IEEE P802.11  
Wireless LANs

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| TGbn May 2024 Meeting Minutes | | | | |
| Date: 2024-05-17 | | | | |
| Author(s): | | | | |
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Abstract

This document contains the minutes for TGbn May 2024 sessions.

Revision history:

* Rev0: First version of the document.

Abbreviations:

* C: Comment.
* A: Answer.

# May 13th, Monday (13:30-15:30 CEST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
  + The chair announced that registration is needed to attend this meeting.
* Meeting protocol
  + The chair announced that everyone is required to log in WebEx to vote.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Attendance reminder.
  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802 Wireless Interim/Plenary Session” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbn conference call that you are attending.
  + If you are unable to record the attendance via [IMAT,](https://imat.ieee.org/attendance) then please send an e-mail to:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
    - PHY: Sigurd Schelstraete ([sschelstraete@maxlinear.com](mailto:sschelstraete@maxlinear.com)), Tianyu Wu ([tianyu@apple.com](mailto:tianyu@apple.com)), and Dongguk Lim ([dongguk.lim@lge.com](mailto:dongguk.lim@lge.com))
    - MAC: Xiaofei Wang ([xiaofei.wang@interdigital.com](mailto:xiaofei.wang@interdigital.com)), and Srinivas Kandala ([srini.k1@samsung.com](mailto:srini.k1@samsung.com)), Jeongki Kim ([jeongki.kim.ieee@gmail.com](mailto:jeongki.kim.ieee@gmail.com))
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

Nobody speaks/writes up.

* + Copyright Policy: Participants are advised that
    - IEEE SA’s copyright policy is described in [Clause 7](https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7) of the IEEE SA Standards Board Bylaws and [Clause 6.1](https://standards.ieee.org/about/policies/opman/sect6.html) of the IEEE SA Standards Board Operations Manual;
    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/0653r3](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-03-00bn-tgbn-may-2024-meeting-agenda.pptx).)
* Agenda
  + Chair reviewed proposed agenda found in [11-24/0653r3](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-03-00bn-tgbn-may-2024-meeting-agenda.pptx).
  + Discussion: None.
  + The modified agenda was approved with unanimous consent.
* Summary from March 2024 meeting
  + Nine teleconferences were held between March and May 2024 ([11-24/0633r15](https://mentor.ieee.org/802.11/dcn/24/11-24-0633-15-00bn-mar-may-tgbn-teleconference-agenda.docx)).
  + The group discussed 55 technical submissions on the calls.
  + Targets for the May interim are as follows:
    - Presentation of technical submissions (~170 pending submissions)
    - Continue populating the TGbn SFD with approved concepts
    - MAC/Joint sessions have 20’ allocated at the start for straw polls
* Approve TG minutes
  + TG motions: Approve TG minutes from the January 2024 meeting  
    **Motion: Move to approve TGbn minutes listed below:** 
    - March Plenary: <https://mentor.ieee.org/802.11/dcn/24/11-24-0693-01-00bn-tgbn-march-2024-meeting-minutes.docx>
    - Teleconferences Mar-May: <https://mentor.ieee.org/802.11/dcn/24/11-24-0748-02-00bn-tgbn-march-april-may-2024-teleconference-minutes.docx>

Move: Yusuke Asai Second: Stephen McCann

* + - Discussion: None.

Result: Approved with unanimous consent

* TGbn officers’ Confirmation
  + Call for nomination: None.
  + Chair closed the call for nominations.
  + Confirmation motion

**Motion:**

* + - Confirm Laurent Cariou, Jianhan Liu & Kiseon Ryu as TGbn Vice Chairs
    - Confirm Ross Jian Yu as TGbn Technical Editor
    - Confirm Yusuke Asai as TGbn Secretary

Move: Abhishek Patil Second: Xiaofei Wang

* + - Discussion: None.

Result: Approved by acclamation

* Technical Submissions – Multi-AP Coordination Part 1
  + Straw Poll 1:

To help regulators permit LPI BSSs to use Static Preamble Puncturing as a sufficient method to protect incumbents, do you agree to add the following text to the 11bn SFD:

* + - 11bn shall define a mode of operation where transmission on punctured subchannels is conditional on performing de-sensed CCA (details TBD)

Note: SP requested by author (ref: [24/0534r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0534-02-00bn-lpi-static-preamble-puncturing.pptx)).

* + - Discussion

C: I’m confused by the term of “de-sense.” Would it imply lowering the threshold?

A: We are making it less sensitive as dcescribed in the slide 7.

C: Why do you say “de-sense”?

A: Because any other noise self interference is going to trigger, and we are trying to avoid.

C: I presume that there has been discussion with FCC as to what level there is acceptable.

A: There are concurrent discussions with FCC and. They are open to cinsider the proposals.

C: It seems to be built on some kind of assumption of reciprocity, where based on the interference level. Presuming interference level to the incumbent is important.

A: We need to make CCA and the neighboring subchannels. But we don't need to know exactly what incumbents are.

C: The goal is to avoid interfering with the incumbent. And by looking at the the single level the income is provided, you don't know what your insurance level is.

C: I agree punctured transmisisn is something helpful in general. However, this concept of doing CCA where we are not actually going to transmit is something very new. I would like to take this very carefuly. For example, in the case of the slide 7, within the 80 MHz, once we start introducing the de-sensed CCA to the regulatory body that we are able to do CCA where we are not transmitting, then I am wondering the regulatory body wants to ask us to do the CCA outside of 80 MHz, for example, left and right side of 80 MHz, which becomes even more difficult to implement. So, I would like to take it a bit more cautiously and I appreciate if you could defer it.

A: Thank you for your comment.

C: It's good to think about the intentions. You are proposing something which is even more aggressive. So, there's even language your issues if we were to go with what you propose that young back to the original proposal. Let's just see if it's a good idea or not.

A: Thank you.

C: I tought LPIs are allowed to transmit whole 6 GHz band without any constraint. Why does it need?

A: Yes, whole of 1,200 MHz is open for LPI; however, puncturing as a functionality for interference avoidance cannot be used. We are allowed to use puncturing in LPI only for network optimization puroposes. This is something we advocated to the FCC and earned it last October. But they still do not allow channel puncturing to be used for incumbent detection.

C: The need of CCA is not very clear. I would suggest that you take the straw poll until we have a better understanding on that.

A: Thank you. We decided to defer the starw poll.

SP was deferred by the presenter.

* + [11-24/0317r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0317-00-00bn-coordinated-transmission-id.pptx): Coodinated Transmission ID Yanchun Li (Huawei)

C: I think beamforming for joint transmission needs to align the BSS color in their frame headers. In addition to the preamble, the report from the beamformee is needed. In the slide 8 table, what do you mean “the AP1 + the AP2: BSS color1 + partial bits (=3) in AID”?

A: This argument is to differentiate from the joint transmission cases. When the station sees “3”, it means that both the AP1 and the AP2 are easily coordinating this transmission.

C: Do both the AP1 and the AP2 use the same BSS color of the AP1?

A: Thy use same BSS color but they use some extra bit.

C: It is difficult to understand because we didn’t agree on either of the scheme the joint transmission and the C-BF. We can discuss later once we determine the coordination shcmes.

A: 11be has introduced very challenging high order modulation of 4K QAM. So, to increase the throughput, the only way is to increase efficiency and concurrency.

C: I think a little bit more detail in each scheme is needed.

C: If we have more than two APs, for example, five APs, do we need the five different values? It consumes three bits.

A: To improve the the network efficiency, we must increase the density of the APs. In this case, we have this opportunity to implement this is just an initial idea.

C: In ths slide 8, I would like to know the difference between the cases C and D. Why the case D caused the legacy STAs has some proble with intra-BSS collision?

A: If we assume the AP1 has an associated STA of lgecacy and uses the color of one for its transmission, then, when AP1 is involved a multi-AP transmission, it will use the color of three. In this case, all legacy STAs in the AP1 won’t understand it.

C: In the slide 4, I understand you have collision for AID which is going to cause some problems. Do the non-AP STAs need to use the same color or different value?

A: Usually, it is applied to the payload of the data part.

C: I think you make a lot of assumptions about multi-AP transmissions and so on. In the slide 5, what is the spatial reuse that you assume? Is the regacy SR or the 11bn context?

A: Here is just the general idea of SR. The basic idea is, for example, that identify the AP3 finds that is OK for the concurrent transmission is not for its own, then it can initate a transmission to its STAs.

C: We need to identify the issue with the whole thing with a spatial reuse case.

C: In the slie 8, you mentioned in case the AP1 and the AP2 use different colors with each other. If there are three APs, the AP1 is the left, the AP 3 is the right, the AP2 is in the middle of the AP1 and the AP3, then, hidden node proble occurs.

A: I think you are seeing a very detailed scenario. We can use a set of your scenario to start for different BSS colors.

A: I can defer the straw poll because more people are interested in this topic. We will seek some offline discussions.

C: When you say coordinated transmission, do you mean a coordinated scheme where the coordinating BSSs transmit together?

A: Correct. Something like TDMA or C-TDMA. They don’t have concurrent transmissions so then it woun’t be bigger issue at the collision part.

* + [11-24/0405r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0405-01-00bn-managed-networks-under-highly-congested-scenarios-follow-up.pptx): Managed Networks under highly congested scenarios - Follow up

Iñaki Val (MaxLinear)

C: In the slide 12, I have a concern. If the AP-A is in range of the AP-B, the AP-B is in range of the AP-C and so on, every AP sees with each other directly or indirectly. The AP-A and the AP-B would agree on a basic period and synchronize and then the AP-B and the AP-C ditto, and so forth. It seems we would need a global basic period.

A: Actually, that is why I tried to propose two different mechanisms.

C: I think the coordinated TDMA with this kind of thing can be quite synergistic.

C: In the slide 9, how do you decide the best service period length amonf those APs?

A: In this presentation, I do not propose in a specific mechanism for doing such a negotiation but clearly it is needed. For example, the AP collects all the requirements, for example, using SCS mechansims. Of course, we need to define those management frames to have that negotiation.

C: The slide 4 says 2.4 GHz band is not considered to support the strict QoS requnremts. Why do you exclude the 2.4 GHz band for the QoS support?

A: I assume that the 2.4 GHz band is legacy band for IoT devices that don’t have very strict QoS requirement.

C: How do you perceive this map to other techniques that have been discussed like C-RTWT? My perception is that there may be some combination with C-TDMA or C-RTWT. That type of coordination on a broader scale.

A: I mentioned both the connected to the and coordinad TDMA that could be used.

C: One to one coordination is maybe easier to achieve. Coordination schemes organizing these QoS TXOP on a broader scle maybe more difficult.

C: What are we changing QoS TXOP? What is from the AP side is different than a regular TXOP?

A: We are using standard mechanisms. It’s more related to the long interval to the AP. We are not proposing to change the QoS regular TXOP.

C: As you probably have seen, the channels of the APs are different.

A: That is one of the key points. In the slide 7, we can see the regular TXOP nothing changes from the current standard.

* + [11-24/0453r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0453-00-00bn-multi-ap-coordination-and-roaming.pptx): Multi-AP Coordination and Roaming Xiaofei Wang (InterDigital)

C: You discuss multi-AP and roaming. Multi-AP is generally about APs in the same channel. I’m not entirely sure like just putting multi-AP and roaming together.

A: If we have a common framework whatever you’re transmitting over the pipes, that means even for the different variants of the multi-AP operation.

C: I think it’s good that you bring up this discussion. Because most of the time we focus too much on the specific future like coordinated something. But we don’t really focus on how the coordination will take place. I think it is still a bit early to decide, but it is important to keep in mind.

A: I agree with you. I think as a general question here is really trying to bring up the fact that discussion.

C: I want to support your approach. We also have contributed similar submissions which follows a unified framework for the multi-AP and to find most of simiralities.

C: Multi-AP coordination is probably mostly initiated by the AP while roaming is indicated by the STA. So, from that different nature, it’s not quite clear to me what functions were defining for the framework. What kinds of function do you need to implement as specification?

A: I understand it is true initiated by the STA. We are trying to have identify set and they have established a mechanism for them to exchange information. There is no established mechanism to exchange information.

C: Regarding roaming, it is a different category because for other multi-AP schemes except for joint tranmisiossion, mostly the traffic is contained in one or more BSSs.

A: I agree. I think we need to examine all the things but the type of support that we build on top of that we have a common framework for thinking.

C: I agree with the direction to create the common framework for multi-AP coordination. At the same time, we should consider more how much level of common is among AP coordination. But seamless roaming is totally different procedure for with TXOP and SP based process coordination.

A: I think we understand there is at least three different approaches for seamless roaming. I think one of them may be a little more aligned compared with other two.

C: I think no matter you will be a unified framework or a piecewise one, I think those each individual meterialiy operation s has a lot of things in common. I am wondering we have a special group for 11ax STAs. What is your opinion about it?

A: I think that should probably leave left to multi-AP coordination.

C: I am generally supportive on this proposal especially for the considering the need of defining a unified framework for multi-AP cooperations. Can you clarify the second straw poll?

A: I think this is a little early, but I think what we are trying to see here is like if we basically coming back to this slide 6, we identify the three aspects that maybe common for the multi-AP operations, so obviously that is not necessarily in part of the multi-AP discovery.

C: I just have a comment related to the part where you are trying to link MAP multi-AP coordination with seamless roaming. In some architectures for seamless roamling, it may be non-colocated AP MLD.

A: This presentation is mostly for multi-AP operations. But if we end up defining a coordinating or information sharing entity, that can be leveraged for seamless roaing, at least for one of the approaches.

C: I think we might end up having a set of capabilities that are possible with a centralized coordination and a different set of capabilities, a subset maybe when there is no centralized coordination. Because the situation dynamically changes with STAs coming in and coming off. So, the different capabilities coming in power loading and multiple RUs and so on. I think in either case, the entire set of capabilities may not be definable at one time, or maybe you can come up with two sets of capabilities, one with centralized coordination, and the other without it.

A: I think it depends on scenarios. I do agree that there are a lot of dynamics but there are less dynamic for the APs side. We do the question here is if we will be able to achireve particularly arbitration part for a coordination, ahtat would be great. But then I am having some difficulty for those case, I think our operation may be needed.

* AoB: None.
* Recessed at 15:26.

# May 13th, Monday (16:00-18:00 CEST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
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  + Please record your attendance during the conference call by using the IMAT system:
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  + If you are unable to record the attendance via [IMAT,](https://imat.ieee.org/attendance) then please send an e-mail to:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
    - PHY: Sigurd Schelstraete ([sschelstraete@maxlinear.com](mailto:sschelstraete@maxlinear.com)), Tianyu Wu ([tianyu@apple.com](mailto:tianyu@apple.com)), and Dongguk Lim ([dongguk.lim@lge.com](mailto:dongguk.lim@lge.com))
    - MAC: Xiaofei Wang ([xiaofei.wang@interdigital.com](mailto:xiaofei.wang@interdigital.com)), and Srinivas Kandala ([srini.k1@samsung.com](mailto:srini.k1@samsung.com)), Jeongki Kim ([jeongki.kim.ieee@gmail.com](mailto:jeongki.kim.ieee@gmail.com))
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

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    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/0653r4](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-04-00bn-tgbn-may-2024-meeting-agenda.pptx).)
* Agenda
  + Chair reviews proposed agenda found in [11-24/0653r4](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-04-00bn-tgbn-may-2024-meeting-agenda.pptx).
  + Discussion:
    - [11-24/0384](https://mentor.ieee.org/802.11/dcn/24/11-24-0384-02-00bn-low-latency-based-on-l4s.pptx) wad deferred.
  + Modified agenda approved with unanimous consent.
* Technical Submissions – Multi-AP coordination Part 2 + Misc.
  + [11-24/0284r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0284-02-00bn-low-latency-low-collision-low-power-uhr-medium-access.pptx): Ultra-reliable PHY elements:

Low latency, low collision, low power medium Access

Seán Coffey (Realtek)

* + - The presentation was already done at the teleconference on 29th April.
    - After brief wrap-up presentation, C+A session was conducted.

C: What happens to the existing stations when they see this start of the STF and suddenly goes away? I presume a lot of devices might continue to proceed as if there will be the rest of the STF and LTF preamble and so forth. So, those devices will be confused by these signals.

A: There is some language in the spec about what they should do.

C: Often that can occasionally become this because the L-SIG has only one bit parity, so it’s easy to be false. Are you confident that this will not have any problems?

A: The argument is what one of our problems by the way overall with Wi-Fi 8. There are a lot of things we can do, but then when we started looking into them, there are a lot of problems like what you said how do we make sure that we don’t harm legacy devices.

C: The packet detection part is very fairly implementation specific. So, we can’t really use a lot of missdetection.

A: What I would say is that at least up to that first four microseconds, then nothing is certain in wireless. But if we can rely on the accuracy of the fact that forceful for microseconds, then we may as well give up at some point. So, people use it successfully.

C: It might be just the term you are using the chirp, which is very short pulses going off and sending a bit of random times. Because you have multiple devices trying to random access. I wonder whether they will be devices which might confuse this with radars and the DFS chennls. That is another thing where I want to be more cautios.

A: I haven’t thought about DFS.

C: If it is for microsecond synchronization in an AP, how can the AP differentiate whether the signal is from my BSS or OBSS?

A: Once it receives that four microseconds signal, it does not know at that point. It has to kind of deternmine it. If you have five APs in a certain region, they must work out how to manage like interrupt traffic. You can also have a coordinated BSS type thing. So, any one of those APs can get access to the medium and hear that people are tying to transmit to somebody.

* + [[11-24/0](https://mentor.ieee.org/802.11/dcn/24/11-24-0108-00-00bn-triggered-beamforming-in-tgbn-follow-up.pptx)454r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0454-00-00bn-multi-ap-sounding.pptx): Multi-AP Sounding Xiaofei Wang (InterDigital)

C: In the slide 9, I understand the concern that if there are multiple APs and there are response CTS, then it will be difficult for the sharing AP to distinguish between these different responses. Are there any alternatives using an announcement frame of a PSR?

A: It depends on how wideband the MU-RTS/CTS is transmitted. For example, you have one first AP to transmitted on tha primary 20 MHz and then you have another one times on 40 MHz, but you will receive a 20 MHz CTS. In this case, it is not clear which one has responded.

C: Regarding the opion 1, I remember multi-AP sounding scheme had benn discussed in TGbe and we have defined some schemes such as sequential sounding and joint sounding. Do you think to reuce them to the C-OFDMA proposal?

A: The proposed scheme is a little more compact and then they can be done within a relatively short period of time. It’s more efficient ways.

C: For C-TDMA itself, it does not require sounding. I saw your proposal is trying to introduce some new procedure. If you could exploit it, you will need to consider it from that angle. Because for the C-TDMA we can still do something else in the baseline mode.

A: I agree with you.

* + [11-24/0](https://mentor.ieee.org/802.11/dcn/24/11-24-0511-01-00bn-requirements-and-functionalities-for-multi-ap-framework.pptx)511r1: Requirements and Functionalities for Multi-AP Coordination

Rubayet Shafin (Samsung Elecronics)

C: To me, it's not a question of administering enterprise domain. This was an issue in 11aa many years ago. Fundamentally, the issue is how I trust my peer not to scream over. The best answer to that, I can come up with this list of the ongoing policing, we have customer identity, we agreed us with private trust each other.

A: This policing can be a self policing. Then this trust mechanisms or whatever we should trust, I should trust the other AP it to be left to me. I should be given the choice to and then the spec should give the tools to at least if I want to trust. I should be able to give them the tools to trust.

C: The problem is it for the two APs have the backhaul, they can exchange some information via backhaul. But in some cases, if you want to use some multi-APs schemes, you need to have with muitl-AP discovery and negotiation. There are some different scenarios, but we can define a uniform solution.

A: I’m not saying discovery and negotiation are not needed. There should be some tools in the spec that would allow me to discover the other.

C: You touched on a very important point. Capability exchange and negotiation should be provisioned for the specification.

A: There are some use cases in my previous contributions. They say there are some values that define a generalized TWT framework.

C: I wanted to see the merit of basically this did the signaling that is required for the C-TWT. Because my understanding of your view was that basically TWT can be supportive of more coordination techniques. But our CTS that as a coordination technique that has its own merit. So, I was wondering if that is the goal, because my understanding is that TWT can provide some time indication that can be useful for supporting some other coordination techniques.

A: It seems to the same level as other coordinations. This is not the main agenda of this contribution.

C: The problem is kind of a side question.

A: Any kind of information sharing between the AP is basic definition.

C: TWT was born for power saving and it does have individual agreements. That’s not sure if they will be very useful for these coordination schemes.

A: Do you have any questions, specifically this contribution?

C: The one that we just asked why imposing the same level. Because I understood it was for the other techniques, but there was a question that you asked so we can discuss what the influence is.

C: I do agree that the multi-AP should not be limited only to enterprise cases. There are some other use cases like high dense residential scenarios.

* + [[11-24/0](https://mentor.ieee.org/802.11/dcn/24/11-24-0108-00-00bn-triggered-beamforming-in-tgbn-follow-up.pptx)515r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0515-00-00bn-multi-ap-coordination-for-ap-failure-mitigation.pptx): Multi-AP Coordination for AP Failure Mitigation Jiayi Zhang (Offino)

C: In the slide 5, how the AP2 can trust the STA1? I mean the AP2 must send notify after receiving report that but STA1 is not associated with AP2.

A: We assign the multi-AP group at the beginning. Since the AP1 and the AP2 are already in a multi-AP group, an AP can trust an STA that are not associate with it.

C: Is your assumption that the AP2 already has some kind of information regarding the associated STAs?

A: Yes.

C: I want to verify with you this broadcasted beacon frames are exchanged between the AP1 and the AP2.

A: We assume that beacon frames are normal beacon frames.

C: I think the AP2 can determine alone that the AP1 may be failed or in failure mode because the AP2 has not received this periodic beacon frame a certain period.

A: That is one of the solutions. But if the AP2 only rely on the beacon frame exahanges periodically, then that may lose some opportunity to detect it. The failure events happen within the beacon intervals. So, this example is a better solution.

C: Why do STAs have to wait until the AP2 verifies that the AP1 is in failure?

A: You can just delete the STA’s report saying OK to determine the AP1’s failure, so then theysend out the request frames, sometimes reassociation procedures to those STAs. But the AP at that group may also have opportunity to double-check it with the AP1 then sends some reassociation sequences.

C: In the slide 3, the use case seems a little bit too extreme like suppose you are APs on fire. Your priority would not really be to do rolling, you would go outside your building. So, you wouldn't really do a role in particular situation. I am not really convinced that is a good use case for this.

C: In the slide 5, there is sending a request or notification frame. Is this like a broadcast frame? And how is the response frame from the other STAs?

A: The AP2 knows those associations in previous associations with the STAs to the AP1. So, once the AP2 receives a failure report from the STA1, the request or notification will be sen out to the other STAs.

C: I understand there is a request and notify. You said that is sent in a groupcaset fashion. So, the response from the STA, how is that sent?

A: We can discuss offline.

C: In the slide 5, what are your thoughts that the AP2 essentially just checking on the AP1 whether it’s powered off and populating its own beacon and letting the STAs which were associated to the AP1 to themselves? My point was that there may not be enough association availability when we get a spark data request, there will be some decisions such as going home or associating with.

A: If you send out a beacon and then you'd learn the reassociation selection procedure and I own each station again. It is based on existing procedure. The stations have to do the same similar decision as they are going to share. Each station has to perform this resulting reassociation decision one by one separately.

C: From unscheduled power off at the AP1, that is what we do. When the AP1 get powered off not in from a STA point of view, it is unscheduled but from a network infrastructure point of view, there are so many events. We should discuss later.

C: In the slide 5, how does the STA1 detect the AP1 failure? Monitoring beacons?

A: The beacon is one of the possible casess. The STA1 may have the previous communication with the AP1.

C: Because the STA can be mobile, it is a little bit dangerous only based on the beacon.

C: In the slide 4, for the second bullet, I don’t think this case will happen. Because if there is any station which does not support the unscheduled AP policy, the AP cannot enter the unscheduled AP power saves.

A: We said it is not a power save. When the AP is in failure, it enters power off and unscheduled power off.

C: In the slide 5, the AP2 does not know which situation are within each range. So, the AP2 should allocate the resource to reassociated station with the AP1 and you assume that the number of STAs are associated with AP1.

A: The AP2 may reserve this resource. But if a STA is out of coveratge, then this situation may not send back any response. It means tha resource is not successful.

C: How do you think this operates if the AP2 has multiple neighbors, and some of the STAs that are associated with it might be covered by some and others by others? It seems like very confusing situation.

A: This can be in another discussion how they solve the problem.

* + Chair proposed to add the submission on [11-24/0573r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0573-00-00bn-channel-bonding-rules-in-en-301-893-en-303-687.pptx) for the rest of time.
    - Approved without objection.
  + [11-24/0573r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0573-00-00bn-channel-bonding-rules-in-en-301-893-en-303-687.pptx): Challe bonding rules in EN 301 893 & EN 303 687

Guido R. Hierz (Ericsson)

C: I heard that the new version of this ETSI site that is close to December. If we go to option 20, that is suitable for current target, then call some regulation issue. I think we should adjust this as a new policy.

A: ETSI is an organization which is as much contribution driven. As RTP added to eleven or any other SDO as in membership is unlike 802.11 by entitiens. We do have around five meetings per year, and if who attend 802.11 and is also an ETSI member, they are of courese welcome.

C: Are the options 1 and 2 common to 5 and 6 GHz bands?

A: Yes. They are basically identical 5 and 6 GHz bands.

C: Do you have any understanding on how the multi-link is dealt?

A: In MLO transmission, all the links are independent to the band.

C: Also in a single band, you can have multiple links that 11be defined.

A: We do have some terminology where we talk about devices and equipments and the differentiation was necessary. There is something like a box that can have multiple radios within that box. You need to independently fulfill the requirements for teach of these radios.

C: (Chair referred the chat window) How does this requiremets accomodate with puncturing?

A: You can do puncturing. We have foreseen this now, but this mean that 20 MHz out of the 80 or whatever you have idle channels.

C: Regarding the slide 9, e.g., second top sub channel now it is doing back off. Is this change of operation at most per second?

A: Exactly. I cannot arbitrarily switch different bands of channels and so on. When these rules were defined by ETSI/BRAN, they targeted other technologies were expected to come into the band. These limitations would give fair access to each other.

* AoB: None.
* Recessed at 17:55 CEST.

# May 14th, Tuesday (10:30-12:30 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 14th, Tuesday (13:30-15:30 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 15th, Wednesday (8:00-10:00 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 15th, Wednesday (13:30-15:30 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 16th, Wednesday (8:00-10:00 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 16th, Thursday (10:30-12:30 CEST)

* Split PHY and MAC sessions.
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-0959-00-00bn-minutes-802-11-bn-phy-ad-hoc-warsaw-f2f-may-2024.docx>
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-0755-00-00bn-802-11bn-mac-ad-hoc-may-2024-warsaw-minutes.doc>

# May 16th, Thursday (16:00-18:00 CEST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
  + The chair announced that registration is needed to attend this meeting.
* Meeting protocol
  + The chair announced that everyone is required to log in WebEx to vote.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Attendance reminder.
  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802 Wireless Interim/Plenary Session” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbn conference call that you are attending.
  + If you are unable to record the attendance via [IMAT,](https://imat.ieee.org/attendance) then please send an e-mail to:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
    - PHY: Sigurd Schelstraete ([sschelstraete@maxlinear.com](mailto:sschelstraete@maxlinear.com)), Tianyu Wu ([tianyu@apple.com](mailto:tianyu@apple.com)), and Dongguk Lim ([dongguk.lim@lge.com](mailto:dongguk.lim@lge.com))
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* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

Nobody speaks/writes up.

* + Copyright Policy: Participants are advised that
    - IEEE SA’s copyright policy is described in [Clause 7](https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7) of the IEEE SA Standards Board Bylaws and [Clause 6.1](https://standards.ieee.org/about/policies/opman/sect6.html) of the IEEE SA Standards Board Operations Manual;
    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/0653r14](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-14-00bn-tgbn-may-2024-meeting-agenda.pptx).)
* Agenda
  + Chair reviews proposed agenda found in [11-24/0653r](https://mentor.ieee.org/802.11/dcn/24/11-24-0653-14-00bn-tgbn-may-2024-meeting-agenda.pptx)14.
  + Discussion: None.
  + The agenda approved with unanimous consent.
* Straw Polls
  + Straw Poll 1

TGbn shall define Coordinated Beamforming (CBF) and Coordinated Spatial Reuse (CSR), which allow concurrent transmissions of at least two PPDUs from at least two BSSes on the same channel.

Note: Supporting list: [[23/0776r1](https://mentor.ieee.org/802.11/dcn/23/11-23-0776-01-0uhr-performance-of-c-bf-and-c-sr.pptx), [23/1998r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1998-00-00bn-zero-mui-coordinated-bf.pptx), [24/0010r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0010-00-00bn-coordinated-beamforming-for-802-11bn.pptx), [24/0011r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0011-00-00bn-coordinated-spatial-nulling-c-sn-concept.pptx), [23/0325r0](https://mentor.ieee.org/802.11/dcn/23/11-23-0325-00-0uhr-coordinated-spatial-reuse-for-uhr.pptx), [23/1917r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1917-00-00bn-coordinated-spatial-reuse.pptx), [22/1822r0](https://mentor.ieee.org/802.11/dcn/22/11-22-1822-00-0uhr-recap-on-coordinated-spatial-reuse-operation.pptx), [24/0577r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0577-00-00bn-thoughts-on-coordinated-spatial-reuse-c-sr.pptx), [23/1037r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1037-00-0uhr-performance-of-coordinated-spatial-reuse.pptx), [23/1023r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1023-02-0uhr-coordinated-spatial-reuse-in-a-4-ap-topoplogy.pptx), [24/0529r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0529-00-00bn-coordinated-spatial-reuse-discussion.pptx), [23/1832r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1832-00-00bn-multi-ap-coordinated-spatial-reuse.pptx)]

* + - Discussion:

C: Have you considered splitting the straw poll? Coordinated beamforming is like an extension of MU-MIMO, which in theory is a great technology. But from our practical experience, it doesn’t get us much in the field. So, it’s kind of the cost benefit trade-off is just not very favorable. My voting would be different for each mode. So, to me, it makes sense to split this straw poll into two different ones.

A: Thanks for the suggestion. We had tried once for the coordinated spatial reuse and the members are not quite aligned on that. Some of members want to see this is for higher throughput. It is composed of two schemes, because these two distinct schemes have many things in common. I want to try this straw poll.

C: In the last meeting, we had discussed on C-SR. What is the difference? Did you resolve all the issues we raised in concerns for the C-SR especially?

A: I think you mentioned the two major issues for the C-SR. First one is that if we do some power control, then maybe there may be some complexity on construcnting a PPDU. I think this is a new project and we are adding the value. Maybe it is also for other schemes like C-BF, we also need to make some changes. They will need to introduce some complexity to make it work.

C: I don’t recall any discussion after that. Suddenly you ask for another straw poll, then probably there is no change.

C: I know these are important topics still under discussion. I request to defer the SP.

A: As you mentioned, this has been deferred last time. So, let’s see other people’s support.

Result: Y-N-A = 108-127-41

* Technical Submissions
  + [11-24/0444r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0444-02-00bn-considerations-on-joint-transmission.pptx): Considerations on Joint Transmission Kazunobu Serizawa (ATR)

C: 3GPP NR standardized like coherent and non-coherent joint transmission. Maybe some criticality is in the fact that new radio systems are slotted. So, it is easier to convey synchronization when the joint transmission is done. As you mentioned, there are some difficulties here in terms of clock drift and clock timing interpretation between different APs, which need to be overcome. I also guess the channel access has some uncertainty. I was wondering if you have some ideas how to overcome these challenges.

A: Synchronizing using in-band transmission is needed. This presentantion says that data delivery is better to use backhaul.

C: I think there need careful consideration.

C: I support this direction, but it relies on the implementation.

A: I would like to have face to face discussion.

* + [11-24/0529r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0529-01-00bn-coordinated-spatial-reuse-discussion.pptx): Coordinated spatial reuse discussion Yusuke Tanaka (Sony)

C: How tight is the time requirement for the sharing AP to take the decision of assessment, calculation, interference estimation and everything and then to take a decision to join the sharing AP within the rest of the shared TXOP? Is it more relaxed or more stringent? For the TXOP, it must do this right before or at the beginning of the TXOP. While for SP based, it seems like it is announced much time ahead.

A: This is just a kind of pros and cons. SP based can have a time to do such kind of thing, but that is not based on real time or not based on the fresh information.

C: By comparing with the TXOP based one, the SP based one is seemed to be easier to be implemented.

A: The recorded calculation is smaller if we use the SP-based comparing to the TXOP based. The TXOP based one with the appropriate parameter would be better performance.

C: For the simplicity, we cannot guarantee that the C-SR transmission can happen. So, even for the R-TWT, there are still problems of non-supporting STAs and legacy STAs because they still contend during those SPs. I think maybe you can add at the point that there was no guaranteed C-SR transmission during the during the SP.

A: Thank you.

* Motions (from the slides 16 to 25 in [11-24/0171r7](https://mentor.ieee.org/802.11/dcn/24/11-24-0171-07-00bn-tgbn-motions-list-part-1.pptx))
  + Motion 11 (MAC)

**Move to add the following text to the TGbn SFD**

TGbn defines a mode of operation that enables a STA to access the secondary channel while the primary channel is known to be busy due to OBSS traffic or other TBD conditions.

* + - The mode of operation shall not assume that the STA is capable to detect or decode a frame and obtain NAV information of the secondary channel concurrently with the primary channel.
    - A BSS shall only have a single NPCA primary channel (name TBD) on which the STA contends while the primary channel of the BSS is known to be busy due to OBSS traffic or other TBD conditions.

Note: Discussed in several sessions and several submissions discuss similar concept, ref: [[23/1911r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1911-00-00bn-secondary-channel-access-and-frame-transmission.pptx), [23/1913r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1913-02-00bn-secondary-channel-access-operation.pptx), [23/1935r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1935-01-00bn-secondary-channel-usage-follow-up.pptx), [23/2005r1](https://mentor.ieee.org/802.11/dcn/23/11-23-2005-01-00bn-non-primary-channel-access-npca.pptx), [23/2023r1](https://mentor.ieee.org/802.11/dcn/23/11-23-2023-01-00bn-further-discussion-on-non-primary-channel-access.pptx), [24/0070r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0070-01-00bn-some-details-about-non-primary-channel-access.pptx), [24/458r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0458-00-00bn-considerations-on-non-primary-channel-access.pptx), [24/486r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0486-00-00bn-some-considerations-on-non-primary-channel-access.pptx), [24/538r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0538-00-00bn-sp-based-non-primary-channel-access.pptx), [24/670](https://mentor.ieee.org/802.11/dcn/24/11-24-0670-00-00bn-different-view-problems-of-npca.pptx)]. No objection to the SP.

Move: Minyoung Park Second: Yumbo Li

* + - Discussion:

C: Is this feature optional or mandatory?

A: We have not decided yet at this point. Personally, I think it should be optional.

C: Can we add a bullet as “TBD: It is optional or mandatory.”?

A: If we don’t have it, it is default. So, I don’t think we need it.

C: Obviously, if the AP elects not to change the channel, then not a lot of stuff are going to happen. So, I guess implicitly whether it’s optional or mandatory. The AP can have some policy and then probably wants to advertise their policy. I’m not against the motion but I’m just sort of thinking here and this is how I would interrupt it. If people disagree, please let me know.

A: (Chair confirmed that that nobody disagreed.)

(The recorded vote was requested.)

Result: Y-N-A = 200-7-28 (The voting record is listed on the Annex of this document.)

The motion passed.

* + Motion 12 (MAC)

**Move to include the following into the 11bn SFD**

Define a way in 11bn to include in an initial control frame an intermediate FCS for UHR STA(s) that precedes padding and the FCS field

Note: Reference documents are [[11-23/1873](https://mentor.ieee.org/802.11/dcn/23/11-23-1873-01-00bn-post-fcs-mac-padding.pptx), [11-23/2003](https://mentor.ieee.org/802.11/dcn/23/11-23-2003-01-00bn-client-power-save.pptx)] No objection to the SP.

Move: Laurent Cariou Second: Ming Gan

* + - Discussion: None.

Result: The motion was approved with unanimous consent.

* + Motion 13 (MAC)

**Move to include the following into the 11bn SFD**

TGbn enables per-TID buffer size reporting of a larger queue in UHR

* + - Note: It is an optional feature.
    - Note: In the baseline, the maximum approximate per-TID queue size to report is 2,147,328 octets

Note: Reference document is [11-23/2007r2](https://mentor.ieee.org/802.11/dcn/23/11-23-2007-02-00bn-enhancement-of-bsr.pptx). No objection to the SP.

Move: Frank Hsu Second: Bruce Kang

* + - Discussion:

C: Regarding the baseline in the note, does it mean the HE?

A: It is based on HE.

C: I don’t have an objection to this motion but, I have a question in the underlying docmnet, [11-23/2007r2](https://mentor.ieee.org/802.11/dcn/23/11-23-2007-02-00bn-enhancement-of-bsr.pptx). As a part of being able to report a large queue size, you take eight bits instead of six bits, I guess. Do you really need that many bits? Once you have large buffer, the size of the buffer seems to be less important. How much critical traffic is delayed is seemed to be more important. The key question is the straw poll doesn’t say six or eight bits or anything. Do you really need the bits?

A: It doesn’t depend on the how much we expect the throughput in the future generation could be. I don’t have strong opinion about how many bits to defined in my proposal. It depends on the group’s discussion in the follow-up.

C: I look forward to the discussion.

Result: The motion was approved with unanimous consent.

* + Motion 14 (PHY)

**Move to include the following into the 11bn SFD**

DRUs tone plan design on distribution BW 20MHz and 40MHz is 26-tone RU based DRU method (using 26-tone DRUs as basic building blocks).

* + - DRUs tone plan design on other distribution BWs is TBD.

Note: Reference document is [11-24/468r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0468-02-00bn-dru-tone-plan-for-11bn.pptx). No objection to the SP.

Move: Shengquan Hu Second: Jianhan Liu

* + - Discussion: None.

Result: The motion was approved with unanimous consent.

* + Motion 15 (PHY)

**Move to include the following into the 11bn SFD**

* + - Global CSD is used for DRU UHR-STF transmission to solve unintentional beamforming issue
    - Global CSD is applied in each distribution BW

Note: Reference document is [11-24/752r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0752-02-00bn-stf-design-consideration-for-dru.pptx). No objection to the SP.

Move: Lin Yang Second: Sameer Vermani

* + - Discussion:

C: Is intentional beamforming allowed with dRU?

A: Intentionally beamforming is another topic. It is not the scope of this straw poll.

Result: The motion was approved with unanimous consent.

* + Motion 16 (PHY)

**Move to include the following into the 11bn SFD**

DRU transmission reuses the 8 CSD table/values in 11ax/be for global CSD allocation

Note: Reference document is [11-24/752r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0752-02-00bn-stf-design-consideration-for-dru.pptx). No objection to the SP.

Move: Lin Yang Second: Bo Gong

* + - Discussion: None.

Result: The motion was approved with unanimous consent.

* + Motion 17 (PHY)

**Move to include the following into the 11bn SFD**

11bn defines frequency domain aggregation of PPDUs. A frequency domain aggregated PPDU consists of multiple PPDUs.

Note: Reference document is [11-24/224r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0224-02-00bn-discussion-on-a-ppdu-follow-up.pptx). SP result: 68Y/20N/8A.

Move: Ross J. Yu Second: Yan Xin

* + - Discussion:

C: I was supporting this feature and I think it is important. But there is another discussion from opponent of this motion. I request to defer the motion.

A: I would like to have a try because I do receive strong support.

C: When an A-PPDU is used, you nesecsarily need a MAC protocol to move some STAs to a secondary part of the bandwidth. There has been some discussion on such mechanisms in the MAC during this week. That has called DSO (dynamic subband operation). During this discussion, there have been quite a few opposition ot it, in terms of the use cases. Maybe I would be a good thing to defer.

A: I do see there are some discussions in the MAC and this A-PPDU relies on the mechanisms either SST or DSO. As far as I know, the current mechansims can support part of the A-PPDU mode.

(The recording vote was requested.)

Result: Y-N-A = 115-72-55

(The voting record is listed on the Annex of this minutes.)

The motion was failed.

* + Motion 18 (PHY)

**Move to include the following into the 11bn SFD**

The UHR-STF for DRU in a TB PPDU uses 11ax/11be trigger based STF sequences.

Note: Reference document is [11-24/749r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0749-02-00bn-thoughts-on-stf-design-for-dru.pptx). No objection to the SP.

Move: Bo Gong Second: Lin Yang

* + - Discussion: None.

Result: The motion was approved with unanimous consent.

* + Motion 19 (PHY)

**Move to include the following into the 11bn SFD**

For UHR-STF corresponding to distribution bandwidth for DRU,

* + - STF sequence depends on PPDU BW.
    - Occupied STF tones are the same as that of the largest RRU corresponding to the distribution BW within PPDU BW.

Note: Reference document is [11-24/749r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0749-02-00bn-thoughts-on-stf-design-for-dru.pptx). No objection to the SP.

Move: Bo Gong Second: Lin Yang

* + - Discussion: None.

Result: The motion was approved with unanimous consent.

* + Motion 20 (PHY)

**Move to include the following into the 11bn SFD**

In a non-punctured 80 MHz PPDU, the following distribution bandwidth modes are allowed for DRU

* + - 80 MHz
    - 20 MHz + 20 MHz + 40 MHz (or 40 MHz + 20 MHz + 20 MHz)

Note: Reference document is [11-24/766r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0766-02-00bn-distribution-bandwidth-within-80-mhz-for-dru.pptx). No objection to the SP.

Move: Eunsung Park Second: Dongguk Lim

* + - Discussion:

C: I am OK with this motion. But I don’t know if the group wants to change the 80 MHz PPDU to a non-punctured 80 MHz disrbibution bandwidth.

C: I prefer to still use the PPDU as the SP because for a larger bandwidth we need some further discussion.

Result: The motion was approved with unanimous consent.

* Teleconference Plan
  + Discussion:
    - No conference calls were assigned to the holidays.
  + The modified schedule was approved:
    - May 27 (Monday) (not assigned) Holiday
    - May 30 (Thursday) – MAC/PHY 10:00-12:00 ET
    - June 03 (Monday) – Joint 19:00-21:00 ET
    - June 06 (Thursday) – MAC/PHY 10:00-12:00 ET
    - June 10 (Monday) (not assigned) Holiday
    - June 13 (Thursday) – MAC/PHY 10:00-12:00 ET
    - June 17 (Monday) – MAC/PHY 19:00-21:00 ET
    - June 20 (Thursday) – Joint 10:00-12:00 ET
    - June 24 (Monday) – MAC/PHY 19:00-21:00 ET
    - June 27 (Thursday) – MAC/PHY 10:00-12:00 ET
    - July 01 (Monday) – Joint 19:00-21:00 ET
    - July 04 (Thursday) (not assigned) Holiday
    - July 08 (Monday) – MAC/PHY 19:00-21:00 ET
* Goals for July 2024
  + Discuss technical submissions
  + Continue populating the TGbn SFD
  + Chair informeded the number of conducted motions smaller than that was in TGbe era, and some acceleration is needed if we want to follow the timeline.
* Any Other Business: None.
* Adjourned at 17:23.

# Appendix

* The record of the voting result for Motion 11

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name / Affiliation | Yes | No | Abs. | Note |
| [V] William Li, Spreadtrum-US | X |  |  |  |
| [V] Rana Abdelaal, Broadcom | X |  |  |  |
| [V] Srinivas Kandala Samsung |  | X |  |  |
| [V] Meriam Rezk Qualcomm Technologies Inc. | X |  |  |  |
| [V] Hyungjin Kim, Broadcom | X |  |  |  |
| [V] Sheetal Pandey, Synaptics | X |  |  |  |
| [V] Shengquan Hu Mediatek |  |  | X | INVALID VOTE: NON VOTER |
| [V] Yongsen Ma, Samsung |  | X |  |  |
| [V] Albert Bredewoud, Broadcom | X |  |  |  |
| [V] Srinath Puducheri, Broadcom | X |  |  |  |
| [V] Siukai Mak, Broadcom | X |  |  |  |
| [V] Henry Tzu-Hsuan Chou, Qualcomm | X |  |  |  |
| [V] Qing Xia, Sony | X |  |  |  |
| [V] Lalit Garg, Broadcom | X |  |  |  |
| [V] Azin Neishaboori, GM | X |  |  |  |
| [V] Gaurav Patwardhan, HPE | X |  |  |  |
| [V] Eugene Baik, Qualcomm | X |  |  |  |
| [V] Sanket Kalamkar, Qualcomm | X |  |  |  |
| Chris Young | X |  |  |  |
| [V] Li-Hsiang Sun, MediaTek | X |  |  |  |
| [V] Rolf de Vegt, Qualcomm | X |  |  |  |
| [V] Liwen Chu, NXP | X |  |  |  |
| [V] Alice Jialing Li Chen Qualcomm | X |  |  |  |
| [V] Jeff J.Q. Liu, Broadcom | X |  |  |  |
| [V] You-Wei Chen, MediaTek | X |  |  |  |
| [V] Rubayet Shafin, Samsung Electronics | X |  |  |  |
| [V] Sherief Helwa, Qualcomm Technologies, Inc. | X |  |  |  |
| [V] Anuj Batra, Apple | X |  |  |  |
| [V] Luis Gutierrez, Broadcom | X |  |  |  |
| [V] Kazunobu Serizawa, ATR | X |  |  |  |
| [A]Jin-Kyu Han, Samsung | X |  |  | INVALID VOTE: NON VOTER |
| [V] Kazuto Yano, ATR | X |  |  |  |
| Si-Chan Noh, Newracom |  | X |  |  |
| [V] Guido R. Hiertz, Ericsson GmbH |  | X |  |  |
| [V] Yanchun Li, Huawei | X |  |  |  |
| [V] Yunbo Li Huawei | X |  |  |  |
| [V] Davide Magrin, Meta | X |  |  |  |
| [V] Liuming Lu OPPO |  |  | X |  |
| [V] Pei Zhou, TCL |  |  | X |  |
| [V] Mehdi Ganji-Charter Communications | X |  |  |  |
| [V] Zhongjiang Yan, NWPU | X |  |  |  |
| [V] Joonsoo, Newracom |  |  | X |  |
| [V] Frank Chien-Fang Hsu, Mediatek | X |  |  |  |
| [V] Dong Wei, OPPO |  |  | X |  |
| [V] Takuhiro Sato, Sharp |  |  | X |  |
| [V] Charlie Pettersson Ericsson |  |  | X |  |
| [V]Jun Minotani, Panasonic Holdings Corporation | X |  |  |  |
| [V] David Boldy Broadcom | X |  |  |  |
| [V] SunHee Baek LGE | X |  |  |  |
| [V] Kosuke Aio, Sony |  |  | X |  |
| [V] Yuki FUJIMORI Canon | X |  |  |  |
| [V] Inaki Val, MaxLinear |  |  | X |  |
| [V] Geert Awater, Qualcomm | X |  |  |  |
| [V] David Ferruz, Maxlinear | X |  |  |  |
| [V] Zhuqing Tang, Huawei | X |  |  |  |
| [V] Salvatore Talarico – Sony | X |  |  | INVALID VOTE: NON VOTER |
| [V] Youhan Kim, Qualcomm Technologies, Inc. | X |  |  |  |
| [V] Junghoon Suh Huawei | X |  |  |  |
| [V] Taeyoung Ha Samsung | X |  |  |  |
| [V] Arik Klein Huawei | X |  |  |  |
| [V] Minyoung Park, Intel | X |  |  |  |
| Yong Liu | X |  |  |  |
| [V] Claudio da Silva, Meta | X |  |  |  |
| [V] Pascal Viger Canon | X |  |  |  |
| [NV] Yung-Lin Hsu, National Taiwan University | X |  |  | INVALID VOTE: NON VOTER |
| [V] Ryota Yamada, Sharp | X |  |  |  |
| [V]XIANDONG DONG-XIAOMI |  |  | X |  |
| [V] Hongwon Lee, LG | X |  |  |  |
| [V] Shawn Kim, WILUS Inc. | X |  |  |  |
| [V]HanGyu Cho\_LGE | X |  |  |  |
| [NV] Riemann Chen, Acer Inc | X |  |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Ali Raissinia Qualcomm | X |  |  |  |
| [V] Leif Wilhelmsson Ericsson | X |  |  |  |
| [V] Ray Yang, InterDigital |  |  | X |  |
| [V] Yan Zhang, Apple | X |  |  |  |
| [V]Colin Kim, Broadcom | X |  |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Jinyoung Chun, LG | X |  |  |  |
| [V] Hank ChiHan Huang, MediaTek | X |  |  |  |
| [V] Bo Gong Huawei | X |  |  |  |
| [V] Mao Yang Northwestern Polytechnical University | X |  |  |  |
| [PV] Renlong Zhou,Sanechips |  |  | X | INVALID VOTE: NON VOTER |
| [V] Bruce HaoHua Kang, MediaTek | X |  |  |  |
| [V] Bo Li Northwestern Polytechnical University | X |  |  |  |
| [V] Tomoko Adachi Toshiba | X |  |  |  |
| [V] Sungjin Park, Senscomm | X |  |  |  |
| [V], Yanchao Xu, Amlogic |  |  | X |  |
| [V] Hirohiko INOHIZA Canon | X |  |  |  |
| [V] Chen-Yi Chang, MediaTek | X |  |  |  |
| [V]Phoebe Shumin Cheng, Mediatek | X |  |  |  |
| [V] Ryuichi Hirata, Sony | X |  |  |  |
| [V] Wayne ChengYing Wu, Mediatek | X |  |  |  |
| [V] Peshal Nayak, Samsung |  |  | X |  |
| [V] Juan Fang, intel | X |  |  |  |
| [V] Karim Nassiri Toussi, Broadcom | X |  |  |  |
| [V] Bin Tian | X |  |  |  |
| [V] Sangho Seo, Broadcom | X |  |  |  |
| [V] Subrahmanyam Yanamandra, Broadcom | X |  |  |  |
| [V] manoj raveendranath [Broadcom] | X |  |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Dinakar Prabhakaran Broadcom | X |  |  |  |
| [V] Rakshith Rajashekar, Broadcom | X |  |  |  |
| [V] Gaurang Naik, Qualcomm | X |  |  |  |
| [V] Abhishek Mantha, Broadcom | X |  |  |  |
| [V] Ankit Sethi NXP | X |  |  |  |
| [V] Yue Zhao, Huawei | X |  |  |  |
| [V] GaborB, Mediatek | X |  |  |  |
| [V] Prabodh Varshney Nokia | X |  |  |  |
| [V] Nehru Bhandaru | X |  |  |  |
| [V] Yan Xin, Huawei | X |  |  |  |
| [V] Naveen Kakani, Qualcomm | X |  |  |  |
| [V] xiangxin, Spreadtrum |  |  | X |  |
| [V] Mengshi Hu Huawei | X |  |  |  |
| [V]Peng Liu | X |  |  |  |
| [V] John Zhang, OPPO | X |  |  |  |
| [V] George Chih-Chun Kuo, MediaTek |  | X |  |  |
| [V] Chaoming Luo, OPPO | X |  |  |  |
| [V] Steven Qi Wang Huawei | X |  |  |  |
| [V]Maolin Zhang, Huawei | X |  |  |  |
| [V] Yunsi Ma, Huawei | X |  |  |  |
| [V]Lan Pen | X |  |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Ronny Yang-Hung Peng, Mediatek | X |  |  |  |
| [V] Ross Jian Yu Huawei | X |  |  |  |
| [V] Lei Zhou, New H3C | X |  |  |  |
| [V] Yiyan Zhang, Huawei | X |  |  |  |
| [V]Zhenguo Du, Huawei | X |  |  |  |
| [V]Jerome Gu, Clourney Semiconductor | X |  |  |  |
| [V] Chenchen Liu Huawei | X |  |  |  |
| [V] Cheng-Ming Chen Qualcomm | X |  |  |  |
| [V] Narengerile, Huawei | X |  |  |  |
| [V]HungTao Hsieh, Mediatek | X |  |  |  |
| [V] Carol Ansley, Cox | X |  |  |  |
| [V] Leo Montreuil, Broadcom | X |  |  |  |
| [V] Leonardo Lanante, Ofinno | X |  |  |  |
| [V] Ezer Melzer, Huawei | X |  |  |  |
| [V] Ishaque Kadampot, Qualcomm | X |  |  |  |
| [V] John Wullert, Peraton Labs |  |  | X |  |
| [V] Jiayi Zhang, Ofinno | X |  |  |  |
| [V] Hassan Omar [Huawei] | X |  |  |  |
| [V] GeonHwan Kim, LGE | X |  |  |  |
| [V] Dmitry Akhmetov Intel | X |  |  |  |
| [V] Alejandro Torrijo, Maxlinear Corp |  |  | X |  |
| [V] Yajun Cheng, Xiaomi |  |  | X |  |
| [V] Eunsung Park LGE | X |  |  |  |
| [V] Richard van Nee, Qualcom | X |  |  |  |
| [V] Akira Kishida NTT | X |  |  |  |
| [V] Duncan Ho, Qualcomm | X |  |  |  |
| [V] Shimi Shilo Huawei | X |  |  |  |
| [V]Hanqing Lou, InterDigital |  |  | X |  |
| [V] Sameer Vermani Qualcomm | X |  |  |  |
| [V] Kaiying Lu Mediatek USA | X |  |  |  |
| [V] Dongguk Lim, LGE | X |  |  |  |
| [V] Anton Karamyshev, IITP RAS | X |  |  |  |
| [V] Hiroyuki Motozuka, Panasonic | X |  |  |  |
| [V] Dror Regev -Huawei | X |  |  |  |
| [V] Hitoshi Morioka, SRC Software |  |  | X |  |
| Chitto Ghosh | X |  |  |  |
| [V] Atsushi Shirakawa, Sharp | X |  |  |  |
| [V] Lei Wang, Futurewei/Huawei | X |  |  |  |
| [V] Mor Reich, Huawei | X |  |  |  |
| [V] Lin Yang Qualcomm | X |  |  |  |
| [V] Jason Yuchen Guo Huawei | X |  |  |  |
| Tianyu Wu | X |  |  |  |
| [V] Genadiy Tsodik Huawei | X |  |  |  |
| [V] Stephane Baron Canon | X |  |  |  |
| [V] Oded Redlich Huawei | X |  |  |  |
| [V] Mahmoud Kamel InterDigital | X |  |  |  |
| [V] BIAN Tong, Panasonic | X |  |  |  |
| [V] Yusuke Tanaka, Sony | X |  |  |  |
| [V] Tuncer Baykas, Ofinno | X |  |  |  |
| [V] Giovanni Chisci, Qualcomm | X |  |  |  |
| Binita Gupta | X |  |  |  |
| [V]Aditi Singh, Charter Comm. | X |  |  |  |
| [V] Sean Coffey Realtek | X |  |  |  |
| [V] Brian Hart Cisco Systems | X |  |  |  |
| [V] Yapu Li, OPPO | X |  |  |  |
| [V]Shuling Julia Feng, Mediatek | X |  |  |  |
| [PV] Qinglai Liu, Panasonic |  |  | X | INVALID VOTE: NON VOTER |
| [V] Shuntaro Suzuki, Yamaha | X |  |  |  |
| [V] Wook Bong Lee, Apple | X |  |  |  |
| [V] Dibakar Das, Intel | X |  |  |  |
| Alvin Hsu, MediaTek | X |  |  | INVALID VOTE: NON VOTER |
| [V] Allert van Zelst, Qualcomm | X |  |  |  |
| [V] Subir Das Peraton Labs |  |  | X |  |
| [V] Pooya Monajemi, Apple | X |  |  |  |
| [V] James Yee, MediaTek | X |  |  |  |
| [V] Po-Kai Huang Intel | X |  |  |  |
| [V] Serhat Erkucuk, Ofinno | X |  |  |  |
| [V] Thomas Pare, MediaTek | X |  |  |  |
| [V] Rainer Strobel, MaxLinear | X |  |  |  |
| [V] Shaima ABIDRABBU, VESTEL, IMU | X |  |  |  |
| [V] Jonathan Segev intel corporation | X |  |  |  |
| [V] Sindhu Verma, Broadcom | X |  |  |  |
| [V] Dignus-Jan Moelker Broadcom | X |  |  |  |
| [V] George Cherian Qualcomm | X |  |  |  |
| [V] Al Petrick, InterDigital |  |  | X |  |
| [V] Hongyuan Zhang NXP | X |  |  |  |
| [V] Insik Jung LGE | X |  |  |  |
| [V] Abhishek Patil Qualcomm Technologies Inc | X |  |  |  |
| Wei Lin Huawei | X |  |  |  |
| [V] Max Riegel, self | X |  |  |  |
| [V]Yan Li,ZTE |  | X |  |  |
| [V] Ziv Avital, Maxlinear | X |  |  |  |
| [V] Sang Kim, LGE | X |  |  |  |
| [V] Benedikt Schweizer, Apple | X |  |  |  |
| Yusuke Asai, NTT |  |  | X |  |
| [V] Edward Harrison Anritsu | X |  |  |  |
| [V] Jinsoo Choi LG | X |  |  |  |
| [V] Yongho Seok, Apple | X |  |  |  |
| [V] Rocco Di Taranto, Ericsson | X |  |  |  |
| [V] Patrice NEZOU, Canon | X |  |  |  |
| [A] Ke Zhong, Ruijie Networks | X |  |  | INVALID VOTE: NON VOTER |
| [V] Kanke Wu, Apple | X |  |  |  |
| [V] Insun Jang LGE | X |  |  |  |
| [V] Jay Yang [ZTE] |  |  | X |  |
| [V] Dongju Cha, LGE | X |  |  |  |
| [V] Shubhodeep Adhikari, Broadcom | X |  |  |  |
| [V] Jianhan Liu, Jianhan Liu | X |  |  |  |
| [V] Marcos Martínez Maxlinear |  |  | X |  |
| [V] Kiseon Ryu, NXP | X |  |  |  |
| [V] Vinko Erceg, Broadcom | X |  |  |  |
| [V] Jeongki Kim, Ofinno | X |  |  |  |
| Yonggang Fang | X |  |  |  |
| [V] Ning Gao, OPPO | X |  |  |  |
| [V] Rethna Pulikkoonattu Broadcom | X |  |  |  |
| Morteza Mehrnoush | X |  |  |  |
| Timothy Jeffries | X |  |  |  |
| [V] Laurent Cariou Intel | X |  |  |  |
| [V] Ming Gan Huawei | X |  |  |  |
| [V] Romain GUIGNARD Canon |  |  | X |  |
| [V] Yingqiao Quan, Spreadtrum | X |  |  |  |
| [V] Julien SEVIN Canon | X |  |  |  |
| Ahmed Helmy | X |  |  |  |
| [V] Ron Porat, Broadcom | X |  |  |  |
| [V] Samir Khericha, Broadcom | X |  |  |  |
| [V] Peyush Agarwal Broadcom | X |  |  |  |
| SK Yong | X |  |  |  |
| [V] Hang Su Broadcom | X |  |  |  |
| Thomas Derham | X |  |  |  |
| An Nguyen [CISA/ECD] |  |  | X |  |
| [V] Aniruddh Rao Kabbinale, Samsung Electronics | X |  |  |  |
| [V] Matthew Fischer, Broadcom | X |  |  |  |
| [V] BO SUN, Sanechips |  |  | X |  |
| [V] Ilya Levitsky IITP RAS |  |  | X |  |
| [V] Massinissa Lalam, Sagemcom |  | X |  |  |
| [V] Qi Wang, Apple | X |  |  |  |
| Pooria Pakrooh Qualcomm | X |  |  |  |
| [V] Sigurd Schelstraete MaxLinear |  |  | X |  |
| [V] Huizao Wang, NXP Semiconductors | X |  |  | \* Voted via chat window of the Webex |

The record of the voting result for Motion 17

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name / Affiliation | Yes | No | Abs. | Note |
| [V] William Li, Spreadtrum-US |  |  | X |  |
| [V] Srinivas Kandala Samsung | X |  |  |  |
| [V] Meriam Rezk Qualcomm Technologies Inc. |  | X |  |  |
| [V] Hyungjin Kim, Broadcom |  | X |  |  |
| [V] Sheetal Pandey, Synaptics | X |  |  |  |
| [V] Abdel Karim Ajami, Apple | X |  |  |  |
| [V] Shengquan Hu Mediatek |  |  | X | INVALID VOTE: NON VOTER |
| [V] Yongsen Ma, Samsung | X |  |  |  |
| [V] Albert Bredewoud, Broadcom |  | X |  |  |
| [V] Thomas Derham |  | X |  |  |
| [V] Hao Song, Intel |  | X |  |  |
| [V] Srinath Puducheri, Broadcom |  | X |  |  |
| [V] Siukai Mak, Broadcom |  | X |  |  |
| [V] Henry Tzu-Hsuan Chou, Qualcomm |  | X |  |  |
| [V] Qing Xia, Sony | X |  |  |  |
| [V] Lalit Garg, Broadcom |  | X |  |  |
| [V] Azin Neishaboori, GM | X |  |  |  |
| [V] Gaurav Patwardhan, HPE |  |  | X |  |
| [V] Eugene Baik, Qualcomm |  | X |  |  |
| [V] Sanket Kalamkar, Qualcomm |  | X |  |  |
| Chris Young |  | X |  |  |
| [V] Alice Jialing Li Chen Qualcomm |  | X |  |  |
| [V] Ahmed Elsherif Qualcomm |  | X |  |  |
| [V] Jeff J.Q. Liu, Broadcom |  | X |  |  |
| [V] You-Wei Chen, MediaTek | X |  |  |  |
| [V] Rubayet Shafin, Samsung Electronics | X |  |  |  |
| [V] Sherief Helwa, Qualcomm Technologies, Inc. |  | X |  |  |
| [V] Anuj Batra, Apple | X |  |  |  |
| [V] Debashis Dash, Apple | X |  |  |  |
| [V] Kazunobu Serizawa, ATR | X |  |  |  |
| [V] Kazuto Yano, ATR |  |  | X |  |
| Si-Chan Noh, Newracom | X |  |  |  |
| [V] Yanchun Li, Huawei | X |  |  |  |
| [V] Yunbo Li Huawei | X |  |  |  |
| [V] Davide Magrin, Meta |  | X |  |  |
| [V] Liuming Lu OPPO | X |  |  |  |
| [V] Pei Zhou, TCL |  |  | X |  |
| [V] Mehdi Ganji-Charter Communications |  |  | X |  |
| [V] Zhongjiang Yan, NWPU | X |  |  |  |
| [V] Joonsoo, Newracom |  | X |  |  |
| [V] Frank Chien-Fang Hsu, Mediatek |  |  | X |  |
| [V] Dong Wei, OPPO | X |  |  |  |
| [V] Takuhiro Sato, Sharp |  |  | X |  |
| [V] Charlie Pettersson Ericsson |  |  | X |  |
| [V]Jun Minotani, Panasonic Holdings Corporation | X |  |  |  |
| [V] David Boldy Broadcom |  | X |  |  |
| [V] SunHee Baek LGE | X |  |  |  |
| [V] Kosuke Aio, Sony | X |  |  |  |
| [V] Yuki FUJIMORI Canon | X |  |  |  |
| [V] Inaki Val, MaxLinear |  |  | X |  |
| [V] Geert Awater, Qualcomm |  | X |  |  |
| [V] David Ferruz, Maxlinear |  |  | X |  |
| [V] Zhuqing Tang, Huawei | X |  |  |  |
| [V] Salvatore Talarico - Sony | X |  |  | INVALID VOTE: NON VOTER |
| [V] Youhan Kim, Qualcomm Technologies, Inc. |  | X |  |  |
| [V] Junghoon Suh Huawei | X |  |  |  |
| [V] Taeyoung Ha Samsung | X |  |  |  |
| [V] Arik Klein Huawei | X |  |  |  |
| [V] Minyoung Park, Intel |  | X |  |  |
| Yong Liu | X |  |  |  |
| [V] Claudio da Silva, Meta |  | X |  |  |
| [V] Pascal Viger Canon |  |  | X |  |
| [NV] Yung-Lin Hsu, National Taiwan University |  |  | X | INVALID VOTE: NON VOTER |
| [V] Ryota Yamada, Sharp |  |  | X |  |
| [V]XIANDONG DONG-XIAOMI | X |  |  |  |
| [V] Hongwon Lee, LG | X |  |  |  |
| [V] Shawn Kim, WILUS Inc. |  |  | X |  |
| [V]HanGyu Cho\_LGE | X |  |  |  |
| [V] Ali Raissinia Qualcomm |  | X |  |  |
| [V] Leif Wilhelmsson Ericsson |  |  | X |  |
| [V] Ray Yang, InterDigital | X |  |  |  |
| [V] Huizhao Wang, NXP |  |  | X |  |
| [V] Yan Zhang, Apple | X |  |  |  |
| [V]Colin Kim, Broadcom |  | X |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Jinyoung Chun, LG | X |  |  |  |
| [V] Hank ChiHan Huang, MediaTek |  |  | X |  |
| [V] Bo Gong Huawei | X |  |  |  |
| [V] Eunsung Jeon Samsung |  |  | X |  |
| [V] Mao Yang Northwestern Polytechnical University | X |  |  |  |
| [PV] Renlong Zhou,Sanechips | X |  |  | INVALID VOTE: NON VOTER |
| [V] Bruce HaoHua Kang, MediaTek | X |  |  |  |
| [V] Bo Li Northwestern Polytechnical University | X |  |  |  |
| [V] Tomoko Adachi Toshiba | X |  |  |  |
| [V] Hirohiko INOHIZA Canon |  |  | X |  |
| [V] Chen-Yi Chang, MediaTek | X |  |  |  |
| [V]Phoebe Shumin Cheng, Mediatek |  |  | X |  |
| [V] Ryuichi Hirata, Sony | X |  |  |  |
| [V] Wayne ChengYing Wu, Mediatek |  |  | X |  |
| [V] Ziyang Guo - Huawei | X |  |  |  |
| [V] Peshal Nayak, Samsung | X |  |  |  |
| [V] Juan Fang, intel |  | X |  |  |
| [V] Karim Nassiri Toussi, Broadcom |  | X |  |  |
| [V] Bin Tian |  | X |  |  |
| [V] Sangho Seo, Broadcom |  | X |  |  |
| [V] Vishnu Ratnam, Samsung Electronics | X |  |  |  |
| [V] Subrahmanyam Yanamandra, Broadcom |  | X |  |  |
| [v] manoj raveendranath [Broadcom] |  | X |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Dinakar Prabhakaran Broadcom |  | X |  |  |
| [V] Rakshith Rajashekar, Broadcom |  | X |  |  |
| [V] Gaurang Naik, Qualcomm |  | X |  |  |
| [V] Abhishek Mantha, Broadcom |  |  | X |  |
| [V] Ankit Sethi NXP |  |  | X |  |
| [V] Neel Krishnan, Apple | X |  |  |  |
| [V] Yue Zhao, Huawei | X |  |  |  |
| [V] GaborB, Mediatek |  |  | X |  |
| [V] Prabodh Varshney Nokia | X |  |  |  |
| [V] Nehru Bhandaru |  | X |  |  |
| [V] Yan Xin, Huawei | X |  |  |  |
| [V] Naveen Kakani, Qualcomm |  | X |  |  |
| [V] Aiguo Yan - Samsung | X |  |  |  |
| [v] xiangxin, Spreadtrum | X |  |  |  |
| [V] Mengshi Hu Huawei | X |  |  |  |
| [V]Peng Liu | X |  |  |  |
| [V] John Zhang, OPPO | X |  |  |  |
| [V] George Chih-Chun Kuo, MediaTek |  |  | X |  |
| [V] Chaoming Luo, OPPO | X |  |  |  |
| [V] Steven Qi Wang Huawei | X |  |  |  |
| [V] Guogang Huang Huawei | X |  |  |  |
| [V]Maolin Zhang, Huawei | X |  |  |  |
| [V] Yunsi Ma, Huawei | X |  |  |  |
| [V]Lan Pen | X |  |  | INVALID VOTE: NO MATCH FOUND! |
| [V] Ronny Yang-Hung Peng, Mediatek |  |  | X |  |
| [V] Ross Jian Yu Huawei | X |  |  |  |
| [V] Lei Zhou, New H3C | X |  |  |  |
| [V]Zhenguo Du, Huawei | X |  |  |  |
| [V] Chenchen Liu Huawei | X |  |  |  |
| [V] Cheng-Ming Chen Qualcomm |  | X |  |  |
| [V] Rui Du, Huawei | X |  |  |  |
| [V] Narengerile, Huawei | X |  |  |  |
| [V]HungTao Hsieh, Mediatek |  |  | X |  |
| [V] Carol Ansley, Cox |  |  | X |  |
| [V] Leo Montreuil, Broadcom |  | X |  |  |
| [V] Leonardo Lanante, Ofinno | X |  |  |  |
| [V] Ishaque Kadampot, Qualcomm |  | X |  |  |
| kiwin |  | X |  | INVALID VOTE: NO MATCH FOUND! |
| [V] John Wullert, Peraton Labs |  |  | X |  |
| [V] Jiayi Zhang, Ofinno | X |  |  |  |
| [V] Hassan Omar [Huawei] | X |  |  |  |
| [V] GeonHwan Kim, LGE | X |  |  |  |
| [V] Alejandro Torrijo, Maxlinear Corp |  |  | X |  |
| [V] Lili Hervieu - Cablelabs |  |  | X |  |
| [V] Yajun Cheng, Xiaomi |  |  | X |  |
| [V] Eunsung Park LGE | X |  |  |  |
| [V] Richard van Nee, Qualcomm |  | X |  |  |
| [V] Akira Kishida NTT |  | X |  |  |
| [V] Michail Koundourakis, Samsung | X |  |  |  |
| [V] Duncan Ho, Qualcomm |  | X |  |  |
| [V] Shimi Shilo Huawei | X |  |  |  |
| [V]Hanqing Lou, InterDigital | X |  |  |  |
| [V] Sameer Vermani Qualcomm |  | X |  |  |
| [V] Kaiying Lu Mediatek USA |  |  | X |  |
| [V] Dongguk Lim, LGE | X |  |  |  |
| [V] Jouni Malinen, Qualcomm |  | X |  |  |
| [V] Anton Karamyshev, IITP RAS | X |  |  |  |
| [V] Hiroyuki Motozuka, Panasonic |  |  | X |  |
| [V] Okan Mutgan, Nokia |  | X |  |  |
| [V] Dror Regev -Huawei | X |  |  |  |
| [V] Hitoshi Morioka, SRC Software |  |  | X |  |
| Chitto Ghosh |  |  | X |  |
| [V] Atsushi Shirakawa, Sharp |  |  | X |  |
| [V] Lei Wang, Futurewei/Huawei | X |  |  |  |
| [V] Lin Yang Qualcomm |  | X |  |  |
| [V] Jason Yuchen Guo Huawei | X |  |  |  |
| Tianyu Wu | X |  |  |  |
| [V] Genadiy Tsodik Huawei | X |  |  |  |
| [V] Stephane Baron Canon |  |  | X |  |
| [V] Oded Redlich Huawei | X |  |  |  |
| [V] Mahmoud Kamel InterDigital | X |  |  |  |
| [V] BIAN Tong, Panasonic | X |  |  |  |
| [V] Yusuke Tanaka, Sony | X |  |  |  |
| [V] Tuncer Baykas, Ofinno | X |  |  |  |
| [V] Binita Gupta, Cisco Systems |  | X |  |  |
| [V]Aditi Singh, Charter Comm. | X |  |  |  |
| [V] Sean Coffey Realtek |  |  | X |  |
| [V] Brian Hart Cisco Systems |  | X |  |  |
| [V] Yapu Li, OPPO | X |  |  |  |
| [V]Shuling Julia Feng, Mediatek |  |  | X |  |
| [V] Shuntaro Suzuki, Yamaha |  |  | X |  |
| [V] Wook Bong Lee, Apple | X |  |  |  |
| [V] William Carney Sony | X |  |  |  |
| [V] Dibakar Das, Intel |  | X |  |  |
| [V] Allert van Zelst, Qualcomm |  | X |  |  |
| [V] Subir Das Peraton Labs |  |  | X |  |
| [V] Pooya Monajemi, Apple |  |  | X |  |
| [V] James Yee, MediaTek |  |  | X |  |
| [V] Mikael LORGEOUX Canon |  |  | X |  |
| [V] Menzo Wentink, Qualcomm |  | X |  |  |
| [V] Po-Kai Huang Intel |  | X |  |  |
| [V] Serhat Erkucuk, Ofinno | X |  |  |  |
| Yanjun Sun | X |  |  |  |
| [V] Liangxiao Xin OPPO | X |  |  |  |
| [V] Thomas Pare, MediaTek |  | X |  |  |
| [V] Rainer Strobel, MaxLinear |  |  | X |  |
| [V] Sindhu Verma, Broadcom |  | X |  |  |
| [V] Dignus-Jan Moelker Broadcom |  | X |  |  |
| [V] George Cherian Qualcomm |  | X |  |  |
| [V] Al Petrick, InterDigital | X |  |  |  |
| [V] Hongyuan Zhang NXP |  |  | X |  |
| [V] Insik Jung LGE | X |  |  |  |
| [V] Abhishek Patil Qualcomm Technologies Inc |  | X |  |  |
| Kumail Meta |  | X |  |  |
| Wei Lin Huawei | X |  |  |  |
| [V]Yan Li,ZTE | X |  |  |  |
| [V] Sang Kim, LGE | X |  |  |  |
| [V] Benedikt Schweizer, Apple | X |  |  |  |
| Yusuke Asai, NTT |  | X |  |  |
| [V] Jinsoo Choi LG | X |  |  |  |
| [V] Yongho Seok, Apple | X |  |  |  |
| [V] Rocco Di Taranto, Ericsson |  |  | X |  |
| [V] Bin Qian, Huawei | X |  |  |  |
| [A] Ke Zhong, Ruijie Networks | X |  |  | INVALID VOTE: NON VOTER |
| [V] Kanke Wu, Apple | X |  |  |  |
| [V] Insun Jang LGE | X |  |  |  |
| [V] Jay Yang [ZTE] | X |  |  |  |
| [V] Dongju Cha, LGE | X |  |  |  |
| [V] Shubhodeep Adhikari, Broadcom |  | X |  |  |
| [V] Jianhan Liu, Jianhan Liu |  |  | X |  |
| [V] Marcos Martínez Maxlinear |  |  | X |  |
| [V] Kiseon Ryu, NXP |  |  | X |  |
| [V] Vinko Erceg, Broadcom |  | X |  |  |
| [V] Jeongki Kim, Ofinno | X |  |  |  |
| Yonggang Fang | X |  |  |  |
| [V] Ning Gao, OPPO |  | X |  |  |
| [V] Rethna Pulikkoonattu Broadcom |  | X |  |  |
| Morteza Mehrnoush |  | X |  |  |
| David Yang Huawei | X |  |  |  |
| Timothy Jeffries | X |  |  |  |
| [V] Laurent Cariou Intel |  | X |  |  |
| [V] Ugo Campiglio, Cisco |  |  | X |  |
| [V] Ming Gan Huawei | X |  |  |  |
| [V] Romain GUIGNARD Canon |  |  | X |  |
| [V] Yingqiao Quan, Spreadtrum | X |  |  |  |
| [V] Julien SEVIN Canon |  |  | X |  |
| [V] Reza Hedayat, Apple | X |  |  |  |
| Ahmed Helmy | X |  |  |  |
| [V] Ron Porat, Broadcom |  | X |  |  |
| [V] Samir Khericha, Broadcom |  | X |  |  |
| [V] Peyush Agarwal Broadcom |  | X |  |  |
| SK Yong | X |  |  |  |
| [V] Hang Su Broadcom |  | X |  |  |
| [V] Cheng Chen, Intel |  | X |  |  |
| Jinjing Jiang | X |  |  |  |
| [V] BO SUN, Sanechips | X |  |  |  |
| [NV] Samith Abeywickrama, Huawei | X |  |  | INVALID VOTE: NON VOTER |
| [V] Massinissa Lalam, Sagemcom |  | X |  |  |
| [V] Qi Wang, Apple | X |  |  |  |
| Mohamed Abouelseoud |  |  | X |  |
| [V] Rolf de Vegt Qualcomm |  | X |  |  |
| [V] Xiaofei Wang InterDigital | X |  |  |  |
| [V] Juan Carlos Zuniga, Cisco |  | X |  |  |
| [V] Pooria Pakrooh Qualcomm |  | X |  |  |
| [V] Sigurd Schelstraete MaxLinear |  |  | X |  |