Radiocommunication Study Groups

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Source: Attachment 6.11, Chapter 6 of Doc. 5D/97
(Source: Doc. 5D/TEMP/28)

Institute of Electrical and Electronics Engineers (IEEE)

PROPOSED CHANGESS TO SECTIONS 5 AND 6 OF THE ITU-R/ IMTADVANCED/IMT.TECH DOCUMENT AS PRESENTED IN DOCUMENT 5D/TEMP/28

1 Source information

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 802.11™ Working Group on Wireless Local Area Networks, 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 Comments

This contribution proposes changes in Sections 5 and 6 of the ITU-R/IMT-Advanced/IMT.TECH document, as presented in Attachment 6.11, Chapter 6 of Document 5D/97 (source: Document 5D/ TEMP/28).

It is proposed to delete Section 6 and to incorporate the attached changes in Section 5.

The proposed amendments include those provided previously by IEEE for Section 5 in Doc. 5D/7; which has been implemented by doing an electronic comparison of Document 5D/7 and Attachment 6.11, Chapter 6 of Doc. 5D/97 (source: Doc. 5D/TEMP/28) from Section 5.1 to the end of Section 5. As a result the presentation of Section 5, after accepting the tracked changes, will present the intended result.

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Attachment

Proposed amendments to Section 5_

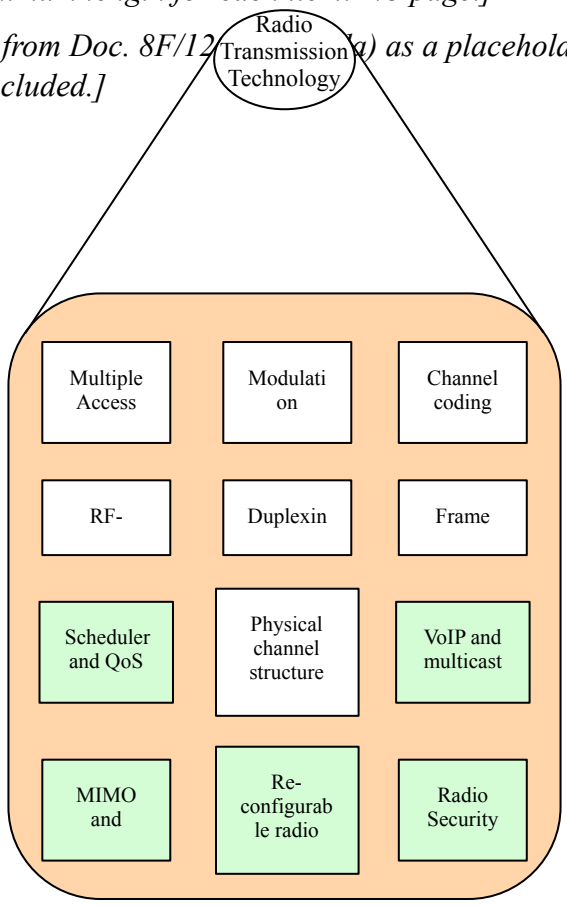
Source: Att. 6.11, Chapter 6 of Doc. 5D/97

5 Description of Technological Aspects~~items required to describe candidate air interface~~

~~Proponents must describe their proposal for a radio interface for IMT to a level of detail that would permit independent third-party assessment of compliance with t~~The minimum performance requirements are~~s~~ specified in ~~s~~Section 4 ~~and other relevant Recommendations (see section nn). The information in the remainder of this section describes a minimum set of information that must be provided. Proponents are encouraged to provide additional information if such information may assist in the assessment of compliance.~~ This section provides guidance on the type of information that needs to be provided in a response to the description template and as such this section does not include any system requirements.

[Editor's note: Target maximum length for each item: 1/3 page.]

[Included diagram below from Doc. 8F/12(Rev.1) as a placeholder, to be updated when subsections in 2.1 are concluded.]



5.1 Multiple ~~a~~Access ~~m~~Methods

The choice of the multiple access technology has major impact on the design of the radio interface~~. For~~ ; for instance, OFDMA, CDMA, SDMA, ~~and single~~CSMA, also Single-carrier/Multi-carrier operation, as well as enhancement and combination of those technologies.

The following are some ~~key~~ factors that ~~could~~ should be ~~considered~~ described:

~~– new multiple access technologies could support compatibility and co-existing with legacy IMT system;~~

- ~~supporting~~Supporting flexible reuse and allocation of resource~~;~~.
- ~~supporting~~Supporting high-efficiency usage of spectrum ~~(such~~. (Such as~~:~~ reducing and avoiding interference, reducing overhead, etc.)~~;~~.
- ~~adequate~~Adequate for broadband transmission and packet switching~~;~~.
- ~~high~~High granularity/flexibility for provision of wide class of services.

5.2 Modulation ~~s~~Scheme

~~The choice of the baseband modulation scheme depends mainly on radio environment and~~ The modulation schemes used should be described.

~~[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~~

5.3 Error ~~e~~Control ~~e~~Coding ~~s~~Scheme

The ~~choice of the~~ error control coding ~~affects quality of service over the air link, throughput, terminal complexity, coverage and also delay performance of the radio interface technology. The following factors can be considered~~schemes used should be described. Examples may include:

- ~~advanced~~ Advanced forward error correction coding ~~scheme~~schemes such as Turbo and LDPC ~~could be considered;~~.

~~– AMC (adaptive modulation and coding) scheme should provide various MCS (modulation and coding scheme) levels;~~

- ~~hybrid~~Adaptive Modulation and Coding (AMC) schemes with various Modulation and Coding Scheme (MCS) levels.
- Hybrid ARQ ~~could also be considered for both efficient use of spectrum and link reliability/ adaptation;~~.

~~– if~~

If more than one ~~schemes are~~ scheme is employed, ~~it is also needed to be described~~ the adaptation method for each scheme (e.g. error control coding A is adapted to B modulation scheme, etc.) should be described.

5.4 Physical ~~e~~Channel ~~s~~Structure and ~~m~~Multiplexing

~~A physical channel is a manifestation of physical resources (time, frequency, code, and space) and corresponding physical layer processing that are used to transport data, control, or signalling to or~~

~~from a single user or a multitude of users. Physical channels represent actual PHY processing on the data and control signal bearers.~~

~~It is needed to be described the~~The physical channel structure and multiplexing method employed in the radio interface technology should be described.

5.5 Frame ~~s~~Structure

The frame structure ~~of radio frame depends mainly on the multiple access technology (e.g. OFDMA, TDMA, CDMA) and the duplexing scheme (e.g. FDD, TDD). Commonality of baseband processing for various duplexing schemes is desired by maintaining the same or similar frame structure whenever possible. That is, data fields identifying physical and logical channels, as well as the frame length~~used should be ~~maintained when possible or design of frame structure, some elements could be considered below~~described.

~~1)~~

5.6 Spectrum ~~coexistence: Two coexistence scenarios should be considered intra-~~Capabilities

~~– Scenario I: IMT-Advanced system co-exists with a co-located legacy IMT system in adjacent carriers (partly re-farming legacy IMT~~

5.6.1 Duplex Methods (Paired and unpaired operation)

The duplex method used should be described. The IMT-Advanced systems may support unpaired and/or paired frequency allocations.

5.6.3 Spectrum Sharing

Any spectrum~~).~~

~~– Scenario II: IMT-Advanced systems co-exists with each other.~~

~~2) Commonality between FDD and TDD modes is desired. However, difference due to FDD/ TDD inherent features is allowed.~~

~~3) The design of frame structure to support relay station could be considered~~

~~4) In order to maximize 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.~~

~~**5.6 Spectrum capabilities**~~

~~**5.6.1 Duplex methods (Paired and unpaired operation)**~~

~~The proponents should indicate if their proposal supports paired and/or unpaired operation, and in which test environment, and in which frequency bands.~~

~~The IMT-Advanced systems may support both unpaired and paired frequency allocations, with fixed duplexing frequency separations when operating in FDD mode. System performance in the desired bandwidths should be optimized for both TDD and FDD independently while retaining as much commonality as possible.~~

~~**5.6.2 Flexible spectrum use**~~

~~The potential flexible spectrum usage mechanisms to enable FSU~~ sharing techniques within ~~the same Radio Access Technology between operators may be described.~~

~~5.6.3 Spectrum sharing~~

~~Dynamic spectrum management inside~~ a specific radio interface technology or between different radio interface technologies ~~should~~may be described.

5.6.4 Channel ~~bandwidth scalability~~Bandwidth Scalability

[Editor's note: WG spectrum may expect input on requirements in this area from IMT.TECH.]

~~The proponents [shall/should] describe how the capability of the proposed RIT may evolve to support higher bandwidths (e.g. up to 100 MHz) in order to maximise the absolute performance towards the targets expressed in M.1645, where those bandwidths are not currently supported in the RIT.~~

The following items may be taken into consideration when describing the channel bandwidth utilization of the candidate radio interface technologies:~~—~~

~~– MINIMUM~~

- MINIMUM AND MAXIMUM OPERATING BANDWIDTHS OF THE SYSTEM~~;~~.
- ~~– FLEXIBILITY~~FLEXIBILITY AND SCALABILITY OF SPECTRUM USAGE~~;~~.

~~– MULTIPLE~~MULTIPLE CONTIGUOUS OR NON-CONTIGUOUS BAND AGGREGATION~~;~~ ~~–~~

- ~~–~~FREQUENCY ~~PLAN~~ PLANS INCLUDING ~~BOTH~~ PAIRED AND /OR UNPAIRED CHANNEL PLANS WITH MULTIPLE BANDWIDTHS FOR ALLOWING CO-DEPLOYMENT WITH EXISTING CELLULAR SYSTEMS~~;~~.

~~– TDD OR FDD LICENSED SPECTRUM ALLOCATION TO THE MOBILE SERVICE;~~

~~– SUPPORT OF WIDER CHANNELS AS THEY BECOME AVAILABLE IN THE FUTURE.~~

~~5.6.5 Supported bands~~

~~THE SUPPORTED FREQUENCY BANDS SHOULD BE DESCRIBED.~~

5.7 Support of Advanced Antenna Technologies

Any advanced antenna ~~capabilities Antenna~~ technologies, such as ~~multiple-input multiple-output~~MIMO, beamforming, antenna~~, adaptive array antenna~~ diversity, etc. ~~affect spectrum efficiency and also complexity of the terminal.~~, supported by the system should be described.

~~It is needed to be described what kind of antenna technology is employed and effectiveness of the technology.~~

~~5.8 Link~~

5.8 Link Adaptation and Power Control

Any link adaptation ~~and power control Link adaptation~~ (e.g., adaptive modulation and coding, power control, etc.) ~~may be~~ used by the ~~IMT-Advanced~~ systems. should be described.

~~The number of transmit power levels as well as the associated control messaging could be optimized for cost effectiveness and performance.~~

5.9 RF eChannel pParameters

Any applicable RF channel parameters ~~include parameters such as~~including (e.g., bandwidth, allocation, channel spacing (FDD), guard time (TDD~~) and~~), FFT size (OFDMA~~)~~), or chip rate (CDMA~~) are the key of characterizing radio interface technologies.~~)) should be described.

~~**5.10 [Scheduling algorithm]**~~

~~Scheduling is a key attribute to achieve the QoS requirement and increase the resource usage efficiency in various the radio interface technologies. following characteristics such as distributed, QoS aware, channel-dependent and channel adaptation, etc. may be taken into consideration.~~

~~[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**~~

~~Radio Interface Architecture and protocol stack including control channel structure, Logical channel and transport channel are needed to be described.~~

~~**5.12 Positioning**~~

~~Not required for evaluation.~~

~~From 1292 (Finland): [Proponents should describe how the proposed technology supports positioning, and how positioning accuracy in different environments is achieved while preserving user privacy.~~

~~**5.13 Support of multicast and broadcast**~~

~~Not required~~

5.10 Radio Interface Architecture and Protocol Structure

The radio interface architecture and protocol structure including Layer 1 and Layer 2 as well as interface to Layer 3 should be described.

5.11 Positioning

If the proposed technology supports positioning, it should describe what the achieved positioning accuracy in different environments is.

5.12 Support of Multicast and Broadcast

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 should be described.

5.13 QoS Support and Management

The following should 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).

5.14 Security Aspects

Any security methods that are employed in the radio interface technology should be described.

5.14.1 Privacy and Authentication Aspects

Any privacy and authentication functions supported should be described.

5.15 Network Topology

The radio access network topology should be described; e.g., support for ~~evaluation.~~

~~The proponents should describe~~any of the ~~supported broadcasting solutions.~~

~~[~~

~~– It is desirable that IMT-Advanced systems support multimedia broadcast and multicast Services with higher spectrum efficiency than IMT-2000 systems.~~

~~– Multimedia broadcast and multicast services could be supported at both a dedicated carrier and mixed carrier where multimedia broadcast and multicast services and unicast services exist simultaneously.~~

~~– It is further desirable that IMT-Advanced systems support optimized switching between broadcast and unicast services, including the case when broadcast and unicast services are deployed on different frequencies.~~

~~]~~

~~**5.14 QoS support and management**~~

~~The~~ following ~~considerations may be taken into account to support QoS in IMT-Advanced systems:~~:

~~– supporting QoS classes in order to meet the end-user QoS requirements for the various applications;~~

~~– QoS class associated with each service flow could be negotiable;~~

~~– QoS class could be defined by operators;~~

~~– QoS attributes includes, but not limited to:~~

- ~~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);~~

~~– when feasible, QoS should be supported when switching between networks;~~

~~– users may utilize several applications/service with differing QoS requirements at the same time.~~

~~**5.15 Security aspects**~~

~~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, the following considerations may be taken into account:~~

~~– secure communication at least the same level as the IMT-2000;~~

~~– enabling independent identification of equipment and user for authentication;~~

~~– both the network and mobile terminal having to perform mutual entity authentication and session key agreement protocol;~~

~~– enabling data confidentiality on the air interface for user and control plane traffic;~~

~~– enabling message integrity and origin authentication across the air interface to protect user data traffic and signalling messages from unauthorized modification;~~

~~– security methods that are employed in the radio interface technology should be described;~~

~~– allowing for flexible mobile terminal and/or user credentials for authentication to be specified by the authentication server;~~

~~– ensuring messages are fresh to protect against replay attacks;~~

~~– providing protection of both user and control plane data over non-secure backhaul links.~~

~~**5.15.1 Privacy and authentication aspects**~~

~~IMT-Advanced systems include privacy and authentication functions which provide the necessary means to mainly achieve:~~

~~• system access via certificate, smart card, SIM, USIM, UIM, password, etc.~~

~~• secure Operations, Administration, Maintenance and Provisioning (OAM&P) of system components.~~

~~**5.16 Network topology**~~

~~The following considerations may be taken into account for network topology:~~

• ~~single~~Single-hop mode, ~~multi~~Multi-hop mode, ~~mesh~~Mesh mode and ~~peer~~Peer to peer mode ~~could be considered as the future network topology;~~.

~~– how~~

• How the proposed system scales to different types of operators and deployment cases ~~should be described;~~.

~~– deployment scalability, service provision, resource planning and spectrum use;~~

~~– simple and flat network architecture;~~

~~– supporting multi-RATs operation;~~

~~– supporting relay system;~~

• ~~– cognitive ability~~Supporting multi-RATs cooperation.

5.16 Interference Mitigation within Radio Air-interface

Support of ~~the network could be considered;~~

~~reconfigurable radio networks could be considered.~~

~~**5.17 Mobility management and RRM**~~

~~Centralized/Distributed RRM, Inter-RAT spectrum sharing/mobility management need to be considered.~~

~~**5.17.1 Mobility management**~~

~~The following considerations may be made in the context of mobility management:~~

- ~~seamless mobility in the integrated systems composed of WLAN / Mobile WiMAX/ cellular /satellite and broadcasting cells;~~
- ~~vertical handover is desirable in the IMT-advanced systems, especially between cellular (New Mobile Wireless Access) and nomadic (New Nomadic/Local Area Wireless Access) systems;~~
- ~~seamless mobility across different radio access systems is desirable.~~

~~**5.17.2 Radio resource management**~~

~~The radio resource management is used to ensure efficient utilization of radio resources in the IMT-Advanced systems, the following considerations should be taken into account:~~

- ~~efficient load balancing and policy management;~~
- ~~dynamic and flexible radio resources management mechanism to accommodate all relevant aspects including service type, radio environments, QoS class, terminal speed, power consumption, charging rate, etc.;~~
- ~~the service environments and mobility classes defined in Report ITU-R M.2078.~~

~~**5.17.3 Inter-RAT interworking**~~

~~The interworking functions used to enable inter-RAT operations should not introduce unreasonable load in the air interface and unnecessary power consumption in user terminal. The interworking functions should consider user terminals with varying capabilities.~~

~~The support of interworking functions between heterogeneous radio access systems is desirable to provide seamless connectivity which includes mobility management, interoperability, constant connection and application scalability.~~

~~**5.17.4 Reporting, measurements, and provisioning support**~~

~~The measurement attributes should be classified into two categories, one is for handover support and the other is for quality of service monitoring.~~

~~IMT-Advanced systems could 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.~~

~~IMT-Advanced systems could support measurements in the physical layer of both base station and mobile terminal. The physical layer measurements to be provided for handover support may include:~~

- ~~signal strength;~~
- ~~signal quality (*C/I*);~~
- ~~neighbouring cells' signals.~~

~~The physical layer measurements to be provided for the quality of service monitoring may include:~~

- ~~error rates;~~
- ~~access delays;~~
- ~~session interruption;~~
- ~~effective throughput.~~

~~Some of these measurements may be reported to the opposite side of the air link on a periodic basis, and/or upon request, and/or event-triggered basis.~~

~~5.17.5 Connection/Session management~~

~~The support of multiple protocol states with fast and dynamic transitions among them is desirable.~~

~~It will provide efficient signalling schemes for allocating and de-allocating resources, which may include logical in-band and/or out-of-band signalling, with respect to resources allocated for enduser data.~~

~~Power saving features can be used to improve battery life for idle mobile terminals.~~

~~5.18 Interference mitigation within radio interface~~

~~The support of~~any advanced interference mitigation ~~schemes~~ and enhanced flexible frequency re-use schemes ~~are recommended.~~

~~The interference mitigation schemes~~ should be described ~~in the proponents' proposals~~.

5.1~~9~~7 Synchronization

~~It is necessary for user terminals to acquire time and frequency synchronization with a serving cell. The technology proponents are required to describe the~~ any synchronization mechanisms used ~~in their proposals~~ including synchronization between a user terminal and a site, synchronization between ~~inter-site and synchronization between a site and core networks~~sites should be described.

~~5.20 Transmission~~

5.18 Power Efficiency

The techniques used for power–

~~The maximum transmission power is the minimum power required to meet the performance targets over coverage area while maintaining the required quality of service.~~

~~5.21 Layer 1 and Layer 2 overhead estimation~~

~~IMT-Advanced systems shall describe and account for all layer 1 (PHY) and layer 2 (MAC) overhead and provide an accurate estimate that includes static and dynamic overhead are need to be described.~~

~~5.22 Technology complexity~~

~~The IMT-Advanced systems should minimize complexity of the architecture and protocols and avoid excessive system complexity. It~~ efficiency as applicable to base station and the user terminal should ~~enable interoperability of access networks, support low cost devices and minimize total cost of ownership.~~be described.