOS channel profile as in [2, section 1.3.2.1].

The last two delays in B2 and C3 are assigned for far scatterer clusters.

Step 4:

Set the delays of both the FS clusters zero, and create them typical urban channel powers, as in [2, section 1.3.2.1].

Step 5:

Next create excess delays due to far scatterer clusters as

$$\tau_{excess} = \frac{d_{BS->FS->MS} - d_{LOS}}{c} \qquad (1.23)$$

Attenuate FS clusters as $FS_{loss,}$ given in Table 1-3.

Step 6:

Select directions of departure and arrival for each FS cluster according to far scatterer locations. i.e., corresponding to a single reflection from far scatterer.

It is worth noticing that depending on the location of the mobile user within the cell the FS clusters may appear also at shorter delays than the maximum C2 or B1 NLOS cluster. In such cases the far scatterers do not necessarily result to increased angular or delay dispersion. Also the actual channel statistics of the bad urban users depend somewhat on the cell size.

Table 2 - Channel model parameters parameter

Scenarios		A1		A2		B1/B2		B4	C1		C2/C3	D1		D2a
		LOS	NLOS	LOS	NLOS	LOS	NLOS	NLOS	LOS	NLOS	NLOS	LOS	NLOS	LOS
Delay spread σ_{DS} $\log_{10}$([s])	μ	-7.42	-7.60	-7.71	-7.41	-7.44	-7.12	-7.31	-7.23	-7.12	-6.63	-7.80	-7.60	-7.4
	σ	0.27	0.19	0.18	0.14	0.25	0.12	0.36	0.49	0.33	0.32	0.57	0.48	0.2
AoD spread σ_{ASD} ++ $\log_{10}$([°])	μ	1.64	1.73	1.60	1.63	0.40	1.19	1.08	0.78	0.90	0.93	0.78	0.96	1.07
	σ	0.31	0.23	0.18	0.25	0.37	0.21	0.42	0.12	0.36	0.22	0.21	0.45	0.31
AoA spread σ_{ASA} $\log_{10}$([°])	μ	1.65	1.67	1.62	1.77	1.40	1.55	1.76	1.48	1.65	1.72	1.20	1.52	1.5
	σ	0.26	0.14	0.22	0.16	0.20	0.20	0.14	0.20	0.30	0.14	0.18	0.27	0.1
Shadow fading σ_{SF} [dB]	σ	3	6	1.5	1.1	3	4	7	4/6 +	8	8	4/6 +	8	2.5
Cross-Correlations **	σ_{ASD} vs σ_{DS}	0.5	-0.1	0.6	0.4	0.5	0.2	0.3	0.3	0.3	0.4	0.1	-0.4	0.1
	σ_{ASA} vs σ_{DS}	0.7	0.3	0.8	0.3	0.8	0.4	0	0.8	0.7	0.6	0.2	0.1	0.2
	σ_{ASA} vs σ_{SF}	-0.4	-0.4	-0.5	-0.4	-0.5	-0.4	0	-0.2	-0.3	-0.3	-0.1	0.1	-0.1
	σ_{ASD} vs σ_{SF}	-0.1	0	-0.4	-0.1	-0.5	0	-0.3	0.4	-0.4	-0.6	-0.1	0.6	-0.1
	σ_{DS} vs σ_{SF}	-0.7	-0.5	-0.8	-0.5	-0.4	-0.7	0.5	-0.7	-0.4	-0.4	-0.7	-0.5	-0.7
	σ_{ASD} vs σ_{ASA}	0.4	-0.3	0.4	-0.1	0.4	0.1	-0.1	0.3	0.3	0.4	-0.5	-0.2	-0.5
Delay distribution		Exp	Exp	Exp	Exp	Exp	Uniform ≤800ns	Exp	Exp	Exp	Exp	Exp	Exp	Exp
Delay scaling parameter r_τ		3	2.4	3.6	3	3.2	—	1.8	2.4	1.5	2.3	3.8	1.7	3.8
XPR_V [dB]	μ	11.4	9.7	-0.17	9.32	8.6	8.0	4.0	7.9	3.3	7.6	6.9	7.9	6.9
	σ	3.4	3.5	0.97	3.73	1.8	1.8	11.2	3.3	2.5	3.4	2.3	3.5	2.3
XPR_H [dB]	μ	10.4	10.0	—	—	9.5	6.9	9.5	3.7	5.7	2.3	7.2	7.5	7.2
	σ	3.4	3.1	—	—	2.3	2.8	11.3	2.5	2.9	0.2	2.8	4.0	2.8

AoD and AoA distribution		Wrapped Gaussian		Laplacian		Wrapped Gaussian								
Number of clusters		12	16	15	19	8	16	12	15	14	20	11	10	4
Number of rays per cluster		20	20	20	20	20	20	20	20	20	20	20	20	20
Cluster ASD		5	5	5	5	3	10	5	5	2	2	2	2	2
Cluster ASA		5	5	8	11	18	22	8	5	10	15	3	3	3
Per cluster shadowing std ζ [dB]		6	3			3	3	4	3	3	3	3	3	3
K-factor [dB]		8.3 – 0.06d	—	15.3- 0.25d	—	3 + 0.0142d	—	8.1	17.1 – 0.021d	—	—	3.7 + 0.02d	—	6
Correlation distance [m]	σ_{DS}	7	4	8	5	9	8	10	64	40	40	64	36	64
	σ_{ASD}	6	5	7	3	13	10	11	20	30	50	25	30	25
	σ_{ASA}	2	3	5	3	12	9	6	18	30	50	40	40	40
	σ_{SF}	6	4	10	6	14	12	4	23	50	50	40	120	40
Bad Urban scenario							**B2**				**C3**			
Power 1st FS cluster [dB]							-5.7				-9.7			
Power 2nd FS cluster [dB]							-7.7				-13.0			
Delay 1st FS cluster [µs]							1.1				3.1			
Delay 2nd FS cluster [µs]							1.6				4.8			

+ Scenarios C1 LOS and D1 LOS contain two shadowing std. deviations; one (left) for before and one (right) for after the path loss breakpoint.

++ Angle of departure spread σ_{ASD} corresponds to σ_ϕ and angle of arrival spread σ_{ASA} to σ_φ in the text.

* For scenario B3, XPR_H is not available. In the channel model implementation, these values have bee substituted by the XPR_V.

** The sign of the shadow fading is defined so that positive SF means more received power at MS than predicted by the path loss model.

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[Editor's Note: The table 2 should also be modified to incorporate C1, C2 and C3 for NLOS scenario as proposed by Doc. 1244 with the condition that the channel coefficients given Eq. (3) of Section 7.2 can be produced by Doc. 1244.]

TABLE 3

Expectation (median) output values for large scale parameters

Scenario		DS (ns)	AS at BS (º)	AS at MS (º)	ES at BS (º)	ES at MS (º)
A1	LOS	40	44	45	8	9
	NLOS	25	53	49	11	13
A2	LOS	27	40	42		
	NLOS	41	43	59		
B1	LOS	36	3	25		
	NLOS	76	15	35		
B2	NLOS	480	33	51		
B4	NLOS	49	12	58	10	10
C1	LOS	59	6	30		
	NLOS	75	8	45		
C2	NLOS	234	8	53		
C3	NLOS	630	17	55		
D1	LOS	16	17	33		
	NLOS	37	9	33		
D2a	LOS	39	5	30		

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[Editor Note: The table 3 should also be modified to incorporate C1, C2 and C3 for NLOS scenario as proposed by Doc. 1244 with the condition that the channel coefficients given Eq. (3) of Section 7.2 can be produced by Doc. 1244.]

[Editor Note: Elevation spread for bothe MS and BS for A2 scenario will be submitted by next meeting.]

1.3.2.2 Reduced Variability Models

In the CDL model each cluster is composed of 20 rays with fixed offset angles and identical power. In the case of cluster where a ray of dominant power exists, the cluster has 20+1 rays. This dominant ray has a zero angle offset. The departure and arrival rays are coupled randomly. The CDL table of all scenarios of interest are give below, where the cluster power and the power of each ray are tabulated. The CDL models offer well-defined radio channels with fixed parameters to obtain comparable simulation results with relatively non-complicated channel models.

Delay spread and azimuth spreads medians of the CDL models are equal to median values given in Table 3.

The following steps are used to generate a MIMO channel with N transmit and M receive antennas using the reduced variability or CDL model. For the purpose of illustration, let us assume that the target channel profile has K taps.

Step 1:

Generate the path loss based on the distance between the transmitter and receiver based using the path loss models in Error! Reference source not found. Error! Reference source not found.

Step 2:

Generate the shadow fading loss using the model in Error! Reference source not found. Error! Reference source not found.

Step 3:

For each tap $i,\ 1 \le i \le K$, in the targeted channel model, generate a transmit and receive correlation matrices $\mathbf{R}_{\mathrm{Tx},\,i}$ and $\mathbf{R}_{\mathrm{Rx},\,i}$ using the transmit and receive antenna geometry, the per tap mean AoA, mean AoD, and the corresponding cluster ASD and ASA.

Step 4:

Generate $N \cdot M$ SISO links based on the chosen channel profile as follows

a. Let $A_1, A_2, \cdots, A_K$ and $\tau_1, \tau_2, \cdots, \tau_K$ represent the power-delay profile for the specified channel model.

b. Generate K independent fading processes each having a Doppler spread f_d (function of the chosen mobile speed). [One issue that needs to be resolved here is

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the issue of the Doppler spectrum or the scattering processes associated with each fading process. Note that each CDLN model specifies an departure and arrival angle spread which in some sense defines the scattering process, i..e the Doppler spectrum]

c. Scale the k-th Rayleigh process by P_k where

$$P_k^2 = \frac{A_k}{\sum_{k=1}^{K} A_k}$$

Step 5:

Given the $N \cdot M$ SISO links generated in step 4 above, each is described by K processes, we define the following $M \times N$ i-th tap gain matrix for every channel sample (i.e. for every t)

$$\mathbf{H}_i(t) = \begin{pmatrix} h_{11}^{(i)}(t) & \dots & h_{1N}^{(n)}(t) \\ \vdots & \ddots & \vdots \\ h_{M1}^{(i)}(t) & \cdots & h_{MN}^{(i)}(t) \end{pmatrix}$$

Step 6:

Color the tap gain matrix by the receive and transmit correlation matrices as follows

$$\hat{\mathbf{H}}_i(t) = \mathbf{R}_{\mathrm{Rx},i}^{1/2} \cdot \mathbf{H}_i(t) \cdot \mathbf{R}_{\mathrm{Tx},i}^{1/2}$$

Step 7:

The K channel tap gains $\left\{\hat{h}_{mn}^{(1)}(t), \hat{h}_{mn}^{(2)}(t), \cdots, \hat{h}_{mn}^{(K)}(t)\right\}$ with corresponding tap delays $\{\tau_1, \tau_2, \cdots, \tau_K\}$ fully describe the multipath channel between transmit antenna m and receive antenna n. In order to generate an equivalent digital channel, say with $L+1$ taps, the effect of the pulse shaping, transmit, and receive filters needs to be taken into account. The following steps may be used to generate the equivalent digital channel.

1. Let $g(t)$ be the combined effect of the pulse shaping, transmit, and receive filters.

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2. Define the $(L+1) \times (L+1)$ pulse shaping matrix $\mathbf{G}(\tau_1, \tau_2, \cdots, \tau_K)$ as

$$\mathbf{G}(\tau_1, \tau_2, \cdots, \tau_K) = \mathbf{G}(\boldsymbol{\tau}) = \begin{bmatrix} \tilde{g}(-\tau_1) & \tilde{g}(-\tau_2) & \tilde{g}(-\tau_3) & \cdots & \tilde{g}(-\tau_K) \\ \tilde{g}(T-\tau_1) & \tilde{g}(T_s-\tau_2) & \tilde{g}(T_s-\tau_3) & \cdots & \tilde{g}(T_s-\tau_K) \\ \tilde{g}(2T-\tau_1) & \tilde{g}(2T_s-\tau_2) & \tilde{g}(2T_s-\tau_3) & \cdots & \tilde{g}(2T_s-\tau_K) \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \tilde{g}(LT-\tau_1) & \tilde{g}(LT_s-\tau_2) & \tilde{g}(LT_s-\tau_3) & \cdots & \tilde{g}(LT_s-\tau_K) \end{bmatrix}$$

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where T_s is the channel sampling period.

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3. The equivalent digital channel taps can be calculated as

$$\begin{bmatrix} \tilde{h}_{mn,0}(t \\ \tilde{h}_{mn,1}(t) \\ \tilde{h}_{mn,2}(t) \\ \vdots \\ \tilde{h}_{mn,L}(t) \end{bmatrix} = \mathbf{G}(\boldsymbol{\tau}) \begin{bmatrix} \hat{h}_{mn}^{(1)}(t) \\ \hat{h}_{mn}^{(2)}(t) \\ \hat{h}_{mn}^{(3)}(t) \\ \vdots \\ \hat{h}_{mn}^{(K)}(t) \end{bmatrix}$$

A1 – Indoor office

The CDL parameters of LOS and NLOS condition are given below. In the LOS model Ricean K-factor is 8.1 dB, which corresponds to 3m distance between Tx and Rx.

TABLE 4

Scenario A1: LOS Clustered delay line model, indoor office

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]		Cluster ASD = 5º	Cluster ASA = 5º
1	0			0.0			0	0	-0.08*	-30.2**		
2	20			-25.3			-160	164	-38.3			
3	35	40	45	-15.7	-17.9	-19.7	-113	-116	-25.7			
4	45			-21.0			-146	149	-34.0			
5	45			-19.4			140	143	-32.4			
6	90			-23.3			153	157	-36.3			
7	110	115	120	-18.8	-21.0	-22.7	148	151	-28.8			
8	155			-25.2			-159	163	-38.2			
9	190			-21.6			148	151	-34.7			
10	245			-19.1			-139	-142	-32.1			
11	255			-27.9			-168	-172	-40.9			
12	320			-30.5			176	-180	-43.5			

* Power of dominant ray,

** Power of each other ray

FIGURE 5

PDP and frequency correlation (FCF) of CDL model

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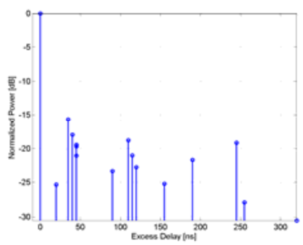

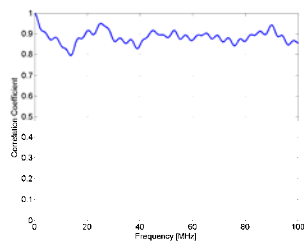

TABLE 5

Scenario A1 NLOS Clustered delay line model, indoor office

<table>
<tr><th>Cluster #</th><th colspan="3">Delay [ns]</th><th colspan="3">Power [dB]</th><th>AoD [º]</th><th>AoA [º]</th><th>Ray power [dB]</th><th rowspan="17">Cluster ASD = 5º</th><th rowspan="17">Cluster ASA = 5º</th></tr>
<tr><td>1</td><td>0</td><td>5</td><td>10</td><td>-3.0</td><td>-5.2</td><td>-7.0</td><td>0</td><td>0</td><td>-13.0</td></tr>
<tr><td>2</td><td colspan="3">5</td><td colspan="3">-4.0</td><td>59</td><td>-55</td><td>-17.0</td></tr>
<tr><td>3</td><td colspan="3">20</td><td colspan="3">-4.7</td><td>-64</td><td>-59</td><td>-17.7</td></tr>
<tr><td>4</td><td colspan="3">25</td><td colspan="3">-9.0</td><td>89</td><td>-82</td><td>-22.0</td></tr>
<tr><td>5</td><td colspan="3">30</td><td colspan="3">-8.0</td><td>83</td><td>-77</td><td>-21.0</td></tr>
<tr><td>6</td><td>30</td><td>35</td><td>40</td><td>-4.0</td><td>-6.2</td><td>-8.0</td><td>-67</td><td>62</td><td>-14.0</td></tr>
<tr><td>7</td><td colspan="3">35</td><td colspan="3">-1.1</td><td>32</td><td>29</td><td>-14.2</td></tr>
<tr><td>8</td><td colspan="3">45</td><td colspan="3">-5.2</td><td>-67</td><td>62</td><td>-18.2</td></tr>
<tr><td>9</td><td colspan="3">55</td><td colspan="3">-9.5</td><td>-91</td><td>-84</td><td>-22.5</td></tr>
<tr><td>10</td><td colspan="3">65</td><td colspan="3">-7.9</td><td>-83</td><td>77</td><td>-20.9</td></tr>
<tr><td>11</td><td colspan="3">75</td><td colspan="3">-6.8</td><td>-77</td><td>-71</td><td>-19.8</td></tr>
<tr><td>12</td><td colspan="3">90</td><td colspan="3">-14.8</td><td>-113</td><td>105</td><td>-27.8</td></tr>
<tr><td>13</td><td colspan="3">110</td><td colspan="3">-12.8</td><td>-106</td><td>98</td><td>-25.8</td></tr>
<tr><td>14</td><td colspan="3">140</td><td colspan="3">-14.1</td><td>111</td><td>-103</td><td>-27.2</td></tr>
<tr><td>15</td><td colspan="3">210</td><td colspan="3">-26.7</td><td>-152</td><td>141</td><td>-39.7</td></tr>
<tr><td>16</td><td colspan="3">250</td><td colspan="3">-32.5</td><td>-168</td><td>-156</td><td>-45.5</td></tr>
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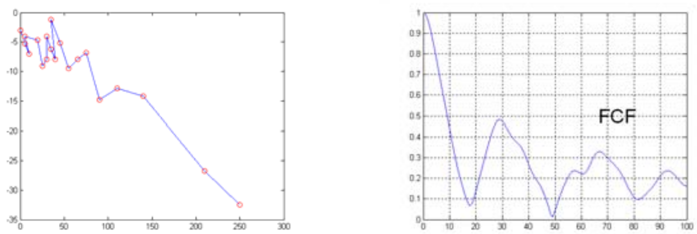
FIGURE 6

PDP and frequency correlation (FCF) of CDL model



A2 – Indoor hotspot

The CDL parameters of LOS and NLOS condition are given below. In the LOS model Ricean K factor are 15.3 dB and 10.4 dB, respectively for the first and second clusters.

TABLE 6

Scenario A2 LOS Clustered delay line model, indoor hotspot

Cluster #	Delay [ns]	Power [dB]	AoD [º]	AoA [º]	Ray power [dB]			
1	0	0	0	0	-0.1*	-28.4**	Cluster ASD = 5º	Cluster ASA = 8º
2	5	-3.4	7	-2	-3.7*	-27.1**		
3	10	-9.2	0	-12	-22.2			
4	20	-18.9	7	13	-31.9			
5	30	-17.1	11	16	-30.1			
6	40	-16.3	-7	-34	-29.3			
7	50	-13.7	-60	-12	-26.7			
8	60	-16.3	-43	-17	-29.3			
9	70	-16.8	11	-59	-29.8			
10	80	-17.9	8	-78	-30.9			
11	90	-15.9	14	-65	-28.9			
12	100	-17.4	-1	-56	-30.4			
13	110	-25.8	-11	-57	-38.8			
14	120	-31.0	-129	-22	-44.0			
15	130	-33.4	-123	-12	-46.4			

* Power of dominant ray,

** Power of each other ray

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FIGURE 7

PDP and frequency correlation (FCF) of CDL model

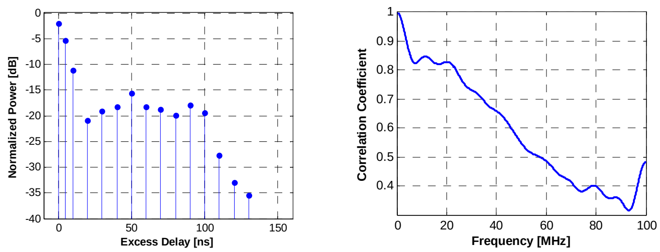

TABLE 7

Scenario A2 NLOS Clustered delay line model, indoor hotspot

Cluster #	Delay [ns]	Power [dB]	AoD [º]	AoA [º]	Ray power [dB]		
1	0	-6.9	2	2	-19.9	Cluster ASD = 5º	Cluster ASA = 11º
2	5	0	-2	9	-13.0		
3	10	-0.7	-7	14	-13.7		
4	15	-1.0	-3	-7	-14.0		
5	20	-1.4	-1	-6	-14.4		
6	25	-3.8	-5	-18	-16.8		
7	30	-2.6	0	-3	-15.6		
8	35	-0.2	-6	-3	-13.2		
9	45	-3.6	-9	14	-16.6		
10	55	-5.7	1	44	-18.7		
11	65	-11.6	4	13	-24.6		
12	75	-8.9	-5	65	-21.9		
13	95	-7.3	-11	46	-20.3		
14	115	-11.2	-4	35	-24.2		
15	135	-13.5	-3	48	-26.5		
16	155	-13.4	-7	41	-26.4		
17	175	-12.2	8	7	-25.2		
18	195	-14.7	4	69	-27.7		
19	215	-15.8	-11	133	-28.8		

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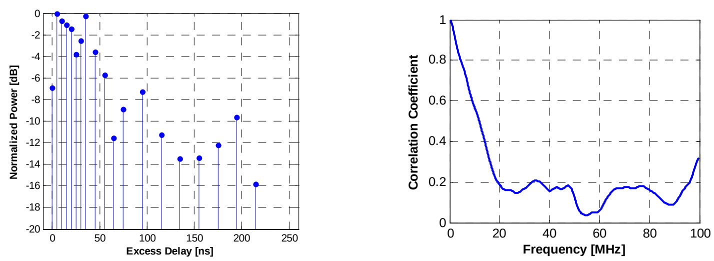
FIGURE 8

PDP and frequency correlation (FCF) of CDL model



B1 – Urban micro-cell

In the LOS model Ricean K-factor is 3.3 dB, which corresponds to 20m distance between Tx and Rx.

TABLE 8

Scenario B1: LOS clustered delay line model, urban mico-cell

Cluster #	Delay [ns]	Power [dB]	AoD [º]	AoA [º]	Ray power [dB]		
1	0	0.0	0	0	-0.31* / -24.7**	Cluster ASD = 3º	Cluster ASA = 18º
2	30 / 35 / 40	-10.5 / -12.7 / -14.5	5	45	-20.5		
3	55	-14.8	8	63	-27.8		
4	60 / 65 / 70	-13.6 / -15.8 / -17.6	8	-69	-23.6		
5	105	-13.9	7	61	-26.9		
6	115	-17.8	8	-69	-30.8		
7	250	-19.6	-9	-73	-32.6		
8	460	-31.4	11	92	-44.4		

* Power of dominant ray,

** Power of each other ray

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FIGURE 9

PDP and frequency correlation (FCF) of CDL model

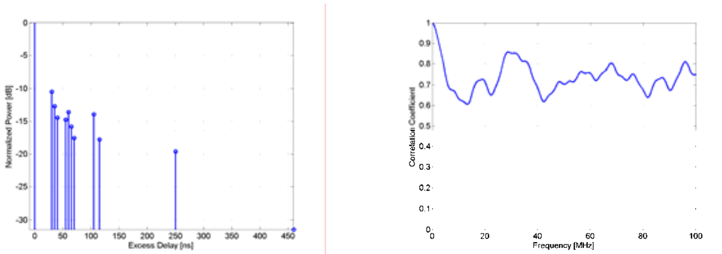

TABLE 9

Scenario B1: NLOS Clustered delay line model, urban micro-cell

<table>
<tr><th>Cluster #</th><th colspan="3">Delay [ns]</th><th colspan="3">Power [dB]</th><th>AoD [º]</th><th>AoA [º]</th><th>Ray power [dB]</th><th rowspan="17">Cluster ASD =10º</th><th rowspan="17">Cluster ASD = 22º</th></tr>
<tr><td>1</td><td colspan="3">0</td><td colspan="3">-1.0</td><td>8</td><td>-20</td><td>-14.0</td></tr>
<tr><td>2</td><td>90</td><td>95</td><td>100</td><td>-3.0</td><td>-5.2</td><td>-7.0</td><td>0</td><td>0</td><td>-13.0</td></tr>
<tr><td>3</td><td>100</td><td>105</td><td>110</td><td>-3.9</td><td>-6.1</td><td>-7.9</td><td>-24</td><td>57</td><td>-13.9</td></tr>
<tr><td>4</td><td colspan="3">115</td><td colspan="3">-8.1</td><td>-24</td><td>-55</td><td>-21.1</td></tr>
<tr><td>5</td><td colspan="3">230</td><td colspan="3">-8.6</td><td>-24</td><td>57</td><td>-21.6</td></tr>
<tr><td>6</td><td colspan="3">240</td><td colspan="3">-11.7</td><td>29</td><td>67</td><td>-24.7</td></tr>
<tr><td>7</td><td colspan="3">245</td><td colspan="3">-12.0</td><td>29</td><td>-68</td><td>-25.0</td></tr>
<tr><td>8</td><td colspan="3">285</td><td colspan="3">-12.9</td><td>30</td><td>70</td><td>-25.9</td></tr>
<tr><td>9</td><td colspan="3">390</td><td colspan="3">-19.6</td><td>-37</td><td>-86</td><td>-32.6</td></tr>
<tr><td>10</td><td colspan="3">430</td><td colspan="3">-23.9</td><td>41</td><td>-95</td><td>-36.9</td></tr>
<tr><td>11</td><td colspan="3">460</td><td colspan="3">-22.1</td><td>-39</td><td>-92</td><td>-35.1</td></tr>
<tr><td>12</td><td colspan="3">505</td><td colspan="3">-25.6</td><td>-42</td><td>-99</td><td>-38.6</td></tr>
<tr><td>13</td><td colspan="3">515</td><td colspan="3">-23.3</td><td>-40</td><td>94</td><td>-36.4</td></tr>
<tr><td>14</td><td colspan="3">595</td><td colspan="3">-32.2</td><td>47</td><td>111</td><td>-45.2</td></tr>
<tr><td>15</td><td colspan="3">600</td><td colspan="3">-31.7</td><td>47</td><td>110</td><td>-44.7</td></tr>
<tr><td>16</td><td colspan="3">615</td><td colspan="3">-29.9</td><td>46</td><td>-107</td><td>-42.9</td></tr>
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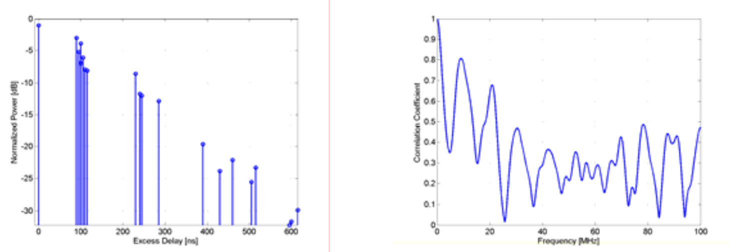
FIGURE 10

PDP and frequency correlation (FCF) of CDL model



B2 – Bad Urban micro-cell

TABLE 10

Scenario B2: NLOS Clustered delay line model, bad urban micro-cell

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]		
1	0	5	10	-3.0	-5.2	-7.0	0	0	-13.0	Cluster ASD = 3º	Cluster ASA = 5º
2	25	30	35	-3.4	-5.6	-7.3	-14	31	-13.4		
3	25			-1.7			-13	30	-14.7		
4	35			-1.9			-14	31	-14.9		
5	45			-2.2			15	-34	-15.2		
6	70			-5.0			22	51	-18.0		
7	70			-3.6			19	44	-16.6		
8	90			-3.8			-19	-45	-16.8		
9	155			-6.4			-25	-58	-19.4		
10	170			-2.7			-17	-38	-15.7		
11	180			-7.5			-27	-63	-20.5		
12	395			-16.5			-41	93	-29.5		
13	1600			-5.7			-110	15	-18.7		
14	2800			-7.7			75	-25	-20.7		

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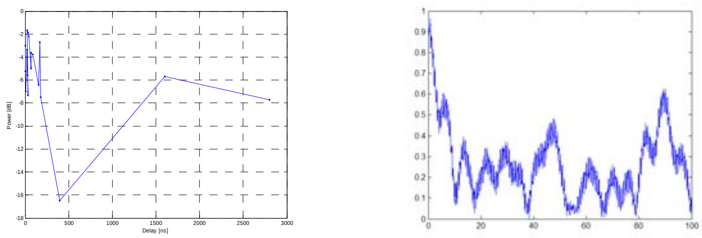
FIGURE 11

PDP and frequency correlation (FCF) of CDL model



B4 – Outdoor to indoor

[Editor's Note: The B4 terminology is a concern since it doesn't have a flow with the previous B1 and B2 models. Further discussion required to make all test scenarios terminology more consistent.]

TABLE 11

Scenario B4: NLOS Clustered delay line model, outdoor to indoor

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]	Cluster ASD = 5º	Cluster ASA = 8º
1	0			-7.7			29	102	-20.8		
2	10	15	20	-3.0	-5.2	-7.0	0	0	-13.0		
3	20			-3.7			20	70	-16.7		
4	35			-3.0			-18	-64	-16.0		
5	35			-3.0			18	-63	-16.0		
6	50			-3.7			20	70	-16.7		
7	55	60	65	-5.4	-7.6	-9.4	29	100	-15.4		
8	140			-5.3			24	84	-18.3		
9	175			-7.6			29	100	-20.6		
10	190			-4.3			-21	76	-17.3		
11	220			-12.0			36	-126	-25.0		
12	585			-20.0			46	163	-33.0		

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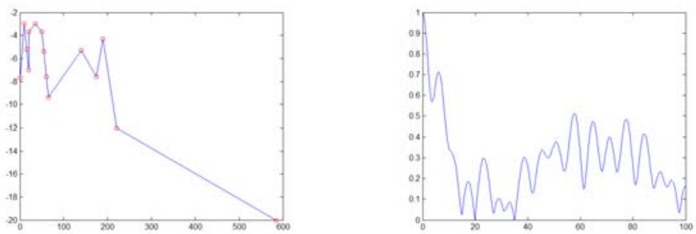
FIGURE 12

PDP and frequency correlation (FCF) of CDL model



C1 – Suburban

The CDL parameters of LOS and NLOS condition are given below. In the LOS model Ricean K-factor is 12.9 dB, which corresponds to 200m distance between Tx and Rx.

[Editor Note: Japan Doc. 1244 proposed to incorporate the distance dependency of the C1 NLOS scenario into the table. This issue will need to be further discussed in the next meeting.]

TABLE 12

Scenario C1: LOS Clustered delay line model, suburban

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]		Cluster ASD = 5º	Cluster ASD = 5º
1	0	5	10	0.0	-25.3	-27.1	0	0	-0.02*	-33.1**		
2	85			-21.6			-29	-144	-34.7			
3	135			-26.3			-32	-159	-39.3			
4	135			-25.1			-31	155	-38.1			
5	170			-25.4			31	156	-38.4			
6	190			-22.0			29	-146	-35.0			
7	275			-29.2			-33	168	-42.2			
8	290	295	300	-24.3	-26.5	-28.2	35	-176	-34.3			
9	290			-23.2			-30	149	-36.2			
10	410			-32.2			35	-176	-45.2			
11	445			-26.5			-32	-159	-39.5			
12	500			-32.1			35	-176	-45.1			
13	620			-28.5			33	-165	-41.5			
14	655			-30.5			34	-171	-43.5			
15	960			-32.6			35	177	-45.6			

* Power of dominant ray,

** Power of each other ray

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FIGURE 13

PDP and frequency correlation (FCF) of CDL model

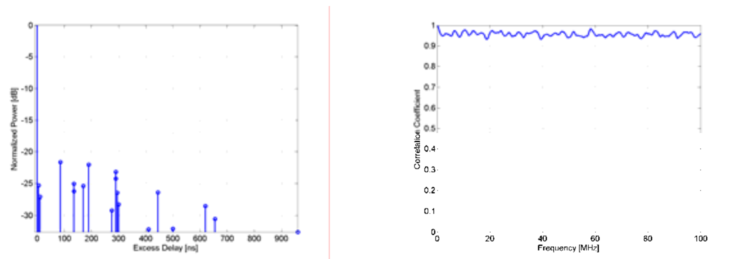

TABLE 13

Scenario C1: NLOS Clustered delay-line model, suburban

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]	Cluster ASD = 2º	Cluster ASD = 10º
1	0	5	10	-3.0	-5.2	-7.0	0	0	-13.0		
2	25			-7.5			13	-71	-20.5		
3	35			-10.5			-15	-84	-23.5		
4	35			-3.2			-8	46	-16.2		
5	45	50	55	-6.1	-8.3	-10.1	12	-66	-16.1		
6	65			-14.0			-17	-97	-27.0		
7	65			-6.4			12	-66	-19.4		
8	75			-3.1			-8	-46	-16.1		
9	145			-4.6			-10	-56	-17.6		
10	160			-8.0			-13	73	-21.0		
11	195			-7.2			12	70	-20.2		
12	200			-3.1			8	-46	-16.1		
13	205			-9.5			14	-80	-22.5		
14	770			-22.4			22	123	-35.4		

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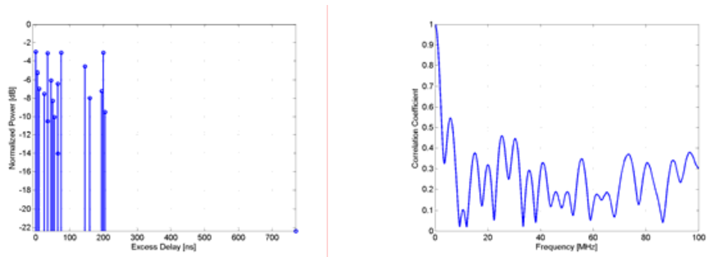
FIGURE 14

PDP and frequency correlation (FCF) of CDL model



C2 – Urban macro-cell

[Editor's Note: Japan Doc. 1244 proposed to incorporate the distance dependency of the C2 NLOS scenario into the table. This issue will need to be further discussed in the next meeting.]

TABLE 14

Scenario C2: NLOS clustered delay line model, urban macro-cell

<table>
<tr><th>Cluster #</th><th colspan="3">Delay [ns]</th><th colspan="3">Power [dB]</th><th>AoD [º]</th><th>AoA [º]</th><th>Ray power [dB]</th><th rowspan="21">Cluster ASD = 2º</th><th rowspan="21">Cluster ASD = 15º</th></tr>
<tr><td>1</td><td colspan="3">0</td><td colspan="3">-6.4</td><td>11</td><td>61</td><td>-19.5</td></tr>
<tr><td>2</td><td colspan="3">60</td><td colspan="3">-3.4</td><td>-8</td><td>44</td><td>-16.4</td></tr>
<tr><td>3</td><td colspan="3">75</td><td colspan="3">-2.0</td><td>-6</td><td>-34</td><td>-15.0</td></tr>
<tr><td>4</td><td>145</td><td>150</td><td>155</td><td>-3.0</td><td>-5.2</td><td>-7.0</td><td>0</td><td>0</td><td>-13.0</td></tr>
<tr><td>5</td><td colspan="3">150</td><td colspan="3">-1.9</td><td>6</td><td>33</td><td>-14.9</td></tr>
<tr><td>6</td><td colspan="3">190</td><td colspan="3">-3.4</td><td>8</td><td>-44</td><td>-16.4</td></tr>
<tr><td>7</td><td>220</td><td>225</td><td>230</td><td>-3.4</td><td>-5.6</td><td>-7.4</td><td>-12</td><td>-67</td><td>-13.4</td></tr>
<tr><td>8</td><td colspan="3">335</td><td colspan="3">-4.6</td><td>-9</td><td>52</td><td>-17.7</td></tr>
<tr><td>9</td><td colspan="3">370</td><td colspan="3">-7.8</td><td>-12</td><td>-67</td><td>-20.8</td></tr>
<tr><td>10</td><td colspan="3">430</td><td colspan="3">-7.8</td><td>-12</td><td>-67</td><td>-20.8</td></tr>
<tr><td>11</td><td colspan="3">510</td><td colspan="3">-9.3</td><td>13</td><td>-73</td><td>-22.3</td></tr>
<tr><td>12</td><td colspan="3">685</td><td colspan="3">-12.0</td><td>15</td><td>-83</td><td>-25.0</td></tr>
<tr><td>13</td><td colspan="3">725</td><td colspan="3">-8.5</td><td>-12</td><td>-70</td><td>-21.5</td></tr>
<tr><td>14</td><td colspan="3">735</td><td colspan="3">-13.2</td><td>-15</td><td>87</td><td>-26.2</td></tr>
<tr><td>15</td><td colspan="3">800</td><td colspan="3">-11.2</td><td>-14</td><td>80</td><td>-24.2</td></tr>
<tr><td>16</td><td colspan="3">960</td><td colspan="3">-20.8</td><td>19</td><td>109</td><td>-33.8</td></tr>
<tr><td>17</td><td colspan="3">1020</td><td colspan="3">-14.5</td><td>-16</td><td>91</td><td>-27.5</td></tr>
<tr><td>18</td><td colspan="3">1100</td><td colspan="3">-11.7</td><td>15</td><td>-82</td><td>-24.7</td></tr>
<tr><td>19</td><td colspan="3">1210</td><td colspan="3">-17.2</td><td>18</td><td>99</td><td>-30.2</td></tr>
<tr><td>20</td><td colspan="3">1845</td><td colspan="3">-16.7</td><td>17</td><td>98</td><td>-29.7</td></tr>
</table>

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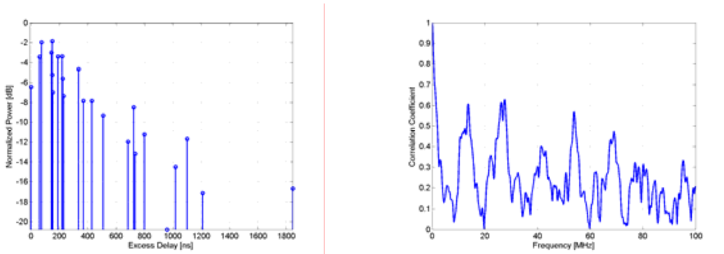
FIGURE 15

PDP and frequency correlation (FCF) of CDL model



C3 – Bad urban macro-cell

[Editor's Note: Japan Doc. 1244 proposed to incorporate the distance dependency of the C3 NLOS scenario into the table. This issue will need to be further discussed in the next meeting.]

The CDL parameters of NLOS condition are given below.

TABLE 15

Scenario C3: NLOS Clustered delay line model, bad urban, macrocell

Cluster #	Delay [ns]	Power [dB]	AoD [º]	AoA [º]	Ray power [dB]		
1	0	-4.7	-10	61	-17.7	Cluster ASD = 2º	Cluster ASA = 15º
2	0, 5, 10	-3, -5.2, -7	0	0	-13		
3	10	-7.2	12	-75	-20.2		
4	10	-6.3	-11	-70	-19.3		
5	30, 35, 40	-4.8, -7, -8.8	-12	76	-14.8		
6	50	-3.7	-9	53	-16.7		
7	80	-7.4	-12	76	-20.4		
8	110	-7.2	12	-75	-20.2		
9	155	-9.6	14	-87	-22.7		
10	165	-5.2	-10	64	-18.3		
11	165	-6.3	11	70	-19.3		
12	250	-8.9	14	83	-21.9		
13	280	-8.5	13	-81	-21.5		
14	440	-8.4	13	-81	-21.4		
15	490	-8.5	-13	81	-21.5		
16	525	-5	10	62	-18		
17	665	-10.9	15	92	-23.9		
18	685	-10.9	15	92	-24		
19	4800	-9.7	-135	25	-22.7		
20	7100	-13	80	40	-26		

[Editor's note: The plots for profile will need to be inserted by Finland by next meeting.]

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D1 – Rural macro-cell

The CDL parameters of LOS and NLOS condition are given below. In the LOS model Ricean K-factor is 13.7 dB, which corresponds to 500m distance between Tx and Rx.

TABLE 16

Scenario D1: LOS Clustered delay line model, rural macro-cell

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]		Cluster ASD = 2º	Cluster ASD = 3º
1	0			0.0			0	0	-0.02*	-35.9**		
2	40			-22.3			-95	189	-35.3			
3	40			-25.6			102	203	-38.6			
4	40	45	50	-23.1	-25.3	-27.1	-90	-179	-33.1			
5	40	45	50	-23.7	-25.9	-27.7	104	-208	-33.7			
6	60			-27.4			-105	210	-40.4			
7	115			-27.0			104	-208	-40.0			
8	135			-25.2			-101	-201	-38.2			
9	175			-30.1			110	-219	-43.1			
10	195			-32.5			114	228	-45.5			
11	215			-31.7			-113	-225	-44.7			
12	235			-33.9			-117	-233	-46.9			
13	235			-31.0			-112	223	-44.0			

* Power of dominant ray,

** Power of each other ray

FIGURE 16

PDP and frequency correlation (FCF) of CDL model

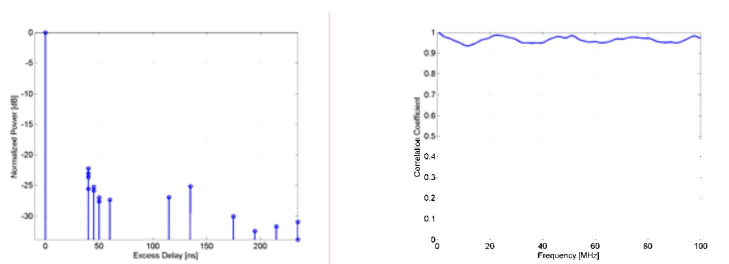

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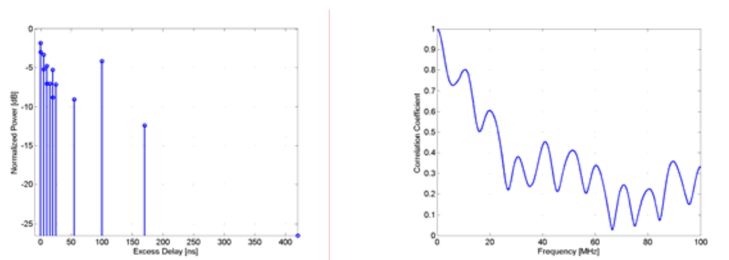
TABLE 17

Scenario D1: NLOS Clustered delay line model, rural macro-cell

Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]	Cluster ASD = 2º	Cluster ASD = 3º
1	0	5	10	-3.0	-5.2	-7.0	0	0	-13.0		
2	0			-1.8			-8	28	-14.8		
3	5			-3.3			-10	38	-16.3		
4	10	15	20	-4.8	-7.0	-8.8	15	-55	-14.8		
5	20			-5.3			13	48	-18.3		
6	25			-7.1			15	-55	-20.1		
7	55			-9.0			-17	62	-22.0		
8	100			-4.2			-12	42	-17.2		
9	170			-12.4			20	-73	-25.4		
10	420			-26.5			29	107	-39.5		

FIGURE 17

PDP and frequency correlation (FCF) of CDL model



D2a – Moving networks

The CDL parameters of LOS condition are given below. In the LOS model Ricean K-factor is 6 dB.

TABLE 18

Scenario D2a: LOS Clustered delay line model, moving networks

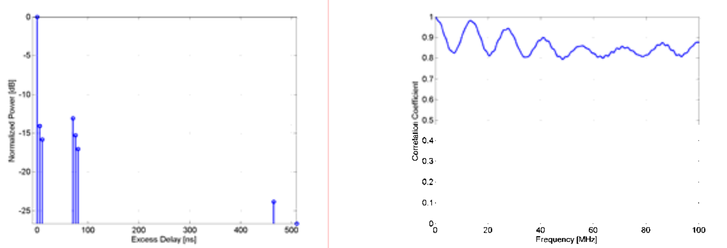
Cluster #	Delay [ns]			Power [dB]			AoD [º]	AoA [º]	Ray power [dB]		Cluster ASD = 2º	Cluster ASA = 3º
1	0	5	10	0.0	-14.1	-15.8	0	0	-0.29*	-21.9**		
2	70	75	80	-13.1	-15.3	-17.1	-64	-171	-23.1			
3	465			-23.8			-60	162	-36.8			
4	510			-26.6			-64	-171	-39.6			

* Power of dominant ray,

** Power of each other ray

FIGURE 18

PDP and frequency correlation (FCF) of CDL model



1.3.3 Advanced Features

1.3.3.1 Elevation angles

For the indoor and outdoor-to-indoor cases it is possible to use also the elevation spread to specify the angles of arrival and departure as given in Table 3.

[Editor's Note: This issue required further discussion during the adhoc meeting.]

1.3.3.2 Cross-polarization values as function of BS–MS separation distance

[Editor's note: To be investigated until the next meeting. Consider also including recommended antenna configurations]

1.3.3.3 Fixed BS and MS with moving scatterers

[Editor's note: Temporal K-factor to be investigated until the following meeting]

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[1] 3GPP TR25.996 V6.1.0 (2003-09) "Spatial channel model for multiple input multiple output (MIMO) simulations" Release 6.

[2] IST-WINNER II Deliverable D1.1.1 v1.0, "WINNER II Interim Channel Models", December 2006.

[3] Gudmundson, M. Correlation Model for Shadow Fading in Mobile Radio Systems. *Electron. Lett*, Vol. 27, **23**, 2145-2146). November, 1991.

1.4 Traffic Models

[This section introduce typical traffic models used for simulation.]

A major objective of system simulations is to provide an operator with a view of the maximum number of active users that can be supported for a given service under a specified configuration at a given coverage level.

1.4.1 Introduction

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[Give some general introduction to traffic model, lay out typical traffic models such as: WWW , FTP , Gaming, VoIP, Streaming, etc.]

1.4.2 Traffic models description

[Give the detail traffic model description for the traffic listed above.]

1.4.2.1 Web Browsing (HTTP) Traffic Model

HTTP traffic characteristics are governed by the structure of the web pages on the World Wide Web (WWW), and the nature of human interaction. The nature of human interaction with the WWW causes the HTTP traffic to have a bursty profile, where the HTTP traffic is characterized by ON/OFF periods as shown in **Figure 4**.

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Figure 4

HTTP Traffic Pattern

The ON periods represent the sequence of packets in which the web page is being transferred from source to destination; while the OFF periods represent the time the user spends reading the webpage before transitioning to another page. This time is also known as Reading Time [1][2].

The amount of information passed from the source to destination during the ON period is governed by the web page structure. A webpage is usually composed of a main object and several embedded objects. The size of the main object, in addition to the number and size of the embedded objects define the amount of traffic passed from source to destination.

In summary, the HTTP traffic model is defined by the following parameters:

SM: Size of main object in page

Nd: Number of embedded objects in a page

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SE: Size of an embedded object in page

Dpc: Reading time

Tp: Parsing time for the main page

In addition to the model parameters, HTTP traffic behavior is also dependent on the HTTP version used. Currently HTTP 1.0 and HTTP 1.1 are widely used by servers and browsers [3]-[6]. In HTTP 1.0, also known as burst mode transfer, a distinct TCP connection is used for each object in the page, thereby facilitating simultaneous transfer of objects. The maximum number of simultaneous TCP connections is configurable, with most browsers using a maximum of 4 simultaneous TCP connections. In HTTP/1.1, also known as persistent mode transfer, all objects are transferred serially over a single persistent TCP connection. Table 4 provides the model parameters for HTTP traffic.

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Table 4

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HTTP Traffic Parameters

Component	Distribution	Parameters	PDF
Main object Size (SM)	Truncated Lognormal	Mean = 10710 bytes SD = 25032 bytes Min = 100 bytes Max = 2 Mbytes (before truncation)	$f_x = \frac{1}{\sqrt{2\pi}\sigma x}\exp\left[\frac{-(\ln x-\mu)^2}{2\sigma^2}\right], x \ge 0$ $\sigma = 1.37, \mu = 8.37$ if x>max or x<min, discard and generate a new value for x
Embedded object size (SE)	Truncated Lognormal	Mean = 7758 bytes SD = 126168 bytes Min = 50 bytes Max = 2 Mbytes (before truncation)	$f_x = \frac{1}{\sqrt{2\pi}\sigma x}\exp\left[\frac{-(\ln x-\mu)^2}{2\sigma^2}\right], x \ge 0$ $\sigma = 2.36, \mu = 6.17$ f x>max or x<min, discard and generate a new value for x
Number of embedded objects per page (Nd)	Truncated Pareto	Mean = 5.64 Max. = 53 (before truncation)	$f_x = \frac{\alpha k^{\alpha}}{x^{\alpha+1}}, k \le x < m$ $f_x = \left(\frac{k}{m}\right)^{\alpha}, x = m$ $\alpha = 1.1, k = 2, m = 55$ Subtract k from the generated random value to obtain Nd if x>max, discard and regenerate a new value for x
Reading time (Dpc)	Exponential	Mean = 30 sec	$f_x = \lambda e^{-\lambda x}, x \ge 0$ $\lambda = 0.033$

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Parsing time (Tp)	Exponential	Mean = 0.13 sec	$f_x = \lambda e^{-\lambda x}, x \ge 0$ $\lambda = 7.69$

To request an HTTP session, the client sends an HTTP request packet, which has a constant size of 350 bytes. From the statistics presented in the literature, a 50%-50% distribution of HTTP versions between HTTP 1.0 and HTTP 1.1 has been found to closely approximate web browsing traffic in the internet [7].

Further studies also showed that the maximum transmit unit (MTU) sizes most common to in the internet are 576 bytes and 1500 bytes (including the TCP header) with a distribution of 24% and 76% respectively. Thus, the web traffic generation process can be described as in FIGURE 5.

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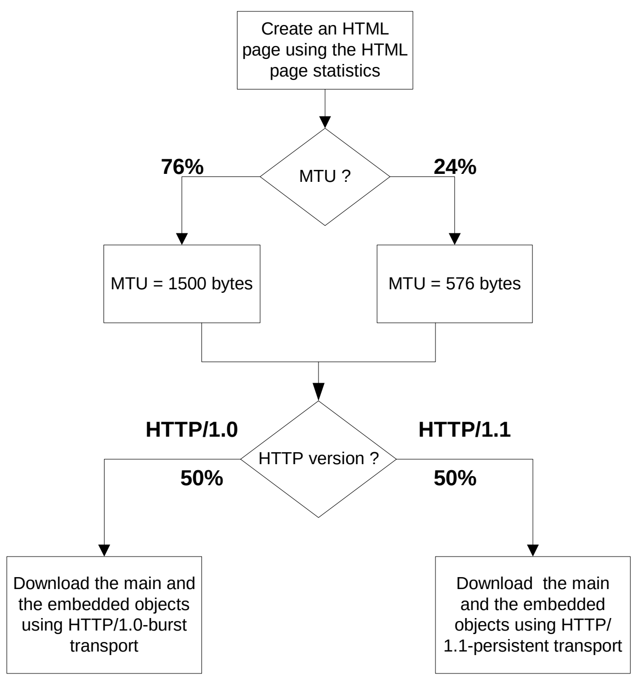
FIGURE 5

HTTP Traffic Profiles



A user is defined in outage for HTTP service if the average packet call throughput is less than the minimum average throughput requirement of 128 kbps. The system outage requirement is such that no more than 2% of users can be in outage. The air link PER of MAC SDUs for HTTP traffic should be not be greater than 1%.

1.4.2.1.1 HTTP and TCP interactions for DL HTTP traffic

Two versions of the HTTP protocol, HTTP/1.0 and HTTP/1.1, are widely used by servers and browsers. Users shall specify 50% HTTP/1.0 and 50% HTTP/1.1 for HTTP traffic. For people who have to model the actual interaction between HTTP traffic and the underling TCP connection, refer to 4.1.3.2, 4.2.4.3 of [8] for details.

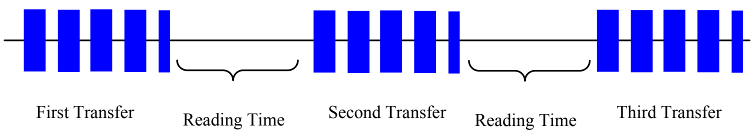
1.4.2.1.2. HTTP and TCP interactions for UL HTTP traffic

HTTP/1.1 is used for UL HTTP traffic. For details regarding the modeling of the interaction between HTTP traffic and the underling TCP connection, refer to 4.2.4.1, 4.2.4.2 of [8].

1.4.2.2 File Transfer Protocol (FTP) Traffic Model

File transfer traffic is characterized by a session consisting of a sequence of file transfers, separated reading times. Reading time is defined as the time between end of transfer of the first file and the transfer request for the next file. The packet call size is therefore equivalent to the file size and the packet call inter-arrival time is the reading time. A typical FTP session is shown in Figure 8.

Figure 8: FTP Traffic Parameters



provides the model parameters for FTP traffic that includes file downloads as well as uploads [9][10]. In the case of file uploads, the arrival of new users is Poisson distributed and each user transfers a single file before leaving the network.

The FTP traffic generation process is described in FIGURE 7. Based on the results on packet size distribution, 76% of the files are transferred using an MTU size of 1500 bytes and 24% of the files are transferred using an MTU size of 576 bytes. Note that these two packet sizes also include a 40 byte IP packet header and this header overhead for the appropriate number of packets must be added to the file sizes calculated from the statistical distributions in TABLE 5. For each file transfer a new TCP connection is used whose initial congestion window size is 1 segment.

A user is defined in outage for FTP service if the average packet call throughput is less than the minimum average throughput requirement of 128 kbps. The system outage requirement is such that no more than 2% of users can be in outage. The air link PER of MAC SDUs for FTP traffic should be not be greater than 1%.

TABLE 5

FTP Traffic Parameters

Component	**Distribution**	**Parameters**	**PDF**
File size (S)	Truncated Lognormal	Mean = 2 Mbytes SD = 0.722 Mbytes Max = 5 Mbytes	$f_x = \frac{1}{\sqrt{2\pi}\sigma x}\exp\left[\frac{-(\ln x-\mu)^2}{2\sigma^2}\right], x \geq 0$ $\sigma = 0.35, \mu = 14.45$ if x>max or x<min, discard and generate a new value for x

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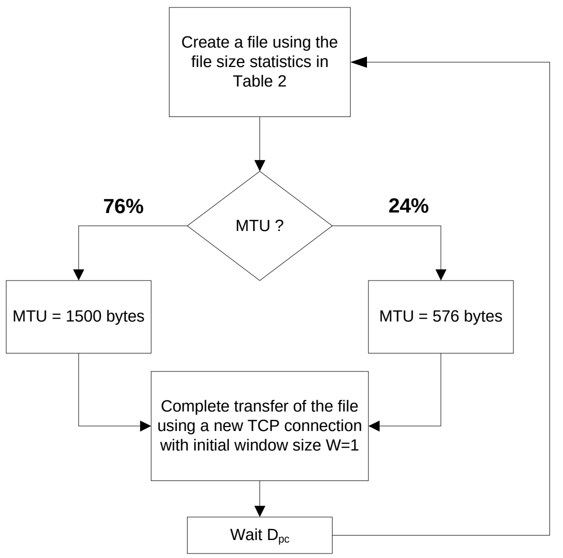
Reading time (D_{pc})	Exponential	Mean = 180 sec.	e

FIGURE 7

FTP Traffic Profiles



1.4.2.3 Speech Source Model (VoIP)

VoIP refers to real-time delivery of voice packet across networks using the Internet protocols. A VoIP session is defined as the entire user call time and VoIP session occurs during the whole simulation period.

There are a variety of encoding schemes for voice (i.e., G.711, G.722, G.722.1, G.723.1, G.728, G.729, and AMR) that result in different bandwidth requirements. Including the protocol overhead, it is very common for a VoIP call to require between 5 Kbps and 64 Kbps of bi-directional bandwidth.

1.4.2.3.1 Basic VoIP Model

A typical phone conversation is marked by periods of active talking / talk spurts (ON periods) interleaved by silence / listening periods (or OFF periods) as shown in FIGURE 8.

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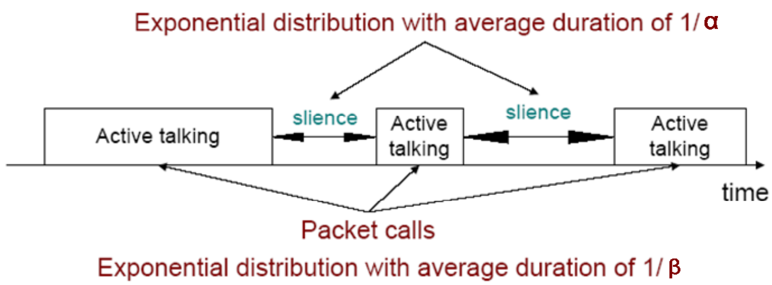
FIGURE 8

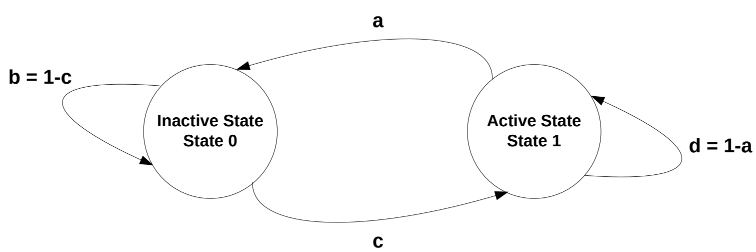
Typical Phone Conversation Profile



Consider the simple 2-state voice activity Markov model shown in FIGURE 9.

FIGURE 9

2-state voice activity Markov model



In the model, the conditional probability of transitioning from state 1 (the active speech state) to state 0 (the inactive or silent state) while in state 1 is equal to a, while the conditional probability of transitioning from state 0 to state 1 while in state 0 is c. The model is assumed to be updated at the speech encoder frame rate R=1/T, where T is the encoder frame duration (typically, 20 ms). Packets are generated at time intervals T+ τ, where τ is the network packet arrival delay jitter. During the active state, packets of fixed sizes are generated at these intervals, while the model is updated at regular frame intervals. The size of packet and the rate at which the packets are sent depends on the corresponding voice codecs and compression schemes. TABLE 6 provides information on some common vocoders.

TABLE 6

Information on various vocoders

Vocoder	**EVRC**	**AMR**	**GSM 6.10**	**G.711**	**G.723.1**		**G.729A**
Source Bit rate [Kb/s]	0.8/2/4/8.55	4.75-12.2	13	64	5.3	6.3	8
Frame duration [ms]	20	20	20	10	30	30	10
Information bits per frame	16/40/80/171	95-244	260	640	159	189	80

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Among the various vocoders in TABLE 6 a simplified AMR (Adaptive Multi-Rate) audio data compression model can be used to simplify the VoIP modeling process. AMR is optimized for speech coding and was adopted as the standard speech codec by 3GPP and widely used in GSM. The original AMR codec uses link adaptation to select from one of eight different bit rates based on link conditions. If the radio condition is bad, source coding is reduced (less bits to represent speech) and channel coding (stronger FEC) is increased. This improves the quality and robustness of the network condition while sacrificing some voice clarity. In the simplified version in this document, link adaptation has been disabled and the full rate of 12.2 kbps is used in the active state. This model captures the worst case scenario.

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Table 7 shows the VoIP packet size calculation for simplified AMR operation with or without header compression when using IPv4 or IPv6. In the table, the MAC CRC of 4 bytes for ARQ is not included and only CRC for HARQ is included because the ARQ process can be assumed to be disabled for VoIP services.

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To calculate the total packet size, technology specific MAC headers and CRC need to be accounted for. Header compression, IP version also need to be accounted for.

The voice capacity assumes a 12.2. kbps codec with a 50% activity factor such that the percentage of users in outage is less than 2% where a user is defined to have experienced voice outage if more than 2% of the VoIP packets are dropped, erased or not delivered successfully to the user within the delay bound of 50 ms.

The packet delay is defined based on the 98th percentile of the CDF of all individual users' 98th percentiles of packet delay (i.e., the 98th percentile of the packet delay CDF first determined for each user and then the 98th percentile of the CDF that describes the 98th percentiles of the individual user delay is obtained).

Bidirectional VoIP capacity is measured in Active Users/MHz/Sector. The total number of active users on the DL and UL is divided by total bandwidth occupied by the system accounting for frequency reuse. For an FDD configuration, the bandwidth is calculated as the sum of the uplink and downlink channel bandwidths. For a TDD configuration, the bandwidth is simply the channel bandwidth.

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Table 7

VoIP Packet Calculation for AMR and G.729

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Description	AMR without Header Compression IPv4/IPv6	AMR with Header Compression IPv4/IPv6	G.729 without Header Compression IPv4/IPv6	G.729 with Header Compression IPv4/IPv6
Voice Payload (20 ms aggregation interval)	7 bytes for inactive 33 bytes for active	7 bytes for inactive 33 bytes for active	0 bytes for inactive 20 bytes for active	0 bytes for inactive 20 bytes for active
Protocol Headers (including UDP checksum)	40 bytes / 60 bytes	3 bytes / 5 bytes	40 bytes / 60 bytes	3 bytes / 5 bytes
RTP	12 bytes		12 bytes	
UDP	8 bytes		8 bytes	
IPv4 / IPv6	20 bytes / 40 bytes		20 bytes / 40 bytes	
Generic MAC Header	Technology Specific	Technology Specific	Technology Specific	Technology Specific
CRC	Technology Specific	Technology Specific	Technology Specific	Technology Specific
Total VoIP packet size	Technology Specific	Technology Specific	Technology Specific	Technology Specific

1.4.2.3.2 VoIP Traffic Model Parameters

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During each call (each session), a VoIP user will be in the Active or Inactive state. The duration of each state is exponentially distributed. In the Active/Inactive state, packets of fixed sizes will be generated at intervals of T seconds, where T is the VoIP frame interval of 20 ms. Table 8 specifies the distributions and parameters associated with the VoIP traffic model.

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VoIP traffic model parameters specification

Component	Distribution	Parameters	PDF
Active/ Inactive state duration	Exponential	Mean = 1.5 second	$f_x = \lambda e^{-\lambda x}, x \geq 0$ $\lambda = 1/Mean$
Probability of state transition	N/A	0.016	N/A

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Link adaptation of AMR codec is disabled in order to evaluate performance under worst case, and to simplify the voice traffic model.

During the inactive state, we have chosen to generate comfort noise with smaller packet sizes at regular intervals instead of no packet transmission. This simplified model does not include a feature called hangover, which generates additional seven frames at the same rate as speech to ensure the correct estimation of comfort noise parameters at the receiver side even if there is a silence period at the end of a talk spurt (ON state), and after the hangover period, a SID_FIRST frame is sent. The voice traffic model specifies only one rate during the ON state (talk spurt) of the AMR codec (12.2 kbps) and another rate for the comfort noise (SID_UPDATE) during the OFF state of the AMR codec. SID_UPDATE frames are generated every 8th frame during the silence period.

1.4.2.4 Near Real Time Video Streaming

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This section describes a model for streaming video traffic for DL direction. FIGURE 10 illustrates the steady state of video streaming traffic from the network as observed by the base station. Call setup latency and overhead are not considered in this model.

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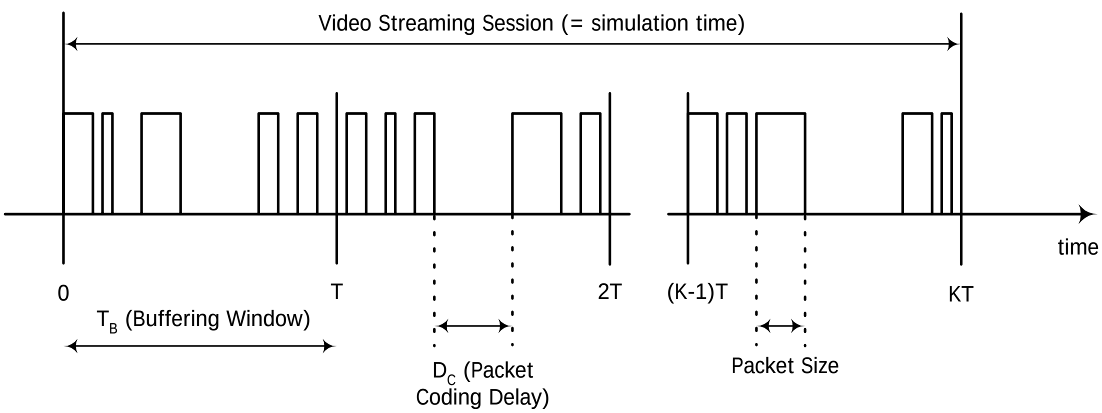
FIGURE 10

Video Streaming Traffic Model



Each frame of video data arrives at a regular interval T. Each frame can be treated as a packet call and there will be zero OFF duration within a session. Within each frame (packet call), packets (or datagrams) arrive randomly and the packet sizes are random as well.

To counter the jittering effect caused by the random packet arrival rate within a frame at the MS, the MS uses a de-jitter buffer window to guarantee a continuous display of video streaming data. The de-jitter buffer window for video streaming service is 5 seconds. At the beginning of the simulation, the MS de-jitter buffer shall be full with video data. During simulation, data is leaked out of this buffer at the source video data rate and filled as DL traffic reaches the MS from the BS. As a performance criterion, the simulation shall record the length of time, if any, during which the de-jitter buffer runs dry.

The packet sizes and packet inter-arrival rate can be found in when using a source rate of 64 kbps.

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TABLE 9 lists the parameters for the video streaming model.

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Near Real Time Video Streaming Traffic Model Parameters

Component	**Distribution**	**Parameters**	**PDF**
Inter-arrival time between the beginning of each frame	Deterministic	100 ms (Based on 10 frames per second)	
Number of packets (slices) in a frame	Deterministic	8 packets per frame	
Packet (slice) size	Truncated Pareto	Mean =10 bytes, Max = 250 bytes (before truncation)	$f_x = \frac{\alpha k^{\alpha}}{x^{\alpha+1}}, k \le x < m$ $f_x = \left(\frac{k}{m}\right)^{\alpha}, x = m$ $\alpha = 1.2, k = 20bytes, m = 10bytes$ if x>max, discard and regenerate a new value for x
Inter-arrival time between packets (slices) in a frame	Truncated Pareto	Mean=6 ms, Max=12.5 ms (before truncation)	$f_x = \frac{\alpha k^{\alpha}}{x^{\alpha+1}}, k \le x < m$ $f_x = \left(\frac{k}{m}\right)^{\alpha}, x = m$ $\alpha = 1.2, k = 2.5ms, m = 6$ ms if x>max, discard and regenerate a new value for x

The other network protocol overhead, such as IP, TCP/UDP header should be added on each packet (slice) generated by the video streaming model described above.

A user is defined in outage for streaming video service if the 98th percentile video frame delay is larger than 5 seconds. The system outage requirement is such that no more than 2% of users can be in outage.

1.4.2.5 Video Telephony

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Based on the compression efficiency and market acceptance as described in the section Error! Reference source not found., MPEG 4 has been selected for the video codec. The estimated values for the parameters to model a video stream vary from one trace to another. For parameters associated with the statistical distributions, the estimates depend strongly on the dimensions of the

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captured frames. For the video telephony traffic model, medium quality of an Office Cam trace is used and the trace library is available at [12]. For the traffic model, two different qualities for the video have been considered; high and medium quality. For the medium quality encoding the quantization parameters for all three frame types were fixed at 10, and for the high quality encoding the quantization parameters for all three frame types were fixed at 4 [12].

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The scene length for the video telephony is assumed to be the entire application session since the background or the main subject may not be so dynamic.

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TABLE 10

Video Telephony Traffic Model

Parameter	**Value**
Service	Video Telephony
Video Codec	MPEG-4
Protocols	UDP
Scene Length (sec)	Session duration
Direction	Bi-direction (DL and UL)
Frames/sec	25 frames/sec
GOP	N=12, M=3
Display size	176x144
Color depth (bit)	8
Video Quality	Medium
Mean BW	110 kbps
I frame size (byte)	Weibull($\alpha =$ 5.15, $\beta =$ 863), shift=3949, μ= 4742 , σ=178 , min=4034, max=5184
P frame size (byte)	Lognormal(μ=259 , σ=134), min=100, max=1663
B frame size (byte)	**Lognormal(μ=147 ,σ=74), min=35, max=882**

1.4.2.6 Gaming Traffic Model

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Gaming is a rapidly growing application embedded into communication devices, and thus wireless gaming needs to be considered. Games in different genre, such as First Person Shooter (FPS), Role Play Game (RPG), etc., show dramatic different traffic behaviors. FPS model is recommended to represent the gaming traffic model in this document because it posts additional requirements to the system performance, such as real time delay with irregular traffic arrivals.

First Person Shooter (FPS) is a genre of video games. It is a good representation of the modern Massively Multiplayer Online (MMO) game. Due to the nature of the FPS game, it has stringent network delay requirement. For the FPS game, if the client to server to client round trip delay (i.e., ping time, or end to end delay) is below 150 ms, the delay is considered excellent. When the delay is between 150 ms to 200 ms, the delay is noticeable especially to the experienced player. It is considered good or playable. When ping time is beyond 200 ms, the delay becomes intolerable.

This end to end delay budget can be break down into internet delay, server processing delay, cellular network delay, air interface delay, and client processing delay, etc. Let the IP packet delay be the time that the IP packet entering the MAC SDU buffer to the time that the IP packet is received by the receiver and reassembled into IP packet. The IP packet delay is typically budgeted

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as 50 ms to meet the 200 ms end to end delay. A gamer is considered in outage if 10% of its packet delay is either lost or delayed beyond the budget, i.e., 50 ms. The system outage requirement is such that no more than 2% of users can be in outage.

The FPS traffic can be modeled by the Largest Extreme Value distribution. The starting time of a network gaming mobile is uniformly distributed between 0 and 40 ms to simulate the random timing relationship between client traffic packet arrival and reverse link frame boundary. The parameters of initial packet arrival time, the packet inter arrival time, and the packet sizes are illustrated in TABLE 11.

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TABLE 11

FPS Internet Gaming Model

Component	Distribution DL	Distribution UL	Parameters DL	Parameters UL	PDF
Initial packet arrival	Uniform	Uniform	a = 0, b = 40 ms	a=0, b=40 ms	$f(x)=\frac{1}{b-a} \quad a\le x\le b$
Packet arrival time	Extreme	Extreme	a = 50 ms, b = 4.5 ms	a = 40 ms, b = 6 ms	$f(x)=\frac{1}{b}e^{-\frac{x-a}{b}}e^{-e^{-\frac{x-a}{b}}}, b>0$ $X=\lfloor a-b\ln(-\ln Y)\rfloor$ $Y\in U(0,1)$
Packet size	Extreme	Extreme	a = 330 bytes, b = 82 bytes	a = 45 bytes, b = 5.7 bytes	$f(x)=\frac{1}{b}e^{-\frac{x-a}{b}}e^{-e^{-\frac{x-a}{b}}}, b>0$ $X=\lfloor a-b\ln(-\ln Y)\rfloor+2$* $Y\in U(0,1)$

* A compressed UDP header of 2 bytes is included in the packet size

Email is an important application that constitutes a high percentage of internet traffic. Email application traffic is included in the UMTS Forum 3G traffic models and ITU R M.2072 [15][16].

Interactions between email servers and clients are governed by email protocols. The three most common email protocols are POP, IMAP and MAPI. Most email software operates under one of these (and many products support more than one) protocols. The Post Office Protocol (currently in version 3, hence POP3) allows email client software to retrieve email from a remote server. The Internet Message Access Protocol (now in version 4 or IMAP4) allows a local email client to access email messages that reside on a remote server. The Messaging Application Programming Interface (MAPI) is a proprietary email protocol of Microsoft that can be used by Outlook to

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communicate with Microsoft Exchange Server. It provides somewhat similar but more functionality than an IMAP protocol.

The email traffic model in this section considers both POP3 and MAPI since these protocols generate different traffic patterns. To model POP3, an FTP model can be used, and an email transaction with MAPI protocol can be modeled with multiple MAPI segment transactions in series. Each MAPI fragment is transmitted using the TCP protocol and segmented into smaller segments again based on the TCP configuration. A maximum MAPI fragment size of 16896 bytes has been found so far, and this information is indicated in the first packet of a MAPI fragment. Outlook finishes all the TCP ACK packet transmission for the current MAPI segment and the Exchange server waits for the MAPI fragment completion indication packet before sending the next one. The last packet in the MAPI fragment sets the "PUSH" bit in the TCP packet to transmit all of the packets in the TCP buffer to the application layer at the receiver side [17].

Email traffic can be characterized by ON/OFF states. During the ON-state an email could be transmitted or received, and during the OFF-state a client is writing or reading an email. **FIGURE 11** depicts a simplified email traffic pattern.

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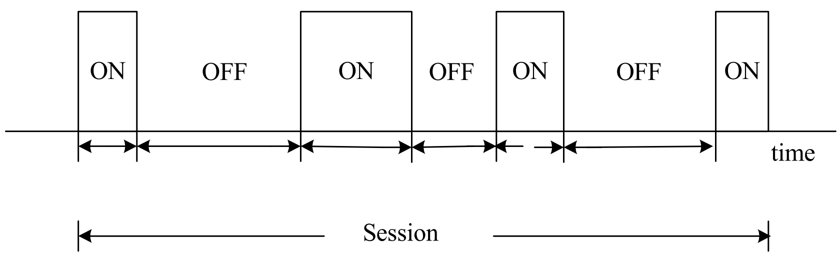
FIGURE 11

Email Traffic Model



The parameters for the email traffic model are summarized in TABLE 12 [17][18][19][20][21].

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TABLE 12

Email Traffic Parameters

Parameter	**Distribution**	**Parameters**	**PDF**
E-Mail Protocol	N/A	POP3, MAPI	N/A
E-Mail Average Header Size (Bytes)	Deterministic	1 K	N/A
Number of email receive	Lognormal	Mean = 30 Std deviation = 17	$f_x = \frac{1}{\sqrt{2\pi}\sigma}\exp\left[\frac{-(\ln x-\mu)^2}{2\sigma^2}\right]$ $x \ge 0$

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			$\sigma = 3.262$, $\mu = 0.5277$
Number of email send	Lognormal	Mean = 14 Std deviation = 12	$f_x = \frac{1}{\sqrt{2\pi}\sigma} \exp\left[\frac{-(\ln x - \mu)^2}{2\sigma^2}\right]$ $x \geq 0$ $\sigma = 2.364$, $\mu = 0.742$
Email reading time (sec)	Pareto	$\alpha = 1.1, k = 2, m = 65$, mean = 60, maximum = 63	$f_x = \frac{\alpha k^\alpha}{x^{\alpha+1}}, k \leq x < m$ $f_x = \left(\frac{k}{m}\right)^\alpha, x = m$
Email writing time (sec)	Pareto	$\alpha = 1.1, k = 2, m = 125$, mean = 120, maximum = 123	$f_x = \frac{\alpha k^\alpha}{x^{\alpha+1}}, k \leq x < m$ $f_x = \left(\frac{k}{m}\right)^\alpha, x = m$
Size of email receive/send without attachment (Kbytes)	Cauchy	median $\mu = 22.7$ Kbytes, 90%-tile = 80Kbytes	$f_x = \frac{A}{\pi((x-\mu)^2+1)}$, A is selected to satisfy 90%-tile value
Size of email receive/send with attachment (Kbytes)	Cauchy	median $\mu = 227$ Kbytes , 90%-tile = 800 Kbytes	$f_x = \frac{A}{\pi((x-\mu)^2+1)}$, A is selected to satisfy 90%-tile value
Ratio of email with attachment	Deterministic	Without attachment: 80% With attachment: 20%	N/A

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1.4.3 Traffic selection and parameters for the test environments

[List the typical models and the distribution rate of the mix of several traffics for the test environments defined in section 1.1 of Annex 2, at which four test environments are defined.]

1.5 Link Adaptation

Link adaptation can enhance system performance by optimizing resource allocation in varying channel conditions. System level simulations should include adaptation of the modulation and coding schemes, according to link conditions.

The purpose of this section is to provide guidelines for link adaptation in system evaluations. The use of link adaptation is left to the proponent as it may not pertain to all system configurations. The link adaptation algorithms implemented in system level simulations are left to Individual proponents for each proposal. Proponents should specify link adaptation algorithms including power, MIMO rank, and MCS adaptation per resource block.

1.5.1 Adaptive Modulation and Coding

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The evaluation methodology assumes that adaptive modulation and coding with various modulation schemes and channel coding rates is applied to packet data transmissions. In the case of MIMO, different modulation schemes and coding rates may be applied to different streams.

1.5.2 Link Adaptation with HARQ

The link adaptation algorithm should be optimized to maximize the performance at the end of the HARQ process (e.g. maximize the average throughput under constraint on the delay and PER, or maximize number of users per service).

1.5.3 Channel Quality Feedback

A Channel Quality Indicator (CQI) channel is utilized to provide channel-state information from the user terminals to the base station scheduler. Relevant channel-state information can be fed back. For example, Physical CINR, effective CINR, MIMO mode selection and frequency selective sub-channel selection may be included in CQI feedback. Some implementations may use other methods, such as channel sounding, to provide accurate channel measurements. CQI feedback granularity and its impact may also be considered. Proponents should describe the CQI feedback type and assumptions of how the information is obtained.

1.5.3.1 Channel Quality Feedback Delay and Availability

Channel quality feedback delay accounts for the latency associated with the measurement of channel at the receiver, the decoding of the feedback channel, and the lead-time between the scheduling decision and actual transmission. The delay in reception of the channel quality feedback shall be modeled to accurately predict system performance.

Channel quality feedback may not be available every frame due to system constraints such as limited feedback overhead or intermittent bursts. The availability of the channel quality feedback shall be modeled in the system simulations.

The proponents should indicate the assumptions of channel quality feedback delay and availability for system proposals.

1.5.3.2 Channel Quality Feedback Error

System simulation performance should include channel quality feedback error by modeling appropriate consequences, such as misinterpretation of feedback or erasure.

The proposals shall describe if CQI estimation errors are taken into account and how those errors are modeled.

1.6 HARQ

The Hybrid ARQ (HARQ) protocol should be implemented in system simulations. Multiple parallel HARQ streams may be present in each frame, and each stream may be associated with a different packet transmission, where a HARQ stream is an encoder packet transaction pending, i.e., a HARQ packet has been transmitted but has not been acknowledged. Different MIMO configurations may also have an impact on the HARQ implementation.

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Each HARQ transmission results in one of the following outcomes: successful decoding of the packet, unsuccessful decoding of the packet transmission requiring further re-transmission, or unsuccessful decoding of the packet transmission after maximum number of re-transmissions resulting in packet error. The effective SINR for packet transmissions after one or more HARQ transmissions used in system simulations is determined according to the link to system mapping.

When HARQ is enabled, retransmissions are modeled based on the HARQ option chosen. For example, HARQ can be configured as synchronous/asynchronous with adaptive/non-adaptive modulation and coding schemes for Chase combining or incremental redundancy operation. Synchronous HARQ may include synchronous HARQ acknowledgement and/or synchronous HARQ retransmissions. Synchronous HARQ acknowledgement means that the HARQ transmitter side expects the HARQ acknowledgments at a known delay after the HARQ transmission. Synchronous HARQ retransmission means that the HARQ receiver side expects the HARQ retransmissions at known times. In the case of asynchronous HARQ, the acknowledgement and/or retransmission may not occur at known times. Adaptive H-ARQ, in which the parameters of the retransmission (e.g. power, MCS) are changed according to channel conditions reported by the MS may be considered. In the case of non-adaptive HARQ, the parameters of the retransmission are not changed according to channel conditions.

The HARQ model and type shall be specified with chosen parameters, such as maximum number of retransmissions, minimum retransmission delay, incremental redundancy, chase combining, etc. HARQ overhead (associated control) should be accounted for in the system simulations on both the uplink and downlink

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1.6.1 HARQ Acknowledgement

The HARQ acknowledgment is used to indicate whether or not a packet transmission was successfully received.

Modeling of HARQ requires waiting for HARQ acknowledgment after each transmission, prior to proceeding to the next HARQ transmission. The HARQ acknowledgment delay should include the processing time which includes, decoding of the traffic packet, CRC check, and preparation of acknowledgment transmissions. The amount of delay is determined by the system proposal.

Misinterpretation, missed detection, or false detection of the HARQ acknowledgment message results in transmission (frame or encoder packet) error or duplicate transmission. Proponents of each system proposal shall justify the system performance in the presence of error of the HARQ acknowledgment.

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1.7 Scheduling

The scheduler allocates system resources for different packet transmissions according to a set of scheduling metrics, which can be different for different traffic types. The same scheduling algorithm shall be used for all simulation drops. Various scheduling approaches will have different performance and overhead impacts and will need to be aligned. System performance evaluation and comparison require that fairness be preserved or at least known in order to promote comparisons. The scheduling will be done with consideration of the reported metric where the reported metric

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may include CQI and other information. The scheduler shall calculate the available resources after accounting for all control channel overhead and protocol overhead.

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1.7.1 DL scheduler

For the baseline simulation, a generic proportionally fair scheduler shall be used for the full-buffer traffic model.

The proponent may also present additional results with an alternative scheduler and shall describe the scheduler in detail, with assumptions, if any.

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1.7.2 UL scheduler

The UL scheduler is very similar to DL Scheduler. The UL scheduler maintains the request-grant status of various uplink service flows. Bandwidth requests arriving from various uplink service flows at the BS will be granted in a similar fashion as the downlink traffic.

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1.8 Handover

The system simulation defined elsewhere in the document deals with throughput, spectral efficiency, and latency. User experience in a mobile broadband wireless system is also influenced by the performance of handover. This section focuses on the methods to study the performance of handover which affects the end-users experience. Proponents of system proposals specifically relating to handover should provide performance evaluations according to this section.

For parameters such as cell size, DL&UL transmit powers, number of users in a cell, traffic models, and channel models; the simulation follows the simulation methodology defined elsewhere in the document. In this document, only intra-radio access technology handover is considered; inter-radio access technology handover is not considered.

The handover procedure consists of cell reselection via scanning, handover decision and initiation, and network entry including synchronization and ranging with a target BS.

Latency is a key metric to evaluate and compare various handover schemes as it has direct impact on application performance perceived by a user. Total handover latency is decomposed into several latency elements. Further, data loss rate and unsuccessful handover rate are important metrics.

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1.8.1 System Simulation with Mobility

Two possible simulation models for mobility related performance are given in this section. The first is a reduced complexity model that considers a single USER moving along one of three trajectories with all other users at fixed locations, and a second simulation model that considers all mobiles in the system moving along random trajectories.

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1.8.1.1 Single Moving User Model

Two possible simulation models for mobility related performance are given in this section. The first is a reduced complexity model that considers a single user moving along one of three trajectories with all other users at fixed locations, and a second simulation model that considers all mobiles in the system moving along random trajectories.

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1.8.1.1.1 Trajectories

The movement of the single moving user is constrained to one of the trajectories defined in this section. More detailed and realistic mobility models may be considered.

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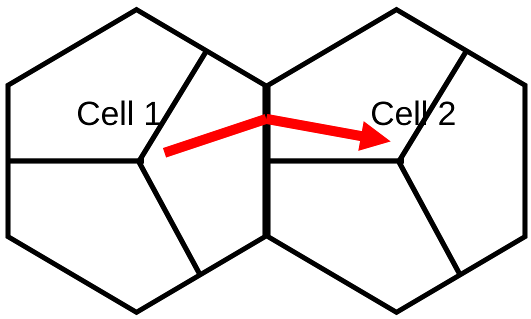
1.8.1.1.1.1 Trajectory 1

In this trajectory, the user moves from Cell 1 to Cell 2 along the arrow shown in FIGURE 14. The trajectory starts from the center of Cell 1 to the center of Cell 2 while passing through the midpoint of the sector boundaries as shown in . The purpose of this trajectory is to evaluate handover performance in a scenario w... decreases whereas the signal strength from the target sector continuously increases.

FIGURE 14: Trajectory 1



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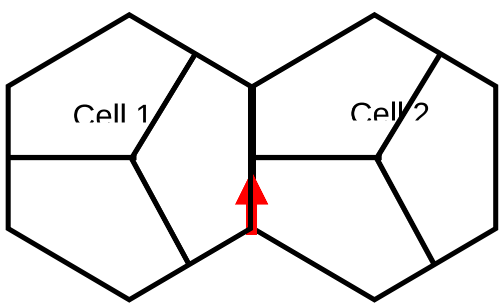
1.8.1.1.1.2 Trajectory 2

In this trajectory, the single moving user moves from Cell 1 to Cell 2 along the arrow shown in FIGURE 15. The user moves along the sector boundary between Cell 1 and Cell 2 until the midpoint of the cell boundary between Cell 1 and Cell 2. The purpose of this trajectory is to evaluate handover performance when the user moves along the boundary of two adjacent sectors.

FIGURE 15: Trajectory 2



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1.8.1.1.1.3 Trajectory 3

In this trajectory, the single moving user moves from Cell 2 to Cell 1 along the arrow shown in Figure 16. The user starts from the center of Cell 2, moves along the boundary of two adjacent

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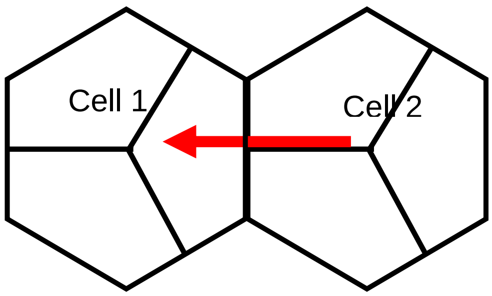
sectors of Cell 2 and towards the center of the Cell 1. The purpose of this trajectory is to evaluate a handover performance in the scenario where the user traverses multiple sector boundaries.

Figure 16: Trajectory 3



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1.8.1.1.2 10 Cell Topology

As a reduced complexity option, a 10 cell topology may be used for handover evaluation with a single moving user. In the 10 cell topology, both serving and target cells should have one tier of neighboring cells as interferers shown in FIGURE 15.

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FIGURE 15

10 Cell Topology

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1.8.1.1.3 Handover Evaluation Procedure

1. The system may be modeled using the 10 cell topology as illustrated in FIGURE 15 for the evaluation of handover performance. Each cell has three sectors and frequency reuse is modeled by planning frequency allocations in different sectors in the network.

2. N users are dropped independently with uniform distribution across the cell area. Different load levels in the network are simulated by changing the number of users and the traffic generated.

3. Path loss, shadow fading and fast fading models for each user should be consistent with the models defined in Section 1.3.1. Fading signal and fading interference are computed from each mobile station into each sector and from each sector to each mobile for each simulation interval.

4. In the single user model, the trajectories defined in Section 1.8.1.1.1 should be used to model the movement of a single user associated with the center cell. The locations of all other users are assumed to be fixed and the serving sector for the fixed users does not change for the duration of the drop.

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5. Path loss, shadow fading and fast fading are updated based on location and velocity of a moving user. As the user moves along the specified trajectory, the target sector is chosen according to the metric used to perform handover.

6. Traffic generated by the users should be according to the mixes specified. The moving user may be assigned one of the traffic types in the chosen traffic mix to analyze the effect of handover on the performance of the assigned traffic application. Traffic from the fixed users constitutes background load. Start times for each traffic type for each user should be randomized as specified in the traffic model being simulated.

7. Statistics related to handover metrics are collected for the moving user only.

8. Packets are not blocked when they arrive into the system (i.e. queue depths are infinite). Packets are scheduled with a packet scheduler using the required fairness metric. Channel quality feedback delay, PDU errors are modeled and packets are retransmitted as necessary. The HARQ process is modeled by explicitly rescheduling a packet as part of the current packet call after a specified HARQ feedback delay period.

9. Sequences of simulation are run, each with a different random seed. For a given drop the simulation is run for this duration, and then the process is repeated with the users dropped at new random locations. A sufficient number of drops are simulated to ensure convergence in the system performance metrics.

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1.8.1.2 Multiple Moving Users Model

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In this model, multiple moving users are uniformly placed over the simulation environment and given a random trajectory and speed. The parameters selected remain in effect until a drop is completed.

1.8.1.2.1 Trajectories

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Each user is assigned an angle of trajectory at the beginning of a call. The assigned angle is picked from a uniform distribution across the range of 0-359 degrees in one degree increments. The angle of zero degrees points directly North in the simulation environment. Movement of the user is established by selecting a random speed for the users according to defined profiles such that the population of users meets the desired percentages. The user remains at the selected random speed and direction for the duration of the simulation drop. When a user crosses a wrap around boundary point within the simulation space, the user will wrap around to the associated segment, continuing to keep the same speed and trajectory. FIGURE 16 depicts an example of the movement process for a 19-cell system.

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FIGURE 16

19 cell abbreviated example of user movement in a wrap around topology *

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*** Blue lines denote paired wrap around boundary segments**

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1.8.1.2.2 19 Cell Topology

The 19 cell topology with wrap around can be used for handover evaluation with multiple moving users.

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1.8.1.2.3 Trajectories

For the 19 cell topology with wrap around defined for the multiple moving user model, the simulation procedure outlined in Section 7.2.3.3 should be followed. In step 7 of this procedure, for the purposes of simulating handover performance, it may additionally be assumed that an user is initially connected to a specific serving sector. As the user moves along the trajectory described in Section 1.8.1.2.3 , the target sector is chosen according to the metric used to perform handover.

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1.8.2 Handover Performance Metrics

The following parameters should be collected in order to evaluate the performance of different handover schemes. These statistics defined in this section should be collected in relation to the occurrence of handovers. A CDF of each metric may be generated to evaluate a probability that the corresponding metric exceeds a certain value.

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For a simulation run, we assume:

- The total number of successful handovers occurred during the simulation time = $N_{HO\_success}$
- The total number of failed handover during the simulation time = N_{HO_fail}

- The total number of handover attempts during the simulation time = $N_{attempt}$, where $N_{attempt} = N_{HO\_success} + N_{HO\_fail}$

1.8.2.1 Radio Layer Latency

This value measures the delay between the time instance $T_{1,i}$ that a user transmits a serving BS its commitment to HO (for a hard handover (HHO), this is the time that the user disconnects from the serving BS) and the time instance $T_{2,i}$ that the user successfully achieves PHY layer synchronization at the target BS (i.e., frequency and DL timing synchronization) due to handover occurrence i. The exact thresholds for successful PHY synchronization are for further study. For this metric, the average radio latency will be measured as

$$\text{Average Radio Layer Latency} = \frac{\sum_{i=1}^{N_{HO\_success}} (T_{2,i} - T_{1,i})}{N_{HO\_success}}$$

1.8.2.2 Network Entry and Connection Setup Time

This value represents the delay between an user's radio layer synchronization at $T_{2,i}$, and the start of transmission of first data packet from the target BS at $T_{3,i}$ due to handover occurrence i. In the case of the reference system, this consists of ranging, UL resource request processes (contention or non-contention based), negotiation of capabilities, registration, DL packet coordination and a path switching time. The transmission error rate of MAC messages associated with network entry can be modeled dynamically or with a fixed value (e.g., 1%). A path switching time, as a simulation input parameter, may vary depending on network architecture.

$$\text{Average Network Entry and Connection Setup Time} = \frac{\sum_{i=1}^{N_{HO\_success}} (T_{3,i} - T_{2,i})}{N_{HO\_success}}$$

1.8.2.3 Handover Interruption Time

This value represents time duration that a user can not receive any service from any BS. It is defined as the time interval from when the MS disconnects from or abandons the serving BS to the start of transmission of first data packet from the target BS.

1.8.2.4 Data Loss

This value represents the number of lost bits during the handover processes. This document uses DL data loss to evaluate the data loss performance of the air link. $D_{RX,i}$ and $D_{TX,i}$ denotes the number of received bits by the user and the number of total bits transmitted by the serving and the target BSs during the user performs handover occurrence *i*, respectively. Traffic profiles used for the simulation experiments to compare different handover schemes need to be identical.

$$\text{Data Loss} = \frac{\sum_{i=1}^{N_{HO\_success}} (D_{TX,i} - D_{RX,i})}{N_{HO\_success}}$$

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1.8.2.5 Handover Failure Rate

This value represents the ratio of failed handover to total handover attempts. Handover failure occurs if handover is executed while the reception conditions are inadequate on either the DL or the UL such that the mobile would have to go to a network entry state.

$$\text{Handover Failure Rate} = \frac{N_{HO\_fail}}{N_{attempt}}$$

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1.9 Summary of Deployment Scenarios

[Give a extreme summary of the deployment scenarios. Define the link channel models, the system channel models, the propagation models, and the traffic models for each scenarios. Those scenarios will be used as simulation cases.]

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Appendix 1

A1 Time-spatial propagation models

A1.1 Principle

The propagation model for IMT-Advanced should be at least considering the following items:

(1) Evaluation for broadband land mobile systems with up to 100 MHz bandwidth using the frequencies of UHF and SHF bands.

(2) Eevaluation for time and spatial processing techniques such as adaptive array antenna (AAA) and multi-input-multi-output (MIMO).

To evaluate above items accurately, a time-spatial profile model, which provides not only path loss characteristics but also delay (time) and arrival angular (spatial) profile characteristics, is necessary. It is well known that time-spatial profile characteristics depend on the distance from base station (BS), the antenna height of BS, city structure such as buildings and roads, etc. as well as carrier frequency and bandwidth. These parameters are key to accurately characterizing the time-spatial profile. Therefore, a time-spatial profile that considers these key parameters is required.

Actual radio propagation environments are very complicate. In order to characterize such environments accurately, a very complex time-spatial profile model is necessary. On the other hand, from a practical point of view, propagation model should be as simple as possible without loss of generality. Furthermore, in order to evaluate the time variant characteristics of the receiver, time variant model of received level is also necessary.

A.2 Time-spatial propagation models

The proposed model consists of three models; long-term time-spatial profile model, short-term time-spatial profile model, and instantaneous time-spatial profile model as shown in Fig. 1.

The instantaneous time-spatial profile is a snapshot of the time-spatial characteristics. Short-term time-spatial profile is obtained by spatial averaging the instantaneous time-spatial profiles over several tens of wavelength in order to suppress the variation of rapid fading. Long-term time-spatial profile is obtained by spatial averaging the short-term time-spatial profiles at approximately the same distance from the BS in order to suppress the variation due to shadowing. On the other hand, delay profile and arrival angular profiles are obtained by focusing on just the delay time or arrival angle yielded the time-spatial profile as shown in Fig. 2.

The time-spatial profiles in Fig.1 and the delay profile and arrival angular profile in Fig. 2 are expressed in terms of a continuous function with respect to delay time and arrival angle. In evaluations based on link level and system level simulations, a discrete model is generally more convenient than a continuous model as shown in Fig. 3 and Fig. 4.

A.3 Key parameters

The key parameters in the proposed model are as follows.

$\langle H \rangle$: average building height (m, 5-50 m: height above the mobile station ground level)

h_b : BS antenna height (m, 20-150 m: height above the mobile station ground level)

d : distance from the BS (km, 0.1-3 km)

B : bandwidth or chip rate (MHz, 0.5-100 MHz)

f_c: carrier frequency (GHz, 2-6 GHz)

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λ : wavelength of carrier frequency(m)

v : moving speed of MS(m/s)

ΔL : level difference between the peak path's power and cut off power

N_{path} : number of observable paths.

A.4 Generation of time-spatial path profile model

Fig. A2-1-1 shows the concept of generating a time-spatial path profile model. After inputting the key parameters, a time-spatial path profile is generated by setting the pseudo random number. This allows a lot of different time-spatial path profile models with the same characteristics such as, for example, delay spread and arrival angular spread to be obtained easily. The time-spatial profile model taking the time variant characteristics into consideration is proposed based on measurement results in various cellular environments.

FIGURE A2-1-1

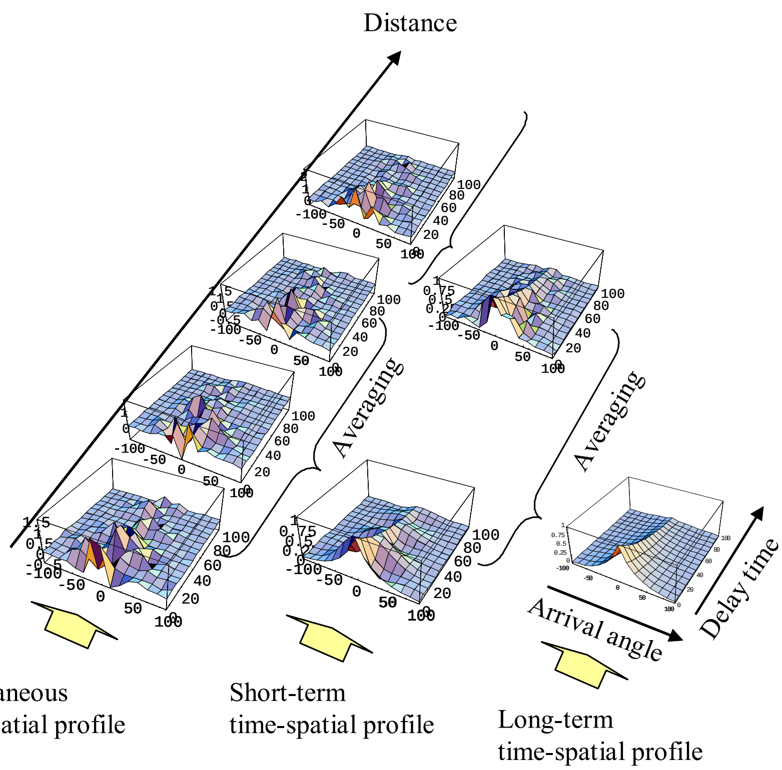

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FIGURE A2-1-2

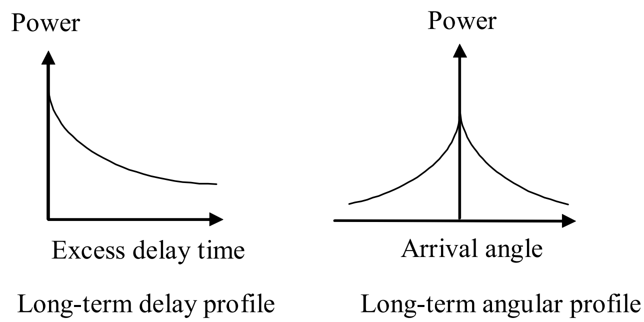

FIGURE A2-1-3

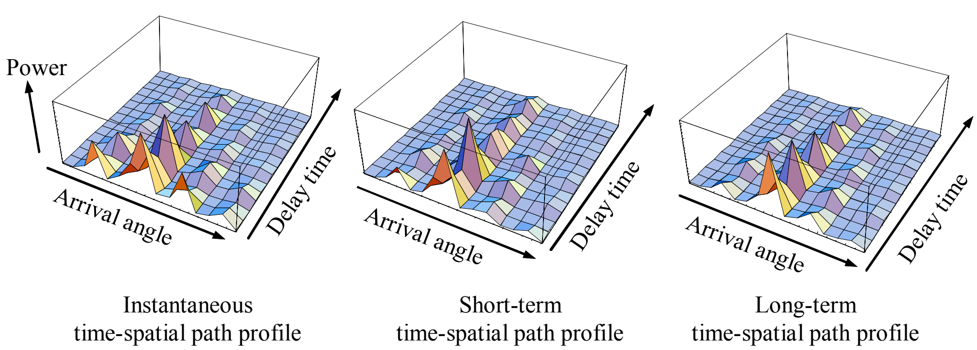

FIGURE A2-1-4

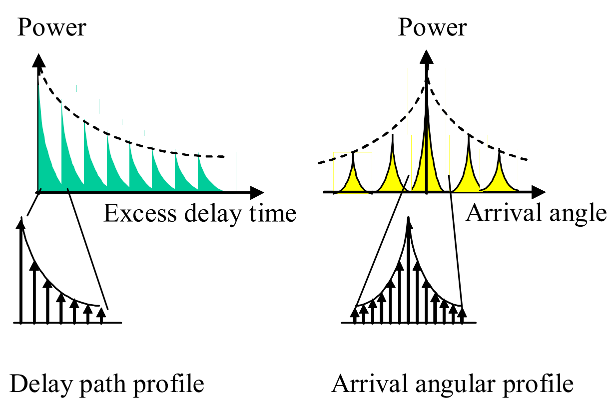

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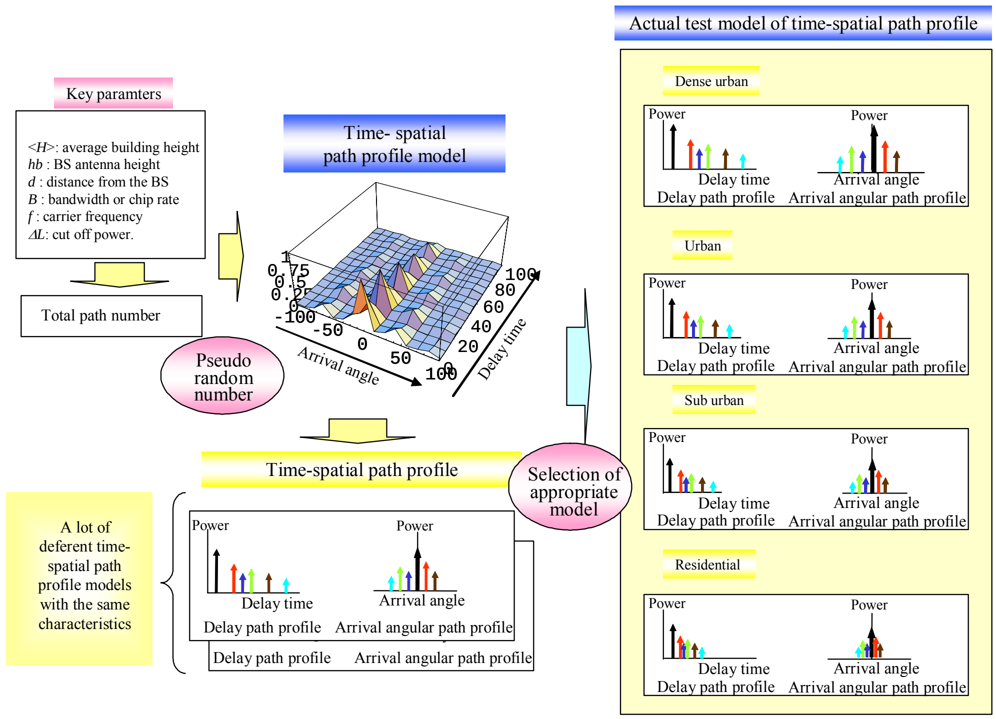
FIGURE A2-1-5

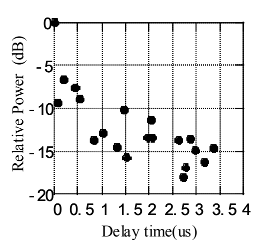


[1 C3 d=0.5km, h_b=40m]

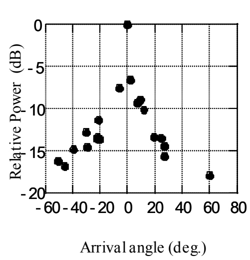
Bad urban <H>=40m

No.	Delay time (µs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	0.0	0	0
2	0.07	-9.3	7	34
3	0.20	-6.6	2	139
4	0.43	-7.5	-6	-128
5	0.53	-8.9	10	115
6	0.83	-13.7	-20	-97
7	1.03	-12.8	-30	-83
8	1.33	-14.4	27	100
9	1.47	-10.2	12	142
10	1.53	-15.7	27	105
11	1.97	-13.3	-22	-124
12	2.03	-11.3	-21	-127
13	2.07	-13.4	19	132
14	2.63	-13.6	-22	-132
15	2.73	-18.0	60	76
16	2.77	-16.9	-46	-94
17	2.87	-13.4	25	130
18	2.97	-15.0	-40	-105
19	3.17	-16.1	-51	-91
20	3.37	-14.5	-30	-124

Bad urban <H>=40m



Delay path profile



Arrival angular profile

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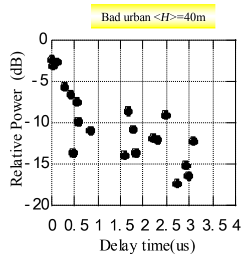
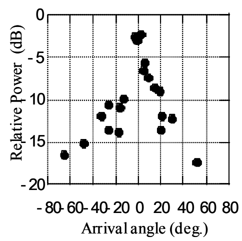
[2 C3 d=1km, h_b=40m]

Bad urban <*H*>=40m

No.	Delay time (µs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-2.4	2	0
2	0.03	-3.1	-1	-62
3	0.10	-2.7	-3	-57
4	0.27	-5.6	6	74
5	0.40	-6.6	6	108
6	0.47	-13.6	20	40
7	0.53	-7.6	9	85
8	0.57	-9.9	-13	-68
9	0.83	-11.0	-17	-74
10	1.57	-14.0	-17	-103
11	1.67	-8.6	14	116
12	1.77	-10.7	-27	-83
13	1.83	-13.5	-26	-86
14	2.20	-11.9	21	107
15	2.30	-12.0	-32	-83
16	2.47	-9.0	19	118
17	2.73	-17.4	51	63
18	2.90	-15.1	-49	-68
19	2.97	-16.5	-65	-51
20	3.07	-12.2	29	101



Delay path profile

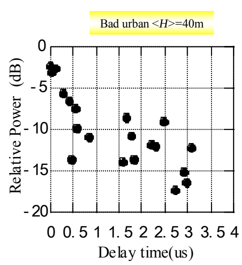


Arrival angular profile

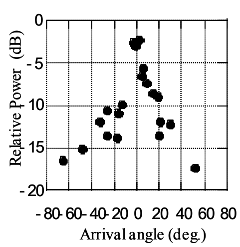
[3 C3 d=1.5km, h_b=40m]

Bad urban <*H*>=40m

No.	Delay time (µs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-2.4	2	0
2	0.03	-3.1	-1	-62
3	0.10	-2.7	-3	-57
4	0.27	-5.6	6	74
5	0.40	-6.6	6	108
6	0.47	-13.6	20	40
7	0.53	-7.6	9	85
8	0.57	-9.9	-13	-68
9	0.83	-11.0	-17	-74
10	1.57	-14.0	-17	-103
11	1.67	-8.6	14	116
12	1.77	-10.7	-27	-83
13	1.83	-13.5	-26	-86
14	2.20	-11.9	21	107
15	2.30	-12.0	-32	-83
16	2.47	-9.0	19	118
17	2.73	-17.4	51	63
18	2.90	-15.1	-49	-68
19	2.97	-16.5	-65	-51
20	3.07	-12.2	29	101



Delay path profile



Arrival angular profile

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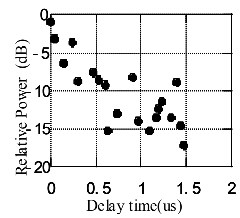
4. C2 d=0.5km, h_b=40m

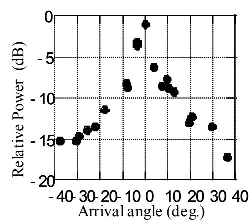
Urban <H>=30m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-0.9	0	0
2	0.03	-3.2	-4	-36
3	0.13	-6.3	3	104
4	0.23	-3.6	-3	-131
5	0.30	-8.7	-8	-101
6	0.47	-7.7	9	113
7	0.53	-8.6	7	130
8	0.60	-9.3	13	107
9	0.63	-15.2	-38	-50
10	0.73	-13.1	20	92
11	0.90	-8.2	-9	-141
12	0.97	-13.9	-26	-89
13	1.10	-15.2	-31	-85
14	1.17	-13.5	-23	-106
15	1.20	-12.3	21	111
16	1.23	-11.4	-18	-120
17	1.33	-13.4	29	95
18	1.40	-8.9	10	146
19	1.43	-14.6	-29	-98
20	1.47	-17.2	36	86

Urban <H>=30m



Delay path profile



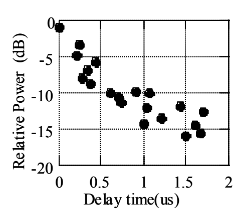
Arrival angular profile

[5 C2 d=1km, h_b=40m]

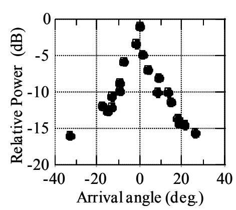
Urban <H>=30m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-0.9	0	0
2	0.20	-4.8	2	132
3	0.23	-3.4	-2	-132
4	0.27	-8.0	9	53
5	0.33	-6.8	4	106
6	0.37	-8.7	-9	-66
7	0.43	-5.8	-8	-86
8	0.60	-9.9	8	96
9	0.70	-10.5	-14	-78
10	0.73	-11.2	15	74
11	0.90	-9.8	-10	-108
12	1.00	-14.3	19	77
13	1.03	-12.0	-14	-97
14	1.07	-10.0	13	100
15	1.20	-13.6	18	88
16	1.43	-11.9	-18	-96
17	1.50	-15.9	-33	-64
18	1.60	-14.4	21	92
19	1.67	-15.6	26	82
20	1.70	-12.5	-15	-113

Urban <H>=30m



Delay path profile



Arrival angular profile

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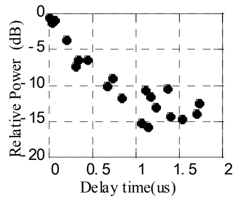
[6 C2 *d*=1.5km, h_b=40m]

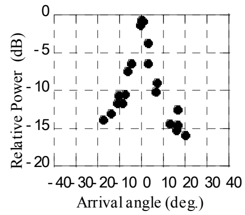
Urban <*H*>=30m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-0.6	0	0
2	0.03	-1.3	0	-81
3	0.07	-0.9	1	112
4	0.20	-3.7	3	72
5	0.30	-7.4	-7	-54
6	0.33	-6.4	3	106
7	0.43	-6.5	-4	-94
8	0.67	-10.1	6	97
9	0.73	-9.0	7	96
10	0.83	-11.7	-9	-92
11	1.07	-15.3	16	70
12	1.10	-10.7	-10	-95
13	1.13	-15.8	20	61
14	1.17	-11.6	-11	-95
15	1.23	-13.0	-14	-84
16	1.37	-10.5	-8	-121
17	1.40	-14.4	13	95
18	1.53	-14.6	16	86
19	1.70	-14.0	-18	-86
20	1.73	-12.5	16	91

Urban <*H*>=30m



Delay path profile



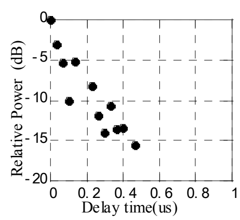
Arrival angular profile

[7. C1 *d*=0.5km, h_b=30m]

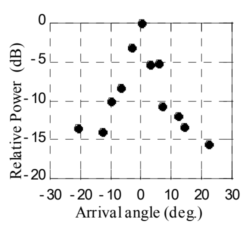
Sub urban <*H*>=10m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	0	0	0
2	0.03	-3.1	-3	-41
3	0.07	-5.3	3	71
4	0.10	-10.1	-10	-37
5	0.13	-5.2	6	75
6	0.23	-8.3	-6	-98
7	0.27	-12.0	12	69
8	0.30	-14.0	-13	-73
9	0.33	-10.7	7.1	111
10	0.37	-13.6	-21	-57
11	0.40	-13.4	14	80
12	0.47	-15.6	23	63

Sub urban <*H*>=10m



Delay path profile



Arrival angular profile

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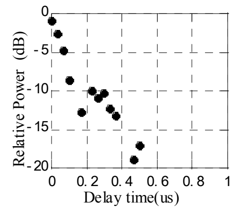
[8. C1 d=1km, h_b=30m]

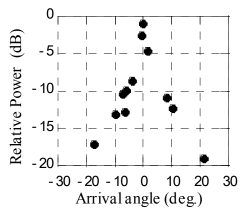
Sub urban <H>=10m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-0.9	0	0
2	0.03	-2.6	-1	-70
3	0.07	-4.7	2	74
4	0.10	-8.6	-4	-47
5	0.17	-12.7	-6	-48
6	0.23	-9.9	-6	-65
7	0.27	-10.9	8.	55
8	0.30	-10.4	-7	-67
9	0.33	-12.4	10	55
10	0.37	-13.2	-10	-63
11	0.47	-19.0	21	39
12	0.50	-17.1	-17	-49

Sub urban <H>=10m



Delay path profile



Arrival angular profile

[9. C1 d=1.5km, h_b=30m]

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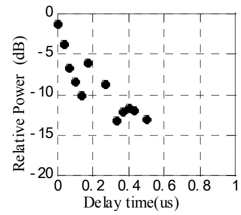
Sub urban <*H*>=10m

No.	Delay time (μs)	Power (dB)	AOD (deg.)	AOA (deg.)
1	0.00	-1.3	0	0
2	0.03	-3.7	-1	-32
3	0.07	-6.7	2	38
4	0.10	-8.4	-3	-48
5	0.13	-10.1	4	43
6	0.17	-6.0	-2	-101
7	0.27	-8.7	4	80
8	0.33	-13.2	7	54
9	0.37	-12.0	-6	-64
10	0.40	-11.6	6	75
11	0.43	-12.0	-7	-68
12	0.50	-13.1	-6	-85

Sub urban <*H*>=10m



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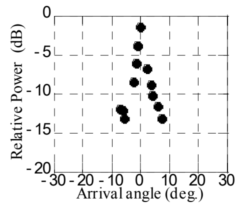

Arrival angular profile

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Appendix 2

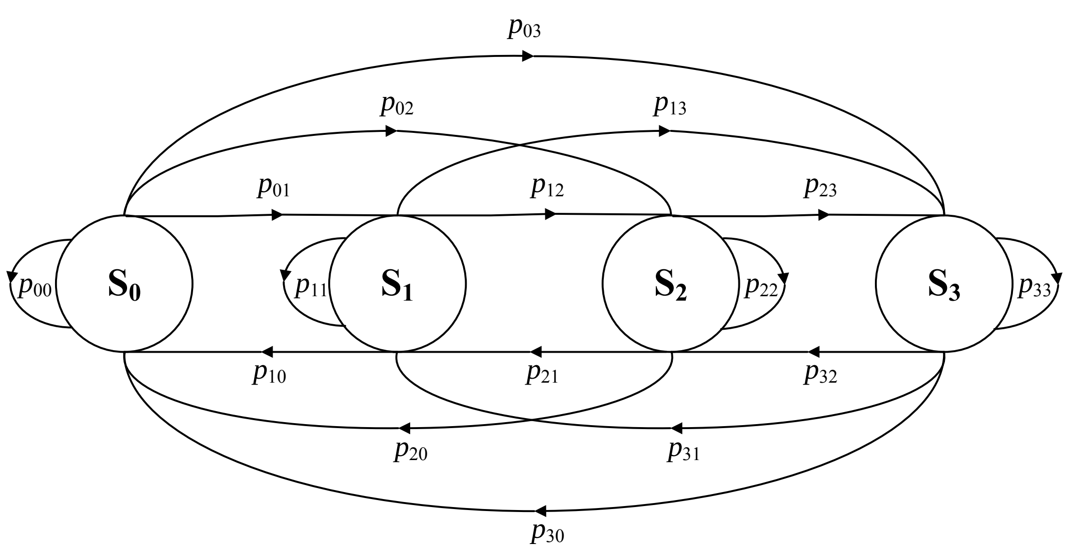
A simple modelling approach based on the Markov chain can be used for the time-evolution simulations in which the dynamic properties are completely modelled by the state transition probability matrix that describe how the clusters "appear" (or "birth") and "disappear" (or "death"). By knowing the birth and death of a cluster, the cluster lifespan can also be derived. A 4-state Markov channel model (MCM) is proposed in order to model the dynamic evolution of clusters when the MS is in motion, where each state is defined as follows:

- S_0 – No "birth" or "death",
- S_1 – 1 "death" only,
- S_2 – 1 "birth" only,
- S_3 – 1 "birth" and 1 "death".

Note that four states are required in order to account for the correlation that exists between number of cluster births, n_B and number of cluster deaths, n_D. Figure A2-2-1 illustrates the state transition diagram of the 4-state MCM in which each node is numbered to represent one state of the model.

FIGURE A2-2-1

State transition diagram of the 4-state Markov channel model



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The probabilistic switching process between states in the channel model is controlled by the *state transition probability matrix*, **P**, given by

$$\mathbf{P} = \left\{p_{ij}\right\} - \begin{pmatrix} p_{00} & p_{01} & p_{02} & p_{03} \\ p_{10} & p_{11} & p_{12} & p_{13} \\ p_{20} & p_{21} & p_{22} & p_{23} \\ p_{30} & p_{31} & p_{32} & p_{33} \end{pmatrix}, \qquad \text{(A2-2-1)}$$

where i and j denotes the state index, while p_{ij} is the state probability that a process currently in state i will occupy state j after its next transition. Note that p_{ij} must satisfy the following requirement

$$0 \le p_{ij} \le 1, \qquad 1 \le i, j \le K_s - 1, \qquad \text{(A2-2-2)}$$

$$\sum_{j=0}^{K_s-1} p_{ij} = 1, \qquad i = 0, 1, \ldots, K_s - 1, \qquad \text{(A2-2-3)}$$

where K_s is the number of states i.e., K_s=4 in our case and **P** describes how clusters appear and disappear when the MS moves.

[Editor's note: The Markov model to be modified for a constant number of paths/clusters. The change of state is achieved by the power levels. The constant number of taps is essential to keep the model simple enough]

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Appendix 3

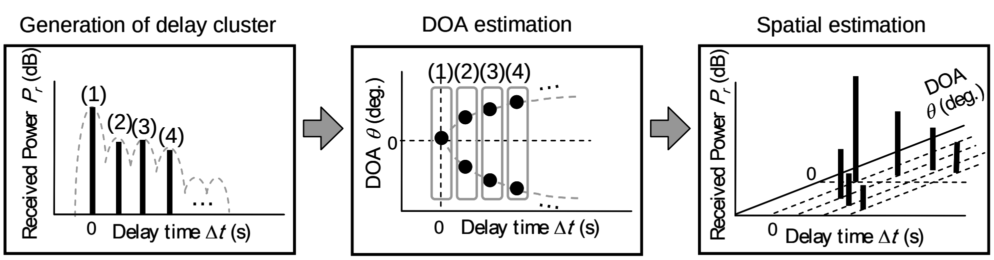
The variation of large scale parameters is conjectured to affect the number of clusters. The cluster generation process proposed in this model can be summarized as follows:

1. The received powers estimated using the conventional Okumura-Hata path loss model is defined as a standard cluster.
2. The standard cluster is separated into N_t delay cluster in the delay domain by using the power profile estimation equation given by equation (A2-3-1).
3. Based on the ellipse scattering model, each of the delay clusters can be spatially separated in the angular domain, N_a.

Finally, the total number of clusters in the spatial-temporal domain can be generated as $N_t \times N_a$. Figure A2-3-1 shows the process for the above 3 steps. Note that the scattering model assumed that the effective scattering area around the MS can be expressed by an ellipse in which the MS is located in the center of the ellipse, and major axis of the ellipse runs in parallel along the street in which the MT is being located.

FIGURE A2-3-1

The generation of clusters in the spatial-temporal domains



As described above, the standard cluster can be estimated using the Okumura-Hata path loss model. Then, the delay cluster can be generated from the power delay profile and can be expressed as follows:

$$P_r^{(i)} = -\left\{19.1 + 9.68 \cdot \log\left(\frac{h_b}{\langle H \rangle}\right)\right\} \cdot B^{\left\{-0.86+0.12\left(\frac{h_b}{\langle H \rangle}\right)\right\}} \cdot D^{(-0.88+0.21\log B)} \cdot \log(i+1)$$
,(A2-3-1)

where $P_r^{(i)}$ is the relative receiving power of ith path, B is the chip rate in Mcps, D is the transmitter and receiver separation distance in meter, h_b is the BS antenna height. Conformed condition is $h_b > \langle H \rangle$.

Afterwards, the delay cluster will be spatially separated by deploying the method proposed in Figure A2-3-3. Based on this methodology, it is assumed that the position of the angular cluster exits at the intersection point between the arriving time at the MS and the scattering distribution ellipse as illustrated by Figure A2-3-2. Thus, a single delay cluster will be split into two delay clusters in which their angles θ_1 and θ_2 are given by:

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$$\theta_1 = \tan^{-1}\left\{\frac{(l-d)(l+d)\tan\phi}{l^2 + D^2 + 2lD\sqrt{1+(\tan\phi)^2}}\right\}, \qquad \text{(A2-3-2)}$$

$$\theta_2 = -\tan^{-1}\left\{\frac{-(l-d)(l+d)\tan\phi}{l^2 + D^2 - 2lD\sqrt{1+(\tan\phi)^2}}\right\}. \qquad \text{(A2-3-3)}$$

where $|\phi| \geq |\theta_2| \geq |\theta_1| \geq 0$, if $\phi < 0$, θ_1 and θ_2 can be interchanged. Figure A-3-3 shows the example on how the angular information can be obtained from equations (A2-3-2 and A2-3-3).

FIGURE A2-3-2

The angular cluster estimation model

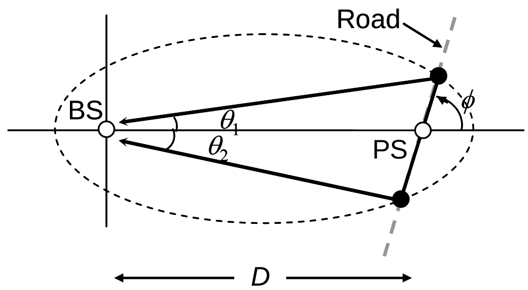
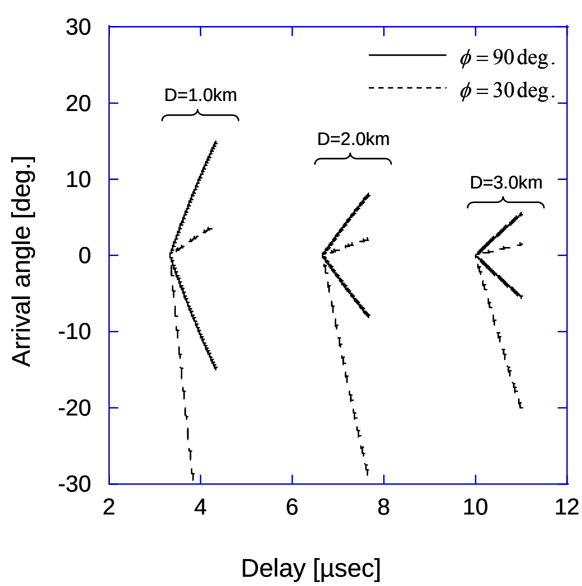


FIGURE A2-3-3

The spatial-temporal cluster estimation results



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After identifying the spatial-temporal cluster, their received power needs to characterize. In general, the cluster located nearer to the MS has larger received power as compared to cluster located further away from the MS. When the delay cluster of received power P_r is spatially separated into angular clusters with angle of arrivals θ_1 and θ_2, their received power can be expressed as P_{r_1} and P_{r_2}, respectively, which are defined as follows:

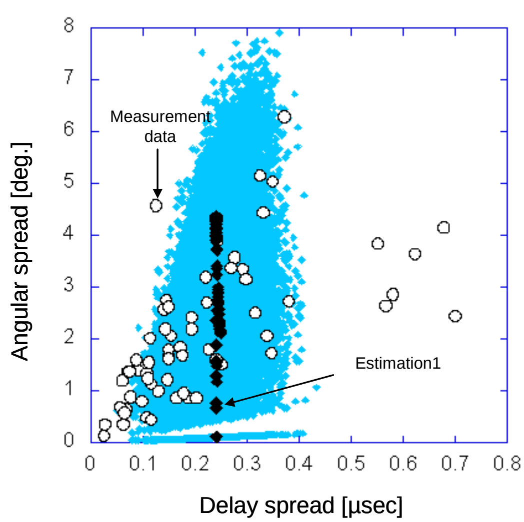
$$P_{r_1} = \frac{|\theta_2|}{|\theta_1| + |\theta_2|} P_r \qquad P_{r_2} = \frac{|\theta_1|}{|\theta_1| + |\theta_2|} P_r \quad . \tag{A2-3-4}$$

In the case when $|\phi|$ becoming small i.e., $|\phi| < |\theta_2|$, it can be assumed that $P_{r_1} = P_r$ and $P_{r_2} = 0$.

Figure A2-3-4 shows the figure in which the estimation using the proposed model was compared with the result obtained from a measurement. From the figure, it is clearly shown that for each cluster, the short section changes with a standard deviation σ=6dB. It is understood that the proposed model can be applied to most measurements to be included in the estimation.

FIGURE A2-3-4

The comparison of the estimation of spatial-temporal cluster based on the proposed model and measurement results



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1.4 Link budget template and deployment models

[Editors note: Text need to be inserted. Startpoint could be M.1225 and MIMO models etc.]

[Editor note: From the document 1143

The detailed evaluation procedures and the technical attributes which should be considered for the evaluation of radio interface technologies against each of the criteria and gives indication on what possible impact upon the different criteria could be included in this section. Radio interface technologies performance evaluation is to be based on a common set of verifiable parameter assumptions for all evaluation criteria for each test environment; if conditions change the technology descriptions should explain it.

To facilitate such criteria evaluation summaries, this part will identify the importance or relative ranking of the various technical attributes within each evaluation criteria. Ranking of some attributes may be different for different test environments. These rankings are based upon current anticipated market needs within some countries. It is also recognized that some new technical attributes or important considerations may be identified during the evaluation procedure that could impact any evaluation criteria summary.]

[Editor's note: source [8F/1257, NZ] proposes to add a new annex]

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Annex 3

Requirements for assessment of candidate technologies

[Editors note: the purpose of this section is to develop a template for evaluation]

[Editors note: the overlap between this template and the template developed in Annex 6 of the Circular Letter need to be considered.]

The table below lists the specific requirements for evaluation as described in [IMT.EVAL]. It also lists the requirements that constitute a positive assessment for a IMT-Advanced candidate technology.

Required technology items for evaluation	**Evaluation Results**
Peak data rates	
Coverage of data rates over the cell area	
Cell edge data rates	
Area spectrum efficiency	
Spectrum efficiency/ Coverage efficiency	
Technology complexity	
Quality for each class of service; – conversational; – interactive; – streaming; – background	
Service Types	
Flexibility of radio interface	
Implication on network interfaces	
Cell Coverage	
Power efficiency	
Spectrum compatibility	
Mobility	

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802.18 Motion to SEC

Agenda: 9.02
Date: 11/16/2007
Time: 3:20 p.m.

Motion by: Lynch **Seconded by:** Marks

Moved:

To approve document:

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as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D. 802.18 approved 8/0/0

Informative: This document is a response to request for further inputs on IMT-Advanced requirements.

Approve: 15 **Do Not Approve:** 0 **Abstain:** 0 **Motion: Approved**

Moved: To approve document: 18-07-0084-00_IMT-Advanced_Eval_d5.doc as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D.

802.18 approved 8/0/0

Informative: This document is a response to request for further inputs on IMT-Advanced requirements.

Moved: Lynch/Marks

Passes: 15/0/0

9.02	**ME**	**Liaison to ITU-R WP5D - IMT-Advanced Evaluation**	**-**	**Lynch**	**5**	**03:44 PM**

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ATTACHMENT 6.8

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DRAFT [Report on] Requirements related to technical system performance for IMT-Advanced Radio interface(s) [IMT.TECH]

TABLE OF CONTENTS

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1 Introduction

[Editor's note: Text will be imported from the common text which is discussed in WG-SERV.]

2 Scope and Purpose

IMT.TECH describes requirements related to technical system performance for IMT-Advanced candidate radio interfaces. These requirements are used in the development IMT.EVAL, and will be attached as Annex 4 to the Circular Letter to be sent announcing the process for IMT-Advanced candidacy.

IMT.TECH also provides the necessary background information about the individual requirements (technology enablers) and the justification for the items and values chosen. Provision of such background information is needed for wider reference and understanding.

IMT.TECH is based on the ongoing development activities from external research and technology organizations. IMT.TECH provides the radio interface requirements which will be used in the development of IMT.RADIO

Deleted: The information in IMT.TECH will also feed in to the IMT.SERV document.

3 Related Documents

Recommendation ITU-R M.[IMT.SERV]

Recommendation ITU-R M.1645

Recommendation ITU-R M.1768

Report ITU-R M.2038

Report ITU-R M.2072

Report ITU-R M.2074

Report ITU-R M.2078

Report ITU-R M.2079

Recommendation ITU-R M.1224

Recommendation ITU-R M.1225

[Recommendation ITU-T Q.1751

Recommendation ITU-T Q.1761

Recommendation ITU-T Q.1711

Recommendation ITU-T Q.1721

Recommendation ITU-T Q.1731

Recommendation ITU-T Q.1703

[Editor's note: Document to be added]

4 Minimum Requirements

[Editorial note: This should be a very limited set of parameters, to determine that proposals provide performance beyond IMT-2000 systems]

Candidate radio interface technologies are required to meet the requirements in all test environments for which they are proposed. New mobile access capabilities can be targeted to cover large cell ranges with high mobility and lower peak data rates, while new nomadic local area wireless access capabilities can be targeted to cover small cell ranges with low or no mobility and higher data rates.

.

The requirements are considered to be assessed separately and need to be evaluated according to the criteria defined in annex 7 of the Circular Letter.

4.1 Cell spectral efficiency

Cell[1] spectral efficiency is defined as the aggregate throughput of all users divided by the spectrum block assignment size (inclusive of PHY and MAC layer overheads).

Test environment	Downlink	Uplink
Stationary	[2.6] bit/s/Hz/cell	1.3 bit/s/Hz/cell
Pedestrian	[2.6] bit/s/Hz/cell	[1.3] bit/s/Hz/cell
Vehicular	[2] bit/s/Hz/cell	[1] bit/s/Hz/cell
High Speed	[1] bit/s/Hz/cell	[0.5] bit/s/Hz/cell

-
- Assuming the Test Environments described in the IMT.EVAL working document, Doc. 8F/1170, Attachment 6.3.

4.2 Peak spectral efficiency

[Editors note: There is still discussion in SWG Radio Aspects as to how to include actual peak data rates within this document. This discussion will continue through the upcoming correspondence activity between WP 8F Meetings #22 and #23]

The peak spectral efficiency is the highest theoretical normalized (by bandwidth) data rate available to applications running over the radio interface and assignable to a single mobile station. The peak spectral efficiency can be determined from the combination of modulation constellation, coding rate, symbol rate, receiver structure amongst others that yields the maximum data rate including PHY overhead. The minimum peak spectral efficiency requirements are given in the following table.

[1] A cell is equivalent to a sector, e.g. a 3-sector site has 3 cells.

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Link direction	Normalized peak rate (bit/s/Hz)
Downlink	7
Uplink	2.8

Notes applicable to table:

a) The specified requirements of normalized peak rates are not distinguished by duplex mode. Rather, 100% of available radio resources are assumed – for the purposes of calculation– allocable to downlink and uplink respectively regardless of duplexing mode. For example, for TDD, when assessing downlink performance, all available radio resources are assigned for downlink transmission.

b) The peak rates account for layer 1 overhead due to provisioning of radio resources for essential functions such as OFDMA pilots, cyclic-prefix, guard bands and guard intervals.

c) The specified minimum supported normalized peak rates are applicable to all supported bandwidths.

•

4.3 Average user throughput and cell edge user throughput

The average user throughput is defined as the sum of the average data throughput of each user in the system divided by the total number of users in the system. The value is [TBD].

Cell edge user throughput is defined as 5% point of cdf (cumulative distribution function) of user throughput.

Cell edge user throughput is to be greater than [TBD] bit/s/Hz and [TBD] bits/s/Hz for downlink and uplink, respectively.

4.4 Latency

4.4.1 Control plane latency

Control plane (C-Plane) latency is typically measured as transition time from different connection modes, e.g. from idle to active state. A transition time (excluding downlink paging delay and wireline network signaling delay) of less than **100 ms** shall be achievable from idle state to an active state in such a way that the user plane is established.

4.4.2 Transport delay (User/Data plane latency)

The transport delay or User/Data Plane delay is defined in terms of the one-way transit time between a packet being available at the IP layer in either the user terminal/base station or the availability of this packet at IP layer in the base station/user terminal. User plane packet delay includes delay introduced by associated protocols and control signaling assuming the user terminal is in the active state, assuming all radio resources have been previously assigned.

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Deleted: [10] b/s/Hz
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Deleted: [5] b/s/Hz¶
Deleted: [5] b/s/Hz
Deleted: Page Break Peak data rates can then be determined as in the following examples:¶ <#>Downlink peak data rate for vehicular mobility in 20MHz is [100]Mb/s¶ Downlink peak data rate for pedestrian mobility in 100MHz is [1]Gb/s]
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IMT-Advanced shall be able to achieve a transport delay of less than **10 ms** in unloaded condition (i.e. single user with single data stream) for small IP packet, e.g. 0 byte payload + IP headers.

4.4.3 QoS

IMT-Advanced systems shall support QoS classes, enabling matching of service, application and protocol requirements (including higher layer signaling) to radio access network resources and radio characteristics. This includes enabling new applications such as interactive gaming. IMT-Advanced systems should provide support for preserving QoS during handover with other RITs.

4.5 Mobility

IMT-Advanced shall support the following mobility classes:

- Stationary: 0 km/h
- Pedestrian: 0-10 km/h
- Vehicular: 10-120 km/h
- High speed vehicular: 120-350 km/h

Vehicular speeds in excess of 350 km/h may also be supported depending on frequency band and deployment.

There is a need to define which mobility classes are supported by each test environment.

	Test environments*			
	Indoor	**Microcellular**	**Base coverage urban**	**High speed**
Mobility classes supported	Stationary, pedestrian	Stationary, pedestrian	Stationary, pedestrian, vehicular	High speed vehicular

* Assuming the Test Environments are as described in the IMT.EVAL working document, Doc. 8F/1170, Attachment 6.3.

IMT-Advanced shall be optimized for low speeds such as mobility classes from stationary to pedestrian and provide high performance for higher mobility classes. The performance degradation as a function of speed should be graceful. In addition, IMT-Advanced shall be able to maintain the connection up to highest supported speed and to support the required spectrum efficiency.

4.6 Handover

4.6.1 Handover Support

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IMT-Advanced systems shall provide handover methods to facilitate continuous service for a population of mobile terminals. Thelayer 2 or higher layers handover methods should enable mobile terminals to maintain seamless connectivity when moving between cells between radio interface technologies, between frequencies.

[Editor's note: Including support of at least one IMT-2000 family member to be included in chapters 5 and 6.]

4.6.2 Handover Interruption Time

Handover performance requirements, and specifically the interruption times applicable to handovers for compatible IMT-2000 and IMT-Advanced systems, and intra- and inter-frequency handover should be defined.

The maximum intra-system MAC-service interruption times during handover are specified in the table below.

Handover Type	Max. Interruption Time (ms)
Intra-Frequency	50
Inter-Frequency	100

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5 Description of technological aspects of candidate air interfaces

The requirements for IMT-Advanced are defined in Section 4. This section provides guidance on the type of information that would be useful in a high-level description to be submitted as part of the proposal. This material could be included in relevant Recommendation(s) for IMT-Advanced.

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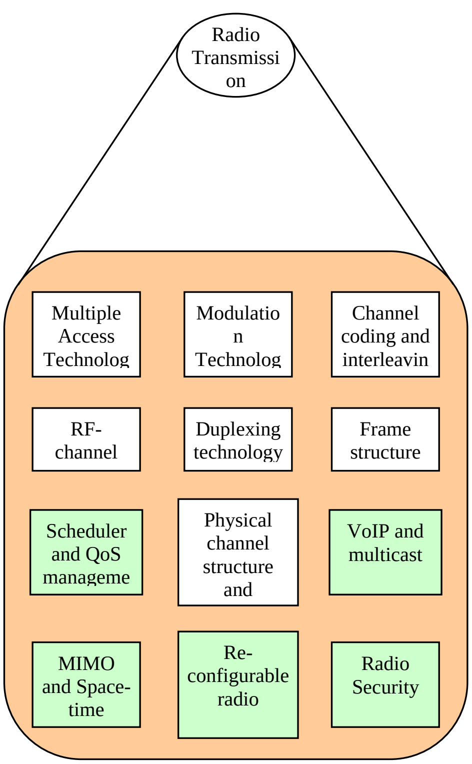

5.1 Multiple access methods

The choice of the multiple access technology has major impact on the design of the radio interface; for instance, OFDMA, CDMA, SDMA, CSMA, also Single-carrier/Multi-carrier operation, as well as enhancement and combination of those technologies.

The following are some factors that could be described :

- Supporting flexible reuse and allocation of resource
- Supporting high-efficiency usage of spectrum. (such as:reducing and avoiding interference, reducing overhead,etc.)
- Adequate for broadband transmission and packet switching
- High granularity/flexibility for provision of wide class of services

5.2 Modulation scheme

Describe the modulation schemes used.

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Deleted: The Orthogonal Frequency Division Multiple Access (OFDMA), Single Carrier Frequency Division Multiple Access (SC-FDMA) or hybrid types are the examples.¶
The Orthogonal Frequency Division Multiplexing - Time Division Multiple Access (OFDM-TDMA) can also be considered in the nomadic environments.
]¶
From 1246 (Japan): [It is needed to be described what kind of multiple access methods is employed in the radio interface technology.]¶
From 1283 (IEEE): [IMT-Advanced should allow for contention-based multiple access methods.]¶

Deleted: [The choice of the modulation technology depends mainly on radio environment and the spectrum efficiency requirements.]¶
From 1259 (China): [The choice of the

Deleted: technology

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5.3 Error control coding scheme

Describe error control coding schemes used. Examples may include:

- Advanced forward error correction coding schemes such as Turbo and LDPC
- Adaptive Modulation and Coding (AMC) schemes with various Modulation and Coding Scheme (MCS) levels.
- Hybrid ARQ.

If more than one scheme is employed, the adaptation method for each scheme (e.g. error control coding A is adpated to B modulation scheme, etc.) should be described.

5.4 Physical channel structure and multiplexing

Describe the physical channel structure and multiplexing method employed in the radio interface technology.

5.5 Frame Structure

Describe the frame structure used.

5.6 Spectrum Capabilities

5.6.1 Duplex Methods (Paired and unpaired operation)

Describe the duplex method used. The IMT-Advanced systems may support unpaired and/or paired frequency allocations.

5.6.3 Spectrum Sharing

Any spectrum sharing techniques within a specific radio interface technology or between different radio interface technologies may be described.

5.6.4 Channel bandwidth scalability

[Editor's note: WG spectrum may expect input on requirements in this area from IMT.TECH.]

The following items may be taken into consideration when describing the channel bandwidth utilization of the candidate radio interface technologies:

- Minimum and maximum operating bandwidths of the system
- Flexibility and scalability of spectrum usage
- Multiple contiguous or non-contiguous band aggregation frequency plans including paired and /or unpaired channel plans with multiple bandwidths for allowing co-deployment with existing cellular systems.

5.7 Support of Advanced Antenna Capabilities

Describe any advanced antenna capabilities, such as MIMO, beamforming, antenna diversity, etc., supported by the system.

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From 1268 (Korea): [Advanced forward error correction coding scheme such as Turbo and LDPC should be considered for reliable communication. In conjunction with modulation scheme, AMC (adaptive modulation and coding) scheme should provide various MCS (modulation and coding scheme) levels. Furthermore, Hybrid ARQ should also be considered for both efficient use of spectrum and link reliability.]¶
From 1246 (Japan): [It is needed to be described what kind of error control coding schemes are employed in the radio interface technology.¶
If more than one schemes are employed, it is also needed to be described adaptation method for each scheme (e.g. error control coding A is adapted to B modulation scheme, etc.).]

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Deleted: [The physical channel is a specified portion of one or more radio frequency channels as defined in frequency, time spatial and code domain.]¶
From 1259 (China): [The physical channel is a specified portion of or ... [6]

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Deleted: From 1268 (Korea): [The IMT Advanced systems should suppo ... [12]

Deleted: [The IMT Advanced system standard should include MAC/PH ... [13]

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Deleted: including features to support multi-antenna capabilities at both ... [14]

5.8 Link Adaptation and Power Control

Describe any link adaptation (e.g., adaptive modulation and coding, power control, etc.) used by the systems.

5.9 RF channel parameters

Describe any applicable RF channel parameters include (e.g., bandwidth, allocation, channel spacing (FDD), guard time (TDD), FFT size (OFDMA), or chip rate (CDMA)).

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Deleted: From 1283 (IEEE): [IMT-Advanced systems shall support automatic selection of optimized user data rates that are consistent with the RF environment constraints and application requirements. The IMT-Advanced shall provide for graceful reduction or increase of user data rates, on the downlink and uplink, as a mechanism to maintain an appropriate frame error rate performance.¶

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Deleted: for increasing spectrum efficiency, data rate, and cell coverage reliability.¶
Both base station and mobile terminal should employ transmit power control mechanisms and exchange control and monitoring information required to achieve optimal performance while keeping the environmental noise floor as low as possible and helping the MS preserve its battery power. The number of transmit Power levels as well as the associated control messaging should be optimized for cost effectiveness and performance.]

Deleted: From 1246 (Japan): [

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5.10 [Scheduling algorithm]¶
From 1246 (Japan): [Scheduling algorithm affects the delay performance and total cell bit rate. It is needed to be described what kind of scheduling algorithm(s) is employed in the radio interface technology and also how that algorithm maintain the delay of each user and total cell bit rate.]¶

5.11 Radio Interface Architecture and Protocol Stack

Describe radio interface architecture and protocol stack including Layer 1 and Layer 2 as well as interface to Layer 3.

5.12 Positioning

Describe if the proposed technology supports positioning, and what is the achieved positioning accuracy in different environments.

5.13 Support of Multicast and Broadcast

Describe any support of Multimedia Broadcast and Multicast capabilities, e.g., Multimedia Broadcast and Multicast Services at both a dedicated carrier and mixed carrier where Multimedia Broadcast and Multicast Services exist simultaneously.

5.14 QoS Support and Management

The following may be described in support for QoS in IMT-Advanced systems:

– Support for QoS classes

- QoS class associated with each service flow;

– QoS attributes may include:

  - ✓ Data rate (ranging from the lowest supported data rate to maximum data rate supported by the MAC/PHY),
  - ✓ Latency (delivery delay),
  - ✓ Packet error rate (after all corrections provided by the MAC/PHY layers), and delay variation (jitter).

5.15 Security Aspects

Describe any security methods that are employed in the radio interface technology.

5.15.1 Privacy and Authentication Aspects

Describe any privacy and authentication functions supported.

5.16 Network topology

Describe radio access network topology, e.g., support for any of the following:

- Single-hop mode, Multi-hop mode, Mesh mode and Peer to peer mode
- How the proposed system scales to different types of operators and deployment cases
- Supporting multi-RATs cooperation

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Deleted: Not required for evaluation¶ From 1292 (Finland) [The proponents should describe the supported broadcasting solutions.]¶ From 1283 (IEEE): [IMT-Advanced systems shall provide

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Deleted: and broadcast spectrum efficiency (Section 5.2.10.2). E-MBS delivery shall be supported via a dedicated carrier.¶ IMT-Advanced systems shall support optimized switching between broadcast and unicast services, including the case when broadcast and unicast services are deployed on different frequencies.]¶

Deleted: [The QoS is important factor especially the applications which are originally supported by circuit switched network in delay/jitter.]¶ ... [15]

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5.18 Interference mitigation within radio interface

Describe support of any advanced interference mitigation and enhanced flexible frequency re-use schemes.

5.19 Synchronization

Describe any synchronization mechanisms used including synchronization between a user terminal and a site, synchronization between sites.

5.20 Power efficiency

Describe techniques used for power efficiency as applicable to base station and the user terminal.

6 Required technology criteria for evaluation

Editorial note: includes the minimum requirements plus any parameters that are useful for evaluation.

Note that some criteria may only be evaluated qualitatively.

6.1 Minimum requirement parameters

These are the requirements detailed in chapter 4 and clearly shall be included in the evaluation. Further details can be found in chapter 4.

- Cell spectral efficiency
- Peak data rate
- Cell edge user throughput
- Latency
    - Control plane
    - Transport delay
    - QoS
- Mobility
- Handover
    - Handover support
    - Handover Interruption Time

6.2 Other parameters for evaluation

6.2.1 VoIP Capacity

From 1283 (IEEE): [The above VoIP capacity assumes a 12.2 kbits/s codec with a 40% activity factor such that the percentage of users in outage is less than 3% where outage is defined as 97% of the VoIP packets are delivered successfully to the users within the delay bound of 80 msec.]

6.2.2 [Technology complexity]

From 1268 (Korea): [Technology complexity should be within the state-of-art hardware implementation not only for specifications but also for future commercialization.]

From Attch. 2 to 1292 (Finland):

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From 1283 (IEEE): [The IMT-Advanced systems' air interface shall support multiple protocol states with fast and dynamic transitions among them. It will provide efficient signaling schemes for allocating and de-allocating resources, which may include logical in-band and/or out-of-band signaling, with respect to resources allocated for end-user data. The air interface shall provide power conservation features to improve battery life for idle mobile terminals]

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Deleted: From 1283 (IEEE): [Interference mitigation technology can be used to avoid or decrease inter-cell interference. There are usually three types of mitigation schemes: inter-cell-interference randomisation, inter-cell-interference cancellation and inter-cell-interference coordination.]¶

Deleted: From 1283 (IEEE): [It is very important and necessary for user terminals to acquire time and frequency synchronization with a cell. Flexible and reliable inter-site time synchronization should also be supported provided these bring sufficient benefits. for example, avoiding system failure due to reliance on single synchronization method.]

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From 1268 (Korea): [Advanced transmitter/receiver technologies for enhancing link budget should be considered. Examples of candidate technologies are as follows:¶
<#>Multiple antenna transmission/reception¶
<#>Advanced FEC including Turbo and LDPC codes¶
<#>Advanced receivers such as iterative receivers¶
<#>Physical channel structure design for taking into account power efficiency¶
<#>Cost and battery efficiency of user equipment]¶
From 1254 (New Zealand): [The maximum transmission power should be the minimum required to meet the required cell area coverage whilst maintaining the required grade o ... [22]

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[This criterion expresses the impact of a given RTT on complexity (and hence on cost) of implementation (equipment, infrastructure, installation, etc.) i.e., the less complex the better. In order to achieve the minimum cost and best reliability of equipment, the technologies selected should have a level of complexity consistent with the state of technology, the desired service objectives and the radio environment. Some technologies have several possible methods of implementation which allow a compromise between complexity/cost and performance.

The installed and ongoing cost of IMT is influenced by both the transmission technology and the level of quality and reliability. At a given quality level, it is impacted by the complexity of the radio hardware, the other necessary network infrastructures, and the ongoing operational aspects of IMT.]

From 1246 (Japan): [This criterion expresses the impact of a given Radio interface technology on complexity (and hence on cost) of implementation (equipment, infrastructure, installation, etc.) i.e., the less complex the better. In order to achieve the minimum cost and best reliability of equipment, the technologies selected should have a level of complexity consistent with the state of technology, the desired service objectives and the radio environment. Some technologies have several possible methods of implementation which allow a compromise between complexity/cost and performance.

The installed and ongoing cost of IMT-Advanced is influenced by both the transmission technology and the level of quality and reliability. At a given quality level, it is impacted by the complexity of the radio hardware, the other necessary network infrastructures, and the ongoing operational aspects of IMT-Advanced.]

From 1283 (IEEE): [The IMT-Advanced systems PHY/MAC should enable a variety of hardware platforms with differing performance and complexity requirements.

IMT-Advanced shall minimize complexity of the architecture and protocols and avoid excessive system complexity.]

6.2.3 Cell Coverage

From 1259 (China): [Requirements that specify the area could be covered by a cell of the IMT-Advanced system.]

[A cell radius over 50km should be supported by proper configuration of the system parameters]

[In IMT-ADVANCED systems, the minimum number of BSs per square kilometre for a given frequency assignment to offer a certain amount of traffic with the required coverage is an important figure, at low traffic levels. At low loading, the system will be noise limited and the number of base stations constrained by the maximum range achievable by the technology.

At low loading, range and coverage efficiency are the major considerations, while at high loading, capacity and spectrum efficiency are more important.

Technologies providing the desired level of coverage with fewer base sites for a specific test environment are defined as having higher coverage efficiency.]

From 1268 (Korea): [A cell radius over 35 km should be supported by proper configuration of the system parameters.

The system should be flexible enough to support the various cell coverage scenarios that meet the performance target. To maintain the balance of the coverage, the cell coverage is considered to be the same between the downlink and the uplink. The performance requirements with respect to cell range are as followings:

- Up to 5km: The specified performance requirements above must be achieved.
- Up to 35km: Graceful degradation

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- Symmetrical coverage between uplink and downlink

And the performance requirements of the nomadic wireless access are as followings:

- Up to 100m: The specified performance requirements above must be achieved.

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Up to 500m: Graceful degradation.]

From Attch 2 to 1292 (Finland): [In terrestrial systems, the minimum number of BSs per square kilometre for a given frequency assignment to offer a certain amount of traffic with the required coverage is an important figure, at low traffic levels. At low loading, the system will be noise limited and the number of base stations constrained by the maximum range achievable by the technology.

At low loading, range and coverage efficiency are the major considerations, while at high loading, capacity and spectrum efficiency are more important.

Technologies providing the desired level of coverage with fewer base sites for a specific test environment are defined as having higher coverage efficiency.]

From 1246 (Japan): [A cell radius over 50 km should be supported by proper configuration of the system parameters.]

From 1254 (New Zealand): [A cell radius over 50km should be supported by proper configuration of the system parameters]

[Tables 15a and 15b of Report ITU-R M.2078 describe cell areas with allowances for cases where penetration loss is and isn't taken into account. The values of these cell areas specified in the software implementation used in the spectrum estimation process is given in the table below.

RE	Teledensity		
	Dense urban	**Sub-urban**	**Rural**
Macro cell	0.65	1.5	8.0
Micro cell(1)	0.1	0.1	0.1
Pico cell(1)	1.6E-3	1.6E-3	1.6E-3
Hot spot(1)	6.5E-5	6.5E-5	6.5E-5

* This example is not applicable to the scenario of large areas with low teledensity coverage.

(1) It is assumed that the cell size of these environments is not teledensity dependent.

]

[IMT-Advanced systems shall support the deployment scenarios in Table 10 in terms of maximum cell range.

Deleted: From 1283 (IEEE):[Support for larger cell sizes should not compromise the performance of smaller cells. Specifically,

TABLE 10

IMT-Advanced Deployment Scenarios

Cell Range	**Performance target**
Up to 100 m	Nomadic performance, up to data rate achieved by maximum spectral efficiency of 15 bit/s/Hz
Up to 5 km	Performance targets defined in section 5.2.1 should be met

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5-30 km	Graceful degradation in system/edge spectrum efficiency
30-100 km	System should be functional (thermal noise limited scenario)

]

[Editor's note: service types removed as assumed to be covered by WG Services]

6.2.4 ccdf of user throughput

[Editor's note: text to describe this criterion is needed]

6.2.5 QoS

[Editor's note: consideration should be given to including the 4 classes from M.1079 and reference to ITU-T Y.1541]

6.2.6 Capacity considerations/ Supported user density

[Description of capacity, e.g. how many users could be supported in different scenarios, such as rural, urban and hotspot.]

7 Conclusions

This Report provides useful information on technology issue which is required for evaluate the air interface(s) for IMT-Advanced.

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8 Terminology, abbreviations

From 1246 (Japan):

[

CDMA	Code Division Multiple Access
CIR	Carrier to Interference Ratio
FDD	Frequency Division Duplex
IWF	Inter-Working Function
OFDMA	Orthogonal Frequency Division Multiplex Access
QoS	Quality of Service
RAT	Radio Access Techniques
RRM	Radio Resource Management
SIR	Signal-to-Interference Ratio
TDMA	Time Division Multiple Access
TDD	Time Division Duplex

]

- From 1283 (IEEE): [*Active users* - An active user is a terminal that is registered with a cell and is using or seeking to use air link resources to receive and/or transmit data within a short time interval (e.g., within 100 ms).
- *Aggregate Throughput* - Aggregate throughput is defined as the total throughput to all users in the system (user payload only).
- *Air Interface*
  1. The air interface is the radio-frequency portion of the transmission path between the wireless terminal (usually portable or mobile) and the active base station or access point.
  2. The air interface is the shared boundary between a wireless terminal and the base station or access point.
- *Cell* - The term "cell" refers to one single-sector base station or to one sector of a base station deployed with multiple sectors.
- *Cell sizes* - The maximum distance from the base station to the mobile terminal over which an acceptable communication can maintained or before which a handover would be triggered determines the size of a cell.
- *Contention based multiple access method* - An access method that allows multiple uncoordinated users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate.
- *Coverage Enhancing Technologies* - In the context of wireless communications - technologies that augment the radio signal, in areas within the boundary of a cell, where the BS/MS transmit signal is obstructed and significantly attenuated by terrain or man-made structures.

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- *Intra-technology handover (Horizontal Handover)* **-** Handover of active sessions between two network points of attachment or between two radio channels within same link or radio technology.
- *Inter-technology handover (Vertical Handover)* **-** Handover of active sessions between two different network interfaces defined as part of IMT-Advanced system or between different network interfaces from IMT-Advanced system and IMT-2000 system.
- *Licensed bands below 3.5 GHz* **-** This refers to bands that are allocated to the mobile service and licensed for use by mobile cellular wireless systems operating below 3.5 GHz.
- *Network selection* **-** The process by which a mobile station or a network entity makes decision to connect to a specific network (possibly out of many available) based on policy configured in the mobile station and/or obtained from the network.
- *Peak data rates per user (or peak user data rate)* **-** The peak data rate per user is the highest theoretical data rate available to applications running over the radio interface and assignable to a single mobile station. The peak data rate per user can be determined from the combination of modulation constellation, coding rate and symbol rate that yields the maximum data rate.
- *Seamless handover* **-** Handover of active session characterized by a mobile node changing the network interface point of attachment, on the same or different radio link technology, within the recommended delay constraints of service interruption and without a noticeable loss in service quality.
- *Service continuity* **-** Transparent maintenance of an active service during handover while the mobile station transitions across coverage area of different networks.
- *Service Flow* **-** A service flow is a MAC transport service that provides unidirectional transport of packets either to uplink packets transmitted by the MS or to downlink packets transmitted by the BS. A service flow is characterized by a set of QoS parameters such as latency, jitter, and throughput assurances.
- *System spectrum efficiency* **-** The ratio of the aggregate throughput (in bit/s) to all users in the system divided by the total size of the spectrum blocks (in Hz) assigned to the system and divided by the number of sectors in the system. System spectrum efficiency calculation shall exclude PHY and MAC overhead from the aggregate throughput to all users. System spectrum efficiency is defined independently for the uplink and downlink. When calculating the uplink or downlink system spectrum efficiency, the assigned spectrum block size (used in the denominator) shall be scaled in proportion to the time/frequency resources assigned to the uplink or downlink, respectively.]

Appendices

The following 2 appendices illustrate technology enablers which can be used for IMT-Advanced Radio Interface(s). The third appendix includes text that was contributed to 22nd meeting of WP 8F for the deleted section 4 – General Requirements – from Document 8F/1170 Attachment 6.2.

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Appendix 1

Overview of major new technologies

1 Spectrum and deployment

[Editor note: Technologies that can improving spectrum efficiency, flexibility and sharing possibility could be included in this section.]

2 Radio Access Interface and Network

[Editor note: New radio access technologies, such as soft-defined radio, short range radio and new multiple access method etc, could be include in this section. The innovations of network deployment, e.g. wireless relay enhanced cellular, can also be included in this section]

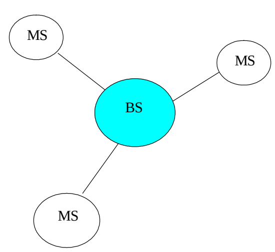
2.1 Network topology

2.1.1 Single-hop mode

The information is transmitted between radio access point (e.g. base-station) and mobile stations (e.g. user terminals) directly in a single hop. An example of network topology in this case is shown in Figure 2.1.1.1).

FIGURE 2.1.1.1

Working mode of radio access network – Single Hop Mode



2.1.2 Multi-hop mode

The direct communications between BSs and the data transportation through multihop across BSs should be considered.

The information is transmitted between radio access point to mobile stations in more than one hop. The intermediate points between access point and destination are relay nodes that regenerate and re-transmit radio signals. The topology of multi-hop mode is shown in Figure 2.1.2.1.

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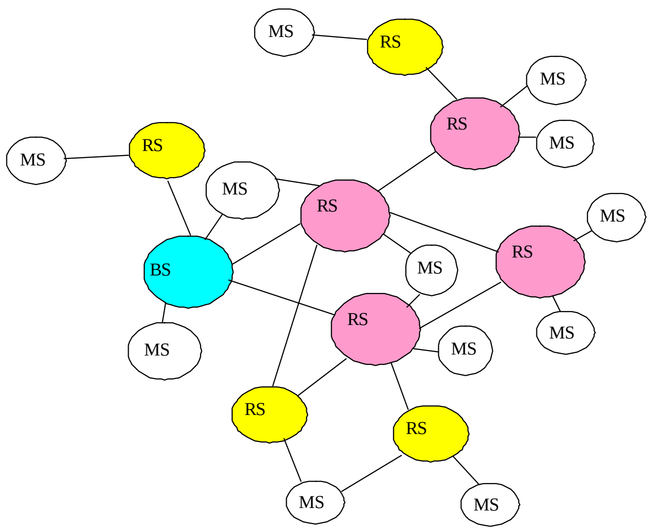
FIGURE 2.1.2.1

Working mode of radio access network – Multi Hop Mode

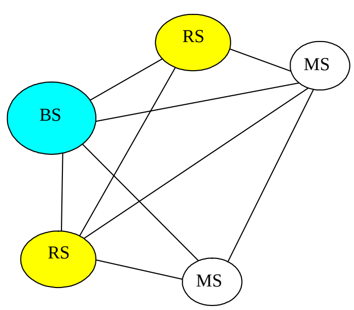


2.1.3 Mesh mode

This mode is similar to multi-hop mode. However, in this mode, relay nodes are supposed to have connections between each of them, if physically possible. Routing algorithms between relay nodes are necessary in this mode. An example of network topology in this case is shown in Figure 2.1.3.1.

FIGURE 2.1.3.1

Working mode of radio access network – Mesh Mode



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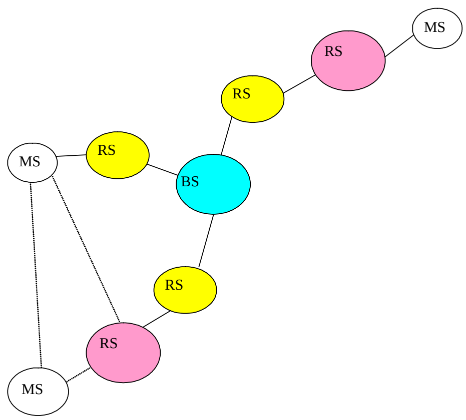
2.1.4 Peer-to-peer mode

In this mode, mobile stations are connected directly or through relay nodes, but no radio access point are explicit in their connections. An example of network topology in this case is shown in Figure 2.1.4.1.

FIGURE 2.1.4.1

Working mode of radio access network – Peer-to-Peer Mode



2.2 Duplexing

2.2.1 FDD

Conventional frequency division duplex (FDD) operation allocates equal-size paired spectrum for uplink and downlink. It is expected that the future IMT-Advanced systems would require higher data rate and throughput mainly in downlink to support ultra high-speed asymmetric services, e.g. large-size file downloading (similar to broadband internet access) and high-quality video broadcasting (similar to digital TV). These asymmetric services encourage an asymmetric spectrum allocation for IMT-Advanced deployment.

2.2.2 TDD

Conventional time division duplex (TDD) operation can support asymmetric transmission very well. Flexibility is available with respect to the degree of traffic asymmetry, depending on the co-channel and adjacent channel interference conditions. The spectrum efficiency of the arrangement is less dependent on the actual network traffic asymmetry since TDD can vary the degree of asymmetry within a specified range.

2.2.3 Half duplex FDD

TBD

2.3 Multiple-Access technologies

2.3.1 Single-carrier transmission

TBD

2.3.1 Multi-carrier transmission

2.3.1.1 OFDMA

2.3.1.2 Multi-carrier CDMA

2.4 Multiple-Antenna technologies

2.4.1 MIMO (MTMR)

2.4.1.1 Single-User MIMO

2.4.1.2 Multi-User MIMO

2.4.2 Beam forming (Smart Antenna)

2.5 Channel Coding

2.5.1 Turbo codes

Double binary tail-biting turbo codes can be regarded as one choice of improved turbo codes.

For the component encoder of the improved turbo codes, the Double Binary Circular Recursive Systematic Convolutional codes shall substitute the original Binary Recursive Systematic Convolutional Codes, which leads to the improvement of the link performance. Compared to the original binary turbo codes, the double binary turbo codes can eliminate the error floor, decrease the performance gap between the optimal algorithm and the approximate algorithm, and enhance the performance of high code rate.

Since the tail bits of UTRA Turbo coding reduce the throughput, tail-biting trellis termination can be considered to improve the transmission efficiency, and then the tail bits can be removed.

To obtain variable code rate and extend the application fields, the combination of rate matching and the improved turbo codes should be considered as a complement of turbo coding.

The improved turbo codes should have the capability of supporting iterative redundancy HARQ (IR_HARQ).

2.5.2 Low density parity check codes (LDPC)

LDPC coding can be considered an alternative channel coding scheme in that it has such benefits as low complexity, large decoder throughput, low latency, and high coding performance.

A special type of LDPC codes, namely structured-LDPC codes, can achieve very efficient hardware architecture and routing. The code rate of LDPC codes is flexible by using different base matrices or by shortening or puncturing base matrices. The code size can be flexible by modifying one base matrix. As a typical choice, with single uniform base matrix and single uniform hardware structure, any code rate and any code size can be supported.

The LDPC codes should have the capability of supporting IR_HARQ.

For irregular LDPC codes, the protection abilities vary differently from the nodes' degrees, and the differential protection ability of different degrees should be considered (e. g. HARQ).

The LDPC coded modulation possibly shall be exploited to improve the link performance.

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2.6 Mobility management and RRM

2.6.1 Centralized RRM

2.6.2 Distributed RRM

2.6.3 Inter-RAT spectrum sharing

2.6.4 Inter-RAT mobility management

3 Mobile user interface

[Editor note: This section include new technologies that can improve user experience when using mobile communication service.]

3.1 Mobile user terminal design

3.2 New innovative network to humane interfaces

3.3 Human-free interface

3.4 RF micro-electro-mechanical systems (MEMS)

3.5 Reconfigurable networks

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Appendix 2

The application of multi-input-multi-output technology in IMT-Advanced system

[Editors note: Particular terms such as "NodeB" and "UE" are being discussed in SWG Radio Aspects and discussion will continue in the correspondence activity which takes place between WP 8F Meetings #22 and #23]

In the IMT-Advanced system, MIMO technology mainly is introduced in the region the capacity already has approached the limit, or hot spot area.

1 The multi-antenna system application scenario

Better performance can be achieved in the following scenarios by using MIMO technology.

Scenario A (suburban macro): The wireless downlink channel, the base station position is high, the wireless signal scattering spots around the mobile terminations are rich. Then, looking from the terminal antenna, the wireless channel relevance of the base station with many transmit antenna is high, but looking from the base station antenna, the wireless channel relevance of the terminal with many receiving antenna is weak, namely low transmit diversity, high receive diversity scenario.

Scenario B (urban macro): The uplink wireless channel of scenario A, high transmit diversity, low receive diversity scenario.

Scenario C (urban micro): The wireless channel relevance of transmit, receiving antenna in uplink, downlink channel is medium, namely the medium transmit diversity, the medium receive diversity scenario.

Scenario D (line of sight-LOS): Because of the existence of the LOS component signal, the relevance between transmit and receive antennas is very strong, namely the low transmit diversity, the low receive diversity scenario.

Performance lost may be suffered in the following scenario: low SNR area and high mobile scenario.

Because MIMO technical may need channel information feedback between receiving and transmitting, based on present feedback mechanism, when UE makes the high speed migration (e.g. velocity >50km/h), The feedback speed is unable to support the variation rate of measure information; These measure information including the scope and phase information in closed loop diversity pattern, as well as feedback link quality information.

In addition, the micro honeycomb environment with rich multi-diameter condition can maximize the MIMO antenna gain, therefore the multi-antenna technology more suits for the micro honeycomb scenario such as the crowded city, the city, the room and so on. One kind of intelligent MIMO system based on the using boundary and user demand is shown in Figure 1.

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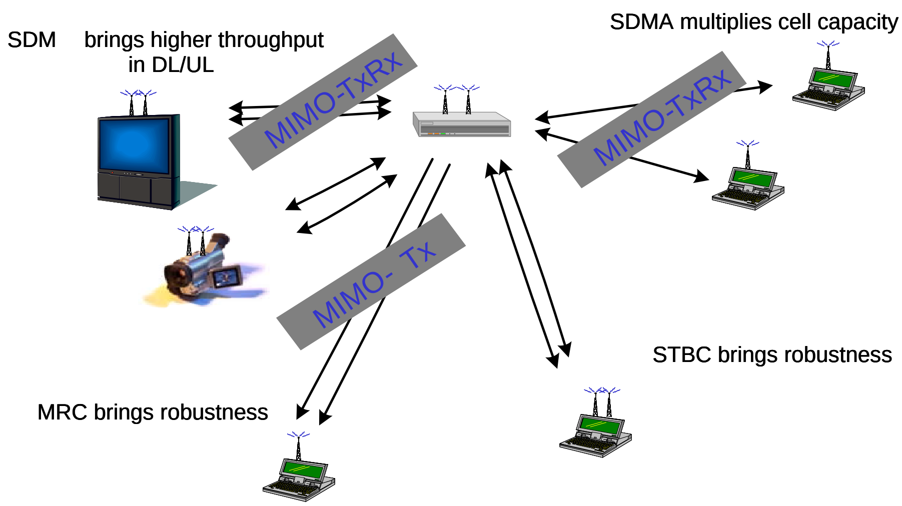
FIGURE 1

The application of smart MIMO in different scenarios

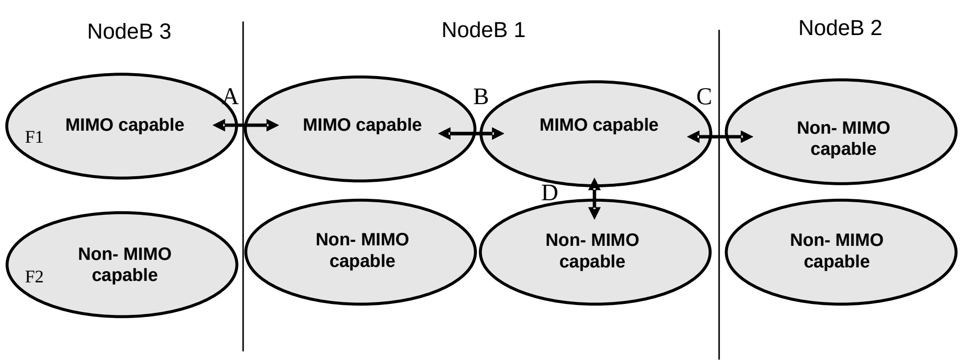


2 MIMO's impact on mobility

After introducing MIMO, the wireless environment of cell has improved, and the carry frequency quality of UE has obtained quite large gain, and the number of hand-over in mobility management has decreased. Because every pair of antennas have been configured a dedicated pilot channel, not a common pilot channel as in SISO. The condition of hand-over synthetically considers multi-pilot channel quality according to some algorithm.

Considering the following network configuration, there are MIMO cells and non-MIMO cells in the neighbour NodeB and in different frequency within a NodeB. Because of the mobility of UE and payload, that may lead to the following scenario.

FIGURE 2



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- UEs work at the F1 frequency in NodeB3, and move towards NodeB1 (Figure 2 A)
  - If the current UE is MIMO UE, when UE moves from NodeB3 towards NodeB1, system should touch off the soft hand-over. For service channel, network can select a best cell according to channel quality, make it as service cell.
  - If the current UE is MIMO UE, but works at the frequency F2 in NodeB3, when moving towards Node B, there are two different strategies: one is to make soft hand-over in same frequency, and the other is to make hard hand-over in different frequency, that makes the UE hand off the frequency which supports MIMO. The former can make use of the benefit which is leaded by soft hand-over, and the disadvantage is the UE still works on the non-MIMO cell. The latter avoids the disadvantage, but that leads the complexity of hand-over increases.
  - If the current UE is MIMO UE, whether working at F1 or F2, soft hand-over should be the optimum choice.
- When the above example occurs in one NodeB, the strategy should be the same as the different NodeB. The only difference is the hand-over is the softer hand-over.
- If MIMO UE moves into a non-MIMO cell(C), the network side can balance between to hold the MIMO service and to ensure UE interference to system at the same frequency is minimum. That is to say, network can configure higher threshold which is used to touch off moving towards non-MIMO, that ensures the largest delay of MIMO service. We can also use the same threshold as the normal hand-over, to ensure MIMO UEs can not produce too large payload to network.
- At different frequency in one NodeB, we also solve the payload balance through blind hand-over in one NodeB (D). The blind hand-over in one NodeB can be touched by the change of channel type. This can place the MIMO UEs and non-MIMO UEs in MIMO cells and non-MIMO cells as possible to ensure the performance of MIMO UE.

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Appendix 3

Input text to 22nd meeting of WP 8F on general requirements

[Editor's note: This text is included so that it can be determined if any requirements described could be included into requirements during further discussion. This appendix will deleted before final approval of the report.]

From 1259 (China): For IMT-Advanced system, User expectations are continually increasing with regard to the variety of services and applications. In particular, users will expect a dynamic, continuing stream of new applications, capabilities and services that are ubiquitous and available across a range of devices using a single subscription and a single identity (number or address).

Multimedia traffic is increasing far more rapidly than speech, and will increasingly dominate traffic flows. There will be a corresponding change from predominantly circuit-switched to packet-based delivery. This change will provide the user with the ability to more efficiently receive multimedia services, including e-mail, file transfers, messaging and distribution services. These services can be either symmetrical or asymmetrical, and real-time or non real-time. They can consume high bandwidths, resulting in higher data rate requirements in the future. This will complement the enhanced IMT-2000 systems and the other radio systems.

It is predicted that potential new radio interface(s) will need to support data rates of up to approximately 100 Mbit/s for high mobility such as mobile access and up to approximately 1 Gbit/s for low mobility.

From 1268 (Korea): IMT-Advanced systems should support more than 100 Mbps in new mobile access environment and 1 Gbps in new nomadic/local area wireless access environment. For this, performance optimization can be done in either way.

1) One system can be designed to meet both of the new mobile access and the nomadic/local area wireless access requirements together.

2) Separate system can be designed for the new mobile access and the nomadic/local area wireless access requirements.

The IMT-Advanced systems should be designed to provide best-in-class performance attributes such as peak and sustained data rates and corresponding spectral efficiencies, capacity, latency, overall network complexity and quality-of-service management.

The IMT-Advanced systems should support applications that conform to open standards and protocols. The examples of applications are, but not limited to, video, full graphical web browsing, e-mail, file uploading and downloading without size limitations, streaming video and streaming audio, IP Multicast, Location based services, VPN connections, VoIP, instant messaging and on-line multiplayer gaming.

The IMT-Advanced systems should provide the mobile user with an "always-on" experience while also taking into account and providing features needed to preserve battery life. The connectivity from the mobile terminal to the base station should be automatic and transparent to the user as it moves between mobile networks.

End-user requirements

Users wish to receive seamless services in a more convenient and accustomed way from and to various networks through various terminals, and demand the diverse services through advancement, integration and innovation of technology. Advent of ubiquitous era rapidly increases the need of personalized services which are based on awareness of dynamically changing environment of the users. In order to implement these requirements successfully, it is required to exchange, refine and manage personal information and context information efficiently, while thoroughly fulfilling the intention of the users.

The major requirements for the users are as followings:

- The system should provide the QoS based differentiated service based on the data transmission rate, data loss rate and real-time service characteristics.
- The system should provide the emergency call service which requires higher priority than general communication services.
- The system should provide various location based services in the indoor environment through the precision location awareness, as well as the in the outdoor environment where GPS is supported.
- The system should support personalization service based on the user profile/preference and context information.
- The system should provide service continuity through uninterrupted interconnection in case of movement between various wireless access networks.
- The system should guarantee reliability by protecting information security and privacy.

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Terminal requirements

The terminals should provide the user with seamless service at any time in any place on various wireless networks. The major requirements for mobile terminal are as followings:

- The terminal should support seamless handover and global roaming in the heterogeneous wireless network as well as in the homogeneous wireless network.
- The terminal should work for longer hours than the existing IMT-2000 terminals with less power consumption.
- **The terminal** should **provide I/O interface that enhances convenience of the users.**

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Network requirements

The IMT-Advanced systems should support high-speed multimedia data transmission, as well as improved flexibility, scalability, stability and reliability through IP-based transmission, modular architecture and open service interface. The IMT-Advanced systems consist of core network which is independent of the access technology and wireless access network which is dependent on the access network for control and provisioning of service. However, this distinction becomes ambiguous due to evolution of IP based technology and the traditional functions of core network and wireless access network will be distributed. Especially, under the cell environment where the various wireless networks are overlapped hierarchically, in order to support seamless mobility between multiple wireless access systems, it is required to develop the technique of selecting the optimum network and managing the multiple wireless resources in consideration of service profile of the users and the current system status.

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The major requirements for the network are as followings:

- The network should provide the fast and reliable packet routing for various connection topologies including point-to-point, point-to-multipoint and multipoint-to-multipoint connection.
- The network should provide flexibility of introduction of various systems and evolution scenario.
- The network should support scalability of capacity in accordance with change of number of users and traffic.
- The network should support the standard interface for cooperation between the communication service providers.
- The network should support the capability of selecting the optimum available network and managing the wireless resources efficiently under the various wireless network environments.
- The network should support the robust encryption and authentication function against the illegal attack.

From 1246 (Japan):

Recommendation ITU-R M.1645 described that the "systems beyond IMT-2000 will encompass the capabilities of previous systems" and also described new capabilities.

According to the recommendation, the general requirements for IMT-Advanced are following:

a) Mobility Speed

Terrestrial cellular systems including IMT are required to support the environment described in Recommendation ITU-R M.1034 which includes:

- Stationary (0 km/hr i.e can be used as a FWA systems)
- Pedestrian (Up to 10 km/hr)
- Typical Vehicular (Up to 100 km/hr)
- High Speed Vehicular (Up to 500 km/Hr)

b) Inter-Connection to/from other mobile networks/PSTN/ISDN and IP networks.

System employing IMT-Advanced radio interface technologies is required to connect other networks.

As IMT-Advanced is required to encompass the capabilities of previous systems, it needs to inter-connect with other mobile networks/PSTN/ISDN in circuit switched mode and also with other mobile networks/ISDN and IP networks in packet switched mode.

In voice application between PSTN, it is necessary to comply the quality required by PSTN such as maximum ratings, delay performance, circuit noise, grade of service, error performance, etc. which is recommended relevant ITU-T Recommendations.

c) Potential to support larger cell

For supporting low population density area with economical solution, IMT-Advanced radio interface technologies are requested to support lager cell.

d) Cheap terminal for world wide use

For spreading IMT-Advanced systems, cheap user terminal is essential element. It can be achieved by employing less complexity technologies, maximize commonalities among radio interface technologies if several specifications are registered for IMT-Advanced radio interface technologies and by supporting not too many radio interface technologies in one device.

d) Peak bit rate per cell

According to Recommendation ITU-R M.1645, the target peak bit rates per cell in 2 environments are as following:

- More than 1G bit/s for Pedestrian (Up to 10 km/hr)
- More than 100M bit/s for high mobility (Up to 250 km/hr or more)

[Editor's note: These are from description of Figure 2 in Rec. ITU-R M.1645]

e) Mobile user interface

[Editor's note: Text to be added]

f) Ubiquitous Access

[Editor's note: Text to be added]

g) Sophisticated handover capability

Handover need to be accomplished in high speed mobility environment and also handover between different networks or radio interface technologies may be required. It may require simple handover protocol, e.g. small amount of signaling.

h) xxxxxxxxxxxxxxx

From 1283 (IEEE): IMT-Advanced will support the following general system requirements and features:

- Improved performance, in comparison to enhanced IMT-2000 systems (per M.1457-7), with respect to parameters, including:
  - Spectrum efficiency and peak data rate.
  - Latency in order to enable new delay-sensitive applications.
  - Cell size and cell-edge performance.
- Support of one or more of the following environments, with increased system performance for low mobility environments:
  - Stationary (fixed or nomadic terminals).
  - Pedestrian (Pedestrian speeds up to 3 km/h).
  - Typical Vehicular (Vehicular speeds up to 120 km/h).
  - High Speed Vehicular (high-speed trains up to 350 km/h).
- Seamless application connectivity to other mobile networks and other IP networks (global roaming capabilities).
- Improved unicast and multicast broadcast services.
- Network support of multiple radio interfaces, with seamless handover, addressing both the cellular layer and the hot spot layer (and possibly the personal network layer) per Rec. ITU-R M.1645.

The IMT Advanced system shall support applications that conform to open standards and protocols. This allows applications including, but not limited to, video, full graphical web browsing, e-mail, file uploading and downloading without size limitations (e.g., FTP), streaming video and streaming

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audio, IP Multicast, Location based services, VPN connections, VoIP, instant messaging and on-line multiplayer gaming.

The IMT Advanced systems shall provide the mobile user with an "always-on" experience while also taking into account and providing features needed to preserve battery life. The connectivity from the mobile terminal to the base station (BS) shall be automatic and transparent to the user as it moves between mobile networks.

From 1259 (China): In defining the framework and objectives for the future development of IMT-ADVANCED systems, the significant technology requirements need to be considered. This section identifies the technology domains in which trends can be foreseen at the time of preparation of this Report. Depending on their development, evolution, realized capabilities and cost structure, each of these technology trends may or may not have an impact or be used for IMT-ADVANCED systems. It is expected that the research and development of IMT-ADVANCED systems will consider these trends and provide guidance on the applicability or influence they might have on IMT-ADVANCED systems.

IMT-ADVANCED systems include some technology as below:

System-related technologies

Access network and radio interface

Utilization of spectrum

Mobile terminals

Applications

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Pedestrian
(10 km/h)

Page 4: [2] Deleted	Cadence Design Systems, Inc	9/20/2007 12:46:00 PM

Vehicular
(120 km/h)

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High speed vehicular
(350 km/h)

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Downlink Peak spectral efficiency

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depends mainly on radio environment and the spectrum efficiency requirements.

The process of varying certain parameters of a digital code signal (carrier) may be achieved, through digital signal processing, in accordance with a digital message signal, to allow transmission of the message signal through IF and RF channels, followed by its possible detection.

Modulation can be categorized as data modulation and spreading modulation. Data modulation explains how data can be mapped to the in-phase branch and quadrature-phase branch. Spreading modulation explains how in-phase branch data and quadrature-phase branch data are spread by channelization code and scrambled by scrambling code based on basic modulation scheme, such as QPSK, 16QAM, and 64QAM etc, several factors need to be considered as below:

For high moving environment, the modulation which are more suit for quick time-variety channel need to be considered(for example: DAPSK)

The modulation which have lower PAPR have higher priority

The modulation not only get higher spectrum efficiency, but have lower complexity.]

From 1268 (Korea): [In order to manage various radio channel environments and requested service traffic types of the users efficiently, various types of modulation schemes should be supported. Higher-order modulation such as 64QAM should be considered at both downlink and uplink in consideration of spectrum efficiency.]

From 1246 (Japan): [It is needed to be described what kind of modulation schemes are employed in the radio interface technology and also target CIR (or SIR) for each modulation scheme.]

From 1254 (New Zealand): [The modulation type is implicit in the determination of the area spectrum efficiency parameter which is input to the software model used to arrive at the spectrum estimation given in Report ITU-R M.2078.]

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[The physical channel is a specified portion of one or more radio frequency channels as defined in frequency, time spatial and code domain.]

From 1259 (China): [The physical channel is a specified portion of one or more radio frequency channels as defined in frequency, time spatial and code domain. The PHY channel can be distinguished by orthogonality of any one of factors such as frequency, time, spatial and code domain, some elements for the design of PHY channel structure should be considered as below:

Frequeny spectrum efficency.

Reliability and capability of coverage.]

From 1268 (Korea): [Physical channels should be constructed in order to support both high granularity and high flexibility. The physical channel structure must be adequate for wide range of packets from very small packets to very large packets for high multi-media.]

From 1246 (Japan): [It is needed to be d

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From 1259 (China): [The frame structure depends mainly on the multiple access technology (e.g. OFDMA, TDMA, CDMA) and the duplexing technology (e.g. FDD, TDD). Commonality should be maximised by maintaining the same frame structure whenever possible. That is, data fields identifying physical and logical channels, as well as the frame length should be maintained when possible. For design of frame structure, some elements should be considered below

Spectrum coexistence: Two coexistence scenarios should be considered intra-

Scenario I: IMT-Advanced system co-exists with a co-located legacy IMT system in adjacent carriers (partly re-farming legacy IMT spectrum).

Scenario II: IMT-Advanced systems co-exists with with each other

Commonality between FDD and TDD modes is desired. However, difference due to FDD/TDD inherent features is allowed.

IMT-ADVANCED system which used different multiple access mode adopting same or similar frame structure are desired.

Legacy system frame structure should be considered, so as to achive the flexible co-exisiting and co-operating among multi-RATs.

The application of new technology (such as multi-antenna) should be considered.]

From 1268 (Korea): [In order to maximise commonality, compatibility and inter-operability, frame structure should be designed in consideration of following items:

Scalable with respect to bandwidth assignment

Scalable with respect to performance and complexity for accommodating cost-effective user equipments

Common and/or scalable frame structure which is adequate for various radio environments and cell types.

To support channel reciprocity in TDD, some portion of frequency resources in a frame structure should be identically allocated to both DL and UL.

To support SDMA, some portion of frequency resources in a frame structure should be identically allocated to a group of users.

To benefit from multi-hop relay, frame structure should be designed to support relay stations.]

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[The proponents should indicate if their proposal supports paired and/or unpaired operation, and in which test environment, and in which frequency bands.]

[The choice of the duplexing technology mainly affects the choices of the RF-channel bandwidth and the frame length. Duplexing technology may be independent of the access technology since for example either frequency division duplex (FDD) , time division duplex (TDD) or half-duplex FDD may be used. It also affects band allocations, sharing studies, and cell size.]

From 1259 (China): [The choice of the duplexing technology mainly affects the choices of the RF-channel bandwidth and the frame length. Duplexing technology may be independent of the access technology since for example either frequency division duplex (FDD) , time division duplex (TDD) or half-duplex FDD may be used. It also affects band allocations, sharing studies, and cell size.

TDD and FDD system have the ability of optimizing performance respectively.

The FDD mode shall support both full duplex and half duplex mobile station operation. The UL/DL ratio should be configurable, which be capable of supporting downlink-only configurations on a given carrier.

In TDD mode, the DL/UL ratio should be adjustable which be capable of supporting downlink-only configurations on a given carrier.]

From 1268 (Korea): [Time Division Duplex (TDD) and Frequency Division Duplex (FDD) with Full Duplex and Half Duplex must be considered depending on the system environment and cell type. Hybrid Division Duplex (HDD) can be considered as an efficient combination.]

From 1246 (Japan): [It is needed to be described what kind of duplex methods is employed in the radio interface technology.]

From 1254 (New Zealand): [In addition to duplexing technology choice, RF channel bandwidth is also dependent on the area spectrum efficiency and the application data rate.]

From 1283 (IEEE): [IMT-Advanced systems shall support TDD and/or FDD operational modes. The FDD mode shall support both full duplex and half duplex mobile station operation. Specifically, a half-duplex FDD mobile station is defined as a mobile station that is not required to transmit and receive simultaneously.

IMT-Advanced systems shall support both unpaired and paired frequency allocations, with fixed duplexing frequency separations when operating in full duplex FDD mode.

System performance in the desired bandwidths specified in Section 5.1.1.3 should be optimized for both TDD and FDD independently while retaining as much commonality as possible.

The UL/DL ratio should be configurable. In TDD mode, the DL/UL ratio should be adjustable. In FDD mode, the UL and DL channel bandwidths may be different and should be configurable (e.g. 10MHz downlink, 5MHz uplink). In the extreme, the IMT-Advanced system should be capable of supporting downlink-only configurations on a given carrier.

Asymmetrical operation should be supported in addition to symmetrical operation.]

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5.6.2 Flexible Spectrum Use

From 1292 (Finland): [Proponents should describe the potential flexible spectrum use mechanisms that they are proposing to enable FSU within the same Radio Access Technology between operators. This might allow going even beyond 100MHz determined in the minimum capabilities.]

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From 1292 (Finland): [Sharing frequency band capabilities: to what degree is the proposal able to deal with spectrum sharing among IMT-systems as well as with all other systems.]

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system should be specified together with possible intermediate steps.]

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From 1268 (Korea): [The IMT Advanced systems should support bandwidths up to TBD MHz with flexible and scalable air interface parameters. Also, aggregation of multiple bands may be supported.

The IMT-Advanced system air interface should support system implementation in TDD or FDD licensed spectrum below [TBD] GHz and allocated to the mobile service. The system's frequency plan should include both paired and unpaired channel plans with multiple bandwidths to allow co-deployment with existing cellular systems. It is desirable that channel bandwidths are consistent with frequency plans and frequency allocations for other wide-area systems. The IMT-Advanced system air interface should be readily extensible to wider channels as they become available in the future.]

From 1283 (IEEE): [IMT-Advanced systems shall initially support scalable bandwidths from 5 to 20 MHz. The IMT-Advanced air interface should be readily extensible to larger channel bandwidths as they become available.

The IMT-Advanced systems air interface shall support system implementation in TDD or FDD licensed spectrum allocated to the mobile service. The system's frequency plan shall include both paired and unpaired channel plans with multiple bandwidths to allow co-deployment with existing cellular systems.]

5.6.5 Supported Bands

From 1292 (Finland): [The supported frequency bands should be described.]

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[The IMT Advanced system standard should include MAC/PHY features to support multi-antenna capabilities at both the base station and at the mobile terminal, including MIMO operation for both UL and DL, both UL and DL beamforming, SDMA, and precoding.]

From 1246 (Japan): [Antenna technologies such as Multiple-input multiple-output antenna, adaptive array antenna, etc. affect spectrum efficiency and also complexity of the terminal.

It is needed to be described what kind of antenna technology is employed and effectiveness of the technology.]

From 1259 (China): [The choice of multi-antenna scheme can greatly improve system performance. Spatial division multiplexing (SDM), transmit diversity (TxD), beamforming (BF), spatial division multi-access (SDMA) and the combinations of those technologies need to be considered.]

From 1283 (IEEE): [IMT-Advanced systems shall support

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including features to support multi-antenna capabilities at both the base station and at the mobile terminal, including MIMO operation for both UL and DL, both UL and DL beamforming, SDMA, and precoding.

Minimum antenna configuration requirements shall be:

For the base station, a minimum of two transmit and two receive antennas shall be supported.

For the MS, a minimum of one transmit and two received antennas shall be supported. This minimum is consistent with a 2x2 downlink configuration and a 1x2 uplink configuration.]

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[The QoS is important factor especially the applications which are originally supported by circuit switched network in delay/jitter.]

From 1259 (China): [The QoS is important factor especially the applications which are originally supported by circuit switched network in delay/jitter.

IMT-ADVANCED system should support QoS classes, enabling an optimal matching of service, application and protocol requirements (including higher layer signaling) to RAN resources and radio characteristics.

This includes:

enabling the QoS keep at least same level when the services converted from CS domain in legacy system to PS domain ,for example ,VoIP in IMT-ADVANCED system should have same QoS compare with voice in CS network;

enabling new applications such as interactive gaming.

Access level QoS management, including Radio access side QoS management and QoS management of UE's traffic, should be supported.]

From 1268 (Korea): [IMT-Advanced systems should support the configuration (e.g., by the system operator) of a flexible set of variety of traffic classes with different latency and packet error rates performance, in order to meet the end-user QoS requirements for the various applications,

Specifically, it is important for IMT-Advanced systems to

Have the ability to negotiate the traffic class associated with each packet flow.

Permit the set of traffic classes to be defined by the system operator in terms of QoS attributes (along with the range of allowed values) that include the following:

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Data rate (ranging from the lowest supported data rate to maximum data rate supported by the MAC/PHY),

Latency (delivery delay),

Packet error rate (after all corrections provided by the MAC/PHY layers), and

Delay variation (jitter).]

From 1246 (Japan): [It is needed to be described QoS control can be achieved in which level (e.g. session level/ connection level/ can be carried during communication, etc.).]

From 1254 (New Zealand): [The quality of service used in the tele-traffic models can have a noticeable impact on the spectrum requirement. The values chosen must reflect the performance to be expected. For example, requirements for blocking probability for Circuit-switched Service Categories and mean packet delay for packet-switched Service Categories are key QoS Service Category attributes given in Report ITU-R M.2078.]

From 1283 (IEEE): [IMT-Advanced systems shall support a flexible set of QoS classes and their respective configuration (e.g., by the system operator), enabling an optimal matching of service, application and protocol requirements (including higher layer signaling) to RAN resources and radio characteristics. This includes enabling a variety of applications including Mobile Internet Access, Voice over IP, IPTV and interactive gaming. The QoS classes should be defined by a common set of parameters to address all classes of service and QoS parameters for all services. Specifically, it is important for IMT-Advanced systems to

Have the ability to negotiate the QoS class associated with each service flow.[1]

Permit the set of QoS classes to be defined by the system operator in terms of QoS attributes (along with the range of allowed values[2]) that include, but not limited to, the following:

Data rate (ranging from the lowest supported data rate to maximum data rate supported by the MAC/PHY),

Latency (delivery delay) (ranging from 10 ms to 10 seconds),

Packet error rate (after all corrections provided by the MAC/PHY layers) (ranging from 10E-8 to 10E-1), and

Delay variation (jitter) (ranging from 0 to 10 seconds).

Support (but not require) PHY/MAC implementations that satisfy the QoS characteristics that are specified by the following QoS classes:

{ADD TRAFFIC LIST HERE}

As is the case for all wireless networks, the specified QoS characteristics for certain QoS classes or services need only be satisfied in deployments and RF link conditions that are appropriate to permit the desired characteristics to be feasible. However, the MAC/PHY structure IMT-Advanced systems should support the capabilities to negotiate and deliver all of the QoS characteristics specified for the indicated QoS classes.

When feasible, support shall be provided for preserving QoS when switching between networks associated with other radio access technologies (RAT's).

Other QoS factors include:

Providing MAC and PHY capabilities to conform to an end-to-end QoS architecture e.g., as negotiated by upper layer protocols such as MPLS, DiffServ, IntServ, and RSVP.

Supporting IPv4 and IPv6 enabled QoS resolutions with efficient radio resource management (allocation, maintenance, and release) to satisfy user QoS and policy requirements.

Providing the MAC and PHY layer capabilities to satisfy link-level QoS requirements by resolving system resource demand conflicts between all mobile terminals while still satisfying the negotiated QoS commitments for each individual terminal. A given user may be using several applications with differing QoS requirements at the same time (e.g., web browsing while also participating in a

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1 *There can be multiple service flows associated with a single user, and multiple users associated with a single mobile terminal, e.g., in the case where a mobile terminal is a device providing service for multiple end devices.*

2 *No specific granularity for these parameters is implied by this requirement.*

video conferencing activity with separate audio and video streams of information).

Providing MAC and PHY layer capabilities to distinguish between various service flows from the same mobile terminal or user and provide differentiated QoS delivery to satisfy the QoS requirement for each service flow.

Providing admission control, as well as the ability to map traffic to an admitted flow, and to negotiate the QoS parameters (e.g.; priority, direction, SDU size, mean data rate, latency, jitter) that define various service flows within a user's IP traffic.

Providing the ability to create static service flows provisioned by the network at the time of network entry as specified by authorization policy.

Providing the ability to create, modify and delete QoS service flows dynamically at any point during the MS's authorized attachment to the RAN as initiated by either the BS or the MS.]

From 1292 (Finland): [Most of the quality parameters which are dealt with in other Report are minimum requirements which must be met and are not to be treated in the evaluation process. RTTs will be evaluated on the impact of transmission processing delay on the end-to-end delay, expected average bit error ratio (BER) under the stated test conditions, on their maximum supportable bit rate under specified conditions and their overall ability to minimise circuit disruption during handover. In addition, they will be evaluated on their ability to sustain quality under certain extreme conditions such as system overload, hardware failures, interference, etc.[Recommendation 1225]]

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[The secure communication should be achieved at least the same level as the IMT-2000.]

From 1268 (Korea): [Network security in IMT-Advanced systems are needed to protect the service providers from theft of service, the user's privacy and mitigate against denial of service attacks. IMT-Advanced systems will need to provide provisions for authentication of both base station and mobile terminal, for privacy, and for data integrity. The IMT-Advanced system link layer security should be part of an end-to-end security mechanism that includes higher layers. Encryption across the air interface to protect user data traffic and signaling messages, from unauthorized disclosure should be supported. The IMT-Advanced systems should provide protection from unauthorized disclosure of the device permanent identity to passive attackers.

Security aspects include:

Both the network and mobile terminal having to perform mutual entity authentication and session key agreement protocol. After authentication of the mobile terminal the network may perform authorization before providing service.

Providing a method that will enable message integrity across the air interface to protect user data traffic and signaling messages from unauthorized modification.

Making it possible to operate the MAC and PHY with any of the following combinations of privacy and integrity:

encryption and message integrity;

encryption and no message integrity;

message integrity and no encryption;

no message integrity and no encryption.]

From 1246 (Japan): [It is needed to be described the security methods are employed in the radio interface technology.]

From 1283 (IEEE): [Network security in IMT Advanced systems are needed to protect the service provider from theft of service, to protect the user's privacy, and to mitigate denial of service attacks. IMT Advanced systems will need provisions for authentication of both base station and mobile terminal, for privacy, and for data integrity. The IMT Advanced link layer security shall be part of an end-to-end security mechanism that includes higher layers such as TLS, SSL, IPSec, etc. Protection of user data traffic and signaling messages across the air interface shall be supported. In addition, the IMT Advanced systems shall provide protection from unauthorized disclosure of the device permanent identity to passive attackers.

The Internet Protocol (IP)-based technologies of the IMT-Advanced architecture should enable secure communications with an identity on every packet, or, at a minimum, an identity within the Domain Name Service (DNS) with which to identify the communicating parties with the Host Identity Tag in the DNS resource record. IMT-Advanced systems shall enable independent identification of equipment and user for authentication purposes. The identity of the equipment may be obtained from a certificate, smart card, SIM, USIM, UIM, password, etc. The identity of the user may be obtained from a smart card or an authenticated identity source and translated to a packet identity that is included the network packets (e.g., IPSEC ESP field).

The provision of emergency services shall be supported.

Security aspects include:

Supporting network and mobile terminal mutual entity authentication and session key agreement protocols. After authentication of the mobile terminal the network may perform authorization before providing service.

Allowing for flexible mobile terminal and/or user credentials for authentication to be specified by the Authentication Server.

Providing a method to enable data confidentiality on the air interface for user and control plane traffic.

Providing a method that will enable message integrity and origin authentication across the air interface to protect user data traffic and signaling messages from unauthorized modification.

Implementing Layer 2 mobility to support crossing network boundaries without losing the connection or the security association.

Providing a method to ensure messages are fresh to protect against replay attacks.

Making it possible to operate the MAC and PHY with any of the following combinations of privacy and integrity:

Encryption and message integrity.

Encryption and no message integrity.

Message integrity and no encryption.

No message integrity and no encryption.

Providing protection of both user and control plane data over non-secure backhaul links.

Providing a method to signal the network that the physical security of the cryptographic module has been compromised.]

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which provide the necessary means to achieve:

Protection for the integrity of the system (e.g. system access, stability and availability).

System access via certificate, smart card, SIM, USIM, UIM, password, etc.

Protection and confidentiality of user-generated traffic and user-related data (e.g. location privacy, user identity).

Secure access to, secure provisioning and availability of services provided by the system.

Secure Operations, Administration, Maintenance and Provisioning (OAM&P) of system components.

Example procedures that can be used to achieve the above-stated goals include user/device authentication, integrity protection of control and management messages, enhanced key management, and encryption/integrity protection of user generated and user-related data. The impact of these procedures on the performance of other system procedures, such as handover procedures, shall be minimized.]

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[Proposed radio interface technology need to be considered for applying to

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From 1292 (Finland): [This item is of utmost importance for IMT operators. IMT systems will have to be flexible in terms of deployment, service provision, resource planning and spectrum use.]

From 1259 (China): [Proposed radio interface technology need to be considered for applying to Single-hop mode, Multi-hop mode, Mesh mode and Peer to peer mode

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the design for IMT-ADVANCED system radio interface technology should be considered:

simplifying the network structure, supporting network complanation;

supporting multi-RATs cooperation;

supporting co-exsiting with legacy system;

supporting Relay system;

supporting multi-hop.]

From 1268 (Korea): [Relay stations may be used in IMT-Advanced systems to extend coverage and to increase capacity of the system, reducing operators' initial investment. The relay stations are auto-configurable and deliver packets to/from mobile station/relay station/base station. Depending on the situation, mobile stations may communicate with base station via multi-hop relay nodes or vice versa.]

5.17 Mobility management and RRM

[Centrarized/Distributed RRM, Inter-RAT spectrum sharing/mobility management need to be considered.]

5.17.1 Mobility management

From 1268 (Korea): [The term "mobility management" in the IMT-Advanced systems indicates the "seamless mobility" technology that ensures global mobility of the terminal on the integrated systems composed of WLAN/Mobile WiMAX/cellular/satellite and broadcasting cells. Vertical handover should be adopted as the mobility management method in the IMT-advanced systems, especially between cellular (New Mobile Wireless Access) and nomadic (New Nomadic/Local Area Wireless Access).

The mobility management enables universal access across different systems by supporting the following technologies:

Global roaming using location management.

Efficient target discovery using 'periodic searching', 'neighbour system information broadcasting' and location server, etc.

Optimal target system selection to minimize the operator's CAPEX & OPEX as well as user's charging burden.

Fast target system acquisition in order to guarantee seamless connection continuity by providing exact guidance to terminal on how to make initial synch, what is initial transmit power level, target system information and radio resource configuration, etc.

Handover decision to minimize ping-pong effect and terminal power consumption, etc.

Vertical handover, especially between cellular (New Mobile Wireless Access) and nomadic (New Nomadic/Local Area Wireless Access).]

5.17.2 Radio Resource Management

From 1268 (Korea): [The radio resource management is used to ensure the efficient utilization of the radio resources on the integrated systems composed of heterogeneous system by supporting the following technologies:

Improved end-to-end QoS provisioning during inter-system handover enabling optimal matching of service requirements to radio resources.

Enhanced mobility control, especially to support best target system selection reflecting the service requirements and radio environments, etc.

Efficient load sharing and policy management across different systems.

Dynamic and flexible radio resources management mechanism (e.g. Policy-Based RRM) to accommodate all the relevant aspects including service type, radio environments, QoS level and charging rate, terminal speed, power consumption, charging rate, etc.

In addition, all the relevant elementary technologies including initial system selection, resource allocation, radio admission control, dynamic resource allocation and inter-cell interference control.]

From 1254 (New Zealand): [The RATG concept was used to facilitate spectrum estimation considering the evolutionary development of IMT-2000 ad IMT-Advanced. Thus, both mature systems (pre-IMT and IMT-2000) and futuristic systems (IMT-Advanced) would both be considered. The traffic is distributed among the RATGs according to tables 24a – 24c in Report ITU-R M.2078 reflecting three timeframes, years 2010, 2015, and 2020.

In each Service Category there are up to six Service Environments (SE). Each Service Environment has values specified for the market parameters, including mobility. The market study gives four mobility classes ranging from stationary to super-high. These are mapped into three mobility classes suitable for input to the spectrum estimation methodology by the use of splitting factors (J-factors). This process is described in section 7.1.3 of Report ITU-R M.2078.]

5.17.3 Inter-RAT Mobility[/Interworking]

[IMT-Advanced systems shall support inter-RAT operations.]

From 1268 (Korea): [The interworking functions among heterogeneous systems should be supported to provide seamless connectivity which includes mobility management, interoperability, constant connection and application scalability.(For definition of seamless connectivity, refer to PDNR IMT.SERV).]

From 1246 (Japan): [It is needed to be described the functional block for interworking (such as network architecture model or network reference model) for each application.]

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5.17.4 Reporting, Measurements, and Provisioning Support

From 1283 (IEEE): [IMT-Advanced systems shall enable advanced radio resource management by enabling the collection of reliable statistics over different timescales, including:

System statistics (e.g. dropped call statistics).

User information and statistics (e.g. terminal capabilities, mobility statistics, battery life).

Flow statistics.

Packet statistics.

Etc.

These resource management elements enable the network operator to effectively control, monitor, and tune the performance of the air interface. The air interface shall support measurements in the physical layer of both the base station and the mobile terminal.

The IMT-Advanced systems shall provide a mechanism to enable the provisioning and collection of metrics, so that the network operator can effectively control, monitor, and tune the performance of the air-interface.

For example, the air interface shall support measurements in the physical layer of both the base station and the mobile terminal. These physical layer measurements should include: signal strength, signal quality (C/I), error rates, access delays, session interruption, effective throughput, neighboring cells' signals and provide any other measurement needed for handover support, maintenance and quality of service monitoring. Some of these measurements should be reported to the opposite side of the air link on a periodic basis, and/or upon request.]

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[The maximum transmission power allowed for achieving the performance requirements]

From 1268 (Korea): [Advanced transmitter/receiver technologies for enhancing link budget should be considered. Examples of candidate technologies are as follows:

Multiple antenna transmission/reception

Advanced FEC including Turbo and LDPC codes

Advanced receivers such as iterative receivers

Physical channel structure design for taking into account power efficiency

Cost and battery efficiency of user equipment]

From 1254 (New Zealand): [The maximum transmission power should be the minimum required to meet the required cell area coverage whilst maintaining the required grade of service and quality of service objectives.]

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802.18 Motion to SEC

Agenda: 9.01
Date: 11/16/2007
Time: 3:15 p.m.

Motion by: Lynch **Seconded by: Marks**

Moved:

To approve document:

18-07-0083-00-0000_IMT-Advanced_Reqrmnt_2_d5.doc

as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D. 802.18 approved 8/0/0

Informative: This document is a response to request for further inputs on IMT-Advanced requirements.

Approve: 15 **Do Not Approve:** 0 **Abstain:** 0 **Motion: Approved**

Moved: To approve document: 18-07-0083-00-0000_IMT-Advanced_Reqrmnt_2_d5.doc as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D.

802.18 approved 8/0/0

Informative: This document is a response to request for further inputs on IMT-Advanced requirements.

Moved: Lynch/Marks

Passes: 15/0/0

9.03	**ME**	**Liaison to ITU-R WP5D - IMT-2000 Roadmap**	**-**	**Lynch**	**5**	**03:46 PM**

Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Proposed contribution to the January meeting of WP 5D on IMT-2000 roadmap update for OFDMA TDD WMAN**
Date Submitted	**2007-11-14**
Source(s)	Reza Arefi Acting Chair, IEEE 802.16 ITU-R Liaison Group Intel Corporation Reza.arefi@intel.com
Re:	
Abstract	Proposed Contribution to ITU-R WP 5D on "IMT-2000 ROADMAP UPDATE FOR OFDMA TDD WMAN"
Purpose	With the approval of ITU-R Rec M.1457-7, the new radio interface OFDMA TDD WMAN is now included in IMT-2000. This radio interface is based on IEEE Std 802.16. Per the IMT-2000 procedures, it is customary to provide updates on the roadmap for future work relevant to IMT-2000 technologies. This contribution proposes the content of a new section of the roadmap and is being sent to 802.18 for their review.
Release	
Patent Policy	

INTERNATIONAL TELECOMMUNICATION UNION

RADIOCOMMUNICATION STUDY GROUPS

Document 5D/IEEE-E
X November 2007
English only

Received: XX XXX 2007 **TECHNOLOGY**

Subject: Question ITU-R 229-1/8

Institute of Electrical and Electronics Engineers (IEEE)

IMT-2000 ROADMAP UPDATE FOR OFDMA TDD WMAN

1 Introduction

This contribution was developed by IEEE Project 802, the Local and Metropolitan Area Network Standards Committee ("IEEE 802"), an international standards development committee organized under the IEEE and the IEEE Standards Association ("IEEE-SA").

The content herein was prepared by a group of technical experts in IEEE 802 and industry and was approved for submission by the IEEE 802.16 Working Group on Wireless Metropolitan Area Networks, the IEEE 802.18 Radio Regulatory Technical Advisory Group, and the IEEE 802 Executive Committee, in accordance with the IEEE 802 policies and procedures, and represents the view of IEEE 802.

2 Discussion

In accordance with Circular Letter 8/LCCE/95, please find the attached material for a proposed update to the IMT-2000 Roadmap contained in Attachment 6.6 of the WP 8F Chairman's Report 8F/1322. This material is for consideration during the meeting of WP 5D in January-February 2008.

3 Proposal

It is proposed to update IMT-2000 roadmap document (reflected in Attachment 6.6 of 8F/1322) with information regarding OFDMA TDD WMAN as contained in Annex 1 to this input contribution.

Annex 1

Attachment 6.6

Roadmap for current work relevant to future updates of Recommendation ITU-R M.1457

6 IMT-2000 OFDMA TDD WMAN

The following amendment to IEEE Std 802.16 was approved as an IEEE Standard on 27 September 2007:

* IEEE Std 802.16g: IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems - Amendment 3: Management Plane Procedures and Services

The IEEE 802.16 Working Group is developing the following projects as draft amendments to IEEE Std 802.16:

* P802.16h: Amendment to IEEE Standard for Local and Metropolitan Area Networks – Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Improved Coexistence Mechanisms for License-Exempt Operation

* P802.16i: Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks – Part 16: Air Interface for Broadband Wireless Access Systems – Mobile Management Information Base

* P802.16j: Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks – Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems – Multihop Relay Specification

* P802.16m: Draft IEEE Standard for Local and metropolitan area networks – Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems – Advanced Air Interface

The IEEE 802.16 Working Group is developing the following project as a draft revision of IEEE Std 802.16:

* P802.16 (Revision): Draft IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Broadband Wireless Access Systems

This revision project will incorporate the material from IEEE Std 802.16-2004, IEEE 802.16e-2005, IEEE 802.16f-2005, and IEEE 802.16g-2007. Material from the P802.16i draft may also be included. The project will update the existing material regarding the air interface for both the TDD and FDD cases.

802.18 Motion to SEC

Agenda: 9.03
Date: 11/16/2007
Time: 3:25 p.m.

Motion by: Lynch **Seconded by:** Marks

Moved:

To approve document:

L80216-07_068.doc IMT-2000 Roadmap

as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D. 802.18 approved 8/0/0

Informative: This document is a consequential requirement since 802.16e has been included in ITU-R Recommendation M.1457.

Approve: 13 **Do Not Approve:** 0 **Abstain:** 1 **Motion: Approved**

Moved: To approve document: L80216-07_068.doc IMT-2000 Roadmap as an 802 document, authorizing the Chair of 802.18 to do necessary editorial and formatting changes and, using the document as a "template", create the appropriate input to ITU-R WP5D.

802.18 approved 8/0/0

Informative: This document is a consequential requirement since 802.16e has been included in ITU-R Recommendation M.1457.

Moved: Lynch/Marks

Passes: 13/0/1

9.04	**ME**		**-**			
9.05	**DT**	**Get 802 update and plan**	**-**	**Hawkins**	**10**	**03:47 PM**

Restructuring the get IEEE 802 Program

Update

John Hawkins
Treasurer, IEEE 802 LMSC
jhawkins@nortel.com
(770) 708-7375

Going Forward w/ get802 re-structuring…

- Data gathering is ongoing at staff level and is expected to wrap up early in 2008.
- As a result, we would like to have a revised get802 program agreement to be presented to the EC for consideration at the March 2008 plenary (before if possible).
- A revised agreement would need to be approved in the July plenary for implementation by year-end 2008.

Current View (my subjective version)

- Short term:
  - Improvements to the current program (single sales distribution, sponsorship, etc) have been highlighted to staff. Staff's ability to react is being hampered by IEEE-wide infrastructure issues, but attempts to address the issues is ongoing.
  - Fulfillment problems are clouding the P&L picture, and will complicate the options going forward – it is hard to predict revenue flows, if you can't fulfill orders
  - Should we recommend that standards and drafts be free until fulfillment is fixed?

Current View (my subjective version, continued)

- Long term:
  - Analysis has yielded a clearer picture of certain revenue flows:
    - 802 share of subscription-based sales is better understood now.
    - RAC revenue stream is better understood now. But: suggestions that 802 somehow receive “credit” for RAC fees are not without complications – it’s not an automatic fix.
  - IMHO… we still have a revenue shortfall
    - especially in light of a desire to move toward free standards/drafts
  - How do we address the expense side of the equation?

9.06	**II**	**Report on ISO matters**	**-**	**Thompson**	**5**	**04:10 PM**

Geoff reported that there was a ballot on the ISO master document TR-8802-1 with negative comments from China and France. At the TAG meeting last night, a document was examined that described a proposed agreement between IEEE and ISO. This document is being developed by the international director of the Standards Board and many folks in the current process that have been completely unaware of this work.

The TAG will provide comments to this document before the BoG approves it.

Carl asked for the following straw polls:

How many WG chairs see value in an agreement that allows ISO to reference our standards as peer standards referenced directly?
5 WG chairs indicated they see value here.

How many WG chairs see value in having their standards fast tracked at ISO and having an ISO number on them?
0 WG chairs indicated they see value here.

9.07	**ME**		**-**			
9.08	**ME**		**-**			
9.09	**ME**		**-**			
9.10	**ME**		**-**			
			-			
10.00		**LMSC Internal Business**	**-**			
10.01	**II**	**TREASURER'S REPORT**	**-**	**Hawkins**	**5**	**04:18 PM**

DRAFT

IEEE Project 802
Estimated Statement of Operations
November 2007 Plenary Session
Atlanta, GA
As of November 16, 2007

Meeting Income	*Estimate*	*Budget*	*Variance*
Registrations	**1,450**	1,200	250
Registration income	**623,500**	519,600	103,900
Cancellation refunds	**(18,705)**	(9,353)	
Deadbeat collections		0	0
Bank interest	**300**	60	240
Other income (commissions & comps)	**40,000**	40,000	0
TOTAL Meeting Income	**645,095**	550,307	94,788

Meeting Expenses	*Estimate*	*Budget*	*Variance*
Audio Visual Rentals	**19,498**	20,000	502
Audit	**0**	0	0
Bank Charges	**500**	500	0
Copying	**3,926**	4,000	74
Credit Card Discount	**17,458**	14,549	(2,909)
Equipment Expenses	**15,000**	15,000	0
Get IEEE 802 Contribution	**125,000**	125,000	0
Insurance	**0**	0	0
Meeting Administration	**85,000**	75,064	(9,936)
Misc Expenses	**3,000**	2,000	(1,000)
Network	**61,680**	60,000	(1,680)
Phone & Electrical	**250**	2,500	2,250
Refreshments	**155,500**	120,500	(35,000)
Shipping	**9,022**	6,500	(2,522)
Social	**56,555**	45,000	(11,555)
Supplies	**1,500**	1,500	0
Other Discounts		0	0
TOTAL Meeting Expense	**553,889**	492,113	(61,776)
Other Income/Expense			
NET Meeting Income/Expense	**91,206**	58,194	33,012
Analysis			
Refreshments per registration	**107**	100	(7)
Social per registration	**39**	38	(2)
Meeting Administration per registra	**59**	63	4
Networking per registration	**43**	50	7
Get IEEE 802 Contribution per regis	**86**	**104**	18
Surplus/Deficit per registration	**63**	48	14

Previous operating reserve	**803,569**
NET Meeting Income/Expense	**91,206**
Projected operating reserve	**894,775**

It was pointed out that there were always many leftover trays of cookies each day at this venue.

Motion

- The 802 Executive Committee agrees to an extension of the current meeting planner contract with Face to Face Events to cover the March 2008 plenary session.

- Mover: John Hawkins
- Second:Carl Stevenson

Moved: The 802 Executive Committee agrees to an extension of the current meeting planner contract with Face to Face Events to cover the March 2008 plenary session.
Moved: Hawkins/Stevenson

Passes: 14/0/0

10.02	**MI**	**nNA Plenary venue survey results and final venue selection**	**-**	**Rigsbee**	**10**	**04:25 PM**

IEEE 802 Plenary Session - November 11-16, 2007 Friday, November 16, 2007 15:25:36 EST

IEEE 802 Plenary Session - November 11-16, 2007
Survey Results

Survey Participation

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
Responses	71	109	114	42	136	5	7	2	11	19	19	17	552
Attendees	129	235	244	167	414	6	10	2	26	44	41	53	1371

Question #1: Please select your personal preference for the March 2009 Plenary venue:

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
Rome	16	28	48	18	45	4	3	1	2	5	8	7	185
Vancouver	55	80	65	23	90	1	4	1	9	13	11	10	362
Abstain	0	1	1	1	1	0	0	0	0	1	0	0	5

Question #2: Should Hawaii be considered an acceptable non-North-American Plenary venue?

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
Yes	56	84	57	26	99	4	6	1	9	13	15	11	381
No	15	25	57	14	36	1	1	1	2	5	4	6	167
Abstain	0	0	0	2	1	0	0	0	0	1	0	0	4

Question #3: Can we accept venues with theater-only seating for non-North-American Plenary venues (i.e. setups with chairs-only, no tables)?

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
Yes	22	21	40	6	27	1	3	0	1	4	0	6	131
No	48	87	74	35	106	4	4	2	10	15	19	11	415
Abstain	1	1	0	1	3	0	0	0	0	0	0	0	6

Question #4: How much subdivision of the group is acceptable? Select your maximum for acceptable:

A1: None – all guest rooms and meeting spaces must be at only one venue.
A2: Low - All meeting space must be together but 2 or more hotels is OK.
A3: Med - Meeting spaces and hotel rooms split across 2 nearby venues only.
A4: High - Meeting space and hotel rooms may be split across several venues

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
A1	3	8	5	4	19	0	1	0	0	0	2	3	45
A2	18	29	25	14	47	1	2	0	4	7	7	5	159
A3	35	48	52	17	59	1	3	2	7	10	6	7	247
A4	15	24	32	7	11	2	1	0	0	2	4	2	100
Abstain	0	0	0	0	0	1	0	0	0	0	0	0	1

Question #5: Should there be a hard price ceiling for non-North-American plenary venue costs?

A1: No – we always want to consider each venue on its merits
A2: Yes – Room Rates must be ≤ $500 US/night & Registration Fee ≤ $1200.US
A3: Yes – Room Rates must be ≤ $350 US/night & Registration Fee ≤ $800.US
A4: Yes – Room Rates must be ≤ $250 US/night & Registration Fee ≤ $600.US

	802.1	802.3	802.11	802.15	802.16	802.17	802.18	802.19	802.20	802.21	802.22	802.xx	Total
A1	19	27	49	14	41	2	4	0	5	3	3	6	173
A2	4	5	9	2	11	2	0	0	1	1	1	1	37
A3	15	29	26	5	26	0	3	2	2	4	5	4	121
A4	33	48	30	21	58	0	0	0	3	11	10	6	220
Abstain	0	0	0	0	0	1	0	0	0	0	0	0	1

Buzz will make available a more detailed spreadsheet of the survey results in a couple weeks, that will also provide information about the home location of the participants.

Moved: to approve the selection of Vancouver, BC as the venue for the March 2009 Plenary Session.
Moved: Rigsbee/Hawkins

Moved: to amend the motion by striking "Vancouver, BC" and replace it with "Rome, Italy".
Moved: O'Hara/Lemon

On the amendment: Passes: 9/5/2

On the call of the question: 8/6/0 fails

On the main motion: 8/6/1: Passes.

10.03	**MI**	**Future meeting site schedule and site selection**	**-**	**Rigsbee**	**15**	**04:50 PM**

Buzz will be sending this out as an email ballot.

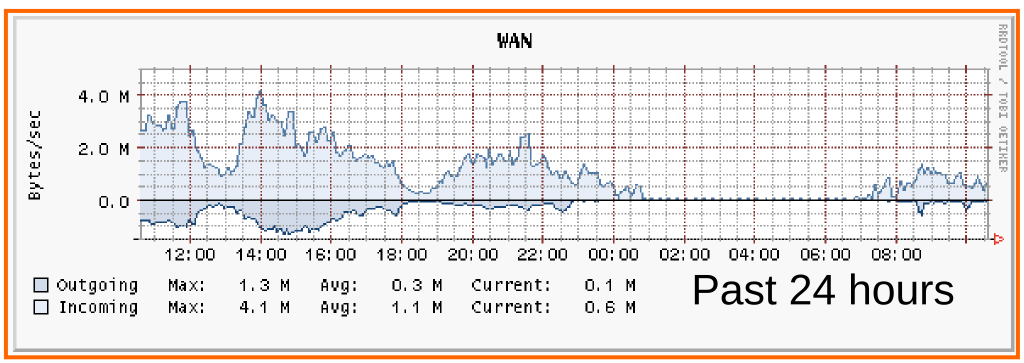
10.04	**MI**	**Network services report, evolution, and investment plan**	**-**	**Rigsbee**	**10**	**04:55 PM**

Network Services Report

- Problems on Monday
  - 80% Packet Loss
    - Replaced IDF Switch
    - Worked around faulty wiring
  - 4 Hour Power Outage
- Network running fine after Monday

Network Services Report

- VeriLAN deployed 79 a/b/g Access Points
- 1000+ Simultaneous Associations
- Traffic
  - ~.5 TB (357 GB Down / 112 GB Up)
  - 33 Mbps peak bandwidth
- Problems Resolved on Monday
  - 80% Packet Loss
    - Replaced IDF Switch
    - Worked around faulty wiring
  - 4 Hour Power Outage
- Network running robustly after Monday



PHASE I

Catalyst 3560 8-port PoE Switches
Model: #WS-C3560-8PC-S
Quantity: 20
List price: $1,695.00 each
Mountain States Networking Price: $850.95 each

Justification: The performance of the 8-port Allied Telesyn switches currently in our inventory has steadily declined. They have also been a source of complaints from the membership due to the din of the loud fans when these switches are deployed in meeting rooms. We have purchased and tested two of these fanless Cisco switches and are extremely pleased with their features, functions and performance. These Cisco switches demonstrate none of the severe latency problems we are experiencing with the Allied Telesyn switches.

This is considered a mission critical upgrade request.

Dell PowerEdge 860 1U Rack Servers
Configured as shown below
Quantity: 6
Dell Price each: $1,216,00 each

- 925, 2x2MB Cache, 3.0GHz Pentium D, 800MHz Front Side Bus for PowerEdge 860
- 1GB DDR2, 667MHz, 1x1GB Dual Ranked DIMMs
- Riser with 2 Slots: 1 PCI Exprx8 slot and 1 PCI Express x4 slot
- 160GB 7.2K RPM Serial ATA 3Gbps 3.5-in Cabled Hard Drive
- Onboard SATA Controller - No RAID
- On-Board Dual Gigabit Network Adapter, No TOE
- 24X IDE CD-RW/DVD ROM Drive for PowerEdge Servers, All OS
- Bezel
- 160GB 7.2K RPM Serial ATA 3Gbps 3.5-in Cabled Hard Drive
- Onboard SATA,2 Drive connected to Onboard SATA Controller No RAID
- Rack Chassis w/Versarail RoundHole-Universal for 3rd-party racks, PE1750
- Power Cord, NEMA 5-15P to C13 wall plug, 6 feet (2 meter)
- Dell Hardware Warranty Plus Onsite Service Initial Year
- Basic Enterprise Support: Business Hours (5X10) Next Business Day Onsite
- Dell Hardware Warranty, Extended Year
- Basic Enterprise Support: Business Hours (5X10) Next Business Day Onsite Service
- S and P Drop-in-Box Marcom for BSD Systems Boxes

Justification: We need three servers hosted by VeriLAN in Portland, which will mirror three servers in the IEEE Rack.

- **Server #1:** Newton is the network server that provides critical network functions, i.e. DNS, backup DHCP, SMTP mail relay, Web services, Print Services and Radius authentication.

- **Server #2:** Griffin is the network server that provides critical network and document server functions, i.e. DNS, Primary DHCP, Network Monitoring Tools, Remote Document Synchronization and Document files.
- **Server #3:** Murphy will be the application server reserved for attendance applications.

The servers currently deployed in the IEEE rack are exhibiting problems associated with age and the wear and tear caused by commercial shipping around the planet. For example, Newton does not reliably power up and requires being removed from the rack, opened up, cables reseated and re-racked before it will boot up.

We need to provide 24/7 online access to the IEEE IMAT Attendance servers for Walter and Tom who are working on mission critical attendance, affiliation tracking and document management support applications. The server rack spends a great deal of time in transit, especially for international meetings. This downtime is causing significant problems in terms of access and also forces us to install new programs, perform system mods and upgrades on our production systems during meetings (a very dangerous and bad practice). These new systems would facilitate Tom and Walter's development work and also provide us with a development platform for staging upgrades, modifications and new installs between meetings.

The purchase of six servers will provide the robustness and redundancy required for mission critical production and network functions.

This is considered a mission critical upgrade request.

Total Cost = $24,315.00 + tax & shipping.

PHASE II

Catalyst 3560E-48PD-SF: 48 10/100/1000 ports w/ PoE
Model: #WS-C3560E-48PD-SF
Quantity: 2
List price: $13,495.00 each
Mountain States Networking Price: $8,366.90 each

SMARTNET 8X5XNBD
CON-SNT-3560E4PS
Maintenance Contract
List price: $1,080.00
Mountain States Networking Price: $1,004.40

Catalyst 3560E-24PD-S: 24 10/100/1000 ports w/ PoE
Model: #WS-C3560E-24PD-S
Quantity: 10
List price: $6,795.00 each
Mountain States Networking Price: $4,212.90 each

SMARTNET 8X5XNBD
CON-SNT-3560E2PS
Maintenance Contract
List price: $544.00
Mountain States Networking Price: $505.95

Justification: These switches will provide us with the means to replace local IDF and MDF switching infrastructure, ensuring a robust network experience and reliability not currently realized with our existing network deployment model. We have experience delivering robust networks for IETF and ICANN where we are required to replace network infrastructure to optimize network performance, uptime and reliability.

This upgrade is strongly recommended. Total Cost = $60,373.15 + tax & shipping.

PHASE III

Cisco 3845 Integrated Services Router with 2 Gigabit Ethernet, 1SFP, 4 NME, 4 HWIC, 2 AIM, Cisco IOS IP Base software, AC power, and PoE.
CISCO 3845 w/AC PWR, 2GE, 1SFP, 4NME, 4HWIC, IP Base, 64F/256D
S384IPBK9-12416
Cisco 3845 IP BASE
MEM3800-256U1024D
256 to 1024MB DDR DRAM factory upgrade for Cisco 3800
MEM3800-64U128CF
64 to 128 MB CF Factory Upgrade for Cisco 3800 Series
NM-1T3/E3
One port T3/E3 network module
HWIC-1GE-SFP
GigE High Speed WIC with One SFP Slot
GLC-SX-MM
GE SFP, LC connector SX transceiver
PWR-3845-AC
Cisco 3845 AC power supply
CAB-AC
Power Cord, 110V
ROUTER-SDM
Device manager for routers

Model: CISCO #3845
Quantity: 2
List price: $30,900.00 each
Mountain States Networking Price: $19,467.00 each

SMARTNET 8X5XNBD 3845 w/AC PWR, 2GE, 1S
CON-SNT-3845
Maintenance Contract
List price: $1,509.00
Mountain States Networking Price: $1,403.37

Justification: These edge routers are the final component required for total control of the network architecture deployed for IEEE meetings. VeriLAN will deploy, manage, and support all aspects of the physical network. We have experience delivering robust networks for IETF and ICANN where we are required to replace all network infrastructure to optimize network performance, uptime and reliability.

This upgrade is strongly recommended. Total Cost = $40,337.37 + tax & shipping.

Network Equipment Requisition Proposal

- Phase I: **“Fix old/broken equipment”**
  - (20) 8-port PoE Switches
  - (6) Network Service/Application Servers
    - Replace aging and unreliable equipment.
    - Provide remote backup & development environment
    - **Total Cost: $24,315.00 + tax & shipping**

- 1/2 Phase II: “**Minimize Outages**”
  - (1) 48-port Managed PoE Switch
  - (5) 24-port Managed PoE Switches
    - Resources required to triage infrastructure related problems
    - **Total Cost: $30,187.00 + tax & shipping**

- Net Request for ≤ $60K to acquire

IEEE-802 EC Motion #10.04

Moved: To approve expenditure of up to $60K for upgrade of Network infrastructure to address critical problems experienced 7/2007 & 11/2007.

Mover: **_Rigsbee__________**

2nder: **_Hawkins__________**

Y: ___ N: ___ A: ___

Moved: To approve expenditure of up to $60K for upgrade of Network infrastructure to address critical problems experienced 7/2007 & 11/2007.
Moved: Rigsbee/Hawkins

There was much discussion of the lack of notice, as well as the specification of equipment from specific vendors.

Fails: 5/8/2

10.05	**MI**	**Approval of minutes of the EC executive session**	**-**	**Nikolich**	**5**	**05:09 PM**

Executive Session minutes

- 12NOV07 executive session output:
  - Moved: To reconfirm the makeup of the non-conflicted EC, consisting of: Paul Nikolich, John Hawkins, Bob O'Hara, Buzz Rigsbee, Tony Jeffree, Bob Heile, John Lemon, Mike Lynch, Arnie Greenspan, Geoff Thompson (non-voting)
  - Mover: Greenspan, Seconder: Rigsbee; 3/0/1 Passes
    (Only the non-conflicted EC members not newly alleged to be conflicted are allowed to vote. There are five non-conflicted EC members, including the chairman, that are able to participate in this vote.)
- Move to approve the executive session minutes distributed by O'Hara 8:30am et 14NOV07
- Moved: O'Hara Second: Thaler

Moved: to approve the executive session minutes distributed by O’Hara 8:30am et 14NOV07
Moved: O’Hara/Thaler

Paul clarified that the entire EC can participate in the vote on this issue.

Passes: 11/0/3

10.06	**MI**	**Recommendation to SASB to dissolve NC-EC**	**-**	**Jeffree**	**5**	**05: 12 PM**

Moved: EC recommends to the SASB that the NC-EC be dissolved once the 802.20 standard is approved by the SASB.
Moved: Jeffree/O’Hara

Straw poll of entire executive committee: 14/0/2 (Geoff Thompson also participating)

Passes: 8/0/0 (non-conflicted members only)

10.07	**ME**	**Approval or 802.11 interpretation responses**	**-**	**Kerry**	**10**	**05:15 PM**

Agenda#: 10.07
Date: 11/16/07
Time:

IEEE 802 LMSC RESOLUTION

Motion By: KERRY Seconded By: O'Hara

Approve the following IEEE 802.11 WG interpretation request response documents: 06/0778r0, 06/0789r0, 06/0963r0, 06/1437r0, 06/1438r0, 07/2248r1.

TG: Moved D Stephenson Second: K. Williams Results: Unanimous

WG: Moved by *Al Petrick* on behalf of the Task Group mb

802.11 WG Results

- Moved by: Al Petrick Result: *(59-0-14)* Approved

Approve: Do Not Approve: Abstain:

Moved: Approve the following IEEE 802.11 WG interpretation request response documents: 06/0778r0, 06/0789r0, 06/0963r0, 06/1437r0, 06/1438r0, 07/2248r1.
Moved: Kerry/O'Hara

Passes: 14/0/0

10.08	**ME**	**Approval of 802.3 interpretation responses**	**-**	**Grow**	**10**	**05:18 PM**

Interpretations retroactive approval

- Interpretations 1-03/06, 2-03/06, 1-07/06, 2-07/06, 3-07/06 and 2-11/06 were approved and have been published for some time.
- Motion:

  The EC approves IEEE 802.3 Interpretations previously approved (by the WG) and published since the November 2005 additional requirement of EC approval.

  M: Bob Grow

  S: Tony Jeffree

Moved: The EC approves IEEE 802.3 Interpretations previously approved (by the WG) and published since the November 2005 additional requirement of EC approval.
Moved: Grow/Jeffree

Passes: 14/0/0

10.09	**ME**	**Approval of 802.1AB interpretation response**	**-**	**Jeffree**	**5**	**05:23 PM**

MOTION

- 802.1 resolves to approve the following response to the outstanding 802.1AB interpretation request and to request EC approval to forward it to the IEEE as an approved response:

  "The requester is correct in his assertion that bit 0 of the ifMauAutoNegCapAdvertisedBits data type would properly be encoded in bit 8 (the most significant bit) of the first octet of the LLDP PMD auto-negotiation advertised capability field, and that bits 0 through 7 of the bitstring are encoded in bits 8 through 1 of the capability field, respectively, with bits 8 through 15 of the bitstring being encoded in bits 8 through 1 of the second octet of the field.

  The above describes the bit and octet ordering in the LLDPDU that is passed across the MAC service boundary between LLDP and the underlying MAC service. Naturally, the representation of the data in this field in the MAC data frames, and the subsequent physical encoding, will follow whatever rules apply to the MAC/PHY technology that supports the operation of the protocol."

- Proposed: congdon Seconded: finn
- For 22 Against 0 Abstain 25
- EC proposed: Jeffree second: Grow

- Please read the following and respond with whether this is a true assessment of the standard or is this incorrect. Thank you.

IEEE Std 802.1AB-2005
G.2.2 PMD auto-negotiation advertised capability field the PMD auto-negotiation advertised capability field shall contain an integer value as defined by the ifMauAutoNegCapAdvertisedBits object in IETF RFC 3636

RFC 3636 says:

```
ifMauAutoNegCapAdvertisedBits OBJECT-TYPE
       SYNTAX      BITS {
         bOther(0),        -- other or unknown
         b10baseT(1),      -- 10BASE-T  half duplex mode
         b10baseTFD(2),    -- 10BASE-T  full duplex mode
         b100baseT4(3),    -- 100BASE-T4
         b100baseTX(4),    -- 100BASE-TX half duplex mode
         b100baseTXFD(5),  -- 100BASE-TX full duplex mode
         b100baseT2(6),    -- 100BASE-T2 half duplex mode
         b100baseT2FD(7),  -- 100BASE-T2 full duplex mode
         bFdxPause(8),     -- PAUSE for full-duplex links
         bFdxAPause(9),    -- Asymmetric PAUSE for full-duplex
                      --     links
         bFdxSPause(10),   -- Symmetric PAUSE for full-duplex
                      --     links
         bFdxBPause(11),   -- Asymmetric and Symmetric PAUSE for
                      --     full-duplex links
         b1000baseX(12),   -- 1000BASE-X, -LX, -SX, -CX half
                      --     duplex mode
         b1000baseXFD(13), -- 1000BASE-X, -LX, -SX, -CX full
                      --     duplex mode
         b1000baseT(14),   -- 1000BASE-T half duplex mode
         b1000baseTFD(15)  -- 1000BASE-T full duplex mode
       }
```

RFC 1906 says:

(3) When encoding an object whose syntax is described using the BITS construct, the value is encoded as an OCTET STRING, in which all the named bits in (the definition of) the bitstring, commencing with the first bit and proceeding to the last bit, are placed in bits 8 to 1 of the first octet, followed by bits 8 to 1 of each subsequent octet in turn, followed by as many bits as are needed of the final subsequent octet, commencing with bit 8. Remaining bits, if any, of the final octet are set to zero on generation and ignored on receipt.

ITU-T Recommendation X.690 says:

6.2 For the purposes of this Recommendation | International Standard only, the bits of an octet are numbered from 8 to 1, where bit 8 is the "most significant bit", and bit 1 is the "least significant bit".

From this, I conclude that bOther is the MSB of the first octet, b10baseT is the next octet down, and so on. That would make a field value of 0x0136 as being:

b100baseT2FD, bfdxSPause, bfdxBPause, b1000baseXFD, b1000baseT

I.e., at least as I read the standards in question, Wireshark is dissecting the packet correctly, and if that's not what the folks at XXXX intended, they misread the standard.

Moved: to approve the response to the 802.1AB interpretation request.
Moved: Jeffree/Grow

Passes: 14/0/1

10.10	**ME**	**Approval or 802.1 existing interpretation responses**	**-**	**Jeffree**	**10**	**05:25 PM**

Motion

- EC retroactively approves all 802.1 interpretations posted since November 2005, as documented here:
- http://www.ieee802.org/1/pages/interpretations.html
- Proposed: Jeffree second: Grow

Moved: EC retroactively approves all 802.1 interpretations posted since November 2005, as documented here: http://www.ieee802.org/1/pages/interpretations.html.
Moved: Jeffree/Grow

Passes: 14/0/0

10.11			-			
10.12			-			
10.13			-			
10.14			-			
10.15			-			
11.00		**Information Items**	-			
11.01	**II**	**P&P Update**	-	**Sherman**	**5**	**05:27 PM**

Mat will send his slides to the EC reflector for discussion.

11.02	**II**		-			
11.03	**II**	**Emergency Services CFI report**	-	**Paine**	**5**	**05:28 PM**

IEEE 802 Emergency Services (ES) Call for Interest (CFI) Report to EC

Date: 2007-11-16

Stephen McCann

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Abstract

The purpose of the Call For Interest was to determine interest in the formation of an IEEE 802 Study Group about Emergency Service (ES) provision

IEEE 802 ES Background

- Maturing IEEE 802 technologies carry VoIP traffic and it's only a matter of time before regulations insist they support emergency services. (FCC & EU commission proposals)
- IEEE 802 technologies by themselves cannot ensure that all factors are compatible for Emergency Service sessions to actually take place.
- Therefore, it's essential to distinguish between the minimum level of support provided by IEEE 802 emergency services, and support of emergency services at higher layers.
- By "IEEE 802 Emergency Services" we refer to the direct support in IEEE 802 of such services, independently of what solutions are adopted at higher protocol layers.
- Under all circumstances, changes to IEEE 802 should be kept to the minimum necessary.

Do What?

- **To initiate a Study Group**
  - WGSG: Technology specific, 802.1, 802.21?
  - ECSG: Harmonized approach to ES in all 802 groups
- **This study will take into account regulatory issues and the architecture requirements of NENA i2 & i3, IETF ECRIT and 3GPP/3GPP2 architecture requirements on radio access technologies.**
- **Attempt to pre-empt upcoming regulatory issues**
- **Determine what aspects of ES would benefit from a harmonized approach across all IEEE 802.**
- **Prepare a PAR for ES provision enhancements, if study shows there is a need.**

ES Study Group

- **Future work**
  - Study group will consider
    - existing work in this area
    - industry input
    - network and service provider input
    - what do regulators require
- **Defined Goals and Timeframe**
  - To determine what work, if any, is necessary to enable an 802 harmonized approach to emergency service provision
- **Timeframe**
  - 2 plenary cycles, to investigate PAR definition

Relevant WG/TG Activity

- 1
- 11 TGk
- 11 TGp
- 11 TGu
- 11 TGv
- 21

Other Requirements?

- **802.16/20/22**
  - Location Determination
- **NG911**
  - Support for non-voice ES connections (e.g. text messaging, email, video)

Call for Interest Polls (115 in room)

- **Support formation of a study group**
  - Yes/No/Abstain 41/4/26
- **Formation of an EC study group**
  - Yes/No/Abstain 23/13/28

- **Formation of an WG study group**
  - 802.1 Yes/No/Abstain 11/15.25
  - 802.21 Yes/No/Abstain 17/16/27
  - Other, than .1,.21 Yes/No/Abstain 17/14/30

- **How many people intend to participate?**
  - 24

- **How many companies intend to participate?**
  - 16

Summary

- **Study group**
  - ECSG/WGSG?
- **Scope**
  - Provision of Emergency Service Capability throughout 802
- **Purpose**
  - To determine what work, if any, is necessary to enable an 802 harmonized approach to emergency service provision
- **Timeframe**
  - 2 plenary cycles, to investigate PAR definition

IEEE 802.1

- LLDP-MED currently supports automatic physical location discovery suitable for wired 802 networks

- 802.1AB-Rev work in process could allow location discovery to be leveraged across all 802 technologies

IEEE 802.11k

- **Reliable Location Determination**
- **Capability information includes**
  - Format (Civic, Geo – shapes not points, Location by Reference…etc)
  - Encoding and Resolution
  - Capable of providing
    - self-location
    - remote-location

IEEE 802.11p

- **Supports Intelligent Transportation Systems (ITS) applications. This includes data exchange between high-speed vehicles and between the vehicles and the roadside infrastructure in the licensed ITS band of 5.9 GHz.**
- **ES from vehicles to authority (eCALL blackbox)**
- **Authority – authority vehicle comms**

IEEE 802.11u

- **New QoS features**
  - expedited bandwidth request
  - QoS mapping
- **Generic Advertising Service (GAS)**
- **Emergency services recommendations (informative)**
  - Use case #1: open network
  - Use case #2: public credentials

IEEE 802.11v

- **Reliable Location Determination**
- **Capability information includes**
  - Format (Civic, Geo – shapes not points, Location by Reference…etc)
  - Encoding and Resolution
  - Capable of providing
    - self-location
    - remote-location

IEEE 802.21

- **Information Server**
  - logical place to support a comprehensive list of all ES support options.
- **Mobility support**
  - assisting handovers during an ES session
- **Location**
  - Service providers need flexibility on how location services are offered in their network
  - Provides help in determining or provide the location to the clients at various layers
    - Link layer specific ones (Layer 2)
    - Link layer agnostic ones (Layer 3+)

11.04	**II**	**Update on IMT-Advanced**	**-**	**Lynch**	**5**	**05:38 PM**

Update on IEEE 802.18 IMT Advanced

- RR-TAG met Wednesday and Thursday on IMT-Advanced
  - Good participation from .11, .16 and .20
  - Completed liaisons to ITU-R WP5D on IMT-Advanced Requirements and IMT-Advanced Evaluation
- Presented to EC on 16 November
  - Approved by EC
  - Next step – IEEE SA liaison to submit to WP5D

Timeline - Technology

- September wireless interim
  - Propose to use same method as used for requirements and evaluation submissions
    - Conference calls only if needed
    - Submissions to 802.18 editor who will use WP8F outline
  - Work to begin March 2008 or on request for inputs from WP5D
    - Develop "terms of reference" for the work
- November 2008 IEEE 802 Plenary
  - Based on current WP5D timeline initial contribution completed and approved
- December 2008 submitted to ITU-R

Mike congratulated the wireless working groups for their cooperation during the week.

11.05 DT 802 meeting logistics - Lemon 10 05:39 PM

John pointed out a number of problems, including the lack of time available to conduct business as an executive committee due to commitments to the working groups and TAGs. He believes that there is insufficient time to complete the work that needs to be done each session, for both the working groups and the executive committee. It is getting much more unwieldy to find venues that can house our plenary sessions, particularly outside North America.

John suggests that the way to solve these problems is to break up the working groups, i.e., make each working groups's meetings their own, so that they do not need to meet at the some locations for the plenary and that the executive committee meet separately. He asks that people begin thinking about this as a solution to the problems.

Some mentioned support for the idea. Others mentioned the difficulty of spending additional money for a separate meeting of the executive committee and the potential for the EC losing visibility of from the 802 membership. Several mentioned that there is significant benefit to the joint meetings, all in one place.

Other ideas:

Separate meetings in nearby (walking distance) hotels

Increase the time for working group meetings and move the EC meeting to the Sunday before and the Saturday after the WG/TAG sessions.

Determine some continuous process that allows the EC to complete more work outside the plenary sessions.

Have a separate EC meeting, once each year.

The time for adjournment having arrived, the meeting was adjourned at 6:00pm. Any material from agenda items following the adjournment are to be sent to the email reflector.

11.06	**II**	**802.11/15 now in concentration banking**	**-**	**Heile**	**1**
11.07	**II**	**802.3 Liaison to ITU-T on OTN Mapping**	**-**	**Grow**	**5**
11.08	**II**	**802.1 Liaison to ITU-T SG4**	**-**	**Jeffree**	**5**
11.09	**II**	**802.1 Liaison to DSL Forum**	**-**	**Jeffree**	**2**
11.10	**II**	**802.1 Liaison to OIF**	**-**	**Jeffree**	**2**
11.11	**II**	**802.1 Liaison to MEF**	**-**	**Jeffree**	**2**
11.12			**-**		
11.13			**-**		
11.14			**-**		
11.15			**-**		
11.16			**-**		
11.17			**-**		
11.18			**-**		

11.19		**-**		
11.20		**-**		
11.21		**-**		
	ADJOURN SEC MEETING	**-**	**Nikolich**	**06:00 PM**
	ME - Motion, External	**MI - Motion, Internal**		
	DT- Discussion Topic	**II - Information Item**		

The meeting was adjourned at 6:00pm.

Respectfully submitted,

Bob O'Hara
Recording Secretary, 802 LMSC