IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LB272 - LB272 Comment resolutions on monostatic sensing | | | | |
| Date: 2023-07-06 | | | | |
| Author: | | | | |
| Name | Affiliation | Address | Phone | Email |
| Yan Xin | Huawei Technologies | Ottawa, Ontario |  | yan.xin@huawei.com |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

This submission includes the resolutions for the following four comments:

1990, 1763, 1764, 1766

on Subclauses 28.9.4 and 11.55.3.6.2.3 in P802.11bf D1.0.

The baseline document is 802.11bf D1.2.

##### Revision history:

##### R0 – initial version

R1 – Revision based on offline discussion.

**CID: 1990**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Comment | Proposed Change | Proposed resolution |
| 1990 | 28.9.4 | 229 | 40 | Subclause 28.9.4 heading reads "DMG monostatic sensing PPDU" inside the EDMG clause. Please change DMG to EDMG | As in the comment. | REVISED.    TGbf editor: Please revise the text in P229L43 in subclause 28.9.4 in 802.11bf D1.0 (P192L43 in 802.11bf D1.2)  as in 11-23/1081r1. |

*Discussion:*

*Monostatic sensing was specified in Annex AB for radar implementation using DMG PHY and EDMG PHY. The terminology of DMG monostatic sensing was agreed in TGbf.*

*The resolution proposes to keep the subclause tile “DMG monostatic sensing PPDU” unchanged.*

*Instead, the first sentence in Sec. 28.9.4 is proposed to be revised to indicate that any EDMG PPDU may also be used for monostatic sensing.*

TGbf editor: Please revise the first sentence in subclause 28.9.4 (P195L40) in 802.11bf D1.2 as below.

As described in Annex AB, any DMG or EDMG PPDU may be used for monostatic sensing.

**CID: 1766**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Comment | Proposed Change | Proposed resolution |
| 1766 | 28.9.4 | 229 | 40 | This subclause includes general descriptions on monostatic DMG sensing PPDU. However, the constrain on the waveform used specificlly in coordinated monostatic DMG sensing PPDU is not addressed, in which sensing signals may interfer each other in some cases. | Specify the potential additional constraint(s) for coordinated monostatic sensing. | REVISED  TGbf editor: Please add the text proposed in 11-23/1081r0 to the end of subclause 28.9.4 in 802.11bf D1.2. |

*Discussion:*

*In the parallel mode of coordinated DMG monostatic sensing, the waveforms of the TRN fields of DMG monostatic sensing PPDUs transmitted by more than one responder in the sounding phase should be orthogonal to minimize cross-interference among those TRN fields in the respective DMG monostatic sensing PPDUs.*

*The TRN subfield for EDMG SC PPDU is defined in subclause 28.9.2.6 TRN subfield definition for EDMG SC PPDUs and EDMG control mode PPDUs, which consists of N\_TX orthogonal waveforms, where N\_TX is the total number of transmit chains used in the transmission of the EDMG PPDU. Therefore, each responder in the parallel mode of coordinated DMG monostatic sensing can be assigned with a unique TRN subfield waveform for EDMG SC PPDU.*

TGbf editor: Please add the following text to the end of subclause 28.9.4 in 802.11bf D1.2.

EDMG PPDUs may be used in the parallel mode of coordinated DMG monostatic sensing. TRN subfield for EDMG SC PPDUs (28.9.2.2.6 TRN subfield definition for EDMG SC PPDUs and EDMG control mode PPDUs) may be used as the waveforms of the TRN field of a coordinated DMG monostatic sensing PPDU. Each responder in the parallel mode of coordinated DMG monostatic sensing may be assigned with a unique TRN subfield waveform for EDMG SC PPDUs.

**CID: 1763**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Comment | Proposed Change | Proposed resolution |
| 1763 | 11.55.3.6.2.3 | 209 | 43 | Figure 11-74o shows the parallel mode of coodinated monostatic sounding, in which the initiator and STA B transmit DMG monostatic sensing PPDUs. However, the text in P210L5-6 says "In the following sounding phase, STA A and STA B transmit DMG monostatic sensing PPDUs and receive the reflected signal in parallel", which disagree with what Figure 11-74o. | If the text in P210L5-6 is correct, modify Figure 11-74o accordingly. | REVISED  Based on the description in details in subclause 11.55.3.6.2.3 including P210L5-6, Figure 11-74o is expected to show the case that the AP is the initiator and STA A and STA B are two responders. STA A and STA B are expected to transmit DMG monostatic sensing PPDUs simultaneously.  TGbf editor: Please revise Figure 11-74o in subclause 11.55.3.6.2.3 in 802.11bf D1.0 (Figure 11-74n in 802.11bf D1.2) by moving the “Monostatic Sounding” box from Initiator STA to Responder STA A for both Instance 1 and 2. |

**CID: 1764**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Comment | Proposed Change | Proposed resolution |
| 1764 | 11.55.3.6.2.3 | 210 | 13 | The draft text "The Sounding Duration of STA A and STA B may have different duration for different PPDU types or different Data Length." implies that for the case that more than one monostatic sounding PPDUs are transmitted by each responder during the sounding phase, those monostatic sounding PPDUs may not be fully aligned in time. How to maintain the orthogonality of sounding signals in the parallel mode? | Need to further consider the sounding signals for coordinated monstatic DMG sensing. | REVISED  TGbf Editor: please revise the text as suggested in 11-23/1081r1 |

*Discussion:*

*As specified in subclause 28.9.4 in 802.11bf D1.2, “As described in Annex AB, any DMG or EDMG PPDU may be used for monostatic sensing.”*

*Annex AB in P5710L30 of IEEE P802.11-REVme/D3.0 specifies: “By using the approach described in this Annex to implement radar function, coexistence with DMG and EDMG transmissions on the same channel is achieved due to the use of IEEE 802.11 EDCA medium access rules and DMG or EDMG PPDUs, which allow other STAs to determine the duration of a transmission.”*

*As described in 11.55.3.6.2.3 Parallel coordinated monostatic DMG sensing instance in 802.11bf D1.2 and as shown in Figure 11-74o as well, in the sounding phase of parallel coordinated monostatic DMG sensing, multiple sensing responders shall send more than one DMG monostatic sensing PPDU in parallel. If the DMG monostatic sensing PPDUs are transmitted on the same channel which may cause a collision. If this is the case, the responders may not correctly detect the preambles and the data fields and a collision in TRN fields and/or mis-aligned TRN fields deteriorate the orthogonality of TRN fields used by different responders. These will impact on the sensing performance.*

*In subclause 10.41.5.1 Allocation of A-BFT in IEEE P802.11-REVme/D3.0, EDMG specifies that multiple A-BFT can be allocated over the primary channel and a secondary channel and can be transmitted by multiple non-AP (or non-PCP) STAs simultaneously.*

*The proposed resolution for CID #1764 is: to allow the PPDUs used in the sound phase of parallel sounding mode in coordinated monostatic DMG sensing to be transmitted by different responders over different channels.*

TGbf editor: Please revise the caption of Figure 11-74n and the following two paragraphs in 802.11bf D1.2 as below.

**Figure 11-74n(a)—Coordinated monostatic DMG sensing instances in parallel sounding mode** with single-channel operation in the sounding phase.

Figure 11-74n(a) (Coordinated monostatic DMG sensing instances in parallel sounding mode with single-channel operation in the sounding phase) gives an example of two parallel coordinated monostatic DMG sensing instances. The PCP/AP is the sensing initiator and two non-AP STAs (STA A and STA B) are sensing responders. The SP is not used and the measurement results need to be reported. In the DMG sensing measurement session phase, STA A and STA B delivered the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b of the first instance to the sensing initiator by the DMG Sensing Instance Duration element within the DMG Sensing Measurement Response frames.

In Instance 1, in the initiation phase, the sensing initiator sends a DMG Sensing Request frame to STA A

(STA ID equal to 0) and receives a DMG Sensing Response frame from STA A. Then the sensing initiator sends a DMG Sensing Request frame to STA B (STA ID equal to 1) and receives a DMG Sensing Response frame from STA B. The DMG Sensing Request frames activate STA A and STA B to be ready to participate in the sounding and reporting phases. The DMG Sensing Response frames indicate to the sensing initiator the readiness of STA A and STA B, and include the Sounding Duration 1a, Report Duration 1a, Sounding Duration 1b, and Report Duration 1b of the Instance 2. Based on the STA ID field and the Num of STAs in Instance field within the received DMG Sensing Request frame, STA A infers that there is one remaining sensing responder to be initiated and estimates when the last DMG Sensing Response ends. In the first DMG Sensing Request frame transmitted by the sensing initiator, the Duration field is set according to Equation (11-10). The sensing initiator calculates it based on the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b fields delivered in the DMG Sensing Instance Duration element within the DMG Sensing Measurement Response frames. In the following sounding phase, STA A and STA B transmit DMG monostatic sensing PPDUs and receive the reflected signal in parallel over the same channel. The duration of the transmission of the DMG monostatic sensing PPDUs of STA A including the SBIFS is equal to the Sounding Duration 0a. The duration of the transmission of the DMG monostatic sensing PPDUs of STA B including the SBIFS is equal to the Sounding Duration 0b. The measurement in DMG monostatic sensing PPDUs covers the number of transmit AWVs indicated by the Number TX Beams Per Instance field and the times of repetition indicated by the Repeat Per Instance field within the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element. The Sounding Duration of STA A and STA B may have different duration for different PPDU types or different Data Length. In the following reporting phase, after the largest Sounding Duration (Sounding Duration 0b) plus SIFS and BRPIFS from the end of the last DMG Sensing Response frame, the sensing initiator sends the first DMG Sensing Poll frame to STA A for the report and receives a DMG Sensing Measurement Report frame from STA A. Then the sensing initiator sends another DMG Sensing Poll frame to STA B for the report and receives a DMG Sensing Measurement Report frame from STA B. The duration of the transmission of the DMG Sensing Measurement Report frame of STA A is equal to the Report Duration 0a. The duration of the transmission of the DMG Sensing Measurement Report frame of STA B is equal to the Report Duration 0b.

TGbf editor: Please add the following Figure 11-71n(b) and the text to the end of subclause 11.55.3.6.2.3 Parallel coordinated monostatic DMG sensing instance in 802.11bf D1.2 as below.



Figure 11-74n(b) - Coordinated monostatic DMG sensing instances in parallel sounding mode with multi-channel operation in the sounding phase.

Figure 11-74n(b) (Coordinated monostatic DMG sensing instances in parallel sounding mode with multi-channel operation in the sounding phase) shows an example of two parallel coordinated monostatic DMG sensing instances, in which the PCP/AP is the sensing initiator and two non-PCP/AP STAs (STA A and STA B) are the sensing responders. In the DMG sensing measurement setup phase, in addition to the information exchanged between the initiator and the responders described above, for Coordinated monostatic DMG sensing instances in parallel sounding mode with multi-channel operation in the sounding phase, the initiator shall allocate a channel for monstatic sounding of STA A and indicate the operating channel to STA A for its transmission of sounding PPDU in the initiation phase of coordinated monostatic DMG sensing instance. Similarly, the initiator shall allocate another channel for monstatic sounding of STA B and indicate the operating channel to STA B for its transmission of sounding PPDU in the initiation phase of coordinated monostatic DMG sensing instance.

Note 1– Multi-channel operation is applied only to the sounding phase. The initiation and reporting phase shall operate over the same channel.

Note 2 – The operating channels in the sounding phase for transmission of multiple sounding PPDUs in parallel may be reserved within an SP.