Cl **00** *SC* *P* *L* # 148

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in Jan 2009*

STBC modes should be mandatory, as they improve range and robustness

SuggestedRemedy

Remove TxSTBC from the HT Capabilities element, and change to "Reserved" the value 0 of RxSTBC in the HT Capabilities element. Change the statement regarding STBC in 20.1.1 (page 245 line 37) from being optional to mandatory.

Response *Response Status* **U**

DISAGREE (GEN: 2009-01-22 17:36:10Z)
While the STBC modes can provide PER improvements, this benefit is not significant for all implementations (eg. Devices with more antennas than spatial streams, MCS with BPSK, etc.) and therefore, the choice of accepting the complexity associated with this option should not be required of all implementations.

Cl **00** *SC* *P* *L* # 2005

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in May 2009*

STBC modes should be mandatory, as they improve range and robustness

SuggestedRemedy

Remove TxSTBC from the HT Capabilities element, and change to "Reserved" the value 0 of RxSTBC in the HT Capabilities element. Change the statement regarding STBC in 20.1.1 (page 245 line 37) from being optional to mandatory.

Response *Response Status* **U**

DISAGREE (PHY: 2009-05-13 15:48:38Z) - As in document 11-09/465r12.

Cl **00** *SC* *P* *L* # 2016

Santhoff, John Pulse-LINK

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

My Disapprove vote remains unchanged. The comment resolution committee failed to adequately address coexistence issues concerning channel bonding in the 2.4 GHz band. Detect and Avoid particularly when used with channel bonding has not been proven to reliably be a solution for co-existence with other spectrum users in the 2.4 GHz band. Other spectrum users such as Bluetooth, Zigbee, cordless phones and even other 802.11 spectrum users will be adversely effected if channel bonding is allowed in the 2.4 GHz band. My concern have not been fully addressed.

SuggestedRemedy

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **00** *SC* *P* *L* # 2004

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in April 2009*

The TGn amendment is incompatible with the scope of the document it is amending. IEEE Std 802.11-2007 1.1 states "to define one medium access control (MAC) and several physical layer (PHY) specification". The use of the HT Capabilities information element to advertise the support of various MAC features violates this principle.

SuggestedRemedy

move the indications of support for MAC features from the HT Capabilities element to the Extended Capabilities element. Specifically, move the indication of support of Block Ack, A-MSDU, RD, and PCO.

Response *Response Status* **U**

DISAGREE (MAC: 2009-04-29 23:34:40Z) (this resolution reads differently from the resolution to CID 2003) There is nothing in the stated scope of the standard that disallows a single MAC from having multiple optional features, and so, from the first version of the 802.11 standard, the MAC has always had optional features. It is convenient and appropriate to create specific terminology related to such optional features in order to create a more readable standard. Such terminology can also apply to sets of optional or mandatory features. There is nothing in the scope that prevents the coupling of multiple optional features, which is what has been done in this instance. An example of coupling of multiple features in the 802.11 standard is: Block Acknowledgement, which can only be employed by STAs that also support the QOS feature. The case cited in the comment is similar, in that some optional features of the amendment are only allowed to exist in an implementation when coupled with another optional feature. This practice is not new and it is not out of scope. In addition, the comment is procedurally disallowed because it refers to text that has not changed between draft 8.0 and draft 9.0.

Cl **00** *SC* *P* *L* # 2003

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in April 2009*

The TGn amendment is incompatible with the scope of the document it is amending. IEEE Std 802.11-2007 1.1 states "...to define one medium access control (MAC) and several physical layer (PHY) specification...". The distinction between "STA" and "HT STA", as applied to MAC functions, violates this scope statement.

SuggestedRemedy

change all occurrences of "HT STA" and "HT AP" in the document to STA and AP, respectively.

Response *Response Status* **U**

DISAGREE (MAC: 2009-04-29 23:32:18Z) There is nothing in the stated scope of the standard that disallows a single MAC from having multiple optional features, and so, from the first version of the 802.11 standard, the MAC has always had optional features. It is convenient and appropriate to create specific terminology related to such optional features in order to create a more readable standard. Such terminology can also apply to sets of optional or mandatory features. An example of the previous use of such terminology is the term PC which refers to the Point Coordinator that performs the point coordination function, which is an optional feature of the first version of the 802.11 standard. There are instances of AP and PC used throughout the standard, and this is perfectly acceptable, as the terms exist solely to note when an optional feature is being employed. Also see HC, and QOS STA, which are later additions to the standard. The uses of HT STA and HT AP are similar to all of these examples, in that they too, simply provide a convenient way to express requirements for STAs that implement an optional set of features. In addition, the comment is procedurally disallowed because it refers to text that has not changed between draft 8.0 and draft 9.0.

Cl **00** *SC* *P* *L* # 27

Santhoff, John Pulse-LINK

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Co-existence with legacy wireless technologies should be required

SuggestedRemedy

See attached document

(Ed: the commenter attached 29486600024-JSanthoff-11n-sponsor-ballot-comments.xls, which is reproduced in document 11-09-0023-00-000n-TGn-Sponsor-Ballot-Attachments.doc)

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **00** *SC* *P* *L* # 2002

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in May 2009*

TGn draft includes essential patented material covered by US patent # 5,487,069. The Patent holder has no LOA on file with IEEE for TGn.

SuggestedRemedy

Investigate alternative designs that do not utilize the encumbered intellectual property. Change the TGn draft to the best alternative found.

Response *Response Status* **U**

UNRESOLVABLE (GEN: 2009-05-13 17:03:15Z) - Posted PatCom guidance related to this topic states:
You must not discuss subjects like the pricing for use of a patent, how a patent should be licensed, validity or interpretation of a patent claim, or any terms or conditions of use. These are not appropriate topics for discussion in a standards developing committee. Further information can be found in "What You Need to Know About IEEE Standards and the Law."

802.11 WG, TGn and the TGn CRC believe they have faithfully followed the procedures provided by PatCom concerning the soliciting of potentially essential patents and associated LOAs as specified in: http://standards.ieee.org/board/pat/pat-slideset.pptGn CRC has asked the WG11 chair to pass this comment on to PatCom for further review and advice.

TGn CRC and WG11 will continue to follow IEEE IP procedures and continue to request LOAs.

Cl **00** *SC* *P* *L* # 2001

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in May 2009*

Include option for protocol-assisted switched diversity to enable single-stream handheld devices (e.g. phones) to use multiple antennas and concatenated spread-coded bursts to achieve reduced packet loss using simple receiver and transmitter archtectures. Handheld devices are more likely to experience fades during packets because of local movement. These devices will also be more challenged on power use and cost, mandating simpler processing architectures.

SuggestedRemedy

See November 2007 contribution regarding PASD. Include implementation language and capability bit to allow multiple bursts of same MSDU to be sent, but received using different antennas with intermediate storage of soft symbols between bursts separated by RIFs using the same space-time coding as 2x2 MIMO implementation, but with diversity switch action between 1st and 2nd burst. The bursts received using two switched antennas emulate reception of a single burst with reception at two simultaneous antennas. The PASD option is to be applied only to a single-stream mobile device, not to the AP (except that the AP provides additional packet redundancy to such devices). This allows the mobile device to use its two antennas more effectively than would be the case with simple switched diversity. The increased overhead that results from redundant transmission is compensated for by the reduction in repeat overhead to achieve transmission success, which uses more radio resource than PASD. The technique also reduces dropouts (timeouts) and latency for VoIP clients, which are inherently challenged by their streaming media focus, operation while users are moving, battery life limitations, and poorer antenna performance.
Note: The PASD option may be invoked only when a device declares that it has the capability and that its PER has become unacceptable.

Response *Response Status* **U**

DISAGREE (PHY: 2009-05-13 15:50:27Z) - As in document 11-09/465r12.

Cl **00** *SC* *P* *L* # 57

Bagby, David Calypso Ventures, Inc.

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

I vote disapprove due to unresolved intellectual property issues with the Tgn draft. Further information including history of the issue, impacts and requested changes necessary to alter this disapprove vote are contained in the word document attached

SuggestedRemedy

See attached document for 5 possible actions, any one of which would resolve this issue.

(Ed: The voter attached document 29640500024-BagbyTGnDraft7SponsorDallotDisapproveComment.doc, which is reproduced in 11-09-0023-00-000n-TGn-Sponsor-Ballot-Attachments.doc)

Response *Response Status* **U**

UNRESOLVABLE (GEN: 2009-02-18 17:14:18Z)
802.11 WG, TGn and the TGn CRC believe they have faithfully followed the procedures provided by PatCom concerning the soliciting of potentially essential patents and associated LOAs as specified in: http://standards.ieee.org/board/pat/pat-slideset.ppt

TGn CRC has asked the WG11 chair to pass this comment on to PatCom for further review and advice. While awaiting further advice, TGn CRC and WG11 will continue to follow IEEE IP procedures.

It has also been noted that the status of LOAs believed relevant to P802.11n will need to be reviewed prior to a request for Standards Board approval and publication as there are potentially two paragraphs that could be selected from the IEEE-SA Ops Manual (sub-clause "6.3.1 Public Notice") for inclusion in the P802.11n front matter (currently page iv of the draft). One paragraph applies when LOAs are not received, and one for when LOAs are received.

Cl **00** *SC* *P* *L* # 146

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in Jan 2009*

The TGn amendment is incompatible with the scope of the document it is amending. IEEE Std 802.11-2007 1.1 states "to define one medium access control (MAC) and several physical layer (PHY) specification". The use of the HT Capabilities information element to advertise the support of various MAC features violates this principle.

SuggestedRemedy

move the indications of support for MAC features from the HT Capabilities element to the Extended Capabilities element. Specifically, move the indication of support of Block Ack, A-MSDU, RD, and PCO.

Response *Response Status* **U**

DISAGREE (GEN: 2009-02-04 15:19:42Z)
802.11 has from the onset created a PHY aware MAC that supports multiple PHYs. Having a MAC be PHY aware has provided a means to enhance the features that 802.11 has included in its current standard. Being able to advertise which MAC specific features are being supported enhances the feature sets that can be supported. Features that have been developed for specific PHYs have been indicated in variable and elements that are specific to the PHY being created. It would need to be verified if a legacy PHY can make use of a new MAC feature. There may be a compatibly issue of legacy devices not being aware of some new features. No change to the HT-extended Capability field is warranted.

Cl **00** *SC* *P* *L* # 144

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

TGn draft includes essential patented material covered by US patent # 5,487,069. The Patent holder has no LOA on file with IEEE for TGn.

SuggestedRemedy

Investigate alternative designs that do not utilize the encumbered intellectual property. Change the TGn draft to the best alternative found.

Response *Response Status* **U**

UNRESOLVABLE (GEN: 2009-02-18 17:14:18Z)
802.11 WG, TGn and the TGn CRC believe they have faithfully followed the procedures provided by PatCom concerning the soliciting of potentially essential patents and associated LOAs as specified in: http://standards.ieee.org/board/pat/pat-slideset.ppt

TGn CRC has asked the WG11 chair to pass this comment on to PatCom for further review and advice. While awaiting further advice, TGn CRC and WG11 will continue to follow IEEE IP procedures.

It has also been noted that the status of LOAs believed relevant to P802.11n will need to be reviewed prior to a request for Standards Board approval and publication as there are potentially two paragraphs that could be selected from the IEEE-SA Ops Manual (sub-clause "6.3.1 Public Notice") for inclusion in the P802.11n front matter (currently page iv of the draft). One paragraph applies when LOAs are not received, and one for when LOAs are received.

Cl **00** *SC* *P* *L* # 143

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

Include option for protocol-assisted switched diversity to enable single-stream handheld devices (e.g. phones) to use multiple antennas and concatenated spread-coded bursts to achieve reduced packet loss using simple receiver and transmitter archtectures. Handheld devices are more likely to experience fades during packets because of local movement. These devices will also be more challenged on power use and cost, mandating simpler processing architectures.

SuggestedRemedy

See November 2007 contribution regarding PASD. Include implementation language and capability bit to allow multiple bursts of same MSDU to be sent, but received using different antennas with intermediate storage of soft symbols between bursts separated by RIFs using the same space-time coding as 2x2 MIMO implementation, but with diversity switch action between 1st and 2nd burst. The bursts received using two switched antennas emulate reception of a single burst with reception at two simultaneous antennas.

Response *Response Status* **U**

Disagree. Explanation: TGn specification mandates support of 2 spatial streams at an AP and 1 spatial stream at a STA. As a result, all TGn specification compliant APs must have at least two antennas for the reception/transmission. This means that STBC or Beamforming may be used during the transmission and MRC-like processing may be used during the reception. Therefore, it is not necessary to mandate alternate diversity techniques as proposed in the comment that require buffering at the receiver, an additional antenna and a switch. In addition, the proposed technique may yield overhead since the same data (burst) has to be transmitted twice in the case a NACK is received. In the presentation 07/2796r0 no comparison was shown to alternate techniques such as STBC and Beamforming, and also overhead due to retransmissions was not accounted for in the results. The STBC and Beamforming techniques do not require an additional antenna, an antenna switch and burst buffering at STAs.

Cl **00** *SC* *P* *L* # 145

Worstell, Harry AT&T Labs Research

Comment Type **TR** *Comment Status* **R** *Approved in Jan 2009*

The TGn amendment is incompatible with the scope of the document it is amending. IEEE Std 802.11-2007 1.1 states "...to define one medium access control (MAC) and several physical layer (PHY) specification...". The distinction between "STA" and "HT STA", as applied to MAC functions, violates this scope statement.

SuggestedRemedy

change all occurrences of "HT STA" and "HT AP" in the document to STA and AP, respectively.

Response *Response Status* **U**

DISAGREE (GEN: 2009-02-04 15:19:42Z)
802.11 has from the onset created a PHY aware MAC that supports multiple PHYs. Having a MAC be PHY aware has provided a means to enhance the features that 802.11 has included in its current standard. Being able to advertise which MAC specific features are being supported enhances the feature sets that can be supported. Features that have been developed for specific PHYs have been indicated in variable and elements that are specific to the PHY being created. It would need to be verified if a legacy PHY can make use of a new MAC feature. There may be a compatibly issue of legacy devices not being aware of some new features. No change to the HT-extended Capability field is warranted.

Cl **00** *SC* *P* **227** *L* # 1063

Walter, Udo — Atmel

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Interfering with other 802.15-based systems is a huge issue. Already existing and world-wide used systems like Bluetooth, ZigBee, 6LowPAN, Wireless HART, and RF4CE will have problems to be operated in the same frequency band. The interoperabilty requirement for 802-based systems gets violated.

SuggestedRemedy

Introduce mechanisms to 11n and make them mandatory identifying other operating 802.15-based systems or do not allow to use the 40 MHz bandwidth in the 2.4 GHz ISM band.

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **00** *SC* **0** *P* **0** *L* **0** # 4006

Allen, James — Arkados

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

Had problems with filing the worksheet. I emailed it Adrian, due to lack of time. Cheers.

SuggestedRemedy

Response *Response Status* **W**

UNRESOLVABLE (EDITOR: 2009-06-23 07:09:50Z) - This comment neither indicates a problem to be resolved nor contains a proposed change.

Note from Editor: The commenter was referring to a spreadsheet I had sent him soliciting his response to resolution of his comments from previous rounds of balloting. He did not send me any additional comments.

Cl **07** *SC* **7.1.4.2** *P* **25** *L* **33** # 223

Epstein, Joseph — Meru Networks

Comment Type **TR** *Comment Status* **A** *Approved Minor Technical*

The BlockAck may also be sent in response to an A-MPDU and not require a non-zero Duration

SuggestedRemedy

Change "not in response to a BlockAckReq frame" to "not in response to a BlockAckReq frame or an A-MPDU"

Response *Response Status* **W**

AGREE IN PRINCIPLE (EDITOR: 2009-01-14 12:45:26Z)
Insert the phrase " or an implicit Block Ack request" after " not sent in response to a BlockAckReq".

This item is supposed to relate to BlockAck frames that are sent by the TXOP holder (i.e. not in response to any other frame). The commenter is correct in that we also need to exclude BlockAcks sent in response to the implicit Block Ack request mechanism (i.e. QoS Data frames with ack-policy set to Implict BAR). However, it is insufficient to say "or an A-MPDU" because BlockAcks are sent not in response to an A-MPDU, but in reponse to an A-MPDU that contains the implicit BAR. It is not necessary to mention "an A-MPDU containing" here, as otherwise the same phrase would be occurring throughout much of the MAC.

Cl **07** *SC* **7.1.4.6** *P* **27** *L* **16** # 90

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Jan 2009*

"Within a frame ("Frame1") (excluding a CTS2 transmission, as defined in 9.2.5.5a) sent by a QoS STA that is not a TXOP holder in a PPDU that contains.....". It seems to me that only duration of a frame being sent by a non-TXOP holder is defined here. Where is the definition of the duration field of a TXOP holder?

SuggestedRemedy

Add the missing rule.

Response *Response Status* **W**

AGREE (MAC: 2009-01-22 16:21:36Z) - TGn editor to add the following as a new paragraph within 7.1.4.6, restructuring the individual cases as a list: "Within a frame ("Frame1") (excluding a CTS2 transmission, as defined in 9.2.5.5a) sent by a QoS STA that is a TXOP holder, the Duration/ID field is set according to the rules described in 7.1.4.2. b) for multiple protection if Frame1 is not a QoS+CF-Poll frame and the TXOP holder is not operating under HCCA or PSMP, 7.1.4.3 if Frame1 is a QoS+CF-Poll frame and the TXOP holder is not operating under HCCA or PSMP, 7.1.4.4 if the TXOP holder is operating under HCCA, and 7.1.4.5. if the TXOP holder is operating under PSMP."

Cl **07** *SC* **7.3.1.14** *P* **45** *L* **41** # 91

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Jan 2009*

"Each buffer is capable of holding an MSDU of the maximum size (when the A-MSDU Supported field is set to 0) or an A-MSDU of the maximum size supported by the STA (when the A-MSDU Supported field is set to 1)." When A-MSDU is supported, a STA may also send a MSDU if the length of the MSDU is too large. so the sentence should be changed to "Each buffer is capable of holding an MSDU of the maximum size when the A-MSDU Supported field is set to 0. Each buffer is capable of holding an MSDU or an A-MSDU of the maximum size supported by the STA when the A-MSDU Supported field is set to 1."

SuggestedRemedy

As proposed.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-01-22 16:24:00Z) - TGn editor to replace the cited text with: "When the A-MSDU Supported field is set to 0 as indicated by the STA, each buffer is capable of holding a number of octets equal to the maximum size of an MSDU. When the A-MSDU Supported field is set to 1 as indicated by the STA, each buffer is capable of holding a number of octets equal to the maximum size of an A-MSDU that is supported by the STA."

Cl **07** *SC* **7.4a.3** *P* **95** *L* **7** # 1071

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 224: I sympathize with the desire t osave power. However, the procedure specified in the resolution as the sole justification for the draft's text is one that is not specified in the draft itself. No evidence has been given that this non-draft mechanism presented in the resolution will work as stated: for example, the mechanism must not require disabling recpetion if the first MPDU has an invalid checksum, etc. Therefore, the resolution is insufficent.

SuggestedRemedy

Change "All the MPDUs within an A-MPDU are addressed to the same receiver address" to "All the MPDUs within an A-MPDU are addressed either to the same unicast receiver address or to any number of possibly different group receiver addresses"

Response *Response Status* **W**

DISAGREE (MAC: 2009-03-12 00:44:49Z) There is no requirement to provide explicit justification for any portion of protocol in the draft. The commenter indicates that the resolution to a previous sponsor ballot comment contains a mechanism that the commenter views as insufficient - the behavior described in the resolution is a behavior that lies outside of the scope of the standard, and therefore does not represent an item for resolution by the CRC. However, in direct response to that portion of the comment, in wireless networking, error events will occur, and while this may subtract from the overall performance of a given protocol, such events are to be expected, and despite such events, effective throughputs and power savings are achievable. The commenter has not provided evidence to show that the suggested change provides a greater value to the expected user base than is provided by the existing solution.

Cl **07** *SC* **7.4a.3** *P* **95** *L* **7** # 224

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Jan 2009*

Given that different multicast destinations are not necessary to be transmitted separately, it is not useful to constrain A-MPDUs to the same receiver address in all cases.

SuggestedRemedy

Change "All the MPDUs within an A-MPDU are addressed to the same receiver address" to "All the MPDUs within an A-MPDU are addressed either to the same unicast receiver address or to any number of possibly different group receiver addresses"

Response *Response Status* **W**

DISAGREE (MAC: 2009-01-22 16:28:44Z) - while some efficiency may be gained by allowing multiple MCAST addresses to appear in a single A-MPDU, this enhanced efficiency is gained at the expense of a power consumption increase that would arise for power-save STAs that would otherwise have been able to identify the first RA within the A-MPDU as either being a match to a local MCAST filter or not a match to that filter, allowing them to turn off their receiver chain for the remaining duration of the A-MPDU in the case of a non-match.

Cl **09** *SC* **9** *P* **107** *L* **1** # 2019

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **R** *Approved in April 2009*

The 11n MAC also includes beamforming, antenna selection etc. which is not shown in Figure 9. Change Figure 9 to include them.

SuggestedRemedy

As proposed.

Response *Response Status* **W**

DISAGREE (MAC: 2009-04-29 23:48:34Z) - The purpose of figure 9-1 is to show the different access methods of the MAC. Beamforming, antenna selection, etc. are not access methods and therefore do not need to appear in the diagram. The introductory sentence to the diagram begins with "The MAC architecture can be described as shown in Figure 9-1" - the implication is that the architecture can also be described in other ways, each of which depends on which aspects of the MAC are being emphasized in the diagram. In this case, the purpose of the diagram is to show access methods.

Cl **09** *SC* **9.10.9** *P* **144** *L* **61** # 226

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

Pursuing the sort of protections suggested by Protected Block Ack is valuable, but the particular implementation fails to address what it attempted to solve: the problem of an attacker moving a window far away from the sender's state by using just one frame. Specifically, a transmitter can force a receiver's WinEnd forward just by transmitting a frame with an SN greater than WinEnd. A BAR is not required. The notion of moving the window forward on an overrun is an important failsafe, and probably should not be removed for a variety of reasons.

SuggestedRemedy

Given that Protected Block Ack does not significantly affect an attacker's ability to mount the same DoS attack, if no alternative is presented that does not also remove or severely restrict the overrun update rule, remove the Protected Block Ack mechanism. (It could be useful to see a permission-based overrun scheme, where the receiver asks privately whether the sender meant to overrun; the balance would be in efficiency.)

Response *Response Status* **W**

DISAGREE (MAC: 2009-02-18 18:08:39Z) - The group is aware that other more difficult attacks on the BlockAck
mechanism exist. However, it sees value in addressing the specific weakness of the unauthenticated BlockAckReq frame.

Cl **09** *SC* **9.10.9** *P* **144** *L* **61** # 1073

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 226: The problem is not that another attack can be pursued with more difficulty, but that the very same attack can be pursed with far less dificulty. Therefore, the resolution is off point and fails to resolve the comment. The technique the draft provides is incomplete, and a locally incomplete solution should not be in the IEEE standard. I support the attempt of the group to protect against these sorts of problems, and would prefer to see the incompleteness addressed in a way that is compatable with devices that do not support the protection mentioned.

SuggestedRemedy

Given that Protected Block Ack does not significantly affect an attacker's ability to mount the same DoS attack, if no alternative is presented that does not also remove or severely restrict the overrun update rule, remove the Protected Block Ack mechanism. (It could be useful to see a permission-based overrun scheme, where the receiver asks privately whether the sender meant to overrun; the balance would be in efficiency.)

Response *Response Status* **W**

DISAGREE (MAC: 2009-03-12 00:46:08Z) the existing draft is the result of the pursuit of the same goals as those of the commenter. No other proposal regarding this issue was met with as high an approval rating as the one that is currently found in the draft, thereby demonstrating that it is the best tradeoff among the competing goals of security, complexity, completeness and compatibility as measured by a large group of participants. Note that the reception of any MPDU can cause WinStartB to move forward if there are no holes in the current sequence space - that is, if the current WinStartB value is X and the next received MPDU has SN=X, then WinStartB moves forward. See 9.10.7.6.2. a) 3) - the proposal of the commenter would require a private message to be sent following nearly every reception.

Cl **09** *SC* **9.13.5.2** *P* **155** *L* **50** # 4013

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

"The TXOP holder should transmit a CF_End frame starting a SIFS after the L-SIG TXOP protected period." If the TXOP holder already transmit a CF_End frame to truncate the -SIG TXOP.

SuggestedRemedy

Change the draft accordingly.

Response *Response Status* **W**

OUT OF SCOPE (EDITOR: 2009-06-23 07:11:57Z) - The cited text was not changed in the last set of edits, and does not relate to an existing comment by a no voter.

This comment will be passed to REVmb for consideration. See 11-09/0690r2 for additional information from the commenter.

Cl **09** *SC* **9.16.1.4** *P* **158** *L* **29** # 1065

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Mar 2009*

Here the note 2 says that "An AP can gain access to the channel after a PIFS in order to start transmission of a PSMP sequence.". So I assume that the AP can also gain access using EDCAF. If this is the case, this is contradictory with the definition of EDCA TXOP: EDCAF is used to initiate EDCA TXOP, EDCA TXOP is used to transmit frame from the same AC (IEEE 802.11 2007 P290, the last paragraph of section 9.9.1.4).

SuggestedRemedy

Restrict PSMP to use PIFS to acquire medium access right or change the last paragraph of section 9.9.1.4 in IEEE 802.11 standard 2007 to exclude PSMP from here or restrict PSMP to transmit frames from one AC when a PSMP TXOP is acquired by EDCAF.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-03-12 00:44:15Z) Agree in principle - tgn editor shall add, at the end of subclause 9.9.1.4 on page 129 line 11 of TGn draft D8.0, an instruction to modify the last sentence of the last paragraph of subclause 9.9.1.4 by adding the following phrase to the end of that sentence: ", unless the EDCA TXOP obtained is used by an AP for a PSMP sequence, in which case, this AC transmission restriction does not apply to either the AP or the STAs participating in the PSMP sequence, but the specific restrictions on transmission during a PSMP sequence described in 9.16 do apply."

Cl **09** *SC* **9.18.2** *P* **164** *L* **18** # 1067

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

"The appearance of more than one instance of an HT Control field with the MRQ field set to 1 within a single
PPDU shall be interpreted by the receiver as a single request for MCS feedback." There is no indication about how a requester to set the MCS requesting information which may create some problem. For example, if multiple MPDUs with the MRQ field set to 1 in a single PPDU have different MRQ information, how can the receiver responds the different MRQ?

SuggestedRemedy

Add the following text before this paragraph "If multiple MPDUs in a PPDU have MRQ field set to 1, they shall include the same MRQ information." or delete the paragraph and add note "If multiple MPDUs in a PPDU have MRQ field set to 1, the responder selects one of them (the last one?) to respond."

Response *Response Status* **W**

DISAGREE (PHY: 2009-03-11 18:52:30Z) - see document 11-09-0327r1. Section 9.7a: "If the HT Control field is present in an MPDU aggregated in an A-MPDU, then all MPDUs of the same frame
type (i.e., having the same value for the Type subfield of the Frame Control field) aggregated in the same AMPDU
shall contain an HT Control field. The HT Control field of all MPDUs containing the HT Control field
aggregated in the same A-MPDU shall be set to the same value."

This requires any HT control fields that are present in a PPDU to have a same value of MRQ information.

Cl **09** *SC* **9.2.3.0b** *P* **109** *L* **27** # 2018

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in April 2009*

Here the draft says "RIFS shall not be used between frames with different RA values, except within a PSMP sequence as explivitly indicated in 9.16.1.2 and 9.16.1.3". But RIFS between frames with different RA values is never allowed in 9.16.1.2 (P164, L21 This means that PPDU to different RA are separated by at least SIFS). In 9.16.1.3, aIUStime can be used between frames with different RA values when RIFS is allowed but aIUstime (8us) is not equal to FIFS(2us). Change this sentence to reflect what is defined in 9.16.1.2 and 9.16.1.3.

SuggestedRemedy

As proposed.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-04-29 23:49:24Z) TGn editor to remove the phrase ", except within a PSMP sequence as explicitly indicated in 9.16.1.2 (PSMP Down link transmission
(PSMP-DTT)) and 9.16.1.3 (PSMP Up link transmission (PSMP-UTT))" From the second paragraph of 9.2.3.0b

Cl **09** *SC* **9.2.5.5a.1** *P* **110** *L* **9** # 92

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Jan 2009*

You define when a STBC RTS shall be used. But the condition when a non-STBC RTS shall be used in a Dual CTS protection procedure is missing.

SuggestedRemedy

Add the missing condition for non-RFS started dual CTS protection.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-01-22 16:33:28Z) - TGn editor shall change the second sentence in the first paragraph of 9.2.5.5a.1 to appear as follows: "The RTS shall be an STBC frame if the STBC transmit and receive capabilities of the non-AP HT STA allow it to receive and transmit STBC frames using a single spatial stream, otherwise the RTS shall be a non-STBC frame."

Cl **09** *SC* **9.6.0d.4** *P* **118** *L* **17** # 3015

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in June 2009*

It seems to me that "a)" is for CF-Poll in a RTS/CTS protection TXOP, and "b)" is for CF-Poll which start TXOP. The rate selection of CF-Poll in a TXOP which is not started by RTS/CTS and does not start a TXOP is missing. For example in the following TXOP, CF-Poll(toSTA1), Data(fromSTA1), ACK, Data(fromSTA1), ACK, DATA(to STA2), ACK, DATA+CF-Poll(toSTA2), Data(fromSTA2), ACK..., it is not good to use b) to select rate for DATA+CF-Poll(toSTA2).

SuggestedRemedy

Change "a)" to "If an RTS/CTS protection or other protection exchange has already been performed before the transmission of the data frame and the duration field in the protection start frame covers the entire TXOP, the rate or MCS is selected according to the rules in 9.6.0d.6"

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-06-04 06:27:28Z)
Make edits in 11-09/0668r1 under CID 3015, which group other protection mechanisms into case a).

Cl **09** *SC* **9.6.0e.1** *P* **121** *L* **12** # 3012

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in June 2009*

"A control frame may be carried in an HT PPDU when the control frame meets any of the following conditions...". So this also means that a control frame may not be carried in a non-HT PPDU when the control frame meets any of the following conditions. How can a control frame is carried in a non-HT frame but with HT Control field.

SuggestedRemedy

Change to"c) A control frame shall be carried in a HT PPDU when the control frame meets any of the following conditions:"

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-06-04 06:24:32Z)
When the HT Control field contains either MRQ or TRQ, under conditions described elsewhere in the standard, there is a choice between HT and non-HT PPDUs.
For example, a +HTC RTS frame (carried in a control wrapper frame in a non-HT PPDU) may set both MRQ and NDP Announce fields to 1, indicating the start of a link adaptation exchange using NDP sounding. The RTS and CTS in this case may be non-HT frames.

However it might appear that the cited subclause is giving license to use or nor use an HT PPDU regardless of these conditions.

Editor: Insert the following NOTE at the end of list item c) in 9.6.0e.1:
"NOTE--In these cases, requirements specified in 9.17 (Sounding PPDUs), 9.18.2 (Link adaptation...) and, 9.19 (Transmit beamforming) further constrain the choice of non-HT or HT PPDU."

Cl **09** *SC* **9.6.0e.2** *P* **118** *L* **50** # 93

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Jan 2009*

"If a Basic BlockAckReq or Basic BlockAck is carried in a non-HT PPDU, the transmitting STA MAY transmit the frame using a rate supported by the receiver STA, as reported in the Supported Rates element and/or Extended Supported Rates element in frames transmitted by that STA." What does the MAY mean? Can the transmitting STA may also transmit the frame using a rate not supported by the receiver STA? I think SHALL should be used here.

SuggestedRemedy

Clarify it.

Response *Response Status* **W**

AGREE IN PRINCIPLE (EDITOR: 2009-02-12 10:08:10Z)
Change the cited sentence to read: (tags show location of changes)
"If a Basic BlockAckReq or Basic BlockAck is carried in a non-HT PPDU, the transmitting STA shall(#93) transmit the frame using a rate supported by the receiver STA, (#93)if known (as reported in the Supported Rates element and/or Extended Supported Rates element in frames transmitted by that STA)."

Cl **09** *SC* **9.6.0e.3** *P* **118** *L* **20** # 4014

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

This whole subclause is for CF_End frame in TXOP acquired through dual CTS mechanism. It seems to me that other TXOP truncating using CF_End is missing.

SuggestedRemedy

Clarify it.

Response *Response Status* **W**

DISAGREE (EDITOR: 2009-06-23 07:11:14Z) - The conditions attached to the second paragraph are:
1.Not during 40MHz phase of PCO
2.Not at the end of a TXOP that was obtained through the use of dual CTS

It then specifies a basic rate or a mandatory rate if the basic rate set is empty.

The commenter is mistaken because the whole subclause does not apply only to the dual-CTS case.

Cl **09** *SC* **9.6.0e.5.2** *P* **118** *L* **34** # 1064

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in Mar 2009*

Here the draft says "If the control response frame (CTS, ACK or Immediate BlockAck including BlockAck sent as a response to an implicit Block Ack request) is carried in a non-HT PPDU, the STA shall select the highest rate in the BSSBasicRateSet parameter that is less than or equal to the rate (or non-HT reference rate, see 9.6.2) of the previous frame to become the primary rate. If no rate in the BSSBasicRateSet parameter meets these conditions, the STA shall select the highest mandatory rate of the attached PHY that is less than or equal to the rate (or non-HT reference rate, see 9.6.2) of the previous frame to be the primary rate." But section 9.6.0e.4 says that BlockAckReq and BlockAck that are not control response frames can select rate from Extended Supported Rates, no restriction to BSSBasicRateSet is mentioned there. Why must the responding BlockAck use one rate from BSSBasicRateSet but non-responding BlockAck has no such restriction? This violates the 802.11 Baseline standard: "The BlockAck control frame shall be sent at the same rate and modulation class as the BlockAckReq frame if it is sent in response to a BlockAckReq frame". To me section 9.6.0e.5.2 does not need to restrict the BlockAck to use one of BSSBasicRateSet.

SuggestedRemedy

As proposed.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-03-12 00:43:34Z) Agree in principle - tgn editor shall make the changes shown in document 11-09-0344r3 under any heading that includes CID 1064. The conflict between the original standard and the amendment has been rectified, but the amendment's new restriction on responding to HT-PPDUs with non-HT PPDUs remains. The intent of that restriction is to force the requirement to use interoperable frame formats in this case, where the difference in transmission times of the compressed block ack format between older and newer frame formats is insignificant. Additionaly, in the original block ack scheme, the DUR field value was repeated in multiple individual PPDUs during the block ack sequence, whereas, in the A-MPDU case, this information is not repeated in a backwards compatible fashion in the data portion of the exchanges - forcing the non-HT PPDU format at a basic rate allows some backwards interoperable repetition of DUR field information.

Cl **09** *SC* **9.9.1.7** *P* **133** *L* **65** # 225

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

TXOP Truncation should not be used by a non-AP STA when associated to a non-HT AP, for the reasons mentioned on the given line.

SuggestedRemedy

Add "TXOP truncation shall not be used when a non-AP STA is associated to a non-HT AP" at the end of the last sentence of the section.

Response *Response Status* **W**

DISAGREE (MAC: 2009-02-11 18:31:45Z) - the issue is only partly related to the mixture of HT and non-HT STAs. The real problem is the result of using L-SIG TXOP. This mechanism creates PHY-based medium busy indications that cannot be reset by TXOP truncation, and therefore, unfairly adversely affect those STAs that are unaware of the L-SIG TXOP signaling - i.e. non-HT STAs. For the mixed case that the commenter describes, the TXOP truncation will properly and fairly affect all STAs, both HT and non-HT, because medium busy indications in this case are based on MAC signaling and NOT PHY signaling.

Cl **09** *SC* **9.9.1.7** *P* **133** *L* **65** # 1072

Epstein, Joseph — Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 225: Fairness is one of the issues, but the resolution incorrectly analyzes the problem. The problem is achieving the same design goals for a non-HT AP as for an HT AP with non-HT clients. As the draft currently states, the HT client shall not use termination if the AP advertises (using HT methods) that there are known non-HT STAs. Unfortunately, a non-HT AP cannot convey this information, and so the protocol is currently inconsistent. The proposed change provides a consistent interpretation.

SuggestedRemedy

Add "TXOP truncation shall not be used when a non-AP STA is associated to a non-HT AP" at the end of the last sentence of the section.

Response *Response Status* **W**

DISAGREE (MAC: 2009-03-12 00:45:26Z) The fairness issue arises solely from the case when L-SIG TXOP causes non-NAV based medium busy indications that cannot be reset by CF-END. A CF-END transmitted in a BSS with mixed HT and non-HT STAs will be received by both sets of STAs. The commenter is missing part of the restriction in his restatement of it within his comment - specifically, the restriction says that truncation shall not be used in the case when both L-SIG TXOP and non-HT STAs present is true - so the commenter is not quite correct in his assertion. As was stated in the resolution to CID 225, it is the combination of L-SIG TXOP in the presence of non-HT STAs and TXOP truncation that causes a fairness problem. I.e. if the HT STA does NOT use L-SIG TXOP in this case, then TXOP truncation will operate fairly, and therefore, the use of TXOP truncation should be allowed. Given that L-SIG TXOP is not permitted to be used by a STA when transmitting to a STA that does not support L-SIG TXOP (e.g. a STA transmitting to an associated non-HT AP) then in this situation, L-SIG TXOP cannot be used, and there is no issue with fairness and use of TXOP truncation. However, one case remains, and that is two HT-STA associated with a non-HT AP and those two STAs performing DLS. In that case, those two STA may both be L-SIG TXOP capable, so it might have been possible for those two STAs to use both L-SIG TXOP and TXOP truncation, which would be unfair to the other non-HT STAs. However, 9.13.3.2 includes explicit rules regarding the assumed operational values of parameters from the HT Operation element that is not present in this case - in that subclause, it notes that STAs in this situation are required to operate as though they had received an HT Operation element with the HT Protection field set to non-HT Mixed Mode. Under this condition, the two STAs are not allowed to use L-SIG TXOP protection in combination with TXOP truncation, as is noted at the end of 9.9.1.7. No change to the draft is needed.

Cl **09** *SC* **9.9.1.7** *P* **135** *L* **20** # 3014

Chu, Liwen — STMicroelectronics

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

"A TXOP holder that transmits a CF-End frame shall not initiate any further frame exchange sequences within the current TXOP." This seems to me that a TXOP holder is not allowed to initiate further fame transmission after sending CF-End and backoff which is not correct.

SuggestedRemedy

Change the sentence to "A TXOP holder that transmits a CF-End frame shall not initiate any further frame exchange sequences within the current TXOP without backoff."

Response *Response Status* **W**

DISAGREE (MAC: 2009-06-04 06:26:43Z)
The transmission of a CF-End frame is intended to end the TXOP -- i.e. the former TXOP holder has no special right or permission to transmit. In the same way, it has no special prohibition from starting any new channel access attempt. So while it is valid for it to follow the transmission of the CF-End frame with a backoff and subsequent frame exchange sequence, this is not part of the original TXOP, but a separate TXOP, and it not disallowed by the cited text.

Cl **11** *SC* **11.14** *P* **222** *L* **9** # 1074

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 227: The CRC missed that this comment is different than CID 228, and requires a different response. If an AP has a secondary channel overlapping another's 20MHz channel, then the former AP should either be forced to follow the same rules without regard to band, so long as the same problem can occur, or the rules should be removed. No evidence has been shown that the problem of exact primary/secondary overlap is any different, in RF or MAC effects, in 5GHz than in 2.4GHz. The one and only problem that has been acknowledged to be different is that 2.4GHz has intermediate overlapping channels, but that is not to point here. Please note that this comment addresses AP behavior.

SuggestedRemedy

Require 5GHz APs and STAs to follow the same overlapping BSS restrictions as 2.4GHz. In the alternative, remove the overlapping BSS scanning and reaction requirements for 2.4GHz, and allow the settling to be performed outside the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-03-12 01:02:29Z) - The CRC continues to view CID 227 and CID 228 as a pair of comments regarding, in the larger sense, the same question, but where each of the two comments differs from the other only by the fact that they each offer a different solution. The CRC disagrees with both solutions for the same reason. The AP required behavior in the 2.4 GHz band relies on associated STA requirements, and therefore, the issue becomes one of STA scanning behavior. As for the specific proposed change requests, the CRC repeats the earlier response, which is that elements exist in the protocol to allow a 20/40 MHz BSS to convey MAC control information to a BSS that lies exactly in the secondary channel, and use of such elements are currently determined outside of the scope of the draft - the current draft provides the tools that an AP or STA may employ to perform the requested functions, and therefore, the only difference between the commenter and the CRC is in whether some specific uses of those tools should be made mandatory or not. The CRC believes that the commenter has not provided an argument to justify a change that would make their use mandatory.

Cl **11** *SC* **11.14** *P* **222** *L* **9** # 227

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

Although it is well-known that the 2.4GHz band is more used than the 5GHz band in residential deployments, the 5GHz band--and all of its channels--is commonly used in enterprise deployments. Given the large number of 11a deployments and the push for more devices to operate in the 5GHz band, it is reckless to provide 5GHz APs a free pass not to perform overlapping BSS scans. Much of the text in the draft pertaining to reasons for excluding 5GHz is based on old (pre-2007) deployments and does not true today. If overlapping BSSs are an issue that needs to be addressed, then they need to be addressed uniformly. (Note: although one can possibly argue that DFS channels are not used as much and should remain exempted, this too is reckless as many 11a devices have been software-updated to support DFS.)

SuggestedRemedy

Require 5GHz APs and STAs to follow the same overlapping BSS restrictions as 2.4GHz. In the alternative, remove the overlapping BSS scanning and reaction requirements for 2.4GHz, and allow the settling to be performed outside the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-01-22 18:36:38Z) - The 5GHz band is different from the 2.4 GHz band - in 5 GHz, any overlap is complete with either the primary or secondary channel of the 20/40 MHz BSS, whereas varying degrees of overlap are possible in the 2.4 GHz band. A complete overlap of the primary channel creates no new problems as compared to existing possible 5 GHz BSS overlapping situations, where the existing protocols simply allow the BSSs to share the channel through ordinary DCF behavior. Overlapping in the secondary channel is different, in that not all control channel information is conveyed to the secondary channel, but the elements exist in the protocol to allow the 20/40 MHz BSS to convey such information to a secondary channel OBSS, use of such elements can be determined outside of the scope of the standard, as suggested by the commenter.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **12** # 1

Lin, John — Wireless Glue Network

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Addition for scanning of non-802.11 radios

SuggestedRemedy

Before an AP or STA starts a 20/40 MHz BSS, it shall perform a non-802.11 radio scan to search for non-802.11 radios

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 39

Brubk, Sverre — Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited

SuggestedRemedy

"Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change ""When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.""."

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 9

Allen, James Arkados

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, a similar method of detecting those devices should be included in the proposed 802.11n amendment.

SuggestedRemedy

Include adequate detection methods for legacy IEEE 802.15 devices similar to those provided for legacy IEEE 802.11 devices. This may require coordination with IEEE 802.15 working group, the Bluetooth SIG, and the Zigbee Alliance instead of ignoring their presence as has been done in the current proposed amendment. One such proposal is included in 11-08-1101-05-000n-Additional-40-MHz-Scanning-Proposal. IEEE P1901 is working on a IPP (Inter PHY Protocol) that creates a universal detection method for dissimular PLC networks. Perhaps that could be useful to look at as well. The prefered alternative would be to prevent use of 40 MHz channels in 2.4 GHz spectrum.

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 1076

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 229: The resolution provided strengthens the argument presented by the commenter in CID 226, although the resolution here is incorrect as a whole. The authors of other drafts, such as TGw, have taken great care to protect the network from a number of signaling-level attacks, which are more severe than jamming or repetitive transmission attacks, because they deny service with far greater efficiency. CTS attacks, for example, require on-line presense of the attacker, as the CTS was designed, from the early days of 802.11, to be self-limiting for this attack by having a relatively small maximum Duration value.

SuggestedRemedy

Allow the AP to use selection rules to exclude potential attackers. If no proposal is made as to what the rules may be, then allow the rules to be outside the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-03-12 01:04:21Z) - without a concrete proposal as to what selection rules would allow APs to both obey "valid" 40 mhz intolerance indications and disregard "invalid" 40 mhz intolerance indications, the CRC cannot make such a change - if the CRC accepts the proposed change that suggests that the AP can make its own rules as to this determination, then the CRC potentially allows APs to create a set of rules that disregards "valid" 40 mhz intolerance indications, and the CRC finds that this is unacceptable - the CRC does not believe that the set of rules desired by the commenter exists. TGw has made changes to its current draft that will allow for discrimination between "valid" and "invalid" information, as long as the information is sent in a unicast frame over an RSNA link. But, in an unlicensed piece of spectrum that is shared among users, denial of service will always be available as an avenue of attack. The on-line nature of the suggested attack is different from the CTS with regard to the time required to "refresh" the DOS, but otherwise, it is similar in the fact that both do require constant vigilance on the part of the attacker, and the CTS attack is worse in that it completely shuts down the network, as opposed to reducing the maximum bandwidth.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 124

Coward, Helge Texas Instruments

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

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 71

Roine, Per Torstein Texas Instruments

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

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 47

Chalfin, Edward — Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 31

Hach, Rainer — Nanotron Technologie

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are many other systems shipped using standards based on IEEE 802.15 and nonstandard technologies, a similar method of detecting those devices should be included in the proposed 802.11n amendment.

SuggestedRemedy

Don't use 40 MHz in the 2.4 GHz spectrum

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 42

Fikstvedt, Oddgeir — Pennsylvania State Un

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause defines mandatory requirements for scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth wireless technology) than legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited.

SuggestedRemedy

"Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change ""When using 40 MHz channels, it can operate in the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in the channels defined in 20.3.15.2.""."

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 37

Sherlock, Ian — Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

This clause requires mandatory scanning for other 802.11 BSSs operating in overlapping channels that are either legacy devices that would not be able to coexist with 802.11n devices, or devices operating on channels that would overlap with a 40 MHz channel. If any such BSSs are found, operation of 40 MHz channels are not allowed. Since there are four times as many devices shipped using standards based on IEEE 802.15.1 (e.g., Bluetooth) as legacy 802.11 devices, the use of 40 MHz mode in 2.4GHz band should be prohibited.

SuggestedRemedy

Disallow use of 40 MHz channels in the 2.4 GHz band. In 20.3.15, page 315, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **6** # 229

Epstein, Joseph — Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Jan 2009*

The requirement that the AP must disable 40MHz operation based on strict intolerance-setting values or client detection criteria can lead to exposure to attacks that seek to prevent 40MHz operation.

SuggestedRemedy

Allow the AP to use selection rules to exclude potential attackers. If no proposal is made as to what the rules may be, then allow the rules to be outside the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-01-22 18:38:03Z) - the exchange of 20/40 Coex information is not the only denial of service attack that exists for the protocol - many such attacks have existed since the first 802.11 standard was created, the CTS frame being the best such example. Because of the particular rules of operation for the spectrum in which a conformant device operates, additional avenues for denial of service attack exist and will continue to be outside of the control of the 802.11 body. Finally, in order to allow fair sharing of limited spectrum among unrelated devices, it is necessary to provide for a "public" mechanism to announce the need for such sharing.

Cl **11** *SC* **11.14.3.2** *P* **223** *L* **65** # 2

Lin, John — Wireless Glue Network

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Addition of mitigation for existence of non-802.11 radios

SuggestedRemedy

An FC HT AP 2G4 shall keep the value of 20/40 Operation Permitted to FALSE if presence of non-802.11 radio is detected.

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **226** *L* **54** # 89

Chu, Liwen STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current non-802.11 device protection in 40MHz transmission is not enough. It is reasonable to add the normative sentence "If a STA is operating in the 2.4GHz ISM band and has no mechanism to know whether any non-802.11 communication devices are operating in the area or has knowledge that a non-802.11 communication device is operating in the area, then it shall assert the 40MHz Intolerant bit in its HT Capabilities IE."

SuggestedRemedy

As proposed.

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 8

Allen, James Arkados

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This is in recognition that the use of 40 MHz channels in 2.4 GHz harms or limits performance of other radio systems attempting to share this spectrum. Additional recommendations to add mandatory detection, since the proposed ammendment is the one introducing 40 MHz channel operation, were dismissed as too costly to implement while insisting that the lower cost devices using IEEE 802.15.1 standard must implement Adaptive Frequency Hopping (AFH) with detection of IEEE 802.11 signals to prevent interference to 802.11 devices operating in the same band.

SuggestedRemedy

As the proposed amendment to IEEE Std 802.11-2007, this amendment should introduce adequate detection mechanisms to prevent undue interference with radio systems in wide use that share the 2.4 GHz spectrum under the assumption that 802.11 based radio systems would be using 20 MHz channels as defined in the current standard. One such proposal is included in 11-08-1101-05-000n-Additional-40-MHz-Scanning-Proposal and a analysis of the final proposal submitted as a coexistence paper. This proposal should be included as a replacement to the non-normative Note included in 11.14.4.1. I prefer not allowing 40 MHz channels in 2.4 GHz spectrum.

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 38

Brubk, Sverre Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Others have been designed using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66 per cent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

"Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change ""When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.""."

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 170

Xhafa, Ariton Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Sub-clause 11.14.4.1, line 15, pg. 227: This line is an additional proof that the working group is aware of the problem at hand: 40 MHz mode of operation in 2.4 GHz band creates problem for non-802.11 devices. However, the current draft does not address this problem and "recommendation" does not mean "enforcement".
Subclause: 20.3.15, line 39, pg. 315: IEEE 802.11n standard proposes a 40 MHz operation mode in the 80 MHz 2.4 GHz band. However, this unlicensed band is used by other technologies, such as Bluetuut, ZigBee, to name a few. The use of 40 MHz mode with disregard to other technologies present in this band is, in my opinion, unacceptable. Contributions to the IEEE 802.11 standard group, either simulation or measurements, have shown that the performance of non-802.11 technologies reduces drastically when IEEE 802.11n devices operate in 40 MHz mode (see for example, 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). As it stands, this draft does not provide an adequate solution to solve the problem created by 40 MHz mode of operation.

SuggestedRemedy

"Use of 40 MHz mode should not be allowed in 2.4 GHz band. Hence, the proposed change: in 20.3.15, page 315, line 39-40: change ""When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.""."

(Ed: The voter also attached document 29677600024-Xhafa-11n-sponsor-ballot-comments_v01.xls, which is reproduced in 11-09-0023-00-000n-TGn-Sponsor-Ballot-Attachments.doc)

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 123

Coward, Helge Texas Instruments

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

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This is in recognition that use of 40 MHz channels in 2.4 GHz does harm or limit performance of other radio systems attempting to share this spectrum.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 70

Roine, Per Torstein Texas Instruments

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

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This is in recognition that use of 40 MHz channels in 2.4 GHz does harm or limit performance of other radio systems attempting to share this spectrum.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 46

Chalfin, Edward Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This is in recognition that use of 40 MHz channels in 2.4 GHz does harm or limit performance of other radio systems attempting to share this spectrum.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 36

Sherlock, Ian — Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The draft includes a statement recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This recognizes that use of 40 MHz channels in the 2.4 GHz band does harm to, or limits performance of, other radio systems attempting to share this band.

SuggestedRemedy

Disallow use of 40 MHz channels in the 2.4 GHz band. In 20.3.15, page 315, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 41

Fikstvedt, Oddgeir — Pennsylvania State Un

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". This is in recognition that use of 40 MHz channels in 2.4 GHz does harm or limit performance of other radio systems attempting to share this spectrum.

SuggestedRemedy

"Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change ""When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.""."

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **227** *L* **15** # 30

Hach, Rainer — Nanotron Technologie

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current draft includes a note recommending that 40 MHz PPDU's not be transmitted "if a STA operating in the 2.4 GHz ISM band has knowledge of non-802.11 communication devices operating in the area". Given the variety of technologies in use in the 2.4 band, does anybody believe that such knowledge can reliably be acquired?

SuggestedRemedy

Don't use 40 MHz in the 2.4 GHz spectrum

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **11** *SC* **11.14.4.1** *P* **231** *L* **15** # 4003

Petranovich, James — ViaSat

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

The text reads "In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to
11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-
802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs."
This is flawed in several ways, as I noted in my comments to the previous draft (D10). The most notable flaw is that "non-802.11 communications" is not defined. The ISM band is open to all and thus there are many types of devices that use this band. It is logically impossible for any device to have means of detecting them all.
The group has avoided defining "non-802.11 devices" and unofficial commented that this is up to the individual manufactorers. This vague approach might be acceptable with "means of detecting" but not defining which systems to actively detect is a failure of the standards body's obligation to create a clear standard. (For example, it probably makes it impossible to acquire a valid certificate of compliance for 802.11n as recognized by governing bodies--such as NIST in the USA--for government use of complaint devices. This may not greatly limit private sector use of the technology but that is not the only obligation of the standards community.)

SuggestedRemedy

It is no secret that the primary coexistence issue is with proponents of 802.15 and Bluetooth. Accomdate them explicitly instead of implicitly:
change "non-802.11 communications" to "recognized non-802.11 communications". In the definitions section, define "recognized non-802.11 communications" as "communications compliant with 802.15 and similar Bluetooth standards".

Response *Response Status* **U**

DISAGREE (EDITOR: 2009-06-23 07:12:39Z) - The comment resolution committee disagrees that the cited language is flawed. One can draw parallels between this text and DFS procedures in 11.9. Nowhere in 11.9 is the method of detection of radars defined. In addition, the types of radars are not defined. In both 11.9 and 11.14.4.1 definition of the device types and detection methods are left to the industry, manufacturers, or other external bodies.

Cl **11** *SC* **11.14.4.1** *P* **233** *L* **15** # 3003

Petranovich, James ViaSat

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

There are seveal problems with the text in these lines
("NOTE 2--In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses subclause
11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has knowledge no means of determining
the presence of non-802.11 communication devices operating in the area, then it is recommended that the STA
shall not transmit any 40 MHz mask PPDUs..
In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 to
11.14.4.4, if a STA operating in the 2.4 GHz ISM band has a means of determining the presence of non-
802.11 communication devices operating in the area and determines that either no non-802.11 communication
device is operating in the area or that non-802.11 communication devices are operating in the area but
the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA
may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.")
First of all "means of determining the presence of npn=802.11 communications" is ill defined; since this is an ISM band any anyone can use it for anything, it is logically impossible for any device to have this means with a certainty.
The concept of presence is not defined--is a device emiiting somethign one inch away present but one foot away not present? Is a device present if it will be impacted in a very minor way by the 802.11n device, or is it present only if it will be impacted in a major way or only if it will be totally blocked?
Even if this is clarified, the ISM band is an unregulated band and belongs to all suers. A manufactorer should not be obligated to implement "means of determining" in order to use the band fully. This places an unfair burden on 802.11 devices and is a dangerous precident.
Thirdly, the concept of "a coexistence mechanism" is ill defined; is this a standardized mechanism or whatever the manufactoer chooses to do?
Finally, most impairment of operations is two-way; if another user is present then it will impair the 802.11n device as much as the other way around. A good design will probably switch back to 20 MHz out of self interest so this text may not be needed.

SuggestedRemedy

Either restrict 40 Mhz operations from being used in the ISM band or remove these clauses (lines 15 to 27, page 233 in redline draft) entirely, or else define the communcations protocols that "means of determining" are required to detect and give some guidance at to what constitutes presence.

Response *Response Status* **U**

DISAGREE (COEX: 2009-06-04 00:48:33Z) - To the first point of the comment, the language of "means of determining the presence" purposely is not rigorously defined to allow implementers and deployers of the system freedom in design, as discussed in 11-09/0576.

While there was substantial sympathy in the comment resolution committee for the commenter's second point, the cited language was a compromise to protect existing 802.15 systems.

Regarding the third point, a specific coexistence mechanism is not specified to allow flexibility in implementations, as discussed in 11-09/0576.

To the fourth point, switching back to 20 MHz on observing impaired operation in 40MHz would be a coexistence mechanism allowed by the cited text.

With regards to the proposed change, several votes in the task group have indictated minimal support for removing 40 MHz operation from 2.4 GHz. As indicated by 11-09/576, the language allows freedom to the implementers

Cl **11** *SC* **11.14.4.1** *P* **233** *L* **21** # 3020

Allen, James Arkados

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

Thanks to the CRC for working toward a solution to the channel bonding problem. After reading the current ballot I have reconsidered my support of document 802.11-09/0511-r1 and renew my vote to not approve. More words have been added but I see no progress toward any measurement method, parameter values, or processes that would prevent using channel bonding in 2.4G from being a major problem for the industry or the SA. More specifics are needed. In the PICS CF16 is optional. It that an error? Also, why is HTM 20 mandatory? Can't an 11n device decide not to support 40MHz bonding? Also noted in the CRC resolutions is that the 40MHz intolerant bit is removed but it is still in the PICS. Thanks for the test results but that brings up additional questions that I will try to address with the authors. Regards

SuggestedRemedy

I propose you do not use channel bonding in the 2.4G band at this time, get the standard done and then go back for an amendment when the details can be done correctly. What's the rush to ruin the band?

Response *Response Status* **U**

DISAGREE (COEX: 2009-06-04 00:52:21Z) - To the first point of the comment, the language of "means of determining the presence" purposely is not rigorously defined to allow implementers and deployers of the system freedom in design, as discussed in 11-09/0576. Furthermore, a specific coexistence mechanism is not specified to allow flexibility in implementations, as discussed in 11-09/0576.

To the second point of the comment, when TGn gets rolled into 802.11-20XX, it will not be required to implement High Throughput features to be compliant with 802.11-20XX. As such, PICS CF16 which addresses High Throughput features is optional.

To the third point of the comment, HTM20 is mandatory conditioned upon HTP2.3.4. Therefore the MLME aspects of 40 MHz (identified as 11.14 in HTM20) are only required if a 40 MHz PLCP sublayer is implemented (identified as 20.3.5 and 20.3.6 in HTP2.3.4).

To the fourth point of the comment, the 40MHz intolerant bit is most certainly still included in 11nD10.0. Please refer to clauses 7.3.2.56.2 HT Capabilities Info field, 7.3.2.60 20/40 BSS Coexistence element, 11.14.11 Signaling 40 MHz intolerance, 11.14.12 Switching between 40 MHz and 20 MHz, and T.5 20/40 MHz BSS establishment and maintenance.

With regards to the proposed change, several votes in the task group have indictated minimal support for removing 40 MHz operation from 2.4 GHz. As indicated by 11-09/576, the language allows freedom to implementers.

Cl **11** *SC* **11.14.5** *P* **223** *L* **43** # 1077

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 230: If the first statement in the resolution is true, then the resolutions for CIDs 227-230 should be altered to be consistent.

SuggestedRemedy

Remove all of the text that requires APs to disable 40MHz operation on the basis of any rule whatsoever, as this is contrary to the existing spirit of 802.11 and adds minimal if not negative value. Retain the requirements that STAs must be able to scan, and the protocol that allows APs to require STAs to scan. Make the decision on whether an AP operates in 40MHz beyond the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-03-12 01:07:17Z) - The first sentence of the resolution to CID 230 was misinterpreted to imply that whatever the voters of 802.11 decided was an appropriate protocol for dealing with 40 mhz overlap issues in 2.4 GHz was identical to what the voters decided would be appropriate for 5 GHz operation, but this conclusion was incorrect - the voters clearly decided that different mandatory behaviors were appropriate for the different operational bands, and therefore, the proposition that the resolutions for CIDs 227-229 need to change is not correct. Regarding the proposed change, some portions of the rules for AP behavior regarding 40 mhz operation are made mandatory because of the perception on the part of the majority of 802.11 voters that if such mandatory actions were not prescribed by the standard, then they would not be performed and existing users of equipment in those situations would be harmed.

Cl **11** *SC* **11.14.5** *P* **223** *L* **43** # 230

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

802.11 has always allowed for possibly-pathological channel selection of neighboring APs: they could always have been partially overlapping in the 2.4GHz band, and could always have been fully overlapping in any band. There are no rules that prevent this, as there should not be, because channel selection (aside from DFS) has been out of the scope of the standard. Although it is admirable for the draft contributors to be concerned about pathological 40MHz/20MHz overlap, there is no need for 802.11 to take on the overlap problem in a normative manner now. Furthermore, the solution described in the standard is needlessly complicated. Finally, who is to say that some managed deployments should not be able to create such overlap if the benefits to them outweigh the RF complications (such as at the transition point between two buildings). The rules, as stated, may even lead to rampant instability in certain situations.

SuggestedRemedy

Remove all of the text that requires APs to disable 40MHz operation on the basis of any rule whatsoever, as this is contrary to the existing spirit of 802.11 and adds minimal if not negative value. Retain the requirements that STAs must be able to scan, and the protocol that allows APs to require STAs to scan. Make the decision on whether an AP operates in 40MHz beyond the scope of the standard.

Response *Response Status* **W**

DISAGREE (COEX: 2009-01-22 18:42:45Z) - a large majority of the voters in 802.11 have agreed with the proposition that changes created by TGn have created the need for normative behaviors regarding overlapping BSS situations related to the use of a 40 mhz wide channel. The protocol provided for this purpose adds only a small amount of functionality to that which is already performed by most production devices - that is, today most devices already scan channels at various times - the TGn protocol requires scanning at a rate which is far below that which is typically done by existing devices. The TGn protocol requires STAs to transmit management frames to report some of the information gathered during such scanning activity. This is a relatively small change for existing implementations.

Cl **11** *SC* **11.14.5** *P* **229** *L* **43** # 228

Epstein, Joseph Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Feb 2009*

Although it is well-known that the 2.4GHz band is more used than the 5GHz band in residential deployments, the 5GHz band--and all of its channels--is commonly used in enterprise deployments. Given the large number of 11a deployments and the push for more devices to operate in the 5GHz band, it is reckless to provide 5GHz APs a free pass not to perform overlapping BSS scans. Much of the text in the draft pertaining to reasons for excluding 5GHz is based on old (pre-2007) deployments and does not true today. If overlapping BSSs are an issue that needs to be addressed, then they need to be addressed uniformly. (Note: although one can possibly argue that DFS channels are not used as much and should remain exempted, this too is reckless as many 11a devices have been software-updated to support DFS.)

SuggestedRemedy

Allow 5GHz APs to require 5GHz STAs to perform scanning operations for overlapping BSSs. Require 5GHz STAs to have the scanning capability in the 5GHz band, even if scanning may be disabled at deployment time. (Doing this does not satisfy my comment that 5GHz should have overlapping be mandatory.)

Response *Response Status* **W**

DISAGREE (COEX: 2009-02-18 17:45:52Z) - The 5GHz band is different from the 2.4 GHz band - in 5 GHz, any overlap is complete with either the primary or secondary channel of the 20/40 MHz BSS, whereas varying degrees of overlap are possible in the 2.4 GHz band. A complete overlap of the primary channel creates no new problems as compared to existing possible 5 GHz BSS overlapping situations, where the existing protocols simply allow the BSSs to share the channel through ordinary DCF behavior. Overlapping in the secondary channel is different, in that not all control channel information is conveyed to the secondary channel, but the elements exist in the protocol to allow the 20/40 MHz BSS to convey such information to a secondary channel OBSS, use of such elements can be determined outside of the scope of the standard, as suggested by the commenter.

Cl **11** *SC* **11.14.5** *P* **229** *L* **43** # 1075

Epstein, Joseph — Meru Networks

Comment Type **TR** *Comment Status* **R** *Approved in Mar 2009*

Regarding CID 228: The CRC missed that this comment is different than CID 227, and so should be resolved differently. The comment is to require that the client implement the minimal part of the protocol to allow 20/40 BSS conveyance for secondary-channel OBSS, something not currently required in the draft for 5GHz. The resolution, incorrectly, states both that the necessary elements do exist, and that the use of these elements are outside the scope of the standard. The former is not true, as the draft eliminates the necessary elements as requirements for 5GHz. The latter cannot be true, as it is in scope for 2.4GHz, and the identical RF problem occurs in both bands. Please note that this comment addresses client behavior.

SuggestedRemedy

Allow 5GHz APs to require 5GHz STAs to perform scanning operations for overlapping BSSs. Require 5GHz STAs to have the scanning capability in the 5GHz band, even if scanning may be disabled at deployment time. (Doing this does not satisfy my comment that 5GHz should have overlapping be mandatory.)

Response *Response Status* **W**

DISAGREE (COEX: 2009-03-12 01:03:53Z) - The CRC continues to view CID 227 and CID 228 as a pair of comments regarding, in the larger sense, the same question, but where each of the two comments differs from the other only by the fact that they each offer a different solution. The CRC disagrees with both solutions for the same reason. The AP required behavior in the 2.4 GHz band relies on associated STA requirements, and therefore, the issue becomes one of STA scanning behavior. As for the specific proposed change requests, the CRC repeats the earlier response, which is that elements exist in the protocol to allow a 20/40 MHz BSS to convey MAC control information to a BSS that lies exactly in the secondary channel, and use of such elements are currently determined outside of the scope of the draft - the current draft provides the tools that an AP or STA may employ to perform the requested functions, and therefore, the only difference between the commenter and the CRC is in whether some specific uses of those tools should be made mandatory or not. The CRC believes that the commenter has not provided an argument to justify a change that would make their use mandatory.

Cl **11** *SC* **11.18** *P* **247** *L* **63** # 2020

Chu, Liwen — STMicroelectronics

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Here the draft says "A STA that is a member of a BSS that transmit a Management frame of Subtype Action, Category Public with a unicast value in the Address 1 field corresponding to a STA that is a member of the same BSS". This violates the definition of Public action frame. The definition of the Public action frame is "The Public action frame is defined to allow inter-BSS and AP to unasociated-STA communicaitons".

SuggestedRemedy

Change the definition of Public action frame accordingly, or
delete this bullet.

Response *Response Status* **W**

AGREE IN PRINCIPLE (MAC: 2009-04-29 23:52:14Z) TGn editor to change the modifications to 7.4.7.1 Public Action frame in TGn draft 9.0 by including editing instructions and modifications to the baseline's first paragraph so that the first paragraph of the baseline will read as follows: "The Public Action frame is defined to allow inter-BSS and AP to unassociated-STA communications in addition to intra-BSS communication."

Cl **20** *SC* **20.1.1, 20.2.4** *P* **251** *L* # 3017

Bagby, David Calypso Ventures, Inc.

Comment Type **TR** *Comment Status* **R** *Approved in June 2009*

As a result of previous ballot round comments, the latest set of TGn changes (for recirc 3) include some enhancements for TGn wrt to 1SS devices. Those changes are a welcome improvement to the TGn draft. The inclusion of those changes has caused me to further consider several trends in the WLAN marketplace and how well TGn is supporting those trends.
When the TGn project started, the general view what that TGn would be a "high thruput addition" to the current popularly deployed 802.11 phys (TGa, b, g).
It is well known that "draft TGn" devices have been shipping since before the TGN Sponsor ballot process started. This has provided an opportunity to get real world information about what features of TGn are being adopted in the industry. Market activity is confirming that TGn is (and will continue to) displacing prior generation PHYs rather than supplanting them. This is becoming particularly significant at the lower end of the TGn performance spectrum where as 1SS TGn devices are increasingly replacing TGg devices.
However, the TGn draft still contains some (IMO, no longer needed or desired) restrictive requirements for SS support. These requirements are impeding the expansion of the 802.11 market in the value / low cost market segments. 1SS "non-AP" stations are currently part of the TGn draft, yet APs are required to support 2SS as minimum finctionality. This hinders the use of TGn technology for value segment APs.
Given the realities of the market, I believe that the minimum requirements for AP vs SSs should be changed. I suggest that APs be allowed to be 1SS as a minimum. 1SS AP devices are going to exist in significant volume in the market (in fact they already exist).
The TGn amendment to 802.11 should encompass and encourage the uses of TGn that are already being seen in the field.

SuggestedRemedy

1) Change the wording in clause 20.1.1 from
"An HT AP shall support all equal modulation rates for 1 and 2 spatial streams (MCSs 0 through 15) using 20 MHz channel width."
to
"An HT AP shall support all equal modulation rates for 1 spatial stream (MCSs 0 through 7) using 20 MHz channel width."
2) Also change the note in section 20.2.4 from
"NOTE--Support of 20 MHz Non-HT Format and 20 MHz HT Format with one and two spatial streams is mandatory at
APs."
to
"NOTE--Support of 20 MHz Non-HT Format and 20 MHz HT Format with one spatial stream is mandatory at
APs."
3) These are the two references to this restriction that I could find in the draft. Also correspondingly change any other references which may exist that require 2SS support for APs.

Response *Response Status* **U**

DISAGREE (GEN: 2009-06-04 06:30:17Z)

The rationale behind P802.11n has been its unique identity as a high throughput amendment. Some accommodation for small, handheld stations has previously been incorporated.

The proposed change to allow HT-APs to operate with only one spatial stream is not supported by the majority of the TGn CRC participants.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 7

Allen, James Arkados

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Other have been design using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66% of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth, 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results and 11-08-1101-05-000n-Additional-40-MHz-Scanning-Proposal). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75% of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level. This seems to be intended to lock out non wi-fi devices and any future devices that may use this band. Aside from the technology for a moment and from a purely business perspective, it is incredible that we promote a method that does not even allow two adjacent 11n devices to use the same bonding mode. In most locations I use 802.11x there are many APs in the area. What will happen is that mfgrs will not want their devices to look slower than a competitor's equipment. In addition, if a customer buys a system depending on bonding to meet it's multimedia requirements, following the BSS detection rules would cause the system to fail as soon as another AP becomes ative. The result is that mfgrs will not follow back off rules in the standard. I can not support any standard that encorages this situation to exist. The result will be embarassing for the market and the Association.

SuggestedRemedy

Do not allow operation of 40 MHz channels in 2.4 GHz spectrum due to lack of available bandwidth for spectrum sharing. Change "When using 40 MHz channels, it can operate in the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in the channels defined in 20.3.15.2."

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 45

Chalfin, Edward Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Others have been designed using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66 per cent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 69

Roine, Per Torstein Texas Instruments

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

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Others have been designed using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66 per cent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 40

Fikstvedt, Oddgeir Pennsylvania State Un

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Others have been designed using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66 per cent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

"Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 342, line 39-40: change ""When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2."" to ""When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.""."

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 29

Hach, Rainer Nanotron Technologie

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by many other standard and non standard devices I would expect more frustration than benefit from enabling 40 MHz channels

SuggestedRemedy

Don't use 40 MHz in the 2.4 GHz spectrum

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 35

Sherlock, Ian Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current draft introduces 40 MHz channels in the 80MHz wide 2.4 GHz band. A single 40MHz 802.11 channel would thus consume half of the available 2.4GHz band, siginificantly reducing the spectrum available for IEEE 802.15.1, 802.15.3 and 802.15.4 systems operating in the same band. Some of the communications protocols operating in the 2.4GHz band have been designed to comprehend typical IEEE 802.11 20 MHz channel presence, where channels 1, 6 and 11 are commonly used leaving space between those channels for operation of devices with smaller channel widths (e.g. IEEE 802.15.4). Others protocols have been designed using the IEEE Std 802.15.2(tm)-2004 recommended practice that includes Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz band have shown that 66 percent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals which is only 28dB down 40MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

Disallow use of 40 MHz channels in the 2.4 GHz band. In 20.3.15, page 315, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **315** *L* **39** # 122

Coward, Helge Texas Instruments

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

40 MHz channel operation in 2.4 GHz spectrum (80 MHz wide) is introduced by this proposed standard. Since the 2.4 GHz spectrum is used by a number of other standards including IEEE 802.15.1, 802.15.3 and 802.15.4, and has been widely adopted in the industry (e.g., Bluetooth SIG and ZigBee Alliance), utilization of 50% of the available spectrum by a single device sginificantly reduces the amount of available spectrum for use by other radio systems sharing the same spectrum. Some of the radio systems using this spectrum have been designed in consideration of typical IEEE 802.11 20 MHz channel operation where channels 1, 6 and 11 are normally used leaving space between those bands for operation of devices with small channel widths (e.g. IEEE 802.15.4). Others have been designed using IEEE Std 802.15.2(tm)-2004 recommended practice that included Adaptive Frequency Hopping (AFH) allowing coexistence between frequency hopping devices (e.g., IEEE Std 802.15.1(tm)-2001/5) using 1 MHz channels and IEEE 802.11 devices using 20 MHz channels. Simulation and measurements of the impact of use of 40 MHz channels in the 2.4 GHz spectrum have shown that 66 per cent of the available IEEE 802.15.1 hopping channels must be removed to prevent interference from a single device using a 40 MHz channel (See 19-08-0027-02-0000-40MHz-11n-impact-on-bluetooth.ppt, 11-08-0992-01-000n-20-40-mhz-11n-interference-on-bluetooth and 11-08-1140-00-000n-11n-40-mhz-and-bt-coexistence-test-results). This is caused by the channel mask used for the proposed 40 MHz signals that is only 28 DB down 40 MHz from the center frequency effectively introducing interference across 75 per cent of the 2.4 GHz spectrum when the 40 MHz signals are at the top or bottom of the band. Good detection algorithms built into devices can determine what portions of the channel to avoid, but the variability of use and compression of the available number of channels into a small portion of the band reduces noise immunity and spectrum sharing capabilities below an acceptable level.

SuggestedRemedy

Do not allow use of 40 MHz channels in 2.4 GHz spectrum. In 20.3.15, page 315, line 39-40: change "When using 40 MHz channels, it can operate in
the channels defined in 20.3.15.1 and 20.3.15.2." to "When using 40 MHz channels, it can only operate in
the channels defined in 20.3.15.2.".

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

TGn Editor change the NOTE 2 paragraph in 11.14.4.1, page 236, lines 36 and 39, move the text above NOTE 1, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclauses 11.14.4.1 (Field used to determine 40 MHz PPDU transmission restrictions) to 11.14.4.4 (Restrictions on non-AP STAs that are not a member of an infrastructure BSS), if a STA operating in the 2.4 GHz ISM band has means of determining the presence of non-802.11 communication devices operating in the area and determines that either no non-802.11 communication device is operating in the area or that non-802.11 communication devices are operating in the area but the STA implements a coexistence mechanism for these non-802.11 communication devices, then the STA may transmit 40 MHz mask PPDUs, otherwise, the STA shall not transmit any 40 MHz mask PPDUs.

Cl **20** *SC* **20.3.15** *P* **331** *L* **14** # 2015

Allen, James Arkados

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

My Disapprove vote stands. I thank the comment resolution committee for considering my concern but still do not see any solutions proposed to prevent abuse of channel bonding that will undoubtedly happen if 802.11n supports any type of channel bonding in the 2.4 GHz band. Please address your response and consideration to the issue of preventing abuse, not just to the means stated, which are insufficient. We know that nothing prevents this today except a standard that implies permission to expand the competitive war. A little systems engineering mixed with competitive some business smarts should not be out of scope when protecting the public's interest and expectations from this talented group. My concern has not been addressed. If a meeting is convened to resolve this topic I will try to attend.

SuggestedRemedy

My original change recommendation stands

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

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Cl **20** *SC* **20.3.15** *P* **331** *L* **14** # 2014

Allen, James Arkados

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

My Disapprove vote stands. I thank the comment resolution committee for considering my concern but still do not see any solutions proposed to prevent abuse of channel bonding that will undoubtedly happen if 802.11n supports any type of channel bonding in the 2.4 GHz band. Please address your response and consideration to the issue of preventing abuse, not just to the means stated, which are insufficient. We know that nothing prevents this today except a standard that implies permission to expand the competitive war. A little systems engineering mixed with competitive some business smarts should not be out of scope when protecting the public's interest and expectations from this talented group. My concern has not been addressed. If a meeting is convened to resolve this topic I will try to attend.

SuggestedRemedy

My original change recommendation stands

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

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Cl **all** *SC* **all** *P* **0** *L* **0** # 14

Reede, Ivan AmeriSys Inc.

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

The current standard does not meet one of the five criteria, namely reverse compatibility with existing 802.11 products to my satisfaction and in my opinion, does not properly address coexistence issues with former 802.11 and 802.15 standards.

SuggestedRemedy

To chnage my vote from disapprove to approve, changes have to be made to provide friendly coexistnece to both prior 802.11 products without needing them to go through a firware upgrade (with is not available for many exisitng products) and in order to provide coexistence with other 802 standards like 802.15 in what I would perceive to be a fair and equitable manner.

Response *Response Status* **W**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

In addition to the restrictions on transmission of 40 MHz mask PPDUs found in subclause 11.14.4.1 to 11.14.4.4, if a STA operating in the 2.4 GHz ISM band has no means of determining the presence of non-802.11 communication devices operating in the area, then the STA shall not transmit any 40 MHz mask PPDUs.

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Cl **Note 2** *SC* **Note 2** *P* **227** *L* # 179

Walter, Udo Atmel

Comment Type **TR** *Comment Status* **A** *Approved in May 2009*

Interfering with other 802.15-based systems is a huge issue. Already existing and world-wide used systems like Bluetooth, ZigBee, 6LowPAN, Wireless HART, and RF4CE will have problems to be operated in the same frequency band. The interoperabilty requirement for 802-based systems gets violated.

SuggestedRemedy

Introduce mechanisms to 11n and make them mandatory identifying other operating 802.15-based systems or do not allow to use the 40 MHz bandwidth in the 2.4 GHz ISM band.

Response *Response Status* **U**

AGREE IN PRINCIPLE (COEX: 2009-07-13)

TGn Editor to add new paragraph before NOTE 1 in 11.14.4.1, page 236, between lines 32 and 33, as follows:

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