IEEE P802.11
Wireless LANs

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| Meeting Minutes November 2019 |
| Date: 2019-11-11 |
| Author(s): |
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Abstract

Minutes from TGbe full sessions during the November 2019 Plenary held at Waikoloa, Hawaii.

**REVISION NOTES:**

**R0**:

Minutes from Monday PM1

**R1**:

Added Minutes from Tuesday AM1 (second half of this time block)

**R2**:

Added Minutes from Thursday AM1

**R3**:

Added Minutes from Thursday PM1

**END OF REVISION NOTES**

**Session 1: Monday 11 November PM1**

**Introduction**

1. The Chair calls the meeting to order at 13:31. The agenda is found in 11-19-1722r5.
2. The Chair reviews attendance and recaps the procedures.
3. The Chair reads the patent guidelines as found on slides 6-11 on 11-19-1722r5 and asks if there is anyone who is aware of potentially essential patents. There is no response.
4. The Chair reviews the proposed agenda items
5. The Chair reviews TGbe session schedule for the week and room assignments
6. The Chair reviews the lists of existing deferred straw polls and submissions noting that due to the number of submissions in the queue, that review of some submissions will occur during conference calls, as not all will be covered during this week
7. Chair asks for comment on the proposed schedule of slide 25, no comment received.
8. The Chair asks if there is any objection of approving the agenda as found in 1722r5. No objection is noted
9. **Motion to approve TG Minutes.**

Move to approve TGbe minutes of meetings and teleconferences from the September 2019 meeting until today:

[**https://mentor.ieee.org/802.11/dcn/19/11-19-1728-01-00be-meeting-minutes-september-2019.docx**](https://mentor.ieee.org/802.11/dcn/19/11-19-1764-03-00be-telephone-conference-meeting-minutes-october-and-november-2019.docx)

[**https://mentor.ieee.org/802.11/dcn/19/11-19-1764-03-00be-telephone-conference-meeting-minutes-october-and-november-2019.docx**](https://mentor.ieee.org/802.11/dcn/19/11-19-1764-03-00be-telephone-conference-meeting-minutes-october-and-november-2019.docx)

 **Move:** Srinivas Kandala **Second: Bin Tian**

**Discussion:** No discussion. **Result:** Approved with unanimous consent.

**Editor’s Report**

1. 11-19-1935r0 ”TGbe Editor’s Report” – Edward Au (Huawei)

**Summary:** The author provides guidelines to members for the creation of submissions that are to be used to define the modifications to the editor-controlled documents, the SFD and Draft.

**Discussion:**
**C:** Chair asks if there are any questions for the editor
R: no questions or comments

**Deferred Straw Polls**

1. As per the agenda item, the group is directed to the agenda itme for review of deferred straw polls as found in 11-19-1722r5 on slide 15, noting that items in green had been reviewed already in the AM1 PHY adhoc of November 11, 2019

The chair reviews the ordering of the straw polls and notes the addition of two documents on the topic of joint sounding protocol to the list of deferred straw polls, suggesting that these documents be reviewed at the end of the straw polls in the list and asks for comment
No comment received
2. 11-19-1535r1 - Sounding for AP Collaboration – Junghoon Suh (Huawei)

C: in your straw poll, is the serial transmission of NDPs is as shown in slide 3?
R: Yes
C: we do not support the sequence shown on slide 3, so we cannot support the proposal, can you change concurrent to joint?
R: author modifies straw poll 1
C: What is meant by AP Coordintaed sounding? Does this cover all modes? Serial and joint?
R: CSI computation is on the non-AP side, so serial sounding is included
C: is it implied that joint TX coordination requires both serial and joint NDP?
R: to be determined
C: But your strawpoll says that you have both
R: straw poll modified
C: does joint TX require sequential sounding?
R: no comment
C: similar to previous, for joint TX, need joint sounding, not convinced that sequential sounding works
R: sequential sounding does work for joint TX
C: disagree, need joint sounding for joint TX, due to phase and amplitude differences
R: no comment
C: agree with previous two commenters, need joint NDP, also disagree with serial NDP in slide 3
R: SIFS between NDP1 and NDP2, so channel is similar
C: agre that for null forming and CP, this is enough
R: no comment
C: slide 3, master AP sends NDP, how do slave APs determine sequence, can AP2 hear AP3?
R: yes, NDPA indicates the sequence
C: What if slave AP2 fails to TX NDP? How will AP3 know the timing? When the sequence breaks?
R: details can be discussed
 **Straw poll 1:**
For the AP collaboration sounding do you agree to have the Joint NDP transmission?
Including the Serial Sounding based on slide 3 is TBD
How and when to apply the Serial sounding and Joint Sounding, TBD

**Discussion:**
C: do not understand the straw poll, why is serial included?
R: AP collaboration sounding, not just joint TX

**Result:**
Y 11
N 31
A 75

C: I Propose to rerun straw poll with two bullets removed
 **Straw poll 1b:**
For the multi-AP system, do you agree to support Joint sounding?

**Discussion:**
C: do not understand the straw poll, why is serial included?
R: AP collaboration sounding, not just joint TX

**Result:**
Y 66
N 0
A 46
3. 11-19-1554r1 - Data Sharing for Multi-AP Coordination – Sungjin Park (LG)

Deferred
4. 11-19-1573r0 - Channel Info. Feedback Method 4 Multi-AP Coord – Dandan Liang (Huawei)

Deferred
5. 11-19-1553r1 – Joint Sounding for Multi-AP Systems– Jianhan Liu (Mediatek)

**Straw poll 1:**
Do you agree that 11be shall provide a joint NDP sounding scheme as optional mode for multiple-AP systems?
Note: Sequential sounding scheme can also be used for multi-AP systems.

**Disucssion**
C: why do we need to specify sequential, but you are not going to define what it is?
R: Because even though it is not included, it cannot be prevented
C: can you instead say that individual AP sends NDP and polls feedback
R: we can define it, as just not sending NDP jointly, but do not want to define from the floor – in your mind, each AP sounding individually, is a sequential sounding mode, and if you agree with that, then you agree with the straw poll
C: I agree that that mode is present
R: no comment
C: are you saying that the difference between sequential and serial is that each AP sends NDPA and NDP
R No, not saying any of that, each AP is sending NDP not jointly, no comment on NDPA
C: if each NDP is independent, 10 ms later, there’s aging,
R: such sequential sounding can be used for other things, but the APs can decide to use it also for joint TX, this cannot be prevented
C: this mode imples that joint transmission is not going to be applied
R: what you do with the sequence is up to the AP, when to use any type of sounding is up to the AP
C: clarify joint sounding? How about when NDP packet is transmitted independently

**Result:**
Y 51
N 1
A 45

**Straw poll 2:**
Do you agree that joint NDP sounding scheme for multi-AP system with less or equal to total 8 antennas at AP has all antennas active on all LTF tones and uses 802.1ax P matrix across OFDM symbols?

(underlined text is addition due to discussion)

**Disucssion**
C: on all LTF tones means exlude 2x LTF for the sounding packet?
R: to make active on all LTF tones means the same as 11ax
C: for total exceeding 8, what is the solution?
R: there is no statement about that case, we do not have a scheme for more than 8
C: not clear to me, the number of antennas, 8 on the AP side?
R: in total, yes, I amend by adding ”at AP”

**Result:**
Y 40
N 2
A 46
6. 11-19-1594r2 - Coord. Beamforming/Null Steering Protocol in 11be – David L Perez (Nokia)

Deferred
7. 11-19-1582r0 – Coordinated AP Time/Frequency Sharing in a Transmit Opportunity in 11be – Lochan Verma (Qualcomm)

**Summary:** The author provides a proposal for sharing of resources within a TXOP among APs

**Discussion:**
**C:** Do all AP have to hear each other?
R: All Aps that participate need to hear each other
C: slide 7, TB PPDU is a requirement or an option?
R: not a requirement
C: allocation of TXOP can create inefficiency, no idea how much data is pending at targeted APs
R: TX indication and request is a phase that is used to determine the neighbor’s requirements, CTR frame can be poor or rich, level of detail of the request/response will determine
C: first sequence is query, second includes a long TXOP, it would be better with sequences separated in time
R: disagree
C: slide 10, sharing TDMA, each AP will start TX at given time – how do you know that the channel control will be maintained from one AP to the next?
R: first TX indication slide 6, lets the TXOP owner establish control with NAV
C: complications, at T2, could be a big gap between AP2 and AP3
R: good observation, have analysis for such cases, short answer, yes, because it is CSMA/CA, there are cases where time is allocated, but an AP failed to access the channel
C: Aps can hear each other, how does master ensure that all requested Aps can hear the request
R: no different than existing trigger rules – if you can hear and decode, then you respond, then master adds that AP to the target list
C: slide 10, do you require that AP2 and AP3 and AP4 hear each other?
R: no, master must hear all, but slaves only need to hear the master
C: ignoring details, see introduction, question on the benefits, this is coordination, have seen that latency improvement is achieved through multi-link or additional queue, how does this scheme offer latency improvement?
R: later presentation will show results, example, assume exposed transmitter, he never has a chance to transmit, but because of sharing, this exposed STA can be invited to participate, so worst case latency improves
C: but you need a specific procedure to determine which STA it is that needs this service
R: which applications would benefit, are AR, VR
C: how do you guarantee that the AP will share? AP will be greedy.
R: gurantee, we cannot, fair, we cannot guarantee
C: slide 7, is there random allocaiton? How to poll which Aps?
R: no predeinfed list, AP sends CTI and 25 hear, but only one succeeds in decoding and only for that AP, CCA says it can respond, so you receive only one CTR, so that is on the fly group formation, example, 25 hear the CTI, 25 are able to respond, 25 received CTRs, TXOP owner can determine the list
C: how can the TXOP owner separate the CTRs?
R: I know neighbor Aps, I can allocate some resources and use UL OFDMA to separate
C: that’s grouping
R: no
C: currently to do scheduling, you need to be associated with an AP
R: otherwise, it is random access
C: if an AP sends CTR, is it possible that there was a contention and one AP beat another AP?
R: all Aps doing EDCA, and one wins and then shares
C: to protect the TXOP, do slave Aps get to send CTS2SELF or something?
R: CTI is good enough
C: and then CTR as well
R: yes
C: legacy?
R: LSIG
C: slide 9, motivation, if Aps are on different primary channels, what is the benefit
R: AP1, AP2, using same 80, but different primary, you do not block your neighbor’s primary if you use this scheme
C: slide 10, master AP transmissions cause NAV to be set at slave Aps, so they cannot actually transmit
R: an exception would be created to allow the slave transmissions
C: why would the master AP share? How does the master make this determination?
R: if in a network that is ESS, managed, then the manager can set up sharing and force it

**Recess.**

**Session 2: Tuesday November 12 AM1 (Second half only)**

**Introduction**

1. At 09:01 the Chair, Alfred Asterjadhi (Qualcomm) calls the meeting to order.
2. The Chair reminds the group about the IPR policy and asks if there is anyone who is aware of potentially essential patents. There is no response.
3. The Chair reminds members about attendence.
4. The agenda for the session is found in 1722r7.

**Presentations**

1. 11-19-1459r1 – HARQ Applicable A-MPDU– Lei Huang (Panasonic)

C:slide 6, one codeword is part of two MPDUs – how do you address this issue?
R: if one CW crosses two MPDUs from different groups, still need feedback
C: good point that for some code words, do not want HARQ, but not certain if this should be tied to MAC ACK
R: acknowledged
2. 11-19-1901r1 – TITLEEEEEEEEE – Subir Das (Perspecta Labs) copresented with An Nguyen (Department of Homeland Security)

**Summary**: recap of main points because most of audience was in the room in the previous hour during the presentation of this document as part of the WNG committee session, covering main points of a request for consideration of National Security and Emergency Preparedness Services requirements for 802.11

**Straw Poll 1**:
Do you support adding NS/EP priority servies access features in IEEEE 802.11be?

As amended during discussion:
Do you support considering NS/EP priority servicess access uses in IEEE 802.11be?

C: if we vote for this in 11be, it will be 5 years to finish 11be, and another 2 years for deployments, have you considered approaching REVmd or other venues where the schedule might be faster?
R: because 11be is potentially modifying the MAC and the PHY, we think it is the best group, I recognize the time schedule involved, even in 5 G, we are in the early stages of defining the mechanism, so we already accept that it might be some number of years to see the realization of this proposal
C: what exactly is the meaning of the straw poll? Are we approving slide 13 content which shows some specific proposals?
R: as mentioned, this is the introduction of the use case, so we have not reviewed detailed solutions and expect to bring those in the future, so at this point, we only want to see if there is support for the high level concept
C: please show the straw poll, for clarification, NS/EP is that AP to STA broadcast only, or does it include STA to AP communication?
R: both directions
C: regarding 802.11 venue, many possible directions to take within 802.11, Tgbe is one option, a study group is another choice, the group can decide, if the desire emphasizes the shortest schedule, you should come to me, the WG chair and on Friday, consider forming a study group
R: we should have arrived earlier, but the timing of our own efforts suggested to us that this is the best path, we are open to suggestions
C: want to support the statement about other possible paths than bringing this work into Tgbe, this looks to be better suited to becoming its own study group
R: thank you
C: agree with previous commenter, Tgbe is a choice, but then I would ask for a change to ”considering NS/EP priority use case”
R: i can modify the straw poll

**Results:**
Y 32
N 15
A 81
3. 11-19-1553r1 – Consideration on HARQ Feedback – Taewon Song (LG)

**Summary**: PHY level HARQ unit is best choice compared to MAC unit, higher performance, need HARQ feedback frame, propose two candidate HARQ FB Frames and review overhead of each

C:slide 3, for clarification, HARQ operates on PHY unit, you assume that each group of CW is approx same length as an MPDU and you provide FB only at the resolution of the group of CW, not individual CW
R: the size of HARQ PHY unit and MPDU might be similar, then FB overhead is reduced
C: major gain of CW retransmission is to retransmit only failing CW, so need per-CW FB information
R: yes, but you can have high cost of FB if you have to provide FB for every CW
C: in simulation, you compare HARQ block and MPDU, but did not compare with AMPDU
R: no, we compared with AMPDU
C: so CW size is similar to MPDU Size
R: no, CW unit is same as MPDU, but not CW itself
C: did you do any comparison of the complexity of different schemes? E.g. memory, processing rate, etc
R: cannot hear because of echo, offline discussion
C: one example of FB presented, CW unit == 13 CW, could make other choices, when CW unit == MPDU, FB comparison is valid, CW unit can be synchronized, it should always be syncrhonized,
R: no response due to end of time for the session

**Recess at 10:02**

**Session 3: Thursday November 14 AM1**

**Introduction**

1. At 08:03 the Chair, Alfred Asterjadhi (Qualcomm) calls the meeting to order.
2. The Chair reviews the group about the IPR policy and asks if there is anyone who is aware of potentially essential patents. There is no response.
3. The Chair reviews the agenda for the session found in 1722r9.
Chair proposes to add an item for ”non-controversial motions”
No objection to the addition
No objection to the final version of the agenda

**Presentations**

1. **11-19-1578r1** – HARQ Applicable A-MPDU– Shimi Shilo (Huawei)

**Summary**: Presenting a solution for the problem of alignment of HARQ with existing 802.11 LDPC, transmit new codewords corresponding to the missing information of the failed MPDUs

C: how does this help with mapping problem between MPDUs and codewords
R: do not understand the question
C: slide 10, need to know which information bits from which codewords to combine, receiver does not know which codewords in a new transmission should be combined with which information stored at the receiver
R: assume that the receiver stores LLRs for all incorrectly decoded MPDUs, it knows where the errors are, the receiver knows which codewords correspond to the failed MPDUs, so it knows where to begin combining with the new bits
C: on the retry, the info bits are not the same, retry bit and CRC will be different, so they cannot be combined
R: we agree, on slide 9, we note that some minor MAC changes are necessary, including the retry bit
C: always assume that you are always going to do HARQ, you do not want to send the same information twice to avoid security issues, need to change things on the MAC
C: in the results, slide 13, what is the difference between codeword vs info only, so how does it work in low SINR case when there is no protection
R: codeword retransmission, we assume that an incorrectly decoded is retransmitted entirely, could have done a different number of bits, but we assumed retransmit of the same codeword, for info only, we assume that in the first transmission, you encode and maybe puncture, and for retransmisssion, only the info bits, you could add more parity and maybe puncture, might not be efficient, almost like chase combining
C: only sending info bits you have no channel protection
R: there is no difference between retransmitting one portion of a codeword vs another, it will not matter whether the retransmission contains only info or only parity, in any case, the repeat of some portion of the codeword helps the receiver
C: how did you compute throughput in that case
R: will address offline
C: performance vs complexity, we show that IR is bettr than chase, this should be worse than chase, because you are only combining LLRs with only information
R: these plots do not have sufficient information, chase would be best, entire CW twice, combining, is best
C: IR is better than chase, because you send a much shorter first TX, because of puncturing, 2nd TX unsent punctured bits, which is short, so this is less overhead
R: agree
C: this should be worse than other schemes
R: throughput, I agree is worse, making specific assumptions about IR pieces, definition of the exact scheme is important
C: your claim is that FB complexity is reduced, but that is the lowest complexity addition, CW FB, is a simple new frame, and that is all that you are saving I do not think it is helpful
R: disagree, CW FB removal is not the only gain, at TX side, you do not have to regenerate specific CW, in this scheme, you can generate new ones, nothing to save, nothing to regenerate, these are helpful changes, any HARQ requires memory at the receiver, we disagree on the amount of memory, I believe that there are more gains outside of the FB
C: slide 8, MPDU level, do you assume that they are concatenated without a delimiter?
R: yes, there is more detail missing, you do not know where MPDU2 starts, but that is not difficult to determine
C: slide 11, we did not see any gains for chase combining, your curves are very close, this does not seem to show gains, this is a strange scheme, not really HARQ with only info bit retransmission
R: on performance, similar to your results, with optimal MCS, gap is not large, for chase combining, gain is not large, but somewhat over no HARQ at all, this is optimal MCS, not practical, ours is more practical, different companies compute throughput differently, we assume all overheads, preamble duration, SIFS, etc is counted in our case, we note that our BA frame would be longer, we believe that other results do not account for all details of overhead
2. 11-19-1589r0 – What shoul be the HARQ unit and why? – Imran Latif (Quantenna)

**Summary**: We will show that MPDU is not the best choice for HARQ unit

C: slide 9, FB is transmitted by the MAC, since this is PHY FB, the PHY has to transmit it, how can the MAC TX this FB?
R: FB is not the topic, this can be done by a MAC, we previously presented MAC-dual FB, and another was PHY FB, that’s a different topic
C: you are discounting MPDU retransmission too easily, typically, there will be delimiters, MAC has to change values in the MAC header, but to keep these things fixed in order to allow MPDU retx is a worthwhile effort, depending on the PER point, for a practical operating point, the CW error rate, in my next contribution, will be about 50-60%, so the advantage is not large, because of the number of lost CWs, the changes that we propose for MPDU Based re-tx are minor
R: not minor, many changes between MAC and PHY required, for simulations, would prefer to show the efficiency, not just throughput, some other parameter to show the difference and how we gain more when using a combination of the retransmission of CW with new CW
C: need more detailed justificaiton
R: I agree
C: we should back up and have more offline discusssion – I believe your straw poll is too early after seeing these two presentations, the assumptions on errors in CW suit your approach
R: this is only an example, efficiency analysis is needed, this is just a snapshot
C: can we have better statitics on where CW errors occur?
R: next ppt will follow up with more meat on the plate regarding various possible scenarios

**Straw Poll 1**
Do you agree that HARQ unit for 802.11be shall be based on codewords?

Y 32
N 11
A 45
Need more time 41

**Discussion**
C: Would like to add another vote option for ”need more time”
C: we have not agreed whether we even have HARQ
C: similar point, nice ppt, but we have not agreed to have HARQ
Chair: limit your comments to only procedural points
C: do you need to change the CRC?
Chair: that is not procedural

**Non-controversial motions**

1. **Motion 14

Move to add the following text into IEEE 802.11be SFD:**
**11be shall provide a joint NDP sounding scheme as optional mode for multiple-AP systems.**
Sequential sounding scheme that each AP transmits NDP independently and sequentially without overlapped sounding period of each AP can also be used in multi-AP systems.
 **Moved: Jianhan Liu
Second: Junghoon Suh

no discussion
approved by unanimous consent**
2. **Motion 15

Move to add the following text into IEEE 802.11be SFD:
Joint NDP sounding scheme for multi-AP system with less or equal to total 8 antennas at AP has all antennas active on all LTF tones and uses 802.11ax P matrix across OFDM symbols

Moved: Jianhan Liu
Second: Wook Bong Lee

no discussion
approved by unanimous consent**
3. **Motion 16

Move to add the following text to the TGbe SFD
11be supports 240 MHz and 160+80 MHz transmission
Whether 240/160+80 MHz is formed by 80MHz channel puncturing of 320/160+160 MHz is TBD

Moved: Jianhan Liu
Second: Wook Bong Lee

no discussion
approved by unanimous consent**
4. **Motion 17

Move to add the following text to the TGbe SFD
240/160+80 MHz bandwidth is constructed from three 80MHz channels which include primary 80MHz

Moved: Eunsung Park
Second: Wook Bong Lee

no discussion
approved by unanimous consent**
5. **Motion 18

Move to add the following to the TGbe SFD
A 160MHz tone plan is duplicated for the Non-OFDMA tone plan of 320/160+160 MHz PPDU
The 160 MHz tone plan is TBD

Moved: Eunsung Park
Second: Wook Bong Lee

no discussion
approved by unanimous consent**
6. **Motion 19

Move to add the following to the TGbe SFD
12 and 11 null tones are placed at the left and right edges in each 160MHz segment for the Non-OFDMA tone plan of 320/160+160 MHz PPDU

Moved: Eunsung Park
Second: Wook Bong Lee

no discussion
approved by unanimous consent**
7. **Motion 20

Move to add the followings to the 11be SFD:
Shall allow the following asynchronous multi-link channel access
Each of STAs belonging to a multi-link device performs a channel access over their links independently in order to transmit frames
Downlink and uplink frames can be transmitted simultaneously over the multiple links

Moved: Jeongki Kim
Second: Eunsung Park

no discussion
approved by unanimous consent**
8. **Motion 21

Move to add the followings to the 11be SFD:
Support a mechanism that
An AP affiliated with an AP multi-link device can indicate the capabilities and operational parameters for one or more STAs of the multi-link device
A non-AP STA affiliated with a non-AP multi-link device can indicate the capabilities for one or more non-AP STAs of the non-AP multi-link device
Specific information of capabilities and operational parameters of multi-link device is TBD

Moved: Jeongki Kim
Second: Eunsung Park

no discussion
approved by unanimous consent**
9. **Motion 22

Move to add the followings to the 11be SFD:
The 802.11be amendment shall define mechanism(s) for an AP to assist a STA that communicates with another STA.

Moved: Patrice NEZOU
Second: Pascal VIGER

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
10. **Motion 23

Move to add the followings to the 11be SFD:
Multi-link device (MLD): A device that has more than one affiliated STA and has one MAC SAP to LLC, which includes one MAC data service.
NOTE–The device can be logical
NOTE–It is TBD for a MLD to have only one STA.
NOTE–Whether the WM MAC address of each STA affiliated with the MLD is the same or different is TBD

Moved: Po-Kai Huang
Second: Laurent Cariou

no discussion
approved by unanimous consent**
11. **Motion 24

Move to add the followings to the 11be SFD:
AP multi-link device (AP MLD): A multi-link device, where each STA affiliated with the multi-link device is an AP.
Non-AP multi-link device (non-AP MLD): A multi-link device, where each STA affiliated with the multi-link device is a non-AP STA.**
 **Moved: Po-Kai Huang
Second: Jeongki Kim

no discussion
approved by unanimous consent**
12. **Motion 25

Move to add the followings to the 11be SFD:
Define a multi-link setup signaling exchange executed over one link initiated by a non-AP MLD with a AP MLD as follows:
Capability for one or more links can be exchanged during the multi-link setup
The AP MLD serves as the interface to the distribution system (DS) for the non-AP MLD after successful multi-link setup
NOTE–The link identification is TBD
NOTE–Details for non-infrastructure mode of operation TBD

Moved: Po-Kai Huang
Second: Jeongki Kim

no discussion
approved by unanimous consent**
13. **Motion 26

Move to add the followings to the 11be SFD:

A multi-link device can indicate capability to support exchanging frames simultaneously on a set of affiliated STAs to another multi-link device

Moved: Po-Kai Huang
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
14. **Motion 27

Move to add the following to the spec-framework document

There shall be a 2 OFDM symbol long, jointly encoded Universal-SIG(U-SIG) field in the EHT preamble immediately after the RL-SIG

The U-SIG will contain version independent fields. The intent of the version independent content is to achieve better co-existence among future 802.11 generations.
In addition, the U-SIG can have some version dependent fields

The size of the U-SIG for the case of an Extended Range Mode (if such a mode were to be adopted) is TBD

The U-SIG will be sent using 52 data tones and 4 pilot tones per-20MHz

Moved: Sameer Vermani
Second: Xiaogang Chen

no discussion
approved by unanimous consent**
15. **Motion 28

Move to add the following to the spec-framework document
PHY version identifier field shall be one of the version independent fields in the U-SIG
Purpose is to simplify auto-detection for future 802.11 generations, i.e, value of this field is used to identify the exact PHY version starting with 802.11be
Exact location of this field is TBD

Moved: Dongguk Lim
Second: Eunsung Kim

no discussion
approved by unanimous consent**
16. **Motion 29

Motion number is reserved**
17. **Motion 30

Move to add the following text to the TGbe SFD
The 802.11be amendment shall support a preamble puncture mechanism for an EHT PPDU transmitted to multiple STAs

Moved: Oded Redlich
Second: Ross Jian Yu

no discussion
approved by unanimous consent**
18. **Motion 31

Move to add the following text to the TGbe SFD
The 802.11be amendment shall support a preamble puncture mechanism for an EHT PPDU transmitted to a single STA

Moved: Oded Redlich
Second: Ross Jian Yu

no discussion
approved by unanimous consent**
19. **Motion 32

Move to add the followings to the 11be SFD:
Define mechanism(s) for multi-link operation that enables the following:
Indication of capabilities and operating parameters for multiple links of an AP multi-link device (AP MLD)
Negotiation of capabilities and operating parameters for multiple links during a single setup signaling exchange.

Moved: Abhishek Patil
Second: Jeongki Kim

no discussion
approved by unanimous consent**
20. **Motion 33

Move to add the following to the 11be spec framework document
11be reuses 11ax tone plan for 20/40/80/160/80+80MHz PPDU
For 320MHz and 160+160MHz PPDU, 11be uses duplicated HE160 for OFDMA tone plan

Moved: Bin Tian
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
21. **Motion 34

Move to add the following to the 11be spec framework document
The 11be 320/160+160 MHz non-OFDMA tone plan uses duplicated tone plan of HE160
Note: puncturing design TBD

Moved: Bin Tian
Second: Sameer Vermani

Discussion
C: not aligned with Tgbe goals, prefer a new design for 320 MHz tone plan
R: previous motion agreed to a 160 MHz tone plan, with your proposal, each 160 MHz segment would have a different tone plan than the individual 160 MHz segment, and that would create additional complexity
C: motion refers to a duplicated tone plan, motion previous was deferred, so we should defer this motion as well
R: motion for duplicated 160 has already passed, the individual 160 should be the same as the two pieces of the 320, 320 as two 160 already passed, we should harmonize the two
C: motion we passed was OFDMA tone plan
R: this is different
C: this refers to non-OFDMA, so I am ok with it

Y: 51
N: 5
A: 43

Motion PASSES**
22. **Motion 35

Move to add the following to the 11be spec framework document
11be 240/160+80 transmission consists of 3x80MHz segments while the tone plan of each 80MHz segment is the same as HE80 in 11ax

Moved: Bin Tian
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
23. **Motion 36

Move to add the following text into IEEE 802.11be SFD:
A single block ack agreement is negotiated between two Multi-link devices (MLDs) for a TID that may be transmitted over one or more links.
Note: The format of the setup frames is TBD.

Moved: Rojan Chitrakar
Second: Jeongki Kim

no discussion
approved by unanimous consent**
24. **Motion 37

Move to add the following text into IEEE 802.11be SFD:
Sequence numbers are assigned from a common sequence number space shared across multiple links of a Multi-link device (MLD), for a TID that may be transmitted to a peer Multi-link device over one or more links.

Moved: Rojan Chitrakar
Second: Abhishek Patil

no discussion
approved by unanimous consent**
25. **Motion 38

Move to add the followings to the 11be SFD:
A MLD that supports multiple links can announce whether it can support transmission on one link concurrent with reception on the other link for each pair of links.
Note - The 2 links are on different channels
Note - Whether to define a capability of announcing the support transmission on one link concurrent with transmission on the other link is TBD.

Moved: Liwen Chu
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
26. **Motion 39

Move to add the following text to the 11be SFD:
The links between AP multi-link device (MLD) and non-AP multi-link device may be disabled or enabled

Moved: Liwen Chu
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
27. **Motion 40

Move to add the followings to the 11be SFD:
A MLD has a MAC address that identifies the MLD management entity
For example, the MAC address can be used in multi-link setup between a non-AP MLD and an AP MLD

Moved: Po-Kai Huang
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
28. **Motion 41

Move to add the following to the TGbe SFD
Phase rotation is applied to the legacy preamble part of EHT PPDU
Coefficients applied to each 20MHz channel are TBD
Application to the other fields is TBD

Moved: Eunsung Park
Second:

Chair sees objection to the motion
Motion deferred to PM1 sesssion**
29. **Motion 42

Move to add the following to the spec-framework document:
The U-SIG shall contain the following version independent fields
PHY version identifier: 3 bits
UL/DL flag: 1 bit

Moved: Sameer Vermani
Second: Bin Tian

No Discussion
approved by unanimous consent**
30. **Motion 43

Move to add the following to the spec-framework document:
There shall be a variable MCS and variable length EHT-SIG, immediately after the U-SIG, in an EHT PPDU sent to multiple users

Moved: Sameer Vermani
Second: Steve Shellhammer

no discussion
approved by unanimous consent**
31. **Motion 44

Move to add the following to the spec-framework document:
The EHT-SIG (immediately after the U-SIG) in an EHT PPDU sent to multiple users shall have a common field and user-specific field(s).
Special case compressed modes (e.g., full BW MU-MIMO) are TBD

Moved: Sameer Vermani
Second: Bin Tian

no discussion
approved by unanimous consent**

**Recess at 10:01**

**Session 4: Thursday November 14 PM1**

**Introduction**

1. At 13:30 the Chair, Alfred Asterjadhi (Qualcomm) calls the meeting to order.
2. The Chair reviews the group about the IPR policy and asks if there is anyone who is aware of potentially essential patents. There is no response.
3. The Chair reviews the agenda for the session found in 1722r10.
Chair proposes to move presentations item after motions item
No objection to the proposed modification
No objection to the final version of the agenda

**Motions**

1. **Motion 22**
 **Move to add the followings to the 11be SFD:
The 802.11be amendment shall define mechanism(s) for an AP to assist a STA that communicates with another STA.

Moved: Patrice NEZOU
Second: Pascal VIGER

Discussion**C: Can another STA be an AP?
R: yes, but focused only on STA, not AP STA
C: but it can be either now, right?
R: yes
C: this motion does not add anything, we already have DLS,
R: for AP to manage the STA to STA communication, the proposal is that DLS is only validated by the AP as STA to STA is considered as interference, so the proposal is to add a mechanism to avoid this **Y: 46
N: 1
A: 44

Motion PASSES**
2. **Motion 26**
 **Move to add the followings to the 11be SFD:
A multi-link device can indicate capability to support exchanging frames simultaneously on a set of affiliated STAs to another multi-link device**
**Moved: Po-Kai Huang
Second: Laurent Cariou

Discussion**C: Request a deferral for more discussion
R: we agreed that a STA can have say, 4 links, but unreasonable to operate all 4 links, do not want to have to require a STA to operate 4 links simultaneously, commenter seems to want to have a minimum number of links supported, do not feel that this is appropriate at this time, this is detail that does not need to be resolved yet
C: do you agree to add a number say more than 2? Definition of multi link to have a number, we’d like it to be 2 or more links.
R: do you want to amend?
C: exchanging simultaneous is not clear, can we add a note, simultaneously receive or simultaneously transmit and receive?
R: those details can be added in a later motion, exchange frames simultaneously is enough, we would suggest a follow up motion
C: this is capability, we think that if we do it in two motions, then it would make it a two-step process and we prefer it to be a one step process
R: we think it can be a follow up motion

Chair asks if there would be a motion to amend
No response

C: discussion should be on the motion only, if there is discussion to change it, that can occur offline
C: Can the chair ask if there is other opinion?
Chair asks if there is other opinion
No response from the floor
Chair asks one more time if the mover wants to amend
Mover says he does not want to amend
No further discussion
 **Y: 66
N: 9
A: 22

Motion PASSES**
3. **Motion 33**
 **Move to add the following to the 11be spec framework document
11be reuses 11ax tone plan for 20/40/80/160/80+80MHz PPDU
For 320MHz and 160+160MHz PPDU, 11be uses duplicated HE160 for OFDMA tone plan**

**Moved: Bin Tian
Second: Tianyu Wu

Discussion**C: the reference to 20/40/80 etc 11ac constrains the solution space
1 some are prohibitive for 20 MHz STAs, too many of these make scheduling inefficient
2 if a 20 MHz STA transmits UL, the DC makes it harder to support high MCS, need to tighten DC on 20 MHz STAs
3 option for 20 MHz STAs to support TX and RX in any BW, want this mandatory
4
5 20 MHz STAs congregate on primary 20, SST allows STAs to use different channels, but it is optional, need it to be mandatory
This tone plan makes it harder to address these issues,
R: philosophical difference, commenter is being revolutionary, agreed that efficiency is sacrificed in the face of 20 MHz only devices, some of this is valid, but some is not related to tone plan, prefer an offline discusion to create a solution for 20 MHz only STA, in future, can support on same 80 MHz, 11ax has one plan, 11be has another tone plan, complicates everything where different solutions can be found to solve the highlighted problems
C: the important point is that we are rushing to a PHY soluiton where system level issues have not been considered, too early to prohibit a change to the tone plan, prefer to table the motion or adjust the motion so that it does not call out the HE160, but only the 160 tone plan
R: do not agree that the motion is rushed, the first presentation was in July 2019, we got feedback and in September 2019, the straw poll passed in september without opposition, commenter wanted to table a motion in September and it was, now we have the adhoc session to discuss the tone plan again, so this is not rushed
C: goal is system solution, we prepared our response and it has been discussed
 **Y: 78
N: 3
A: 29

Motion PASSES**
4. **Motion 35**
 **Move to add the following to the 11be spec framework document
11be 240/160+80 transmission consists of 3x80MHz segments while the tone plan of each 80MHz segment is the same as HE80 in 11ax**

**Moved: Bin Tian
Second: Tianyu Wu

Discussion**No discussion
 **Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
5. **Motion 38**
 **Move to add the followings to the 11be SFD:
A MLD that supports multiple links can announce whether it can support transmission on one link concurrent with reception on the other link for each pair of links.
Note - The 2 links are on different channels
Note - Whether to define a capability of announcing the support transmission on one link concurrent with transmission on the other link is TBD**
**Moved: Liwen Chu
Second: Tomoko Adachi

Discussion**No discussion
 **Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
6. **Motion 39**
 **Move to add the following text to the 11be SFD:
The links between AP multi-link device (MLD) and non-AP multi-link device may be disabled or enabled

Motion modified to

Move to add the following text to the 11be SFD:
An AP/non-AP multi-link device (MLD) can disable or enable one or more its links
NOTE – An AP/non-AP multi-link device (MLD) can’t disable all its links.

Moved: Liwen Chu
Second: Jeongki Kim

C: Motion was modified through email, not reflected in the version on the screen as a result of discussion between the mover and a member

Chair modifies motion

Discussion**C: the link concept is unclear, each link has a STA and an AP, it would be more clear if we could disable one or the other STA or AP, not link
R: this is an MLD, we understand what a link is, so we can refer to links
C: it would be more clear if it says an AP or STA can negotiate to enable or disable a link
R: seems clear to me
C: link is better terminology, assumes that there is a pair, disable AP, then suggests that the non-AP STA can disable the AP, we know what the link is
R: multi link STA is tied to a device, not a device pair, should be channel, not link, regarding prefer this new text, clear that an AP or non-AP STA enable or disables a link, it is tied to the device, worry that if we define the concept of link as a pairwise concept, then it will cause more complications, example, the AP can terminate the link for one STA on the same channel, but the AP can still operate on a channel, but disable a STA on that channel, has a lot of implications, in general, this motion, ok with a particular device can enable or disable a particular channel associated with the link, if the AP disables a link, then all STAs operating on that link will not be able to communicate on that link, why can a non-AP STA not disable all links? For the non-AP STA point of view, for PS the STA should be able to disable all links
R: multi link device is agreed after long discussion, but this is not a final definition, we prefer link vs channel
C: there is confusion of enable and disable, we have power states per STA, that is under STA control, you can understand is that functionality, you could also that enable disable is a long term management state, this should be a negotiation, these terms are undefined and that makes itunclear
R: enable disable is not power save, decoupled, we have a contribution, not time to present
C: do you see that as a negotiation?
R: TBD
C: then you need to change the language
C: do not feel that negotiation is clear, prefer to defer until everyone agrees on meaning of setup and link enabled
R: I will defer the motion

Chair suggests that motion be tabled
Chair asks if there is objection to tabling the motion
Chair observes no objection to tabling

**Motion TABLED**
7. **Motion 40**
 **Move to add the followings to the 11be SFD:
A MLD has a MAC address that identifies the MLD management entity
For example, the MAC address can be used in multi-link setup between a non-AP MLD and an AP MLD**
**Moved: Po-Kai Huang
Second: Zhou Lan

Discussion**C: want to understand the use of the address, for MAC level management function, there are fifty of them, we only need a single MAC address to identify the device, if the intention is only for setup, ok, but should this address be used for all other management purposes? Power Save, for example. MLD management entity is too broad application for the address
R: each STA has a MAC address, this is not the WM address, one address to identify the MLD, this STA needs to be managed by an entity, this is not for PS, we don’t say that
C: i do not know what an MLD managmenet entity is, why do you need an address? MAC SAP address, MLD address, MLD Mgmt entity, need a clear indcation of what the entity is
R: we tried MAC SAP address, there is no definition of a MAC SAP address, everyone says that we should have one address to identify the MLD, this is more correct than MAC SAP address according to one particular member, need to identify what the use of the address is, that member also suggested the example use of the address
C: major purpose is for setup, is it easier to say that there is a MAC adddress to use for this operation, can we limit it to this
C: a contribution of the MLD as described here, but no time to present yet, contribution proposes a numerical ID value that is internal and is not a MAC address, no need to purchase an OUI, limited space, we propose to avoid that, could you agree to a modification to the motion to use a numerical address, you do not assign a unique address to this logical entity, you can use one of the physical addreses, can use a numerical ID to differentiate one group from another
R:no other idea would work because this address issomething that ethernet attached would have to use to identify this device, if there are multiple STA addresses, then the outside world cannot use all of those individual STAs, the STA that corresponds to an address might be asleep
C: disagree, between L3 and L2, the ARP table translates L3 address to L2 address, virtual interface, can reuse a link MAC address, this is common practice
C: one MAC address for link setup is straightforward, there are multiple uses, ethernet, entity is unclear, recommend defer and clarify each of these topics, these are building blocks, we must have a solid foundation
R: entity is a general term, definition in 802.11 says that everything is an entity,
R: we need to build the system step by step
C: no such MAC address for SAP, also none for any mgmt entity
R: MAC SAP is an interface, and has no address, the address is for the entity

 **Y: 62
N: 9
A: 36

Motion PASSES**
8. **Motion 41**
 **Move to add the following to the TGbe SFD
Phase rotation is applied to the legacy preamble part of EHT PPDU
Coefficients applied to each 20MHz channel are TBD
Application to the other fields is TBD**
**Moved: Eunsung Park
Second: Wookbong Lee

Discussion**No discussion

**Y: 69
N: 5
A: 22

Motion PASSES**
9. **Motion 45**
 **Move to add the following to the spec-framework document:
The U-SIG is modulated in the same way as the HE-SIG-A field of 11ax.
Extended range SU mode is TBD**

**Moved: Sameer Vermani
Second: Bin Tian

Discussion**No discussion

**Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
10. **Motion 46**
 **Move to add the following to the 11be SFD:
Shall allow a multi-link device that has constraints to simultaneously transmit and receive on a pair of links to operate over this pair of links?
• Signaling of this constraints is TBD**
**Moved: Sharan Naribole
Second: Jeongki Kim

Discussion**No discussion

**Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
11. **Motion 47**
 **Move to add the following text to 11be SFD:
The U-SIG includes Version-independent bits followed by Version-dependent bits.
Version-independent bits have static location and bit definition across different generations/PHY versions.
Version-dependent bits may have variable bit definition in each PHY version.**
**Moved: Rui Cao
Second: Sameer Vermani

Discussion**C: if this motion passes, then 11be STA will not be backwards compatible with 11ax STA, some people say there are no other options, other say that there are other options, too early to make this motion, need to see other possibilities that allow backwards compatibility, I ask that we table this motion
R: The claim is not correct, we have the legacy preamble of 802.11a, so there is backwards compability, new fields cannot be used by legacy devices, but this is not a requirement
C: would be nice to preserve the features that we will lose, we do not have a good solution
R: yes we do not have a solution
C: 11ax already has some issues

**Y: 66
N: 6
A: 27

Motion PASSES**
12. **Motion 48**
 **Move to add the following text to 11be SFD?
The U-SIG field includes the following bits in Version-independent bits portion:
BSS color, number of bits TBD
TXOP duration, number of bits TBD.**
**Moved: Rui Cao
Second: Xiaogang Chen

Discussion**C: was in MAC adhoc, so did not know about PHY adhoc discussion, these look like MAC fields
R: what problems do you see?
C: BSS Color and TXOP are set in MAC header
R: they are in the PHY header for coex from 11ax

**Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
13. **Motion 49**
 **Move to add the following to the 11be SFD:
EHT PPDU shall have a RL-SIG field, which is a repeat of the L-SIG field, immediately following the L-SIG field.**
**Moved: Xiaogang Chen
Second: Sameer Vermani

Discussion**No discussion

**Chair asks if there is any objection to the motion
Chair sees no objection

Motion PASSES with unanimous consent**
14. **Motion 29**
 **Move to add the following to the spec-framework document
The LENGTH field value in L-SIG set to mod3 = 0

Moved: Dongguk Lim
Second: Rui Cao

Discussion**C: backwards compatibility to 11ax, during preamble discussion, made a big deal out of forward compatibility, six or seven years in the future, should spend time to make things backwards compatibile to support TXOP and BSS color, ask for a deferral, we discussed this issue in PHY adhoc, procedurally straw polls failed, suggesting more discussion is needed
R: differentiates 11be and 11ax, straw polls failed, but after the session there was further discussion where harmonization was achieved
C: have heard backwards compatibility, but the problem is forward compatibility
C: do you agree that an 11ax would immediately drop the frame if the length did not conform? In addition to length, we can communicate BSS Color and TXOP, 11ax sees the value 0 instead of 1 or 2, it will drop the frame
R:structure is different from 11ax, so no matter what, 11ax will not understand, everything past the LSIG is different
C: the level of discussion here suggests that the PHY adhoc did not achieve consensus, I move to table

**Motion 29a:
Move to table motion 29

Moved: Joseph Levy
Second: Harry Bims**
Y: 21
N: 42
A: 22

**Motion 29a FAILS**

**VOTING for motion 29:**

**Y: 68
N: 12
A: 19

Motion 29 PASSES**
15. **Motion 47**
 **Move to add the following text to 11be SFD:
The U-SIG includes Version-independent bits followed by Version-dependent bits.
Version-independent bits have static location and bit definition across different generations/PHY versions.
Version-dependent bits may have variable bit definition in each PHY version.**
**Moved: Rui Cao
Second: Sameer Vermani

Discussion**C: if this motion passes, then 11be STA will not be backwards compatible with 11ax STA, some people say there are no other options, other say that there are other options, too early to make this motion, need to see other possibilities that allow backwards compatibility, I ask that we table this motion
R: The claim is not correct, we have the legacy preamble of 802.11a, so there is backwards compability, new fields cannot be used by legacy devices, but this is not a requirement
C: would be nice to preserve the features that we will lose, we do not have a good solution
R: yes we do not have a solution
C: 11ax already has some issues

**Y: 66
N: 6
A: 27

Motion PASSES**
16. **Motion 39a

Move to bring from the table motion 39**
 **Moved: Liwen Chu
Second: Srinivas Kandala

Y: 57
N: 3
A: 19

Last wording of motion 39:

Move to add the following text to the 11be SFD:
An AP/non-AP multi-link device (MLD) can disable or enable one or more its links
NOTE – An AP/non-AP multi-link device (MLD) can’t disable all its links.

Moved: Liwen Chu
Second: Jeongki Kim

Discussion
Mover moves to ~~amend~~ substitute the motion to read as follows:

An AP/non-AP multi-link device (MLD) can negotiate to disable one or more of its links. Exact signaling TBD.

Moved: Liwen Chu
Second: Manish Kumar**
C: if a non-AP STA wants to disable a link, this is different from PS Doze
R: yes
C: what then, does disable mean? Filter to reject packets?
R: no transmission of frames on that link
C: would you reject a packet on that link?
R: just like 80+80, cannot use secondaryC: what is meant by negotiation? If a STA has no link enabled, how can it negotiate?
R: Signaling is TBD
R: do not like negotiate, prefer notify, from AP side, cannot reject the request
C: this si part of defining signaling
R: can also include notify

C: mover cannot comment after every comment, needs to pass back to chair for control
C: is this a complete replacement, not motion to amend, but motion to substitute

**Chair asks if there is objection to table the motion to substitute motion 39

C: if you table the motion to substitute, then you are back to motion 39

Chair calls orders of the day**

**Teleconference plan**

1. Proposed schedule for teleconferences presented

**November 21 (Thursday), 10:00-13:00 ET
December 5 (Thursday), 19:00-22:00 ET
December 12 (Thursday), 10:00-13:00 ET
December 19 (Thursday), 19:00-22:00 ET
January 9 (Thursday), 19:00-22:00 ET**
C: can we have parallel PHY and MAC calls?
C: Could use multiple conference systems
C: can 10:00 EST be changed to 10:30 to provide a better time for Japan?
C: 3 hours is too long, propose 2.5 hours
C: we have a lot of submissions
C: Change 10:30 to 09:30, previous commenter agrees that moving to 10:30 was the wrong direction
C: European participants do not like the move to 09:30
C: we will have parallel calls

**Other business**

1. Chair asks if there is any other business

Chair sees no request for other business

**Adjournment**

1. Chair asks if there is any objection to adjournment

No objection noted

**Adjourned at 15:33**