IEEE P802.11
Wireless LANs

|  |
| --- |
| LB251 Comment Resolution for 11bd D1.0 Clause 4 General description |
| Date: 2021-02-23 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Stephan Sand | German Aerospace Center (DLR) |  |  | stephan.sand@dlr.de |
|  |  |  |  |  |

Abstract

This submission discusses resolutions to the following 22 CIDs from WG LB 251 of TGbd D1.0 related to Clause 4 General description.

Th CID list is:

1001, 1013, 1014, 1015, 1017, 1095, 1101, 1140, 1181, 1200, 1202, 1268, 1269, 1347, 1509, 1510, 1606, 1607, 1608, 1609, 1737, 1738

Proposed changes in this document are with reference to TGbd D1.0.

Revisions:

* Rev 0: Initial version of the document

Proposed comment resolution

Own comments will be addressed in separate contribution

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 1181 | 17.15 | some references seem to be missing here. Why only 31.3.2 on DMG STA and not 31.2? | Please clarify | RejectThis section addresses only STA transmission of Data frames outside the context of a BSS. Clause 11.18 defines all control and data frame subtypes an NGV STA may transmit. As agreed in contribution <https://mentor.ieee.org/802.11/dcn/21/11-21-0044-03-00bd-lb251-cids-related-to-dmg-sta-with-ocb-operation.docx>, all control and data frame subtypes for a DMG STA (60 GHz band) operating OCB are now defined in Clause 11.18.Hence the change to the NOTE after the first paragraph on P17L11-L16 will be removed.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx)  |
| 1013 | 17.30 | Sentence mentions that these STAs are typically used in vehicular environments and also says while operating outside of the context of a BSS. Many questions: Do these STAs typically operate within the context of a BSS if not in vehicular environments? What is a vehicular environment? Perhaps we need a definition for it. Also if they are typically used in these environments then do they non-typically operate in other environments? In addition, the sentence calls out data. Can the STAs also exchange other types of frames such as Control, MGMT and so on? | As in comment. Also there is a typo "recieve". | RevisedIn principle agree with the comment. Hence, we propose to rewrite the sentence as: NGV STAs transmit and receive frames OCB (dot11OCBActivated is true) as specified in 11.18 (STAs communicating Data frames outside the context of a BSS).**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1101 | 17.30 | Thought I saw an e-mail from Dorothy that in TGmd, the terms "unicast" and multicast are being replaced. | check to see if this term is officially being changed. If so, please see if this draft amendment needs to be consistent with TGmd and make the appropriate changes throughout the document. | RevisedAgree in principle on the comment. REVmd 5.0 uses instead of “unicast”, “unicast address”, “multicast”, and “multicast address” the terms “individually addressed”, “individual address”, “group addressed”, and “group address”. However, “broadcast” and “broadcast address” are still used.**TGbd Editor:** Please replace “unicast” with “individually addressed” throughout IEEE P802.11bd D1.0 |
| 1268 | 17.30 | The text could be clearer as it seems to indicate that NGV STAs are only typically operate OCB. While NGV STAs are typically used in a vehicular environment, I believe they are always operate OCB. (This doesn't mean a device containing an NGV STA cannot connect associate with a BSS using a "non-NGV" STA, just that the NGV STA does not make such associations.) | Change:"NGV STAs are typically used in vehicular environments to transmit and receive broadcast and unicast data frames while operating outside the context of a BSS (OCB)."To be:"NGV STAs are typically used in vehicular environments. NGV STAs transmit and receive broadcast and unicast data frames while operating OCB (dot11OCBActivated is true)." | RevisedIn principle agree with the comment. Hence, we propose to rewrite the sentence as: NGV STAs transmit and receive frames OCB (dot11OCBActivated is true) as specified in 11.18 (STAs communicating Data frames outside the context of a BSS).**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1269 | 17.33 | It would be helpful to provide a better introduction to NGV then simply stating the PHY and MAC features. | Add the following text, based on PAR:"NGV STAs have PHY and MAC features to enhance throughput and sensitivity (> twice the throughput and > 3dB lower sensitivity of non-NGV STAs) when operating in high mobility channel environments in the 5.9 GHz band, as defined in clauses E.2.3 and E.2.4. NGV STAs may optionally operate in the 60 GHz frequency band (57 GHz to 71 GHz) as defined in clause E.1. NGV STAs may support positioning based on fine timing measurement (see clause 4.3.19.19 and P.3) using 10 and 20 MHz bandwidth PPDUs in the 5.9 GHz band and any PPDUs in the 60 GHz band. NGV STAs support interoperability, coexistence, backward compatibility, and fairness with non-NGV STAs when operating OCB in the 5.9 GHz band." | RevisedAgree with the comment and revised text.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1001 | 17.36 | Clause 4.3.17a should follow the IEEE 802.11 style guide text used in clause 4 in REVmd D5.0 and 11ax D7.0 for example. The main PHY features and MAC features should include key features that are core to 11bd, stating those that are "Support for....", "Mandatory support for...", Optional support for....". OFDM should be included as part of the main PHY features. | Add OFDM as a main PHY feature. For each of the bulletized and sub-bullet PHY and MAC features change text to read e.g., "Supports new 10 MHz and 20 MHz PPDU formats". as commented. | RevisedAgree in principle with comment on stating wihich features are “Mandatory support for” or “Optional support for”. Reviewing Clause 4.3 in REVmd D5.0 and 11ax D7.0, OFDM is not mentioned as a main PHY feature for HT, VHT, or HE. Hence, we do not list OFDM as a main PHY feature for NGV. Note similar to CID 1140**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1140 | 17.36 | Please describe whether each feature is mandatory or optional | As in the comment | AcceptedNote similar to CID 1001 |
| 1509 | 17.36 | In the following sentence "New 10 MHz and 20 MHz PPDU formats", please remove the word "new" since this will soon become an old amendment once published. Changing to "10 MHz and 20 MHz NGV PPDU formats" would be more precise. | Change the sentence to "10 MHz and 20 MHz NGV PPDU formats" | Accepted Note similar to CID 1014 |
| 1014 | 17.36 | At some point in the amendment evolution anything that is currently new becomes old. Please find an alternate word for "new" | As in comment. | RevisedDeleted the word “new”Note similar to CID 1509 |
| 1015 | 17.38 | Several sub-bullets mention improved "something". Perhaps it is a good idea to mention compared to what. | As in comment. | RevisedAgree with comment. Clause has been rewritten, only in the introduction it contains a statement which compares to non-NGV STA (formerly 11.p). Otherwise comparisons have been removed to use similar style as REVmd D5.0 and 11ax D7.0.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1347 | 17.42 | Usually when disussing interference that is caused by the transmitter, adjacent channel leakage is the commonly used term. Reduce adjacent channel interference can be done in the receiver by a better channel selective filter. It is clear what is meant, but leakage is a better term | replace "interference" by "leakage" | Revised“to reduce adjacent channel interference” has been deleted to follow similar style as in REVmd D5.0 and 11ax D7.0.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1200 | 17.46 | There is some amgibuity in the statement "NGV stations also support clause 17 PPDU formats". Clause 17 specifies 20 MHz, 10 MHz, and 5 MHz PPDU formats. A given NGV station might not support all of those. Given the PAR requirement to coexist with 10 MHz Clause 17 PPDU formats, I believe this statement should be qualified to refer to 10 MHz. | Insert "10 MHz" before "Clause 17 PPDU formats" | RevisedAgree in principle on the comment. Rephrased to “Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification) 10 MHz PPDU”**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1606 | 17.48 | In subclause 32.1 RTT ranging is listed as optional feature. Hence it should be listed here as optional feature, too. | Add bullet "- Optionally, round trip time (RTT) based ranging using 10 and 20 MHz bandwidth PPDUs." | RevisedAgree in principle on comment. Added statement “NGV STAs may support positioning based on NGV Ranging in the 5.9 GHz band” and “An NGV STA may support positioning based on NGV Ranging, which consists of a subset of Fine timing measurement (FTM) functionalities as defined in 11.21.6:” **TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1017 | 17.51 | Some of the bullets under main MAC features seem confusing. Operation with 10 MHz and 20 MHz PPDUs in OCB context is nothing new AFAIK. Also having same channel coexistence with something else is not a feature. And frame aggregation, if referring to A-MPDU this is not new. | As in comment. | RevisedIn principle agree with comment. Bullet list have been revised to list main MAC and PHY feature of an NGV STA and to differentiate with a non-NGV STA.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1095 | 17.55 | When operates in the 60GHz band, it is not clear what PHY will be used. The NGV PHY defined in clause 32 doesn't work in 60GHz band | as in the comment | RevisedRephrased to:Additional main MAC features in an NGV STA are the following:Optional support for operating as DMG STA, when dot11OCBActivated is true, with the MAC and MLME functions defined in Clause 31.3 (Operation in 60 GHz band) in addition to the MAC functions defined in Cause 10 (MAC sublayer functional description) and the MLME functions defined in Clause 11(MLME) for DMG or EDMG STAs.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1737 | 17.55 | "Optionally, operation outside the context of a BSS in the 60 GHz band" Does this mean, when operating in the 60 GHz, the STA has to have a multi-band capability? Is operation in the 5.9 GHz mandatory for NGV STAs? | Clarify. | RevisedYes, 5.9 GHz operation is mandatory for NGV STA and 60 GHz is optional. Hence, an NGV STA optinally supporting DMG operations has multiband capabilities.Pleae note the first paragraph of the subclause defines that an NGV STA is a STA operating OCB in 5.9 GHz and optionaly operated in the 60 GHz band.  |
| 1510 | 17.57 | "New 20 MHz channel access mechanism" doesn't give any idea what it is. Either remove "new" from the sentence or give a name for the new 20 MHz channel access mechanism. | as shown in the comment. | RevisedAgree with comment. Rephrased to: Mandatory support for 20 MHz channel access with 10 MHz primary and 10 MHz secondary channel when communicating OCB **TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1738 | 17.60 | "Same channel coexistence with stations communicating in OCB mode that are not NGV capable" What does same channel coexistence mean? Does this bullet mean that a coexistence scheme is provided to share the medium with non-NGV STAs in the same OCB primary channel or in the same OCB secondary channel? | Clarify. | RevisedAn NGV STA has mandatory support for same channel coexistence with non-NGV STAs and mandatory support for 20 MHz channel access with 10 MHz primary and 10 MHz secondary channel when communicating OCB. Hence an NGV STA coexists with a non-NGV STA in the same primary or secondary OCB channel. |
| 1202 | 17.65 | I think that the indication of NGV capability in the MAC header qualifies as one of the main features of an NGV STA that are presented in this clause. This should be added. | At the end of the bullet list (following "Improvements to the MAC Service ..."), add the following bullet: "NGV capability indication encoded in the MAC header" | RevisedAgree with comment. Rephrased to:— Mandatory support for NGV capability indication for non-NGV PPDUs encoded in the Duration/ID field of the MAC header**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1607 | 17.65 | Since RTT ranging can be implemented according to REVmd D5.0 or 11az D2.3 with several different methods, list at least one specific method here. | Add sentence after main MAC feature list that states "The optional RTT based ranging for NGV STAs operating OCB shall use an adapted FTM session with non-trigger based (non-TB) measurement exchange." | RevisedAgree in principle on comment. Added “— Fine Timing Measurement procedure negotiation for Non-TB Ranging as defined in 11.21.6.3 and Non-TB Ranging as described in 11.21.6.4.4”.**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1608 | 17.65 | Since the 11bd PAR states that "amendment defines procedures for at least one form of positioning in conjunction with V2X communications" , 11bd should provide the means to setup 11az ranging through multi-channel operation. | Add sentence after main MAC feature list that states "NGV STAs operating OCB may support negotation of ranging features using higher layer mechanisms such as multi-channel operation described in the IEEE 1609 [B17] family of standards."Note that [B17] is defined in REVmd D5.0. | RevisedAgree in principle on comment. Added “Additionally, an NGV STA may support positioning based on fine timing measurement (FTM) procedures outside the 5.9 GHz frequency band as defined in 11.21.6.”**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |
| 1609 | 18.1 | Since an NGV PHY may support RTT based ranging using 10 and 20 MHz bandwidth PPDUs, subclause 4.3.19.19 should contain a statement that an NGV STA operating OCB may use an adapted FTM session with non-TB measurement exchange and may be capable to compute differential distance using FTM as in Annex P.3 | After 4.3.17a add a change at the end of the 4.3.19.19 Fine Timing Measurement subclause that "An NGV STA operating OCB may use an adapted FTM session with non-TB measurement exchange and may be capable to compute differential distance using FTM as in Annex P.3." | RevisedAgree in principle on comment. Added ““— Fine Timing Measurement procedure negotiation for Non-TB Ranging as defined in 11.21.6.3 and Non-TB Ranging as described in 11.21.6.4.4” and “— Differential distance computation as detailed in Annex P.3”**TGbd Editor:** Please incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251 CR for 11bd D1.0 Clause 4.docx](https://mentor.ieee.org/802.11/dcn/21/11-20-0083-00-00bd-LB251%20CR%20for%2011bd%20D1.0%20Clause%204.docx) |

## Discussion CID #1181

Clause 11.18 (STAs communicating Data frames outside the context of a BSS) specifies the following frames:

When dot11OCBActivated is true in a STA:

a) Synchronization, authentication, association, and frame classes as defined in 11.1 (Synchronization) and 11.3 (STA authentication and association) are not used. Data confidentiality as defined in Clause 12 (Security) is not used. The STA may send Action frames and, if the STA maintains a TSF Timer, Timing Advertisement frames.

 b) The STA may send Control frames, except those of subtype PS-Poll and CF-End(#2699).

 c) The STA may send Data frames of subtype Data, Null, QoS Data, and QoS Null.

 d) The STA shall set the BSSID field in all Management and Data frames to the wildcard BSSID value

Hence it includes the following frame subtypes

* BlockAck and BlockAckReq frames are control frames and hence covered by 11.18
* A-MSDU is a Data frame of subtype Data and hence covered by 11.18
* A-MPDU contains either Ack, Action No Ack, QoS Null, Immediate BockAckReq, or QoS Data frames. All of these are coved by 11.18

Given the proposed and agreed changes in <https://mentor.ieee.org/802.11/dcn/21/11-21-0044-03-00bd-lb251-cids-related-to-dmg-sta-with-ocb-operation.docx> that all control and data frame subtypes for a DMG STA (60 GHz band) operating OCB are now defined in Clause 11.18, too, the comment is not anymore applicable as the Change to the NOTE should be removed.

## Propose:

***TGbd editor: please remove the “Change the NOTE after the first paragraph as follows:” on P17L11-L16***

***~~Change the NOTE after the first paragraph as follows:~~***

~~NOTE—The specific frame subtypes that a STA is allowed to send when it has dot11OCBActivated true are specified in 11.198 (STAs communicating Data frames outside the context of a BSS) and Clause 31.3.2 (DMG STAs communicating Data frames outside the context of a BSS).~~(#1181)

## Propose:

***TGbd editor: please modify the sentence in P17L26-27 as follows***

The IEEE 802.11 Enhancements for Next Generation Vehicle-to-Everything (NGV) STA is a STA that ~~supports NGV~~ provides MAC and PHY features as ~~identified~~defined in Clause 31 (Next Generation V2X (NGV) MAC specification) and Clause 32 (Next Generation V2X (NGV) PHY specification) that can support at least twice the throughput or at least 3dB lower sensitivity when operating outside the context of a BSS (OCB) in high mobility channel environments in the 5.9 GHz band, as defined in clauses 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)) compared to non-NGV STAs operating OCB. (#1015) (#1737) (#1269)

NGV STAs may optionally operate in the 60 GHz frequency band (57 GHz to 71 GHz) as defined in clause E.1. (#1737) (#1269)

NGV STAs may support positioning based on NGV Ranging in the 5.9 GHz band or on fine timing measurement (FTM) procedures outside the 5.9 GHz frequency band as defined in 11.21.6 (Fine timing measurement (FTM) procedure). (#1269) (#1606) (#1607) (#1608) (#1609)

NGV STAs support interoperability, coexistence, backward compatibility, and fairness with non-NGV STAs when operating OCB in the 5.9 GHz band. (#1269)

## Propose:

***TGbd editor: please modify the sentence in P17L30-31 as follows***

NGV STAs ~~are typically used in vehicular environments to~~ transmit and rec~~i~~eive ~~broadcast and unicast data~~ frames ~~while operating~~ ~~outside the context of a BSS (~~OCB (dot11OCBActivated is true) as specified in 11.18 (STAs communicating Data frames outside the context of a BSS).(#1013)(#1101)(#1268)

## Propose:

***TGbd editor: please modify P17L33-65 as follows***

The main PHY features ~~of~~ in an NGV STA that are not present in a non-NGV STA are the following:
— ~~New~~ (#1014) (#1509)10 MHz and 20 MHz PPDU formats with half of the data subcarrier frequency spacing of VHT PHY defined in Clause 21 (Very High Throughput (VHT) PHY specification) (#1001) (#1140)
• Mandatory support for 10 MHz NGV PPDU
• Mandatory support for LDPC coding ~~for improved reliability~~(#1015)
• Mandatory support for Midambles ~~for improved reliability and range in fast changing RF environments~~(#1015)
• Mandatory support for BPSK with DCM
• Mandatory support for 256 QAM ~~for higher data rates~~(#1015) ~~• Improved spectral mask C2 for 20MHz to reduce adjacent channel interference~~(#1015) (#1347)• Mandatory support for class C2 transmit spectrum mask for 20 MHz NGV PPDU
• Optional support for 20 MHz NGV PPDU
— Mandatory support for repetitive NON\_NGV\_10 PPDU
— Mandatory support for coexistence with non-NGV STAs
— Optional support for transmission and reception of single user (SU) MIMO with 2 spatial streams

Additional main PHY features in an NGV STA are the following: (#1001) (#1140)
— Mandatory support for single spatial stream
— Mandatory support for class C transmit spectrum mask for 10 MHz NGV PPDU
— Mandatory support for ~~NGV stations also support clause 17~~ Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification) 10 MHz PPDU ~~formats~~ (#1200)
— Optional support for Classes A, B, and D of spectrum mask requirement for 10 MHz bandwidth

~~— Optionally, multiple spatial streams (SU-MIMO).~~

The main MAC features of an NGV STA that are not present in a non-NGV STA are the following: (#1001)(#1017)(#1140)
— Mandatory support for same channel coexistence with non-NGV STAs (#1738)
— Mandatory support for extended MAC service inferface to provide higher layers with the ability to control NGV transmissions and receive status regarding NGV receptions and the radio environment
— Mandatory support for 20 MHz channel access with 10 MHz primary and 10 MHz secondary channel when communicating OCB (#1510)(#1738)

— Mandatory support for NGV capability indication for non-NGV PPDUs encoded in the Duration/ID field of the MAC header (#1202)
— Mandatory support for reception of frame aggregation when communicating OCB
— Optional support for transmission of frame aggregation when communicating OCB

Additional main MAC features in an NGV STA are the following: (#1001) (#1017) (#1140)
— Mandatory support for 10 MHz OCB communication
— Optional support for ~~and~~ 20 MHz OCB communication ~~outside the context of a BSS (OCB)~~— Optional support for operating as DMG STA, when dot11OCBActivated is true, with the MAC and MLME functions defined in Clause 31.3 (Operation in 60 GHz band) in addition to the MAC functions defined in Cause 10 (MAC sublayer functional description) and the MLME functions defined in Clause 11(MLME) for DMG or EDMG STAs. (#1001)(#1017)(#1095)(#1140)(#1737)
~~— Optionally, operation outside the context of a BSS in the 60 GHz band
— New 20 MHz channel access mechanism to improve coexistence with 10 MHz~~ (#1014) ~~— Same channel coexistence with stations communicating in OCB mode that are not NGV capable
— Frame Aggregation to improve efficiency
— Improvements to the MAC Service definition for IEEE 1609 and other upper layer protocols to efficiently use the radio.~~ (#1015)

An NGV STA may 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): (#1606)
— Fine Timing Measurement procedure negotiation 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) (#1607) (#1609)
— PASN as defined in 12.12 (Pre Association Security Negotiation)
— Differential distance computation as detailed in Annex P.3 (Differential Distance Computation using Fine Timing Measurement frames) (#1609)

Additionally, an NGV STA may support positioning based on fine timing measurement (FTM) procedures outside the 5.9 GHz frequency band as defined in 11.21.6 (Fine timing measurement (FTM) procedure). (#1608)