IEEE P802.11  
Wireless LANs

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| Minutes for 802.11 bn PHY ad-hoc in March 2025 Plenary session | | | | |
| Date: 2025-03-17 | | | | |
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Abstract

This document contains the PHY ad hoc meeting minutes for TGbn held on:

* Monday AM1, March 10, 2025
* Tuesday AM2, March 11, 2025
* Tuesday PM1, March 11, 2025
* Tuesday PM2, March 11, 2025
* Wednesday AM1, March 12, 2025

## Monday AM1, March 10th, 2025 08:00 – 10:00 ET

**Introduction**

1. The Chair (Tianyu, Apple) calls the meeting to order at 08:00pm ET.
2. The Chair follows the agenda in 11-25/**0221r1**.
3. Reminder for registration for the Interim meeting.
4. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Dongguk Lim (LGE), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
5. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
6. The Chair goes through the Copyright policy.
7. Discussions on the agenda.
   * The two submissions (25/0381 and 25/0283) are added and one submission (25/0368) is deferred

Review/Finalize Comment Assignments for CC50 – PHY tab (TGbn D0.1) – 25/0296r1

* Editor shares the status of CC50 and explain the process about the comment resolution.
* Assign some CIDs to members

**Technical Submissions – CBF**

1. **25/0083 CFO correction and related simplifications for COBF Sameer Vermani**

Discussions:

C: We need to define the CFO pre-correction for joint sounding

A: Sure

C: Could you explain why we need a CFO sync

A: To hand shake the information between Aps, it needs.

C: Why is it a mandatory?

A: If APs are apart by some frequency, the AP will not be accurate. We do this pre-correction for the cross NDP by using the NDPA.

C: What is the difference between the follower and the reference?

A: The behavior of each is different. Follower remembered the pre-correction and used it for transmission.

C: If multi AP capable, is the role of sharing or shared defined as a capability?

A: AP can have both roles

C: The sync follower and sync reference role is for sounding based or for group based.

A: It will last for the duration for which this sounding is valid.

SP1

* Do you support defining the concept of a sync-reference AP and a sync-follower AP for CFO corrections in COBF?
  + Sync-follower AP pre-corrections needed
    - For sequential sounding:
      * All the NDPs sent by it during sounding phase that are sent for the purpose of sounding the STAs in the other BSS (Mandatory)
      * For the NDPs sent by it for sounding the STAs in its own BSS, it is recommended but not mandatory that the sync follower AP pre-correct those NDPs
    - For joint sounding:
      * All the NDPs sent by it during the sounding phase
    - The COBF sync and COBF PPDU during transmission phase using the same frequency pre-correction value as the sounding phase, when it is the sharing AP
  + Sync-reference AP does not pre-correct during transmission phase when it is the sharing AP
* Results : No Objection

SP2

* Do you support that in the sounding phase of COBF, the sync-follower AP shall use the NDPA frame sent by the sync-reference AP to pre-correct the NDP frequency to be within a TBD range (e.g., 350Hz) of the sync-reference AP’s frequency?
  + Applies to sequential and joint sounding
  + The pre-correction of cross-BSS NDP and joint NDP is mandatory
  + The pre-correction of in-BSS NDPs is recommended but not a mandatory requirement
* Results : No Objection

SP3

* Do you support that in the COBF transmission phase, the sharing AP is the AP that transmits the final sync frame before the COBF PPDU
  + Regardless of who is the sync-reference
  + Note: This ensures a consistent protocol and a consistent behavior at sharing AP
* Results : No Objection

SP4

* Do you support that in the COBF transmission phase, the shared AP always pre-corrects COBF PPDU based on the final sync
  + To bring the two APs within a TBD frequency range of each other (e.g., ~350Hz)
  + Note: Regardless of which AP is the sync-reference, this ensures consistent behavior at shared AP
* Results : No Objection

1. **25/0103 Simplified carrier synchronization for CoBF transmissions Shuling Feng**

Discussions:

C: Option1 is simple. How do you remove the CFO from the CSI?

A: It will need to memorize the CFO, which is applied to the sounding.

C: What is a benefit of sharing AP as a sync follower?

A: The performance of the two cases is the same.

**Recess**

The meeting is Recessed at 10:00am ET.

## Tuesday AM2, March 11th,2025, 10:30 – 12:30 ET

**Introduction**

1. The Chair (Tianyu, Apple) calls the meeting to order at 10:30am ET.
2. The Chair follows the agenda in 11-25/**0221r3**.
3. Reminder for registration for the Interim meeting.
4. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Dongguk Lim (LGE), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
5. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
6. The Chair goes through the Copyright policy.
7. Discussions on the agenda.
   1. 25/0283 is deferred.

**PDTs/CRs**

1. **25/0250 PDT on PHY Coordinated Spatial Reuse Genadiy Tsodik**

Discussions:

C: The descriptions for Mode 1 and 2 maybe moved to the MAC session.

A: It is related to PHY

C: It is not good to use MU terminology in the draft.

C: Delete the “total” in front of number of spatial stream.

SP1

Do you agree to incorporate 25/0256r6 to the next version of 11bn draft?

Results: No Objection.

**Technical Submissions – CBF**

1. **25/0103 Simplified carrier synchronization for CoBF transmissions Shuling Feng Q&A**

Discussions:

C: Can AP declare support of CoBF without capability?

A: It has the capability and depends on the agreement.

1. **25/0362 Improvement on Co-BF Sounding Yapu Li**

Discussions:

C: What is the type of trigger frame sent by AP1?

A: It is a new trigger type.

C: Since STA1 is not associated with AP2, it is not a problem

C: If AP2 receives the feedback from STA1, it does not need.

A: Yes, but it can improve in some cases.

C: It is very difficult to do this thing.

C: This issue is very important to successful deployment of coordinating forming.

1. **25/0381 Some open issues on COBF Sameer Vermani**

Discussions:

C: The pre-sounding exchange seems to be defined as a mandatory.

A: Yes

C: Instead of having many options, it is better that sharing AP decides based on his own needs.

A: Sharing AP can ignore the shared AP’s suggestion.

C: Need a bit of time for suggested GI+LTF mode.

C: Do you think about including a similar clause as a decline before the data transmission?

A: Yes, Decline is included in the response frame.

C: It needs to take care of making a good decision when suggested GI is applicable, or when it is not.

A: In the group formation stage, it can tell the sharing AP.

C: Why do you have restrictions like the minimal time for PPDU?

A: It is a suggestion and symbol length by the shared will not be smaller than the minimum.

SP1

* Do you support the following for the COBF PPDU’s GI+LTF support and signaling ?
  + Support of following GI+LTF combinations to be mandatory at both AP and STA
    - 2x LTF +0.8us, 2xLTF+1.6us, 4xLTF+3.2us
  + Additionally, 2x LTF+0.8us GI usage for a COBF pair is exchanged at the group formation stage
    - Each AP conveys if it can use 2x+0.8us GI for this COBF group or not
    - No further last-minute negotiation before COBF transmission
  + Invite frame from sharing AP dictates the LTF+GI combination keeping the shared AP’s ability to use 2x LTF+0.8us in mind

Results: 41Y, 12N, 32A

SP2

* Do you support having the following information exchanged before COBF PPDU?
  + Min-Nsym and Max-Nsym indication about the COBF PPDU length sent in the COBF invite frame
  + Suggested Nsym indication in the COBF response frame from shared AP
    - Sharing AP is allowed to ignore the shared AP’s suggestion
    - Suggested value shall not be smaller than the min-Nsym value from sharing AP

Deferred

SP3

* Do you support the following about BSS ordering of per-user SIG fields
  + In the cases where the user fields of either BSS may go first, while preserving the Nss in non-increasing order, the user fields of the sharing BSS go first

Results: No Objection.

SP4

* Do you support to have a frame-exchange before COBF sounding between the two APs which will at-least serve the following goals:
  + Unavailability/decline indication from the responding AP
* Used by responding AP to refuse participation in a COBF sounding process
* Exchange of sounding Nss capability of the STAs being sounded in the two BSSs
* The minimum sounding Nss capability of the participating STAs in each BSS will be exchanged
* Note: Design of the frames is TBD by MAC group

Results: No Objection.

1. **25/0389 Information Exchange in the CoBF Transmission Phase Alice Chen**

Discussions: will be continued next session.

**Recess**

The meeting is Recessed at 12:30pm ET.

## Tuesday PM1, March 11th, 2025 13:30 – 15:30 ET

**Introduction**

1. The Chair (Tianyu, Apple) calls the meeting to order at 13:30pm ET.
2. The Chair follows the agenda in 11-25/**0221r4**
3. Reminder for registration for the Interim meeting.
4. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Dongguk Lim (LGE), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
5. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
6. The Chair goes through the Copyright policy.
7. Discussions on the agenda.

**Technical contributions**

1. **25/0389 Information Exchange in the CoBF Transmission Phase Alice Chen [Q&A]**

Discussions:

C: Regarding the CoBF synch, is it a new trigger frame?

A: It is deferred from MAC.

C: Why is the BSS color needed in Co-BF sync frame?

A: It is a preference because AP already know it.

C: If AP does not know the precoding, it is difficult to estimate the MCS per SS. How to know the pre-coding algorithm of other APs?

A: The knowledge of precoding algorithm is out of scope. It proposed a signaling to enable APs to build a common preamble.

1. **25/0397 Spatial Streams Indication for CoBF TF and PPDU Junghoon Suh**

Discussions: None

SP2

* Do you support that in a COBF transmission, the per-user-UHR-SIG information of the BSS having the largest NSS for a scheduled STA (largest being across the STAs of both BSSs) is sent first in the UHR-SIG User field followed by the per-user-UHR-SIG information of the other BSS?
  + Within each BSS, the user information of the larger N\_SS user is sent first
* Results: No Objection.

SP3

* Do you support that the order of user information in the Sync frame is aligned with the order of users in the UHR-SIG User field for CoBF transmission?
* Results: No Objection.

1. **25/0399 COBF/COSR Design Follow-up You-Wei Chen**

Discussions:

C: In case of Co-SR, sharing AP can send the frame to Multiple APs more than 2. And need more discussion regarding content

SP1

* Do you support to include the following text to the 11bn SFD?
  + The first BSS color in U-SIG indicates the sharing AP and the second BSS color in U-SIG indicates the shared AP in UHR MU PPDU for COBF and COSR transmission.
* Results: No Objection.

SP2

* Do you support to include the following text to the 11bn SFD?
  + For CO-BF and CO-SR transmissions using UHR MU PPDU, TPE is fixed as 20us.
    - nominal\_packet\_padding =20us and a factor =4.
* Results: No Objection

1. **25/0401 CoBF PHY design consideration Juan Fang**

Discussions:

C: How about your opinion for 4x and 0.8us?

A: Open for now.

1. **25/0411 Misc. CBF Topics Ron Porat**

Discussions:

C: +- 400 us timing error is added to two APs. Does it need to adjust the symbol boundary?

A: I don’t think so.

SP1

* Do you support to add the following to the SFD?
* Joint/cross-BSS sounding feedback is limited to UL OFDMA if >1 STA is sounded
* Results: No Objection

1. **25/0098 Receiver specification Fang, Juan**

Discussions:

C: In the ELR case, maybe you need to use a smaller size.

A: We can discuss more.

1. **25/0109 UHR Receive Procedure Lin Yang**

Discussions:

C: ER SU PPDU already finished the PPDU detection before ELR-mark. Why do we need to ELR check for this.

A: Since it is not reliable, the parallel processing is needed

C: You work with POC and rename the Word file.

SP1

* **Do you agree to include the following into the 11bn SFD?**
  + Remove the requirement, for UHR STAs, to receive the forward-looking EHT ER SU preamble in the UHR RX procedure
* Results: No Objection

**Recess**

The meeting is Recessed at 15:30pm ET.

## Tuesday PM2 March 11th, 2025 16:00 – 18:00 ET

**Introduction**

1. The Chair (Tianyu, Apple) calls the meeting to order at 16:00pm ET.
2. The Chair follows the agenda in 11-25/**0221r**4
3. Reminder for registration for the Interim meeting.
4. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Dongguk Lim (LGE), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
5. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
6. The Chair goes through the Copyright policy.
7. Discussions on the agenda.

**Straw Poll**

1. **25/0389 Information Exchange in the CoBF Transmission Phase Alice Chen**

SP3

* Do you agree to add the following to the 11bn SFD?
  + The CoBF Sync frame carries the following information?
    - How to indicate the information is TBD

|  |  |
| --- | --- |
| Category |  |
| Control | ‘CoBF Sync’ |
| PHY Common Info | Length |
| PHY Version Identifier |
| Bandwidth |
| Punctured Channel Information |
| BSS Color 1, BSS Color 2 |
| TXOP |
| Number of UHR-SIG Symbols |
| GI+LTF Size |
| Number Of UHR-LTF Symbols |
| Number of CoBF Users |
| Per-User Info in Both BSS | STA ID |
| BSS Color Indication |
| MCS |
| Spatial Configuration |
| 2xLDPC |

* + Supporting doc: 11-25/389r1, 11-25/399r0, 11-25/401r0
* Results: No Objection

SP4

* Do you agree to add the following to the 11bn SFD?
  + In each of the CoBF Invite, Response and Sync frames, if there is information for more than one users, the users are ordered according to Nss in non-increasing order?
  + The order of users in the sharing BSS in the Sync frame is aligned with that in the Invite frame.
  + The order of users in the shared BSS in the Sync frame is aligned with that in the Response frame.
  + Supporting doc: 11-25/389r1, 11-25/381r0, 11-25/397r0

Results: No Objection

1. **25/0098 Receiver specification Fang, Juan**

SP1

* Do you agree to include the following to the 11bn SFD?
  + The Rx minimum sensitivity and ACR/NACR specifications for the two ELR MCSs use the same value as EHT/UHR MCS0
  + And do the following proposed text change to the latest TGbn draft (TGbn D0.1).

-In Section 38.3.24.2 (Receiver minimum input sensitivity), change the two “TBDs” in Table 38-47 to “-82”

- In Section 38.3.24.3 (Adjacent channel rejection), change the two “TBDs” in the column of "Adjacent channel rejection (dB)" in Table 38-49 to “16” and change the two “TBDs” in the column of " Nonadjacent channel rejection (dB)" in Table 38-49 to “32”

Supporting doc: 11-25/98r0, 11-25/392r0

* Results: No Objection

**Technical contributions - ELR + IM + UEQM/MCS**

1. **25/0333 Consideration on ELR for 11bn Lei Zhou**

Discussions:

C: For the large bandwidth, it requires more TX power. For long-range operation, to focus on the narrow band.

1. **25/0361 Issue on ELR PPDU Length Indication Yapu Li**

Discussions:

C: We need to double check about it.

C: We can have clarification, but it is enough in person opinion.

C: I agreed that and the exact language has been said, we can work on it..

1. **25/0427 Packet Detection for ELR Sigurd Schelstraete**

Discussions:

C: In slide 12, the text of the second block is wrong.

C: Since it is hard to standardize in spec, we only define it for the immediate response frame.

1. **25/0344 Discussion on Design of Interference Mitigation Pilots Ke Zhong**

Discussions:

C: The optimal number of IM pilots is 10% in my updated proposal.

C: The evenly distributed IM pilot can reduce the extrapolation.

1. **25/0387 IM pilot indices for OFDMA transmissions Daniel Verenzuela**

Discussions: None

1. **25/0354 Transmit Constellation Error for Additional MCSs Genadiy Tsodik**

Discussions:

C: Is the same rule applied to TB PPDU?

A: It is for MU-PPUD.

SP1

* Do you support the following:
* Transmit Constellation Error required values for the new MCSs 17, 19, 20 and 23 (QPSK 2/3, 16QAM 2/3, 16QAM 5/6 and 256QAM 2/3) for the UHR MU PPDU will be:

|  |  |
| --- | --- |
| **MCS** | **Transmit Constellation Error** |
| QPSK 2/3 | -12dB |
| 16QAM 2/3 | -18dB |
| 16QAM 5/6 | -20dB |
| 256QAM 2/3 | -29dB |

* Supporting docs: 11-25/354r0, 11-25/392r0

Results: No Objection

1. **25/0392 Transmit and Receive Specifications for New MCS in 11bn Alice Chen**

Discussions: None

SP1

* Do you agree to include the following to the 11bn SFD?
  + The testing in the transmit and receive specification in IEEE 802.11bn spec should only use EQM (i.e., not use UEQM)
  + The testing in the transmit and receive specification in IEEE 802.11bn spec should not use 2xLDPC, if LDPC is used

Results: No Objection

1. **25/0410 New MCS Capability - follow up Ross J. Yu**

Discussions: None

SP1

* Do you agree to make the following changes to the 802.11bn SFD?
  + Mandatory support MCSs of QPSK with code rate 2/3; 16QAM with code rate 2/3; 16QAM with code rate 5/6; 256QAM with code rate 2/3.
  + Support for 256QAM with code rate 2/3 for 20MHz only devices is TBD optional.
  + [Motion #216, [264] and [274, 275]]
* Results: No Objection

**Recess**

The meeting is Recessed at 18:00am ET.

## Wednesday AM1 March 12th, 2025 08:00 – 10:00 ET

**Introduction**

1. The Chair (Tianyu, Apple) calls the meeting to order at 08:00am ET.
2. The Chair follows the agenda in 11-24/**0221r4**.
3. Reminder for registration for the Interim meeting.
4. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Dongguk Lim (LGE), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
5. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
6. The Chair goes through the Copyright policy.
7. Discussions on the agenda.

**Technical contributions**

1. **25/0358 Open Topics for DRU on 60MHz Shengquan Hu**

Discussions: None

SP1

* Do you agree to include the following text to the 11bn SFD?
  + the occupied STFs tones of UHR-STF for DRU on DBW60 are the same as that of the largest MRU (i.e. 484+242) corresponding to the distribution BW 60MHz within the PPDU BW

Results: No Objection.

SP2

* Do you agree to include the following text to the 11bn SFD?
  + DRU CSD start index assignment for DBW60 is defined as below?

|  |  |
| --- | --- |
| DRU size | CSD starting index for DBW60 |
| DRU52, *i*=1:12 | {1, 5, 2, 6, 3, 7, 4, 8, 1, 5, 2, 6} |
| DRU106, *i*=1:6 | { 1, 2, 3, 4, 5, 6} |
| DRU242, *i*=1:3 | { 2, 4, 6} |

Results: No Objection.

1. **25/0359 Open Issues for 60 MHz DBW Eunsung Park**

Discussions:

C: Could you add the DCN 25/0358 as a supporting document when you are motion

A: Sure

SP1

* Do you support to add the following table for encoding of the PS160 and RU allocation subfields in a UHR variant User Info field for DBW60 to the 11bn SFD?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PS160 subfield | B0 of the RU Allocation subfield | B7-B1 of the RU Allocation subfield | Bandwidth (MHz) | DRU Size | DRU index | 80MHz frequency subblock index (l) | PHY DRU index |
| 0-3: 80 MHz frequency subblock where the DRU is located | | 0-36 | Reserved | Reserved | Reserved | Reserved | Reserved |
| 37-48 | 80, 160, or 320 | 52 | DRU1 to DRU12 | *N* | 16x*N* + DRU index |
| 49-52 | Reserved | Reserved | Reserved | Reserved | Reserved |
| 53-58 | 80, 160, or 320 | 106 | DRU1 to DRU6 | *N* | 8x*N* + DRU index |
| 59-60 | Reserved | Reserved | Reserved | Reserved | Reserved |
| 61-63 | 80, 160, or 320 | 242 | DRU1 to DRU3 | *N* | 4x*N* + DRU index |
| 64-127 | Reserved | Reserved | Reserved | Reserved | Reserved |

Results: No Objection.

SP2

* Do you support to add the following to the 11bn SFD?
  + The constant shift value defined in the 80 MHz frequency subblock is used for DBW60

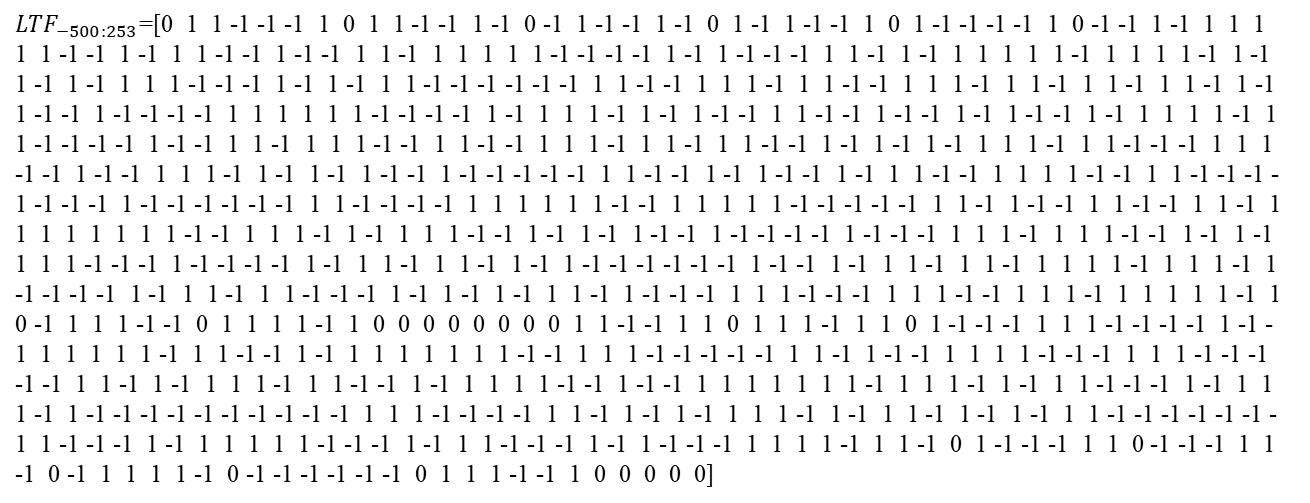
Results: No Objection.

1. **25/0394 DLTF Design for 60DBW Chenchen Liu**

Discussions: None

**SP1**

* Do you agree to include the following 4xLTF sequence for DRU of 60MHz DBW into the 11bn SFD?

****

Results: No Objection.

1. **25/0396 Discussion on LDPC only for MU-MIMO in 11bn Shengquan Hu**

Discussions:

C: When packet size is small, then LDPC performance is not good. Could you consider it?

A: In 20MHz, LDPC provides good performance.

SP1

* Do you agree to include the following text to the 11bn SFD?
  + LDPC is the only FEC coding scheme for DL/UL MU-MIMO in 11bn

Results: No Objection.

SP2

* Do you agree to include the following text to the 11bn SFD?
  + DL/UL MU-MIMO in UHR is optional for 20MHz only STA

Results: No Objection.

**Straw Poll**

1. **25/0381r1 Some open issues on COBF**

SP2

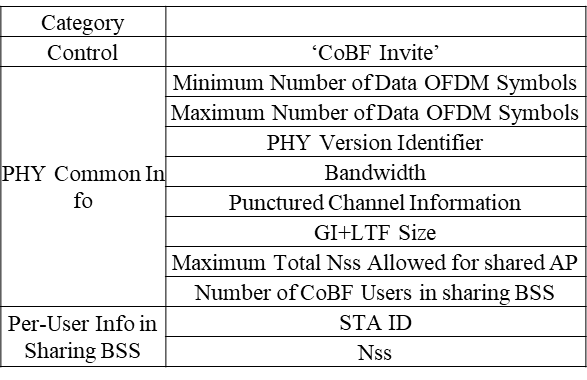
* Do you support having the following information exchanged before COBF PPDU?
  + Min-Nsym and Max-Nsym indication about the COBF PPDU length sent in the COBF invite frame
  + Suggested Nsym indication in the COBF response frame from shared AP
  + Sharing AP is allowed to ignore the shared AP’s suggestion
  + Suggested value shall not be smaller than the min-Nsym value from sharing AP

Results: No Objection.

1. 25/0389r2 Information Exchange in the CoBF Transmission Phase Alice Chen

SP1

* Do you agree to add the following to the 11bn SFD?
  + The CoBF Invite frame carries the following information.
    - How to indicate the information is TBD



* Supporting doc: 11-25/389r1, 11-25/399r0

Results: No Objection.

SP2

* Do you agree to add the following to the 11bn SFD?
  + The CoBF Response frame carries at least the following information.
    - How to indicate the information is TBD

|  |  |
| --- | --- |
| Category |  |
| Control | ‘CoBF Acceptance’ |
| PHY Common Info | Suggested Number of Data OFDM Symbols |
| PHY Version Identifier |
| Extra LTF Allowed |
| Number of CoBF Users in shared BSS |
| Per-User Info in Shared BSS | STA ID |
| MCS |
| Nss |
| 2xLDPC |

* + Supporting doc: 11-25/389r1, 11-25/399r0

Results: No Objection.

**Adjourn**

The meeting is Recessed at 09:10am ET.