IEEE P802.11
Wireless LANs

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| 802.11bd SA Ballot Comment Resolution Clause 4.3.17 and 4.3.17a |
| Date: 2022-05-30 |
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Abstract

This submission discusses resolutions to the following CIDs from 802.11bd SA Ballot 1 (D4.0, Clauses 4.3.17 and 4.3.17a):

CIDs 5000, 5005, 5038, 5039, 5040, 5041, 5043, 5044, 5089, and 5090

Proposed changes in this document are with reference to TGbd D4.0.

Revisions:

* Rev 0: Initial version of the document
* Rev 1: Added document URLs. Added editor notes. Cross referenced comment resolutions.
* Rev 2: Editorial change
* Rev 3: Move Spectrum Mask C2 requirement to Clause 32 from Annex D. Consolidate Class A, B, D and Class C requirements related to 10 MHz NGV PPDU transmission in Clause 32.1.1 (two separate statements consolidated into one).
* Rev 4: Move Spectrum Mask C2 table to Clause 32 from Annex D.
* Rev 5: Change “has to” to “needs to”

Proposed comment resolution

Modification to previous revision

Presented and discussed, no open discussion points

Under discussion

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| --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 5000 | 19.25 | Per this clause, a TGbd STA will share the same bands / channels of operation as a regular (i.e., 11n, 11ac, 11ax etc) Wi-Fi device. However it is not clear how it would inter-op with a regular Wi\_Fi device that is operating on the same channel if the preamble is not a true 20 MHz LTF. TGbd needs to conform to the same preambles as regular Wi-Fi. In other words, it should perform the same preamble detection (20 MHz based) as regular Wi-Fi systems. Not conforming will lead to serious interop/coexistence issues affecting millions of Wi-Fi devices that are already deployed in the field. | As in comment | Rejected.The P802.11bd PAR scope states "This amendment shall provide interoperability, coexistence, backward compatibility, and fairness with deployed OCB (Outside the Context of a BSS) devices". The PPDU modes requested in the comment would not provide coexistence with those devices and are thus outside the scope of the amendment.Also, the task group has consistently declined to have the amendment support the modes requested in this comment. See for example the straw poll from document 11-20-1012r1 (<https://mentor.ieee.org/802.11/dcn/20/11-20-1012-01-00bd-on-802-11bd-mandatory-features-input-from-the-car-2-car-communications-consortium.pptx>), as recorded in document 11-19-0276r11 (<https://mentor.ieee.org/802.11/dcn/20/11-20-0276-11-00bd-tgbd-feb-2020-teleconference-minutes.docx>)Also, the TGbd Coexistence Assessment Document 11-20-1564/r5 (<https://mentor.ieee.org/802.11/dcn/20/11-20-1564-05-00bd-tgbd-coexistence-assessment-document.docx>) includes the following: “802.11bd can coexist with other 802.11 devices with operating bandwidth wider than 10 MHz working on 5.9 GHz frequency band using -65dBm CCA sensitivity per 10 MHz channel.” |
| 5005 | 19.32 | This clause states that 802.11bd operates in 5.850-5.925GHz in the United States. Current FCC rules have allocated a portion of that band (5.850-5.895GHz) for unlicensed use as U-NII-4, which would allow other technologies including "regular" 802.11 (Wi-Fi) to operate in that band. While not required by the PAR, there is no preamble defined that is interoperable with any of the 802.11 PHY standards since 802.11a; there has been discussion in IEEE 802 and SAE about operating NGV in unlicensed bands on a shared basis with other 802.11 devices, but without a 20MHz 802.11n/ac/ax/be 20MHz preamble to enable preamble detection, only Energy Detection is possible. This limits the ability of NGV to operate in unlicensed band with minimal interference from other 802.11 devices. A request was also made by Car to Car Communication Consortium to comment on unlicensed band usage. Furthermore, the FCC has proposed eliminating DSRC (based on 802.11p) from the upper part of the band (5.895-5.925GHz), so there would be no spectrum available for 11bd operation in the US except the unlicensed U-NII-4 band. The current 802.11bd preambles (10 and 10+10MHz in BW) would cause interference to Wi-Fi systems based on 802.11a/n/ac/ax/be in U-NII-4. | Add a mode in 802.11bd that has a true 20MHz Legacy Training Field (LTF) to allow preamble detection by "conventional" Wi-Fi devices operating in U-NII-4 (5.850-5.895GHz) | Rejected.The P802.11bd PAR scope states "This amendment shall provide interoperability, coexistence, backward compatibility, and fairness with deployed OCB (Outside the Context of a BSS) devices". The PPDU modes requested in the comment would not provide coexistence with those devices and are thus outside the scope of the amendment.Also, the task group has consistently declined to have the amendment support the modes requested in this comment. See for example the straw poll from document 11-20-1012r1 (<https://mentor.ieee.org/802.11/dcn/20/11-20-1012-01-00bd-on-802-11bd-mandatory-features-input-from-the-car-2-car-communications-consortium.pptx>), as recorded in document 11-19-0276r11 (<https://mentor.ieee.org/802.11/dcn/20/11-20-0276-11-00bd-tgbd-feb-2020-teleconference-minutes.docx>)Also, the TGbd Coexistence Assessment Document 11-20-1564/r5 (<https://mentor.ieee.org/802.11/dcn/20/11-20-1564-05-00bd-tgbd-coexistence-assessment-document.docx>) includes the following: “802.11bd can coexist with other 802.11 devices with operating bandwidth wider than 10 MHz working on 5.9 GHz frequency band using -65dBm CCA sensitivity per 10 MHz channel.” |
| 5038 | 20.03 | "class C transmit spectrum mask for 10MHz NGV PPDU", the term used here is not consistent with Clause 32. | Change the sentence to "transmit spectrum mask of power Class C for 10MHz NGV PPDU" | Revised. Agree in principle with the commenter. See document 11-22/0827r1 ([https://mentor.ieee.org/802.11/dcn/22/11-22-0827-05-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-0827-01-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx))for redline edits, including edits to Clause 32.1.1, 32.3.10.1, and Annex D for consistent use of power class terminology.  |
| 5039 | 20.39 | Phony requirement in General Descriptions section. | Replace "may" with "might". Same change is necessary on line 50. | Accepted. |
| 5040 | 19.39 | Phony requirement in General Descriptions section. | Replace "may" with "might". Same change is necessary on line 42. | Accepted. |
| 5041 | 19.12 | Phony requirement in General Descriptions section. | Replace "may" with "might". | Accepted. |
| 5043 | 20.30 | Phony requirement in General Description. | Replace "shall support" with "supports". | Accepted.Note to editor: The resolution of CID 5089 refers to this resolution |
| 5044 | 19.35 | Phony requirement located in General Description section. | Replace "shall set" with "sets". Same change is necessary on line 36. | Revised. Agree that “shall set” is not appropriate for this clause (two places: P19.L35 and P19.L36). See document 11-22/0827r1 ([https://mentor.ieee.org/802.11/dcn/22/11-22-0827-05-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-0827-01-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx))for redline edits to the two sentences. Note to editor: CID 5090 addresses the same content. |
| 5089 | 20.30 | In IEEE Std 802.11-2020 clause 4 does not contain any statement of requirements ("shalls") as it is described as a general (informative) overview of the operations defined in the standard. These two "shalls" are likely to be overlooked and belong in an appropriate normative clause. While there is no rule that says clause 4 can not contain requirements, the convention of the standard being amended should be followed. | Remove the statement(s) of requirements from Clause 4. | Revised.Agree with commenter that “shall support” is not appropriate for this clause. Revised to “supports”. Note to editor: CID 5043 has a resolution of “Replace ‘shall support’ with ‘supports’” |
| 5090 | 19.35 | In IEEE Std 802.11-2020 clause 4 does not contain any statement of requirements ("shalls") as it is described as a general (informative) overview of the operations defined in the standard. These two "shalls" are likely to be overlooked and belong in an appropriate normative clause. While there is no rule that says clause 4 can not contain requirements, the convention of the standard being amended should be followed. | Remove these statements of requirements from Clause 4. | Revised.Agree with commenter that “shall set” is not appropriate for this clause (two places: P19.L35 and P19.L36) See document 11-22/0827r1 ([https://mentor.ieee.org/802.11/dcn/22/11-22-0827-05-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-0827-01-00bd-resolutions-to-clause-4-3-17-and-4-3-17a-cids.docx))for redline edits to the two sentences. Note to editor: CID 5044 addresses the same content. |

**Discussion of power class terminology relevant to CID 5038.**

The baseline 802.11-2020 standard uses the terms “transmit power class” and “transmit spectral mask”. The transmit power class is an attribute of a STA, i.e. a STA belongs to a given class. The transmit spectral mask is a bound on the power spectral density of a STA’s transmission, as a function of the STA’s transmit power class. According to Annex D, the requirements in the draft 802.11bd amendment with respect to transmit spectral masks C and C2 only apply to STAs that belong to transmit power class C. An NGV STA might belong to transmit power class A, B, or D as well. The modifications suggested below for Clause 4.3.17a, Clause 32.1.1, Clause 32.3.10.1, and Annex D use the baseline terminology consistently.

*Text with changes based on CID resolutions above.*

**4.3.17 STA transmission of Data frames outside the context of a BSS**

***Insert the following paragraphs after the fourth paragraph (“Communication of Data frames ...”):***

A STA with dot11OCBActivated equal to true might (#5041) operate as a DMG STA. A DMG STA with dot11DMGOCBActivated equal to true supports the MAC and MLME functions defined in 31.3 (Operation in the 60 GHz band) in addition to the MAC functions defined in 10 (MAC sublayer functional description) and the MLME functions defined in 11 (MLME) for DMG or EDMG STAs.(#3079, #3072, #3044)

A STA whose MIB does not include the dot11DMGOCBActivated attribute operates as if the attribute is

false.

***Insert the following subclause immediately after 4.3.17 (STA transmission of Data frames outside the***

***context of a BSS):***

**4.3.17a Next Generation Vehicle-to-everything (V2X) (NGV) STA**

An Next Generation Vehicle-to-everything (NGV) STA provides MAC and PHY features as defined in

Clause 31 (Next Generation V2X (NGV) MAC specification) and Clause 32 (Next Generation V2X (NGV) PHY specification).(#3075) An NGV STA supports at least twice the throughput and at least 3 dB better receiver minimum input sensitivity than a non-NGV STA when operating OCB in high mobility channel environments in the 5.9 GHz band as defined in subclauses E.2.3 (5.9 GHz band in the United States (5.850- 5.925 GHz)) and E.2.4 (5.9 GHz band in Europe (5.855-5.925 GHz)).(#3106) The double throughput and higher receiver minimum input sensitivity might not be supported simultaneously. In an NGV STA dot11NGVActivated is true. (#5044, #5090) In a non-NGV STA with ~~the~~ dot11NGVActivated ~~attribute~~, the attribute is false. (#5044, #5090) A STA whose MIB does not include the dot11NGVActivated attribute operates as if the attribute is false.

An NGV STA might (#5040) be co-located with a DMG STA for which dot11DMGOCBActivated is true in the 60 GHz frequency band (57 GHz to 71 GHz) as defined in E.1 (Country information and operating classes). (#3079, #3048, #3076, #3071) The NGV STA might (#5040) assist the DMG STA in performing DMG discovery OCB by communicating with a peer NGV STA to exchange the higher layer information that contains information of a peer DMG STA with which the peer NGV STA is co-located. The information is provided from/to a DMG STA through the MLME SAP interface. The protocol to exchange this higher layer information is outside the scope of this standard. (#3062)

An NGV STA supports interoperability, coexistence, backward compatibility, and fairness in contending for the medium with non-NGV STAs when operating OCB in the 5.9 GHz band. (#3077)

An NGV STA is capable of transmitting and receiving frames OCB as specified in 11.18 (STAs communicating Data frames outside the context of a BSS).(#3078, #3079)

The main PHY features of an NGV STA that are not present in a non-NGV STA are the following:

— Mandatory support for the 10 MHz NGV PPDU format and optional support for the 20 MHz NGV

 PPDU and 20 MHz non-NGV duplicate PPDU formats (#3055)

— For the 20 MHz and 10 MHz NGV PPDU, mandatory support for LDPC coding, midambles,
 BPSK-DCM, and 256-QAM (#3055)

—Mandatory support for transmit spectral mask C2 by a STA that transmits a 20 MHz NGV PPDU or 20 MHz non-NGV duplicate PPDU ~~and belongs to transmit power class C~~ (#5038) (#3055)

— Mandatory support for repetitive NON\_NGV\_10 PPDU

— Mandatory support for coexistence with non-NGV STAs operating in the same channel

— Mandatory support for transmit spectral mask C by a STA that transmits a 10 MHz NGV PPDU and belongs to transmit power class C (#5038)

— Optional support for transmission and reception of SU MIMO with 2 spatial streams

Additional NGV STA PHY features are:

— Mandatory support for single spatial stream

— Mandatory support for Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY
 specification) 10 MHz PPDU

— Optional support for Classes A, B, and D of spectrum mask requirement for 10 MHz bandwidth

The main MAC features of an NGV STA that are not present in a non-NGV STA are the following:

— Mandatory support for coexistence with non-NGV STAs operating in the same channel

— Mandatory support for extended MAC service interface to provide higher layers with the ability to

 control NGV transmissions and receive status regarding NGV receptions and the radio environment

— Mandatory support for NGV capability indication for non-NGV PPDUs encoded in the Duration/ID

 field of the MAC header

— Mandatory support for block ack

— Mandatory support for reception of frame aggregation when communicating OCB

— Optional support for transmission of frame aggregation when communicating OCB

— Optional support for 20 MHz OCB communication

— For optional 20 MHz OCB communication an NGV STA supports (#5043, #5089) 20 MHz channel access with

 10 MHz primary and 10 MHz secondary channel

— Optional support for 20 MHz non-NGV duplicate operation

Additional NGV STA MAC features are:

— Mandatory support for 10 MHz OCB communication

An NGV STA might (#5039) support positioning based on NGV ranging, which consists of a subset of Fine timing

Measurement (FTM) functionalities as defined in 11.21.6 (Fine timing measurement (FTM) procedure) and P.3 (Differential distance computation using Fine Timing Measurement frames):(#3079)

— Fine Timing Measurement procedure negotiation and termination for non-TB ranging as defined in

 11.21.6.3 (Fine Timing Measurement procedure negotiation) and non-TB ranging as described in

 11.21.6.4.4 (Non-TB ranging measurement exchange) (#3056)

— Differential distance computation as detailed in P.3 (Differential distance computation using Fine

 Timing Measurement frames) (#3079)

An NGV STA might (#5039) be co-located with a STA operating outside the 5.9 GHz band that supports the fine timing measurement procedure as defined in 11.21.6 (Fine timing measurement (FTM) procedure).

**32. Next Generation V2X (NGV) PHY specification**

**32.1 Introduction**

**32.1.1 Introduction to NGV PHY**

Clause 32 (Next Generation V2X (NGV) PHY specification) specifies the PHY entity for an NGV orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 32 (Next Generation V2X (NGV) PHY specification), an NGV STA shall be capable of transmitting and receiving 10 MHz PPDUs specified in Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification).

The NGV PHY is mainly based on the VHT PHY defined in Clause 21 (Very High Throughput (VHT) PHY specification), which in turn is based on the HT PHY defined in Clause 19 (High Throughput (HT) PHY specification), which in turn is further based on the OFDM PHY defined in Clause 17 (Orthogonal

frequency division multiplexing (OFDM) PHY specification). The NGV PHY preamble structure, dualcarrier modulation (DCM), and midamble structure are based on the HE PHY defined in Clause 28 (High Efficiency (HE) PHY specification).

The NGV PHY provides support for both 10 MHz and contiguous 20 MHz channel widths. The NGV PHY data subcarrier frequency spacing is a half of VHT PHY and HT PHY subcarrier frequency spacing defined in Clause 21 (Very High Throughput (VHT) PHY specification) and Clause 19 (High Throughput (HT) PHY specification), respectively.

The NGV PHY data subcarriers are modulated using binary phase shift keying (BPSK), BPSK-DCM,

quadrature phase shift keying (QPSK), 16-quadrature amplitude modulation (16-QAM), 64-QAM, and 256-QAM. The NGV PHY preamble is encoded by a convolutional encoder and the NGV PHY data payload is encoded by an LDPC encoder. STBC is not employed.

The NGV PHY supports the regulatory requirements in 32.3.14 (Regulatory requirements).

An NGV PHY shall support the following features:

— Single spatial stream

— NGV-MCS 0 to 9 and NGV-MCS 15

— Three LTF formats: NGV-LTF-1x, NGV-LTF-2x, and NGV-LTF-2x-Repeat

— LDPC coding (transmit and receive)

— Midamble periodicity of 4, 8, 16 OFDM symbols

— 10 MHz NGV PPDU

— Repetitive NON\_NGV\_10 PPDU

— Transmit spectrum mask C2 when transmitting a 20 MHz NGV PPDU or 20 MHz non-NGV duplicate PPDU, if 20 MHz NGV PPDU is supported ~~and if the STA belongs to transmit power class C~~ (#5038) (#3089)

— Transmit spectrum mask A, B, C, or D when transmitting a 10 MHz NGV PPDU, if the STA belongs to transmit power class A, B, C, or D, respectively (#5038) (#3090)

An NGV PHY may support the following features:

— Transmission and reception of SU MIMO with 2 spatial streams

— NGV ranging NDP for NGV ranging as described in 31.4 (NGV ranging)

— 20 MHz NGV PPDU or 20 MHz non-NGV duplicate PPDU

**32.3.10.1 Transmit spectrum mask**

The transmit spectrum mask by regulatory domain is defined in Annex D and Annex E.

For any STA transmitting a 10 MHz NGV PPDU, tis

For any STA using 20 MHz channel spacing and transmitting a 20 MHz NGV PPDU or 20 MHz non-NGV duplicate PPDU, the transmitted spectral density shall have a 0 dBr bandwidth not exceeding 19 MHz and shall not exceed the spectrum mask created using the permitted power spectral density levels listed in Table 32-X (Spectrum mask C2 data for 20 MHz channel spacing). (#5038)

 or 20 MHz non-NGV duplicate PPDU

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| Table 32-X—Spectrum mask data for 20 MHz channel spacing |
| STA transmit power class | Permitted power spectral density, dBr |
| ± 9.5 MHz offset(±f1) | ± 10.0 MHz offset(±f2) | ± 10.5 MHz offset(±f3) | ± 15 MHz offset(±f4) | ± 25 MHz offset(±f5) |
| Any Class | 0 | –26 | –32 | –40 | –50 |

NOTE 1—In the presence of additional regulatory restrictions, the device needs to meet both the regulatory requirementsand the mask defined in this subclause.

NOTE 2—For rules regarding TX center frequency leakage levels, see 32.3.10.4.2 (Transmitter center frequency leakage).

The spectral mask requirements in this subclause do not apply to the RF LO.

**D.2 Radio performance specifications(#3104)**

**D.2.3 Transmit spectrum mask**

***Change as follows:***

Transmit spectrum masks defined in regulation are subject to change or revision at any time.

For operation in the 5.85**–**5.925 GHz band the transmitted spectrum shall be as follows:

a) For any STA using 5 MHz channel spacing, the transmitted spectral density shall have a 0 dBr bandwidth not exceeding 4.5 MHz and shall not exceed the spectrum mask created using the permitted

power spectral density levels listed in Table D-5 (Spectrum mask data for 5 MHz channel spacing)

for the transmit power class of the STA.

b) For any STA using 10 MHz channel spacing, the transmitted spectral density shall have a 0 dBr

bandwidth not exceeding 9 MHz and shall not exceed the spectrum mask created using the permitted

power spectral density levels listed in Table D-6 (Spectrum mask data for 10 MHz channel spacing)

for the transmit power class of the STA.

c) For any STA using 20 MHz channel spacing and transmitting a PPDU that is not a 20 MHz NGV PPDU or 20 MHz non-NGV duplicate PPDU, the transmitted spectral density shall have a 0 dBr bandwidth not exceeding 18 MHz and shall not

exceed the spectrum mask created using the permitted power spectral density levels listed in Table

D-7 (Spectrum mask data for 20 MHz channel spacing) for the transmit power class of the STA. (#5038)

Note: the conditions under which conformance to transmit spectral mask C2 is required are specified in 32.3.10.1 (Transmit Spectral Mask).

Informative table for readers of this submission. This table is not proposed to be included in the 802.11bd amendment.

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| **PPDU type** | **STA’s transmit power class** | **Transmit spectral mask requirement** | **Comment** |
| Non-NGV 10 | A | A | Legacy treatment in 802.11-2020 |
| Non-NGV 10 | B | B |
| Non-NGV 10 | C | C |
| Non-NGV 10 | D | D |
| NGV 10 | A | A | New specification in 802.11bd |
| NGV 10 | B | B |
| NGV 10 | C | C |
| NGV 10 | D | D |
| NGV 20 | any | C2 |