**IEEE P802.11  
Wireless LANs**

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| **TGbe 2020 May to July teleconference minutes** | | | | |
| **Date:** 2020-05-15 | | | | |
| **Author(s):** | | | | |
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**Abstract**

This document contains the minutes for May to July 2020 TGbe teleconferences.

Revisions:

* Rev 0: Added references to telephone conferences held 4th-11th of May. Added minutes for telephone conference 14th of May.
* Rev 1: Some minor updates to telco 14th of May. Added references to conferences held 18th – 27th of May. Added minutes for telephone conference 28th of May.
* Rev 2: Updated a mistake in the straw poll from 28th of May. Added references to conferences held 1st – 10th of June. Added minutes from Thursday 11th of June.
* Rev 3: Updated the motion counts and added Appendix 1.
* Rev 4: Reference added for telephone conferences held 12th to 22nd of June. Minutes added for telephone conference held 29th of June. Thanks to Laurent Cariou (Intel) for taking the minutes the 29th of June.
* Rev5: References added for telephone conferences held 2nd to 8th of June. Minutes added for 9th of June. Thanks to Matthew Fischer (Broadcom) and Laurent Cariou for taking the minutes on 9th of June.

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# Monday 4 May 2020, 10:00-13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0511-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020.docx>

# Thursday 7 May 2020, 19:00-22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0511-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0587-06-00be-minutes-april-phy-cc.docx>

# Friday 8 May 2020, 10:00-13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0511-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020.docx>

# Monday 11 May 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0748-00-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-march-and-may-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0708-02-00be-minutes-for-tgbe-phy-ad-hoc-cc-march-to-may-2020.docx>

# Thursday 14 May 2020, 10:00 – 13:00 ET

**Introduction**

1. The Chair, Alfred Asterjadhi (Qualcomm) calls the meeting to order at 10:02AM. The agenda can be found [11-20/0735r4](https://mentor.ieee.org/802.11/dcn/20/11-20-0735-04-00be-may-july-tgbe-teleconference-agendas.docx).
2. IEEE 802 and 802.11 IPR policy and procedure. 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 please speak up now. Nobody speaks up.
3. Attendance reminder.
   1. Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
   2. Please record your attendance during the conference call by using the IMAT system:
      1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
   3. If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Dennis Sundman ([dennis.sundman@ericsson.com](mailto:dennis.sundman@ericsson.com)) and Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
   4. Please ensure that the following information is listed correctly when joining the call:
      1. "[voter status] First Name Last Name (Affiliation)"
   5. List of attendees:
   * Aboulmagd, Osama Huawei Technologies Co., Ltd
   * Adhikari, Shubhodeep Broadcom Corporation
   * Aio, Kosuke Sony Corporation
   * Ansley, Carol CommScope
   * Asterjadhi, Alfred Qualcomm Incorporated
   * Au, Kwok Shum Huawei Technologies Co., Ltd
   * Awater, Geert Qualcomm Incorporated
   * baron, stephane Canon Research Centre France
   * Bredewoud, Albert Broadcom Corporation
   * Cao, Rui NXP Semiconductors
   * Carney, William Sony Corporation
   * Cavalcanti, Dave Intel Corporation
   * CHAN, YEE Facebook
   * Chen, Cheng Intel Corporation
   * Chen, Xiaogang Intel
   * Cheng, Paul MediaTek
   * CHERIAN, GEORGE Qualcomm Incorporated
   * Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.
   * Choi, Jinsoo LG ELECTRONICS
   * CHUN, JINYOUNG LG ELECTRONICS
   * Ciochina, Dana Sony Corporation
   * Coffey, John Realtek Semiconductor Corp.
   * Das, Subir Perspecta Labs Inc.
   * de Vegt, Rolf Qualcomm Incorporated
   * Duan, Ruchen SAMSUNG
   * ElSherif, Ahmed Qualcomm Incorporated
   * Erceg, Vinko Broadcom Corporation
   * Fang, Yonggang ZTE TX Inc
   * Fischer, Matthew Broadcom Corporation
   * Galati Giordano, Lorenzo Nokia
   * Gan, Ming Huawei Technologies Co., Ltd
   * Guo, Qiang InfomTechnologies
   * Guo, Yuchen Huawei Technologies Co., Ltd
   * Han, Jonghun SAMSUNG
   * Han, Zhiqiang ZTE Corporation
   * Handte, Thomas Sony Corporation
   * Hervieu, Lili Cable Television Laboratories Inc. (CableLabs)
   * Ho, Duncan Qualcomm Incorporated
   * Hong, Hanseul Yonsei University
   * Hsieh, Hung-Tao MediaTek Inc.
   * Hsu, Chien-Fang MediaTek Inc.
   * Hu, Chunyu Facebook
   * Hu, Glenn Tencent
   * Hu, Mengshi HUAWEI
   * Huang, Guogang Huawei
   * Huang, Lei Panasonic Asia Pacific Pte Ltd.
   * Jang, Insun LG ELECTRONICS
   * Ji, Chenhe Huawei Technologies Co. Ltd
   * Jiang, Jinjing Apple, Inc.
   * Kakani, Naveen Qualcomm Incorporated
   * Kandala, Srinivas SAMSUNG
   * Kasher, Assaf Qualcomm Incorporated
   * Kedem, Oren Huawei Technologies Co. Ltd
   * Kim, Myeong-Jin SAMSUNG
   * Kim, Sang Gook LG ELECTRONICS
   * Kim, Sanghyun WILUS Inc
   * Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)
   * Kneckt, Jarkko Apple, Inc.
   * Ko, Geonjung WILUS Inc.
   * Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)
   * Kumar, Manish Marvell Semiconductor, Inc.
   * Kwon, Young Hoon NXP Semiconductors
   * Lalam, Massinissa SAGEMCOM BROADBAND SAS
   * Lee, Wookbong SAMSUNG
   * Levitsky, Ilya IITP RAS
   * Li, Yiqing Huawei Technologies Co. Ltd
   * Li, Yunbo Huawei Technologies Co., Ltd
   * Lim, Dong Guk LG ELECTRONICS
   * LIU, CHENCHEN Huawei Technologies Co., Ltd
   * Liu, Yong Apple, Inc.
   * Lopez, Miguel Ericsson AB
   * Lou, Hanqing InterDigital, Inc.
   * Lu, Liuming ZTE Corporation
   * Lv, kaiying MediaTek Inc.
   * Lv, Lily Huawei Technologies Co. Ltd
   * Max, Sebastian Ericsson AB
   * Memisoglu, Ebubekir IMU
   * Mirfakhraei, Khashayar Cisco Systems, Inc.
   * Monajemi, Pooya Cisco Systems, Inc.
   * Montreuil, Leo Broadcom Corporation
   * NANDAGOPALAN, SAI SHANKAR Cypress Semiconductor Corporation
   * Nezou, Patrice Canon Research Centre France
   * noh, yujin Newracom Inc.
   * Ouchi, Masatomo Canon
   * Pare, Thomas MediaTek Inc.
   * Park, Eunsung LG ELECTRONICS
   * Park, Minyoung Intel Corporation
   * Park, Sung-jin LG ELECTRONICS
   * Patil, Abhishek Qualcomm Incorporated
   * Patwardhan, Gaurav Hewlett Packard Enterprise
   * PESIN, ANTHONY InterDigital, Inc.
   * Pettersson, Charlie Ericsson AB
   * porat, ron Broadcom Corporation
   * Puducheri, Srinath Broadcom Corporation
   * Redlich, Oded Huawei
   * RISON, Mark Samsung Cambridge Solution Centre
   * Rosdahl, Jon Qualcomm Technologies, Inc.
   * Salman, Hanadi Istanbul Medipol University
   * Schelstraete, Sigurd Quantenna Communications, Inc.
   * Shellhammer, Stephen Qualcomm Incorporated
   * Shilo, Shimi HUAWEI
   * Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel
   * Son, Ju-Hyung WILUS Inc.
   * Song, Taewon LG ELECTRONICS
   * Stacey, Robert Intel Corporation
   * Strauch, Paul Qualcomm Incorporated
   * SUH, JUNG HOON Huawei Technologies Co. Ltd
   * Sun, Bo ZTE Corporation
   * Sun, Li-Hsiang InterDigital, Inc.
   * Sun, Yanjun Qualcomm Incorporated
   * Sundman, Dennis Ericsson AB
   * Tian, Bin Qualcomm Incorporated
   * Torab Jahromi, Payam Facebook
   * Tsodik, Genadiy Huawei Technologies Co. Ltd
   * Turkmen, Halise Vestel
   * Van Zelst, Allert Qualcomm Incorporated
   * Varshney, Prabodh Nokia
   * VIGER, Pascal Canon Research Centre France
   * Wang, Hao Tencent
   * Wang, Lei Huawei R&D USA
   * Wang, Qi Apple, Inc.
   * Wang, Xiaofei InterDigital, Inc.
   * Ward, Lisa Rohde & Schwarz
   * Wentink, Menzo Qualcomm
   * Xin, Yan Huawei Technologies Co., Ltd
   * Yan, Aiguo Oppo
   * Yang, Jay Nokia
   * YANG, RUI InterDigital, Inc.
   * Yang, Steve TS MediaTek Inc.
   * Yano, Kazuto Advanced Telecommunications Research Institute International (ATR)
   * Yee, James MediaTek Inc.
   * yi, yongjiang Futurewei Technologies
   * Young, Christopher Broadcom Corporation
   * Yu, Jian Huawei Technologies Co., Ltd
   * Yu, Mao NXP Semiconductors
   * Zhang, Yan NXP Semiconductors
   * Zhou, Yifan Huawei Technologies Co., Ltd
4. Announcements:
   1. The Chair announces that there are new rules on page 36 in 11-20/0735r4, to be discussed in the next item, TGbe procedure.
5. TGbe Procedure:
   1. Follow up on re-scheduling a subset of new teleconference calls for MAC ad-hoc.
      1. MAC SP result was: 31Y, 13N, 15A.
      2. Discussion on new meeting times for the MAC ad-hoc:

C: Two voices heard that believe it is unfair that no meeting times are good for Europe.

C: Some meetings are such that there is little/no time inbeteen to do any work.

C: Discussion back and forth about pros and cons with different times.

**Straw poll 1:** Option1: Keep current schedule 10 AM WED

Y/N/A/No-answer: 64/40/20/39

**Straw poll 2:** Option2: Alternate between 10 AM and 19:00 on WED – see [11-20/0735r4](https://mentor.ieee.org/802.11/dcn/20/11-20-0735-04-00be-may-july-tgbe-teleconference-agendas.docx)

Y/N/A/No-answer: 57/36/25/42

**Straw poll 3:** Option3: Do you prefer moving the schedule for the new MAC ad hoc conference calls (10 AM Friday)  
Y/N/A/No-answer: 45/57/27/33

**Straw poll 4:** Option4: Do you prefer moving the schedule for the new MAC ad hoc conference calls (9 AM Wednesday)

Y/N/A/No-answer: 59/48/14/41

**Straw poll 5:** Option5: Do you prefer moving the schedule for the new Mac ad hoc conference calls (1 AM Wednesday)

Y/N/A/No-answer: 41/56/15/51

Option1 is the most popular option.

* 1. Update to the Guideline-Building Consensus and Populating the TGbe SFD.

Alfred goes through the changes in [11-20/0735r4](https://mentor.ieee.org/802.11/dcn/20/11-20-0735-04-00be-may-july-tgbe-teleconference-agendas.docx).

**Discussion:**

C: Is this going to be a separate or is it part of the joint session?

A: The proposal is to move the joint sessions.

C: Only existing voting members are allowed to vote?

A: Yes.

C: I would like the WG chair to consider how to change this.

C: What do we do if the compendium on motions marked in green fails.

A: If this happens I will ask the group where the concerns are.  
C: Some of the green text is in question form. I cannot put that into the SFD.  
A: I consider that as editorial. It should be rather straight forward to modify it so that it can go into the SFD. The editor (Edward Au) can do this.

Nobody objects to keep the joint meetings at 10:00 AM.

1. Is there any objection to continue with the submissions as per the agenda below? Nobody objects.
   1. Technical Submissions**-Multi RU**:
      1. [413r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0413-01-00be-discussion-on-eht-trigger-based-ul-mu.pptx) Discussion on EHT Trigger based UL MU (Insun Jang)
      2. [416r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0416-00-00be-mru-signaling-in-trigger-frame.pptx) Mru-signaling-in-trigger-frame (Ross Jian Yu)
   2. Technical Submissions**-HARQ**:
      1. [466r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0466-00-00be-harq-feedback.pptx) HARQ feedback (Li-Hsiang Sun)
      2. [481r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0481-00-00be-impact-of-harq-on-latency-system-level-simulation-analysis.pptx) Impact of HARQ on Latency-System Level Simulation Analysis (Shimi Shilo)
      3. [482r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0482-00-00be-discussion-on-harq-unit.pptx) Discussion on HARQ Unit (Shimi Shilo)
   3. Technical Submissions**-MAP TDMA**:
      1. 574r0 C-TDMA definition (Laurent Cariou)
      2. 595r0 C-TDMA protection (Dibakar Das)
   4. Technical Submissions**-MAP General**:
      1. [560r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0560-00-00be-multi-ap-configuration-and-resource-allocation.pptx) Multi-AP Configuration and Resource Allocation (Po-Kai Huang)
      2. [596r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0596-00-00be-ap-candidate-set-follow-up.pptx) AP candidate set follow up (Cheng Chen)
      3. [617r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0617-00-00be-multi-ap-operation-basic-definition.pptx) Multi-AP-Operation-Basic-Definition (Oren Kedem)
   5. Technical Submissions**-Low Lat**:
      1. [005r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0005-01-00be-proposals-on-latency-reduction.pptx) Proposals on Latency Reduction (Shubhodeep Adhikari)
   6. Technical Submissions**-MAP-MU MIMO**:
      1. 548r0 Discussion On Coordinated UL MU-MIMO (Genadiy Tsodik)
   7. Technical Submissions**-General**:
      1. [674r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0674-00-00be-forward-compatible-ofdma.pptx) Forward compatible OFDMA (Xiaogang Chen)
   8. Technical Submissions**-MAP-SR**:
      1. [576r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0576-01-00be-coordinated-spatial-reuse-protocol.pptx) Coordinated Spatial Reuse Protocol (Yongho Seok)
      2. [590r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0590-00-00be-shared-txop-spatial-reuse-considerations.pptx) Shared TXOP Spatial Reuse Considerations (Jonghun Han)

**Technical contributions**

1. [**413r1**](https://mentor.ieee.org/802.11/dcn/20/11-20-0413-01-00be-discussion-on-eht-trigger-based-ul-mu.pptx) **Discussion on EHT Trigger based UL MU (Insun Jang)**

**Summary:** The authors look at Trigger based UL MU using 240/320 MHz and Multi-RU aggregation. In particular they consider what information fields need to be updated.

**Discussion:**

C: Slide 3, do you assume that you can signal single link with multiple links?

A: For now I don’t consider multi-link.

C: Slide 4, for the user field, do you have enough bits?

A: I think so.

C: Option 2, slide 8, where does AP obtain STA data? To support option 2 I need some additional information.

C: Is there a typo in SP 1, it should be 3 bits right? Furthermore I am preparing a contribution for this. Can you defer your SP until I have presented?

A: Sure.

C: The 240 Mhz is a punctured 320 so that should not be needed to signal. We need to think about forward and backward compatibility.

A: Yes.

C: Slide 8, I prefer option 2. Can you defer the strawpoll?

Straw poll deferred.

1. [**416r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-0416-00-00be-mru-signaling-in-trigger-frame.pptx) **Mru-signaling-in-trigger-frame (Ross Jian Yu)**

**Summary:** The authors propose 3 options for multi-RU indication.

**Discussion:**

C: I believe your option 3 is the best one.

A: Ok.

C: I agree with the previous commentor.

A: Ok.

C: Can you defer SP1 since I have a presentation that is related. I believe you can run SP2 to gather information.

A: Ok I will defer.

C: Are you proposing to use 1 reserved bit in the existing frame?  
A: We are open to it.

**Straw poll 2:**

Which option do you prefer to be used for RU combination indication in the trigger frame+ Non-ofdma mode TBD

A: Option 1, Repeat AID in the User Info field allocated to the same STA

B: Option 2, combination indication in each user info field

C: Abstain

D: Need more discussion

E: Option 3: Change in the RU Allocation subfield

**Result:**

A/B/C/D/E: 14/21/22/41/30/40

1. [**466r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-0466-00-00be-harq-feedback.pptx) **HARQ feedback (Li-Hsiang Sun)**

**Summary:** The authors look at possible ways to determine whether HARQ unit LLRs are buffered.

**Discussion:**

C: On slide 6, In general I consider an MPDU to contain multiple CWs.

A: Here we assume a “CW” is a number of codewords.

C: On slide 4, you mention that it may be hard for the originator to conclude whether a particular HARQ unit is buffered. What do you mean with this?

A: Between transmissions it is hard for the originator to know how many units were buffered.

1. [**481r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-0481-00-00be-impact-of-harq-on-latency-system-level-simulation-analysis.pptx) **Impact of HARQ on Latency-System Level Simulation Analysis (Shimi Shilo)**

**Summary:** The authors present simulation results for HARQ focusing on latency. The simulations are carried out in NS-3 simulator.

**Discussion:**

C: Which system, .11ac, .11ax, etc?

A: I think it is

C: What BW did you run?  
A: I believe 20 MHz

C: How many spatial streams?

A: 2.

C: I would suggest to perform simulations where you sweep different operating points.

A: We did perform many more simulations, not presented here. The results were pretty consistent.

C: There are clearly many retransmissions (due to the large latency). I believe this largely benefits HARQ compared to ARQ. I try to understand how realistic these gains are in practice.

A: Naturally this is a simplified scenario.

C: Whats the target PER for the first transmission? I would expect that ARQ should be better than HARQ in some cases.

A: We didn’t modify Minstrel at all. The same Minstrel for ARQ and HARQ.

1. **Adjourn at 13:00.**

# Monday 18 May 2020, 10:00 – 13:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 20 May 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Thursday 21 May 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 27May 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Thursday 28 May 2020, 10:00 – 13:00 ET

**Introduction**

1. The Chair (Alfred Asterjadhi) calls the meeting to order at 10:02. The agenda can be found [11-20/0735r13](https://mentor.ieee.org/802.11/dcn/20/11-20-0735-13-00be-may-july-tgbe-teleconference-agendas.docx)
2. IEEE 802 and 802.11 IPR policy and procedure. 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 please speak up now. Nobody speaks up.
3. 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> 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 Dennis Sundman ([dennis.sundman@ericsson.com](mailto:dennis.sundman@ericsson.com)) and Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
   * Please ensure that the following information is listed correctly when joining the call:
     + "[voter status] First Name Last Name (Affiliation)"
   * List of attendees:
     + Aboulmagd, Osama Huawei Technologies Co., Ltd
     + Adhikari, Shubhodeep Broadcom Corporation
     + Aio, Kosuke Sony Corporation
     + An, Song-Haur INDEPENDENT
     + Asterjadhi, Alfred Qualcomm Incorporated
     + Au, Kwok Shum Huawei Technologies Co., Ltd
     + baron, stephane Canon Research Centre France
     + Bei, Jianwei NXP Semiconductors
     + Bredewoud, Albert Broadcom Corporation
     + Cao, Rui NXP Semiconductors
     + Carney, William Sony Corporation
     + CHAN, YEE Facebook
     + Chen, Xiaogang Intel
     + Cheng, Paul MediaTek Inc.
     + CHERIAN, GEORGE Qualcomm Incorporated
     + Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.
     + Choi, Jinsoo LG ELECTRONICS
     + CHUN, JINYOUNG LG ELECTRONICS
     + Das, Subir Perspecta Labs Inc.
     + Derham, Thomas Broadcom Corporation
     + de Vegt, Rolf Qualcomm Incorporated
     + Ding, Baokun Huawei Technologies Co. Ltd
     + Dong, Xiandong Xiaomi Inc.
     + Doostnejad, Roya Intel Corporation
     + ElSherif, Ahmed Qualcomm Incorporated
     + Erceg, Vinko Broadcom Corporation
     + Fischer, Matthew Broadcom Corporation
     + Galati Giordano, Lorenzo Nokia
     + Ghosh, Chittabrata Intel Corporation
     + Guo, Qiang InfomTechnologies
     + Guo, Yuchen Huawei Technologies Co., Ltd
     + Han, Jonghun SAMSUNG
     + Han, Zhiqiang ZTE Corporation
     + Handte, Thomas Sony Corporation
     + Ho, Duncan Qualcomm Incorporated
     + Hong, Hanseul Yonsei University
     + Hsieh, Hung-Tao MediaTek Inc.
     + Hsu, Chien-Fang MediaTek Inc.
     + Hu, Chunyu Facebook
     + Hu, Mengshi HUAWEI
     + Huang, Guogang Huawei
     + Huang, Lei Panasonic Asia Pacific Pte Ltd.
     + Huang, Po-Kai Intel Corporation
     + Hwang, Sung Hyun Electronics and Telecommunications Research Institute (ETRI)
     + Inohiza, Hirohiko Canon Inc.
     + Inoue, Yasuhiko Nippon Telegraph and Telephone Corporation (NTT)
     + Ji, Chenhe Huawei Technologies Co. Ltd
     + Jiang, Jinjing Apple, Inc.
     + Kakani, Naveen Qualcomm Incorporated
     + Kedem, Oren Huawei Technologies Co. Ltd
     + Kim, Jeongki LG ELECTRONICS
     + kim, namyeong LG ELECTRONICS
     + Kim, Sanghyun WILUS Inc
     + Kim, Yongho Korea National University of Transportation
     + Kim, Youhan Qualcomm Incorporated
     + Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)
     + Kneckt, Jarkko Apple, Inc.
     + Ko, Geonjung WILUS Inc.
     + Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)
     + Kwon, Young Hoon NXP Semiconductors
     + Lalam, Massinissa SAGEMCOM BROADBAND SAS
     + Lee, Wookbong SAMSUNG
     + Levy, Joseph InterDigital, Inc.
     + Li, Qinghua Intel Corporation
     + Li, Yiqing Huawei Technologies Co. Ltd
     + Li, Yunbo Huawei Technologies Co., Ltd
     + Lim, Dong Guk LG ELECTRONICS
     + LIU, CHENCHEN Huawei Technologies Co., Ltd
     + Liu, Jianhan MediaTek Inc.
     + Liu, Yong Apple, Inc.
     + Lopez, Miguel Ericsson AB
     + Lou, Hanqing InterDigital, Inc.
     + Lu, Liuming ZTE Corporation
     + Lv, kaiying MediaTek Inc.
     + Lv, Lily Huawei Technologies Co. Ltd
     + Max, Sebastian Ericsson AB
     + Mirfakhraei, Khashayar Cisco Systems, Inc.
     + NANDAGOPALAN, SAI SHANKAR Cypress Semiconductor Corporation
     + Naribole, Sharan SAMSUNG
     + Pan, Chun HUAWEI
     + Park, Eunsung LG ELECTRONICS
     + Park, Minyoung Intel Corporation
     + Park, Sung-jin LG ELECTRONICS
     + Patil, Abhishek Qualcomm Incorporated
     + Patwardhan, Gaurav Hewlett Packard Enterprise
     + Petrick, Albert InterDigital, Inc.
     + Pettersson, Charlie Ericsson AB
     + Puducheri, Srinath Broadcom Corporation
     + Pulikkoonattu, Rethnakaran Broadcom Corporation
     + Raissinia, Alireza Qualcomm Incorporated
     + RISON, Mark Samsung Cambridge Solution Centre
     + Rosdahl, Jon Qualcomm Technologies, Inc.
     + Schelstraete, Sigurd Quantenna Communications, Inc.
     + Sedin, Jonas Ericsson AB
     + Seok, Yongho MediaTek Inc.
     + Shellhammer, Stephen Qualcomm Incorporated
     + Shilo, Shimi HUAWEI
     + Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel
     + Song, Taewon LG ELECTRONICS
     + Strauch, Paul Qualcomm Incorporated
     + SUH, JUNG HOON Huawei Technologies Co. Ltd
     + Sun, Li-Hsiang InterDigital, Inc.
     + Sun, Yanjun Qualcomm Incorporated
     + Tanaka, Yusuke Sony Corporation
     + Tian, Bin Qualcomm Incorporated
     + Tsodik, Genadiy Huawei Technologies Co. Ltd
     + Turkmen, Halise Vestel
     + Uln, Kiran Cypress Semiconductor Corporation
     + Verma, Sindhu Broadcom Corporation
     + Vermani, Sameer Qualcomm Incorporated
     + Wang, Hao Tencent
     + Wang, Lei Huawei R&D USA
     + Wilhelmsson, Leif Ericsson AB
     + Xin, Yan Huawei Technologies Co., Ltd
     + Yan, Aiguo Oppo
     + Yang, Jay Nokia
     + Yang, Steve TS MediaTek Inc.
     + Yano, Kazuto Advanced Telecommunications Research Institute International (ATR)
     + Yee, James MediaTek Inc.
     + yi, yongjiang Futurewei Technologies
     + Yin, Yue HUAWEI
     + Young, Christopher Broadcom Corporation
     + Yu, Jian Huawei Technologies Co., Ltd
     + Yu, Mao NXP Semiconductors
     + Yuan, Fangchao HUAWEI
     + Zhang, Yan NXP Semiconductors
     + Zuo, Xin Tencent
4. The Chair asks if there is any objection to approve the agenda. No objection.  
   Discussion: I believe the telco progress is working very smoothly. Thanks to all leadership and participants to make it work so well.
5. Announcements:
   * Motions scheduled during the first half of Joint Conf Call of June 11th. Preliminary list as follows:
     + Motions to approve minutes since (and including) the January F2F meeting.
     + One motion covering all SFD text contributions in 11-20/566r25\* that are highlighted in green. Each SFD text contribution will be identified by their respective SP tag ***[#SPX]****, where X is the SP ID.*
       - These have passed confirmatory SPs in a previous Joint Conf call.
     + One motion covering all SFD text contributions in 11-20/566r25\* that are highlighted in yellow and did not receive a request for further discussion. Each SFD text contribution will be identified by their respective SP tag ***[#SPX]****, where X is the SP ID.*
     + Separate motions covering each SFD text contributions in 11-20/566r25\* that are highlighted in yellow and did receive a request for further discussion (request received since the respective announcement and up to 4 hours before the scheduled Joint Conf call where motions are scheduled).

**Discussion:**

C: Is there any chance of discussion for the green ones?

A: The intention is that it is not needed.

* + Dragon Boat Festival on June 25th 2020:
    - Consider moving 25th June Joint Call to July 3rd 2020 (overlaps with TGbd and TGmd

**Discussion:**

C: Can we move the one on June 24th.

C: I would consider just cancelling the 25th call. I object to that move.

* Cancel both calls June 24th and 25th and find alternative schedules which will be discussed in the next joint call. Nobody objects. Calls cancelled.

**Submissions**

1. [**115r5**](https://mentor.ieee.org/802.11/dcn/20/11-20-0115-05-00be-multi-link-feature-candidates-for-r1.pptx)**, “Multilink Feature Candidates For Release 1”, Huizhao Wang (Quantenna)**

**Summary:** The authors list which features they believe should be included in release 1. They are very specific in the multi-link details.

**Discussion:**

C: You mention single radio. We have no clear idea what a single radio device. What is an enhanced single radio?

A: I agree these things are not clear.

C: I think we should have a separate SP on what a single radio device is.

A: Ok.

C: You mentioned 4 categories for R1: single radio, enhanced single radio, STR multi-radio and non-STR multi-radio, which is what we want. We have so much struggle with the non-STR radio.

C: I don’t think we should limit at this stage. We need more information.

More comments along the lines that it’s too early for this straw poll.

C: Maybe we can split this slide into two parts to separate out things we agree on.

C: Can you cross out the “Define a TID to link mapping mechanism…”

A: Ok.

C: I think we should defer this SP.

C: I think we should run this SP.

**SP Deferred.**

1. [**687r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-0687-00-00be-r1-r2-discussion-for-ap-coordination.pptx)**, “R1-R2 discussion for AP coordination”, Laurent Cariou (Intel)**

**Summary:** The authors would like to move the low complexity AP coordination from R1 to R2.

**Discussion:**

C: Slide 6. In the last subbullet you have additional multi-AP features. Therefore, the “Additional multi-AP features” should read “Multi AP-features”. Second question, what about if something in R1 prohibits things in R2.

A: Yes, and for the second question, we should make sure this does not happen.

C: I don’t agree that there is no consensus on low complexity AP coordination. I believe it should be part of R1.

A: I don’t believe there is only one feature that we have agreed on.

C: I don’t agree with moving the simple AP coordination to R2. At the same time I agree with you it’s unclear what it is. But this is part of the discussion to lead up to the feature. Considering the timeline I believe too much things will be left for R2.

C: To what extent should we work on R1/R2? Because the risk is that we end up with having to do a complete redesign of our chips to enable R2 if we didn’t consider that in R1.

A: I agree we need to consider R2 also.

C: Is your intention to spend a lot of time on multi-AP features in R2?

A: Yes certainly this will be important.

C: I agree with this SP.

**SP:**

Do you agree to remove “a low complexity AP coordination feature” from Release 1 features and to change “16 spatial streams, HARQ, Additional multi-AP features (e.g. C-BF, JT), any other potential features in the scope of PAR (e.g. features for Time-sensitive networks)” to “16 spatial streams, HARQ, multi-AP features (e.g. C-BF, JT, C-OFDMA/TDMA, C-SR), any other potential features in the scope of PAR (e.g. features for Time-sensitive networks)” to candidate Release 2 features

**Yes/No/Abstain/No answer: 68/55/20/39**

Comment: Is this a technical or procedural question?

Answer: This is a technical question.

1. [**697r1**](https://mentor.ieee.org/802.11/dcn/20/11-20-0697-01-00be-supporting-latency-sensitive-applications-in-11be.pptx)**, “Serving low latency applications in r1” – Chunyu Hu (Facebook)**

**Summary:** The authors emphasize that VR/AR is important not only for gaming industry, but for social interactions in times of pandemic. They list technical areas that are sufficient and lacking in maturity for latency. For release 1 they suggest to target single BSS solutions, while for release 2 multiple-BSS solutions.

**Discussion:**

C: In general I support the QoS provisioning. In my opinion the straw poll is too focused on low latency. I would like to see other aspects as jitter, etc. One suggestion is to make it support a QoS framework that supports multiple KPIs.

A: Let’s wait with the discussion on SP text. First I would like to obtain general opionion about our proposal.

C: Can you elaborate with what you mean is lacking in the multi-link aspect?

A: The multi-link itself will not solve the latency challenge.

C: In general MLO will help with low latency. But your point is that what happens if all STAs have similar traffic. When you have contention you would like to enforce some sort of scheduling. 802.11ax introduced trigger based scheduling. Have you considered how TB scheduling works?

A: Trigger is good means but it becomes very hard for the AP to do this effectively.

C: I believe the SP is a bit vague and it should be more specific.

A: Ok.

C: Slide 17, these classes, do you think we should consider these classes with different priority? For example some of these applications are easier to target.

C: Slide 13, second subbullet. What do you mean?

A: The main purpose is that we need some link management.

There is a question to extend the meeting with 5 minutes. The Chair asks if there is any objection. There is. Since the meeting time is out, the meeting adjourns.

**Adjourned at 13:00.**

# Monday 1 June 2020, 10:00 – 1300 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 3June 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-03-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Thursday 4 June 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Monday 8 June 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 10 June 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: currently N/A.

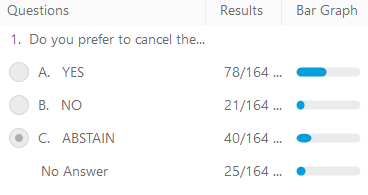
# Thursday 11 June 2020, 10:00 – 13:00 ET

**Introduction**

1. The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order at 10:02 AM.
2. IEEE 802 and 802.11 IPR policy and procedure. 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 please speak up now. Nobody speaks up.
3. 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> 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 Dennis Sundman ([dennis.sundman@ericsson.com](mailto:dennis.sundman@ericsson.com)) and Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
   * Please ensure that the following information is listed correctly when joining the call:
     + "[voter status] First Name Last Name (Affiliation)"
   * List of attendees:

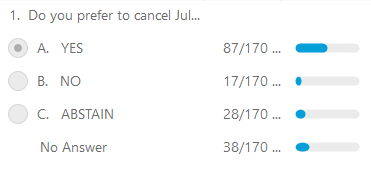
* Aboulmagd, Osama Huawei Technologies Co.,  Ltd
* Adhikari, Shubhodeep Broadcom Corporation
* Agarwal, Peyush Broadcom Corporation
* Aio, Kosuke Sony Corporation
* An, Song-Haur INDEPENDENT
* Ansley, Carol CommScope
* Asterjadhi, Alfred Qualcomm Incorporated
* Au, Kwok Shum Huawei Technologies Co.,  Ltd
* Baik, Eugene Qualcomm Incorporated
* baron, stephane Canon Research Centre France
* Bei, Jianwei NXP Semiconductors
* Bhandaru, Nehru Broadcom Corporation
* Boldy, David Broadcom Corporation
* Bredewoud, Albert Broadcom Corporation
* Cao, Rui NXP Semiconductors
* Cariou, Laurent Intel Corporation
* Carney, William Sony Corporation
* CHAN, YEE Facebook
* Chen, Xiaogang Intel
* Cheng, Paul MediaTek Inc.
* CHERIAN, GEORGE Qualcomm Incorporated
* Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.
* Cho, Hangyu LG ELECTRONICS
* Choi, Jinsoo LG ELECTRONICS
* CHUN, JINYOUNG LG ELECTRONICS
* Das, Dibakar Intel Corporation
* Das, Subir Perspecta Labs Inc.
* DeLaOlivaDelgado, Antonio InterDigital, Inc.
* Derham, Thomas Broadcom Corporation
* de Vegt, Rolf Qualcomm Incorporated
* Dong, Xiandong Xiaomi Inc.
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* Godbole, sachin Broadcom Corporation
* Guo, Yuchen Huawei Technologies Co., Ltd
* Han, Zhiqiang ZTE Corporation
* Hervieu, Lili Cable Television Laboratories Inc. (CableLabs)
* Hirata, Ryuichi Sony Corporation
* Ho, Duncan Qualcomm Incorporated
* Hsieh, Hung-Tao MediaTek Inc.
* Hu, Chunyu Facebook
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* Kain, Carl USDoT
* Kakani, Naveen Qualcomm Incorporated
* Kedem, Oren Huawei Technologies Co. Ltd
* Khorov, Evgeny IITP RAS
* Kim, Jeongki LG ELECTRONICS
* Kim, Myeong-Jin SAMSUNG
* kim, namyeong LG ELECTRONICS
* Kim, Sang Gook LG ELECTRONICS
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* Kwon, Young Hoon NXP Semiconductors
* Lalam, Massinissa SAGEMCOM BROADBAND SAS
* Lan, Zhou Broadcom Corporation
* Lansford, James Qualcomm Incorporated
* Lee, Wookbong SAMSUNG
* Levitsky, Ilya IITP RAS
* Levy, Joseph InterDigital, Inc.
* Li, Yiqing Huawei Technologies Co. Ltd
* Li, Yunbo Huawei Technologies Co., Ltd
* Liang, dandan Huawei Technologies Co., Ltd
* Lim, Dong Guk LG ELECTRONICS
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* Lu, Liuming ZTE Corporation
* Lv, kaiying MediaTek Inc.
* Lv, Lily Huawei Technologies Co. Ltd
* Madpuwar, Girish Broadcom Corporation
* Memisoglu, Ebubekir IMU,Vestel
* Mirfakhraei, Khashayar Cisco Systems, Inc.
* Montreuil, Leo Broadcom Corporation
* NANDAGOPALAN, SAI SHANKAR Cypress Semiconductor Corporation
* Naribole, Sharan SAMSUNG
* Nezou, Patrice Canon Research Centre France
* noh, yujin Newracom Inc.
* Ouchi, Masatomo Canon
* Palm, Stephen Broadcom Corporation
* Pare, Thomas MediaTek Inc.
* Park, Eunsung LG ELECTRONICS
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* Pettersson, Charlie Ericsson AB
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* Shellhammer, Stephen Qualcomm Incorporated
* Shilo, Shimi HUAWEI
* Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel
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* Verma, Sindhu Broadcom Corporation
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* Wang, Lei Huawei R&D USA
* Wang, Qi Apple, Inc.
* Wang, Xiaofei InterDigital, Inc.
* Wu, Tianyu Apple, Inc.
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* yi, yongjiang Futurewei Technologies
* Young, Christopher Broadcom Corporation
* Yu, Jian Huawei Technologies Co., Ltd
* Yu, Mao NXP Semiconductors
* Yukawa, Mitsuyoshi Canon, Inc.
* Zegrar, Salah Eddine [NV] Salah Eddine ZEGRAR (Vestel)
* Zhang, Meihong Huawei Technologies Co., Ltd
* Zhang, Yan NXP Semiconductors

1. The Chair asks if there is any objection to approve the agenda.
   * Comment: Chunyu Hu is first in the agenda. This is listed as SP. Is it possible to spend at least 15 minutes to recap before the SPs?
   * Reply: Yes that is fine.
   * Agenda approved.
2. Announcements:
   * Discuss suggested cancellation request for July 1st conf call (Canada Holiday)
     + The Chair asks to rise hands to figure how many will be attending.
     + C: In fairness, if we consider holidays in one country we should consider holidays in all countries.
     + C: I think you should run a SP.
     + SP result “Do you prefer to cancel the July 1st conference call?”:



Y/N/A/No answer: 78, 21, 40, 25

* + Convert June 29th to Joint.
    - The secretary (Dennis Sundman, Ericsson) will not be able to attend. No objection to convert.
  + Teleconferences during summer season (time off):
    - One week with no conference calls during July or August.
    - Planning to have 1 week in August without conference calls.
    - Discussion:
      * C: The needs for conference calls will depend on what happens with the September meeting.
      * A: (Jon) The week of June 22nd is when the September meeting will be “go or no go”.
      * C: PHY is making good progress, so there will be fewer PHY conference calls.
    - Comment to try to synchronize with the other TGs. Which week is TBD.
  1. SP: Do you prefer to cancel July 6th conference call?



* + - Yes/No/Abstain/No answer: 87/17/28/38
    - The meeting at July 6th cancelled.
    - Comment: I think cancelling is fine, but adding conference call to the schedule is typically more tricky because people have other appointments in their calendars.

**Motions:**

1. **The Chair explains the procedures for the motions.**
2. **Approve TG minutes.**

Move to approve TGbe minutes of meetings and teleconferences from November 2019 meeting to today:

* + January F2F meeting: <https://mentor.ieee.org/802.11/dcn/20/11-20-0228-01-00be-meeting-minutes-january-2020.docx>
  + Teleconferences Feb-March: <https://mentor.ieee.org/802.11/dcn/20/11-20-0287-06-00be-telephone-conference-meeting-minutes-february-and-march-2020.docx>
  + Teleconferences April: <https://mentor.ieee.org/802.11/dcn/20/11-20-0570-04-00be-telephone-conference-meeting-minutes-april-2020.docx>

Move: Edward Au, Second: Subir Das

Discussion: No discussion.

**Result: Approved with unanimous consent.**

1. **Motion 111**

Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags:

* + SP0611-01, SP0611-02, SP0611-03, SP0611-04, SP0611-05, SP0611-06, SP0611-07, SP0611-08, SP0611-09, SP0611-10, SP0611-11, SP0611-12, SP0611-13, SP0611-14, SP0611-15, SP0611-16, SP0611-17, SP0611-18, SP0611-19, SP0611-20, SP0611-21, SP0611-22, SP0611-23, SP0611-24, SP0611-25, SP0611-26, SP0611-27, SP0611-28, SP0611-29, SP0611-30, SP0611-31, SP0611-32, SP0611-33, SP0611-34, SP0611-35, SP0611-36,

Discussion:

C: What is the meaning of the “SP0611”

A: In order to make it easier for people to identify I grouped them together. (6/11 is today’s date).

C: If this motion passes, will these SPs be moved into the SFD?

A: Yes.

Move: Bin Tian, Second: Edward Au

**Result: Approved with unanimous consent.**

Note: These are all candidate SFD texts highlighted in green

1. **Motion 112**

Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags:

* + SP1, SP2, SP3, SP4, ~~SP5~~, SP6, SP7, SP8, SP9, SP10, SP11, SP12, SP13, SP14, SP15, SP16, SP17, SP18, SP19, SP20, SP21, SP22, SP23, SP24, SP25, SP26, SP27, ~~SP28~~, SP29, SP30, SP31, SP32, SP33, SP34, SP35, SP36, SP37, SP38, SP39, SP40, SP41, SP42, SP43, SP44, SP45, SP46, SP47, SP48, SP49, SP50, SP51, SP52, SP53, SP54, SP55

Move: Laurent Cariou, Second: Bin Tian

Discussion:

C: There are SPs with higher number than 55 with yellow text.

A: To be considered in the next round of motions.

**Result: Approved with unanimous consent**

* + Note: These are all candidate SFD texts highlighted in yellow that have not received a request for further discussion

1. **Motion 113** (Amended from nr 114)

Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags:

* + SP28

Move: Wook Bong Lee, Second: Bin Tian

Discussion:

C: This SP should be discussed in a joint call before we can make a decision.

C: Several things we discussed in the PHY group.

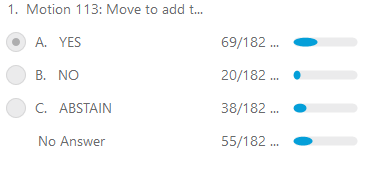
C: I don’t think this is necessary.

C: Why does the .11ax solution not work for .11be?

C: Technical discussion back and forth. Argument that MAC guys should be part of the discussion. Question regarding the BW.

* + Note: These are all candidate SFD texts highlighted in yellow that have received a request for further discussion

Result:



~~Y/N/A/No-answer: 69/20/38/55 🡪 Preliminary passed. (Need to check only Voting members voted)~~

Final result: Y/N/A: 66/19/35 🡪 Passes. See Appendix 1 for details.

1. **Motion 114 (Amended from nr 114)**

Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags:

* SP5

Discussion:

C: I think we should amend the text in SP5. I think the best way to do that is to run the SP now and amend the text later.

C: There are two SP5?

A: The appendix corresponds to the original text, this is modified to suit the SFD.

C: I don’t think we should run a motion with a broken text. I suggest we have further discussion and make a complete motion.

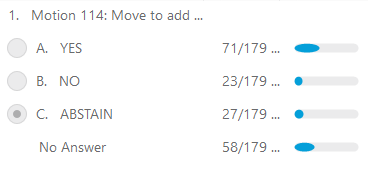
C: I think we should table the motion and move on.

Move: Abhisek Patil, Second: George Cherian

Discussion: No discussion.

* Note: These are all candidate SFD texts highlighted in yellow that have received a request for further discussion

Result:



~~Yes/No/Abstain/No-answer: 71/23/27/58 🡪 Preliminary passes. (Need to check only Voting members voted)~~

Final result: Y/N/A: 70/21/25 🡪 Passes. See Appendix 1 for details.

**The editor points out that some motions will be in conflict. He will make comments in the document to that.**

**Submissions:**

1. [**697r**](https://mentor.ieee.org/802.11/dcn/20/11-20-0697-03-00be-supporting-latency-sensitive-applications-in-11be.pptx)**3 Serving low latency applications in r1 (Chunyu Hu) [SPs]**

SP: Do you support a staged feature development to support latency sensitive applications as following

* + Release 1:
    - A basic framework under multi-link operation framework that includes link management and QoS provisioning
    - Channel access optimization/design for low latency
  + Release 2:
    - Extend to support multi-BSS coordination for low latency
    - Any additional features (including additional channel access improvements)

Notes

* + Channel access improvement for low latency implies more predictable channel access
  + R1 can include any other essential components to make the framework functional.
  + Whether to introduce different mechanisms for different classes of low-latency applications is TBD

Discussion:

C: The TBD in the third Notes point, is it for R1 or R2?

A: We don’t know.

C: You want to have predictable channel access for R1 or R2?

A: We would like to have it within a single BSS case for R1.

C: Should I interpret the first bullet for R1 as generic framework or only for low latency.

A: General framework, but emphasis on low latency.

C: If we start opening up this for R1 now, we will get plenty of contributions. I think we should do it for R2 instead.

A: I think the R1 will not be very exciting in that case.

C: There is a related presentation on Mentor, would you wait with the SP until that contribution?

A: I would like to run the SP.

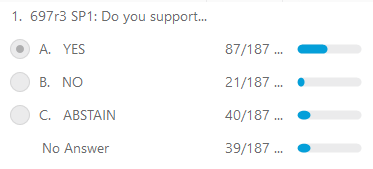
C: I think the first bulletpoint under R1, is sufficient for R1.

A: Ok.

C: I believe the group has a lot of bandwidth and all our targets will be fulfilled.

C: I think it is critical we get low latency into R1 because of market needs.

Result:



Y/N/A/No-answer: 87/21/40/39

1. [**292r**](https://mentor.ieee.org/802.11/dcn/20/11-20-0292-01-00be-mlo-typical-operating-scenarios-and-sub-feature-prioritization.pptx)**1 MLO Typical Op. Scen. & Sub-feature prioritization – Zhou Lan (Broadcom)**

Summary: The authors provides an overview of the MLO and try to subdivide the standardization efforts.

Straw poll 1:

* + Do you agree the following mode of MLO operations are in 11be R1 sub-features? Other mode of operation is TBD (e.g. mode to support NSTR AP)



Comment:

C: I would like to defer this SP until after further discussion.

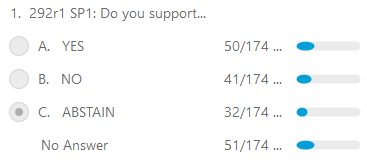
C: Regarding the enhanced single link radio, I don’t know why you put it here. This was not agreed in the group. This enhanced radio is a multiple-radio. This is in a sense performance worse than multiple radio. I want to leave it to R2.

C: What is your definition of a multi-radio?

A: It means concurrent TX/TX or RX/RX.

A bit heated discussion back and forth about the relevance of the SP.

Result:



Y/N/A/No-answer: 50/41/32/51.

1. [**755r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-0755-00-00be-non-str-ap-operation.pptx) **Non-STR AP Operation (Jinjing Jiang)**

Summary: The authors consider non-STR APs and how they interact with legacy STAs. They believe non-STR AP MLD shall be supported in R1.

SP1: Do you agree to define mechanisms to support the operation of a Non-STR AP MLD in R1?

Discussion:

C: What is the performance gain of this? From a timeline standpoint is this worth adding this?

A: There is gain to be had. There is nothing substantial new from what we have discussed.

C: This is already complicated from the AP perspective, now you bring this to the STA side.

A: I don’t understand the point.

**Adjourn at 13:00 ET.**

# Monday 15 June 2020, 10:00 – 13:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-06-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 17 June 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Thursday 18 June 2020, 19:00 – 22:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Monday 22 June 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-06-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Monday 29 June 2020, 10:00 – 13:00 ET

**Introduction**

1. The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order. Laurent Cariou (Intel) takes the minutes since the ordinary secretary is away.
2. IEEE 802 and 802.11 IPR policy and procedure. 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 please speak up now. Nobody speaks up.
3. 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> 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 Dennis Sundman ([dennis.sundman@ericsson.com](mailto:dennis.sundman@ericsson.com)) and Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
   * Please ensure that the following information is listed correctly when joining the call:
     + "[voter status] First Name Last Name (Affiliation)"
   * List of attendees:
     + Akhmetov, Dmitry Intel Corporation
     + Ansley, Carol CommScope
     + Asterjadhi, Alfred Qualcomm Incorporated
     + Au, Kwok Shum Huawei Technologies Co., Ltd
     + baron, stephane Canon Research Centre France
     + Bims, Harry Bims Laboratories, Inc.
     + Bredewoud, Albert Broadcom Corporation
     + Cao, Rui NXP Semiconductors
     + Carney, William Sony Corporation
     + Cepni, Gurkan Apple, Inc.
     + Chen, Xiaogang Intel
     + Cheng, Paul MediaTek Inc.
     + CHERIAN, GEORGE Qualcomm Incorporated
     + Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.
     + Choi, Jinsoo LG ELECTRONICS
     + CHUN, JINYOUNG LG ELECTRONICS
     + Das, Dibakar Intel Corporation
     + Das, Subir Perspecta Labs Inc.
     + Derham, Thomas Broadcom Corporation
     + de Vegt, Rolf Qualcomm Incorporated
     + Dong, Xiandong Xiaomi Inc.
     + Doostnejad, Roya Intel Corporation
     + Duan, Ruchen SAMSUNG
     + ElSherif, Ahmed Qualcomm Incorporated
     + Erceg, Vinko Broadcom Corporation
     + Fischer, Matthew Broadcom Corporation
     + Galati Giordano, Lorenzo Nokia
     + Gan, Ming Huawei Technologies Co., Ltd
     + Ghosh, Chittabrata Intel Corporation
     + Guo, Yuchen Huawei Technologies Co., Ltd
     + Han, Jonghun SAMSUNG
     + Handte, Thomas Sony Corporation
     + Hervieu, Lili Cable Television Laboratories Inc. (CableLabs)
     + Ho, Duncan Qualcomm Incorporated
     + Hsieh, Hung-Tao MediaTek Inc.
     + Hsu, Chien-Fang MediaTek Inc.
     + Hu, Chunyu Facebook
     + Hu, Mengshi HUAWEI
     + Huang, Guogang Huawei
     + Huang, Po-Kai Intel Corporation
     + Hwang, Sung Hyun Electronics and Telecommunications Research Institute (ETRI)
     + Inohiza, Hirohiko Canon Inc.
     + Ji, Chenhe Huawei Technologies Co. Ltd
     + Jia, Jia Huawei Technologies Co., Ltd
     + jiang, feng Apple Inc.
     + Jiang, Jinjing Apple, Inc.
     + Jones, Vincent Knowles IV Qualcomm Incorporated
     + Kain, Carl USDoT
     + Kakani, Naveen Qualcomm Incorporated
     + Kandala, Srinivas SAMSUNG
     + Kim, Jeongki LG ELECTRONICS
     + Kim, Myeong-Jin SAMSUNG
     + kim, namyeong LG ELECTRONICS
     + Kim, Sang Gook LG ELECTRONICS
     + Kim, Sanghyun WILUS Inc
     + Kim, Yongho Korea National University of Transportation
     + Kim, Youhan Qualcomm Incorporated
     + Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)
     + Klein, Arik Huawei Technologies Co. Ltd
     + Ko, Geonjung WILUS Inc.
     + Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)
     + Kumar, Manish Marvell Semiconductor, Inc.
     + Kwon, Young Hoon NXP Semiconductors
     + Lalam, Massinissa SAGEMCOM BROADBAND SAS
     + Lee, Wookbong SAMSUNG
     + Levitsky, Ilya IITP RAS
     + Levy, Joseph InterDigital, Inc.
     + Li, Guoqing Apple, Inc.
     + Li, Yiqing Huawei Technologies Co. Ltd
     + Li, Yunbo Huawei Technologies Co., Ltd
     + Liang, dandan Huawei Technologies Co., Ltd
     + Lim, Dong Guk LG ELECTRONICS
     + Lin, Wei Huawei Technologies Co. Ltd
     + LIU, CHENCHEN Huawei Technologies Co., Ltd
     + Liu, Yong Apple, Inc.
     + Lou, Hanqing InterDigital, Inc.
     + Lu, Liuming ZTE Corporation
     + Lv, kaiying MediaTek Inc.
     + Lv, Lily Huawei Technologies Co. Ltd
     + Ma, Mengyao HUAWEI
     + Memisoglu, Ebubekir IMU, VESTEL
     + Mirfakhraei, Khashayar Cisco Systems, Inc.
     + Montreuil, Leo Broadcom Corporation
     + noh, yujin Newracom Inc.
     + Nurani Krishnan, Neelakantan Qualcomm Incorporated
     + Omar, Hassan Huawei Technologies Co., Ltd
     + Ouchi, Masatomo Canon
     + Ozbakis, Basak VESTEL
     + Pare, Thomas MediaTek Inc.
     + Park, Eunsung LG ELECTRONICS
     + Park, Minyoung Intel Corporation
     + Patil, Abhishek Qualcomm Incorporated
     + Patwardhan, Gaurav Hewlett Packard Enterprise
     + Petrick, Albert InterDigital, Inc.
     + Pettersson, Charlie Ericsson AB
     + Puducheri, Srinath Broadcom Corporation
     + Pulikkoonattu, Rethnakaran Broadcom Corporation
     + Rai, Kapil Qualcomm Incorporated
     + Redlich, Oded HUAWEI
     + RISON, Mark Samsung Cambridge Solution Centre
     + Rosdahl, Jon Qualcomm Technologies, Inc.
     + Sedin, Jonas Ericsson AB
     + Seok, Yongho MediaTek Inc.
     + Shellhammer, Stephen Qualcomm Incorporated
     + Shilo, Shimi HUAWEI
     + Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel
     + Song, Taewon LG ELECTRONICS
     + SUH, JUNG HOON Huawei Technologies Co. Ltd
     + Sun, Bo ZTE Corporation
     + Sun, Yanjun Qualcomm Incorporated
     + Tian, Bin Qualcomm Incorporated
     + Torab Jahromi, Payam Facebook
     + Tsodik, Genadiy Huawei Technologies Co. Ltd
     + Van Zelst, Allert Qualcomm Incorporated
     + Varshney, Prabodh Nokia
     + Vermani, Sameer Qualcomm Incorporated
     + VIGER, Pascal Canon Research Centre France
     + Wang, Chao Chun MediaTek Inc.
     + Wang, Hao Tencent
     + Wang, Huizhao Quantenna Communications, Inc.
     + Wang, Lei Huawei R&D USA
     + Wang, Qi Apple, Inc.
     + Ward, Lisa Rohde & Schwarz
     + Wentink, Menzo Qualcomm
     + Wu, Tianyu Apple, Inc.
     + Xin, Yan Huawei Technologies Co., Ltd
     + Yan, Aiguo Oppo
     + Yang, Bo Huawei Technologies Co. Ltd
     + Yang, Jay Nokia
     + YANG, RUI InterDigital, Inc.
     + Yang, Steve TS MediaTek Inc.
     + Yano, Kazuto Advanced Telecommunications Research Institute International (ATR)
     + Yee, James MediaTek Inc.
     + yi, yongjiang Futurewei Technologies
     + Young, Christopher Broadcom Corporation
     + Yu, Jian Huawei Technologies Co., Ltd
     + Yu, Mao NXP Semiconductors
     + Zegrar, Salah Eddine [NV] Salah Eddine ZEGRAR (Vestel)
     + Zein, Nader NEC Laboratories Europe
     + Zhang, Yan NXP Semiconductors
     + Zuo, Xin Tencent
4. Announcements:
   1. Preparation for IEEE802.11be D0.1.
      * Comment to add a recommendation to post a doc ready for SP 7 days in advance on mentor
      * Comment from editor to remind people to include figure in visio format

**Technical submissions**

**755r1**

SP

Do you agree to define mechanisms to support the operation of a Non-STR AP MLD in R1?

Note:

• The mechanisms are limited to instantiate a Non-STR Non-AP MLD as a Soft AP that could utilize all its links. The exact language to govern such scope is TBD.

70Y /17N/ 38A

**574r1**

SP1:

Do you agree to add the following to the 802.11be SFD:

- The procedure for a sharing AP to share its TxOP time of an obtained TxOP with a shared AP, is called C-TDMA if each time period within the TxOP is only allocated to a single shared AP.

- During the time period allocated to a shared AP, the shared AP can do any PPDU transmissions, including sending DL PPDUs or soliciting UL PPDUs

NOTE: a time period is a subset of the total TxOP time

48Y/31N/33A

**560r0**

SP1:

Do you support the following:

- Sharing AP and Shared AP may not have the same primary 20 MHz channel

- The primary 20 MHz channel of the shared AP shall be within the BSS operating channel width of the sharing AP

- The primary 20 MHz channel of the sharing AP shall be within the BSS operating channel width of the shared AP

58Y/11N/34A

SP2:

Do you support defining the modes of AP coordination that share frequency resources with one or more APs within the AP candidate set only for:

- 20 MHz channels allocated by a sharing AP to a shared AP within the BSS operating channel of the shared AP

Note: 20 MHz channels allocated by a sharing AP within the 20 MHz channels on which the sharing AP gained channel access

50Y/7N/43A

**813r4**

No SPs

**Meeting adjourned.**

# Thursday 2 July 2020, 19:00 – 22:00 ET

Split PHY and MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>
* PHY: <https://mentor.ieee.org/802.11/dcn/20/11-20-0787-06-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020.docx>

# Wednesday 8 July 2020, 10:00 – 13:00 ET

Only MAC.

* MAC: <https://mentor.ieee.org/802.11/dcn/20/11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020.docx>

# Thursday 9 July 2020, 10:00 – 13:00 ET

**Introduction**

1. **10:02:** The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order. Laurent Cariou (Intel) and Matthew Fischer (Broadcom) takes the minutes since the ordinary secretary is away.
2. Agenda is in <https://mentor.ieee.org/802.11/dcn/20/11-20-0735-38-00be-may-july-tgbe-teleconference-agendas.docx>
3. IEEE 802 and 802.11 IPR policy and procedure.
   * 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 please speak up now.
   * Nobody speaks up.
4. 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> 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 Dennis Sundman ([dennis.sundman@ericsson.com](mailto:dennis.sundman@ericsson.com)) and Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
   * Please ensure that the following information is listed correctly when joining the call:
     + "[voter status] First Name Last Name (Affiliation)"
   * Attendee list collected from the meeting participant list during the call

* [V] Matthew Fischer (Broadcom)
* [V] Alfred Asterjahdi (Qualcomm)
* [A] Ankit Sethi [NXP]
* [A] Charlie Pettersson Ericsson
* [A] Greg Geonjung Ko WILUS
* [A] Hari Ram B NXP
* [A] Jonghun Han Samsung
* [A] Lorenzo Galati Giordano [Nokia]
* [A] Yiqing Li Huawei
* [N] Chaoming Luo OPPO
* [N] Daniel Verenzuela Sony
* [N] Hirohiko INOHIZACanon
* [N] Lin Yang Qualcomm
* [N] Masatomo OUCHI Canon
* [N] Mengshi Hu Huawei
* [N] Mitsuyoshi Yukawa Canon
* [N] Muhammad Sohaib Solaija IMU; Vestel
* [N] Namyeong Kim LGE
* [N] SunHee Baek LGE
* [N] Zhiqiang HanZTE
* [NV] Brice Le Houerou Canon
* [NV] Ebubekir Memisoglu VESTEL
* [NV] Francois Thoumy Canon
* [NV] Hanadi Salman VESTEL / IMU
* [NV] Hanqing Lou InterDigital
* [NV] Hassan Omar [Huawei]
* [NV] Jinyoung Chun LG Electronics
* [NV] Julien SEVIN Canon
* [NV] Mickael Lorgeoux Canon
* [NV] Romain GUIGNARD Canon
* [NV]EunheekimETRI
* [P] Frank Hsu Mediatek
* [P] Ilya Levitsky IITP RAS
* [P] Myeongjin Kim Samsung
* [P] Ruchen Duan Samsung
* [P] Sanghyun Kim WILUS
* [P] Yifan Zhou Huawei
* [P] Yoshihisa Kondo ATR
* [P] Young Hoon Kwon NXP
* [P]HT Hsieh Mediatek
* [PV] Harry Wang Tencent
* [PV] Jonas Sedin Ericsson
* [PV] Liangxiao Xin Sony
* [V] Abhishek Patil Qualcomm
* [V] Akira Kishida NTT
* [V] Al Petrick InterDigital
* [V] Albert Bredewoud Broadcom
* [V] Ali Raissinia Qualcomm
* [V] Allert van Zelst Qualcomm
* [V] Arik Klein Huawei
* [V] Bill Carney Sony
* [V] Bin Tian Qualcomm
* [V] Bo Sun ZTE
* [V] Carl Kain USDOT/Noblis
* [V] Carol Ansley CommScope
* [V] Chao-Chun Wang MediaTek
* [V] Cheng Chen Intel
* [V] Chenhe Ji Huawei
* [V] Chris Young Broadcom
* [V] Chunyu Hu FB
* [V] Dana Ciochina Sony
* [V] Dandan Liang Huawei
* [V] dibakar das Intel
* [V] Dongguk Lim LGE
* [V] Duncan Ho Qualcomm
* [V] Edward Au Huawei
* [V] Eunsung Park LGE
* [V] Evgeny Khorov IITP RAS
* [V] Feng Jiang Apple
* [V] Genadiy Tsodik Huawei
* [V] George Cherian Qualcomm
* [V] Hanseul Hong Yonsei Univ.
* [V] Huizhao Wang Quantenna/ON Semi
* [V] Insun Jang LGE
* [V] James Yee, MediaTek
* [V] Jason Yuchen Guo Huawei
* [V] Jeongki Kim LG Electronics
* [V] Jia Jia Huawei
* [V] Jianhan Liu Meditak Inc.
* [V] Jim Lansford Qualcomm
* [V] Jinsoo Choi LGE
* [V] Jon Rosdahl Qualcomm
* [V] Joseph Levy InterDigital
* [V] Junghoon Suh Huawei
* [v] kaiying lu MediaTek
* [V] Kazuto Yano ATR
* [V] Kosuke Aio Sony
* [V] laurent cariou, Intel
* [V] Lei Huang Panasonic
* [V] Lei Wang Futurewei/Huawei
* [V] Leif Wilhelmsson Ericsson
* [V] Li-Hsiang Sun interdigital
* [V] Lily Lv Huawei
* [v] Liwen Chu NXP
* [V] Mao Yu NXP
* [V] Menzo Wentink Qualcomm
* [V] Miguel Lopez Ericsson
* [V] Ming Gan Huawei
* [V] Minyoung Park Intel Corp.
* [V] Mohamed Abouelseoud Sony
* [V] Oded Redlich Huawei
* [V] Oren Kedem Huawei
* [V] osama aboul-magd Huawei
* [V] Pascal VIGER Canon
* [V] Patrice NEZOU Canon
* [V] paul cheng MediaTek
* [V] Payam Torab Facebook
* [V] Po-Kai Huang Intel
* [V] Pooya Monajemi Cisco
* [V] R.Y. Kim KNUT
* [V] Reza Hedayat Charter
* [V] Richard van Nee Qualcomm
* [V] Robert Stacey Intel
* [V] Rojan Chitrakar Panasonic
* [v] Rolf de Vegt Qualcomm
* [V] Ross Jian Yu Huawei
* [V] Rui Cao NXP
* [V] Rui Yang InterDigital
* [V] Sang Kim LGE
* [V] Sebastian Max Ericsson
* [V] Shimi Shilo Huawei
* [V] Sigurd Schelstraete Quantenna/ON Semiconductor
* [V] Stephane Baron Canon
* [V] Steve TS Yang MediaTek
* [V] Subir Perspecta Labs
* [V] Sudhir Srinivasa [NXP]
* [V] Taewon Song LGE
* [V] Thomas Handte Sony
* [V] Tianyu Wu Apple
* [V] Vinko Erceg
* [V] VK Jones
* [V] Wei Lin Huawei
* [V] Wookbong Lee Samsung
* [V] Xiaofei Wang InterDigital
* [V] Xiaogang Chen Intel
* [V] Yan Xin Huawei
* [V] Yan ZhangNXP
* [V] Yang Bo Huawei
* [V] Yasuhiko Inoue, NTT
* [V] Yong Liu Apple
* [V] Yonggang Fang ZTE TX
* [V] Yongho Seok MediaTek
* [V] YongjiangJohn yi Futurewei
* [V] Yoshio Urabe Panasonic
* [V] Youhan Kim Qualcomm
* [V] Yujin Noh Newracom
* [V] Yunbo Li Huawei Technologies
* [V] Yusuke Tanaka Sony
* [v]dongxiandong-xiaomi
* [V]Gaurav Patwardan HPE
* [V]Guogang Huang Huawei
* [V]Jarkko Kneckt Apple
* [V]Manish Kumar nxp\_
* [V]Mengyao Ma Huawei
* [V} Prabodh Varshney Nokia
* [V} Zhou Lan Broadcom
* An Nguyen DHS
* Başak Özbakış Vestel
* Ben Rolfe
* David Boldy
* Frank
* Kiran Rege
* Liuming Lu ZTE
* Naseem Khan
* Qi Wang Apple
* Sai Cypress
* Silvana Rodrigues Huawei
* Stefano Avallone
* Ushasi.Ghosh

1. Announcements:
   1. none
2. Motions for today can be found in <https://mentor.ieee.org/802.11/dcn/20/11-20-0841-09-00be-tgbe-motions-list-for-teleconferences.pptx>

**Motions**

1. **Motion 115**
   * **Move to add to the 11be SFD, candidate specification text in 11-20/566r32 that is identified with the following tags:**
   * SP56, SP57, SP58, SP59, SP60, SP61, SP62, SP63, SP64, SP65, SP66, SP67, SP68, SP69, SP70, SP71, SP72, SP73, SP74, SP75, SP76, SP77, SP78, ~~SP79,~~ SP80, SP81, SP82, SP83, SP84, SP85, SP86, SP87, SP88, SP89, SP90, SP91, SP92, SP93, SP94, SP95, SP96, SP97, SP98, SP99, SP100, SP101, SP102.

Move: Edward Au

Second: Rojan Chitrakar

Discussion:

none

Motion approved by unanimous consent

1. **Motion 116**

**Move to add to the TGbe SFD:**

* + TGbe supports the below pilot indices for 26/52/106/242/484RU in 80/160/320MHz PPDU
    - In a OFDMA/non-OFDMA with puncturing 80MHz EHT PPDU
      * [Pilot indices in 40MHz]-256, [Pilot indices in 40MHz]+256
    - In a OFDMA/non-OFDMA with puncturing 160MHz EHT PPDU
      * [Pilot indices in 80MHz]-512, [Pilot indices in 80MHz]**+**512
    - In a OFDMA/non-OFDMA with puncturing 320MHz EHT PPDU
      * [Pilot indices in 160MHz]-1024, [Pilot indices in 160MHz]+1024

Move: Bin Tian

Second: Edward Au

Discussion:

none

Motion approved by unanimous consent

1. **Motion 117**

**Move to support a staged feature development to support latency sensitive applications as following**

* **Release 1:**
  + A basic framework under multi-link operation framework that includes link management and QoS provisioning
  + Channel access optimization/design for low latency
* **Release 2:**
  + Extend to support multi-BSS coordination for low latency
  + Any additional features (including additional channel access improvements)
* **Notes**
  + Channel access improvement for low latency implies more predictable channel access
  + R1 can include any other essential components to make the framework functional.
  + Whether to introduce different mechanisms for different classes of low-latency applications is TBD

Move: Chunyu Hu

Second: Matthew Fischer

Discussion:

C: agree with the idea of reducing latency and providing mechanisms in the amendment to support that goal, but the motion is not specific enough, represents a blank check, making a mistake that was made earlier, this is premature

R: specific proposals have been made and discussed within the group, detail has been provided

C: request for SP results that brought this motion

R: yes, it is possible

C: agree that latency reduction is important, not specific enough, not suitable for R1

R: members ask whether any proposal applies to R1 or R2, general concept is provided first, and details emerge later as part of further discussion, latency has been part of MLO proposals, but specific goals need to be extracted from that concept and addressed separately

C: similar sentiment with respect to the need for lower latency, but similar concern about non-specificity, noting that there is no proposed change to the SFD as part of this motion

R: supplying an outline or framework and with the timeline specified, we can fill in the details on that schedule, MBSS coordination R2, basic mechanisms in R1, but keep scope limited, the purpose here is to provide a guideline for what would be addressed in R1 v R2

C: prefer to see specific features named in the motion with references to R1 and R2

C: channel access is a topic of continual discussion, channel access is not a feature, STR, non-STR, asynch v synch, this is all channel access, should be labeled as a managed and packaged feature, group has the skills to judge every contribution on channel access and decide whether the contribution should be in the spec and R1 or R2, goal of this motion is to not disallow contributions because they are related to channel access

Preliminary result:

Y 50

N 37

A 32

1. **Motion 118**

**Move to amend the TGbe SFD in the respective figures as proposed in slides 3, 4, and 5, and in the respective paragraphs as proposed in slides 6, 7, and 8 of document 11-20/955r1?**

Move: Bin Tian

Second: Wook Bong Lee

Discussion:

none

Motion approved by unanimous consent

**Deferred Straw Polls**

1. **11-20-0813r6:**

[**https://mentor.ieee.org/802.11/dcn/20/11-20-0813-06-00be-triggered-p2p-transmissions-follow-up.pptx**](https://mentor.ieee.org/802.11/dcn/20/11-20-0813-06-00be-triggered-p2p-transmissions-follow-up.pptx)

SP discussed by Stephane Baron (Canon)

C: have previously expressed views that trigger frame for this purpose is a step too far, already have RDG and such for single use SU PPDU triggering, trigger today for HE TB PPDU, except that MU RTS can trigger an SU PPDU, using the trigger frame in another way makes more sense for coordinated AP use, within a single BSS, to change the trigger format and response for P2P is unnecessary or from a cost benefit analysis, the gain is not worth the complexity

R: as you yourself noted, already can be used for MU RTS, AP knows how to handle SU PPDU after trigger, we want to reuse the existing format, make minimal changes, not addingn or subtracting fields, the cost in the cost-benefit analysis is not high

C: RU allocation is a key item in the trigger frame, what is the problem with RDG?

R: can reverse - what is the advantage of using RDG? we are already using the trigger, because no one is using RDG, that would require changes, whereas trigger is already supported

C: similar view, signaling, can consider existing mechanism in 11ah have similar concept, we have QTP which could address P2P, this is a definition of a new channel access mechanism, should be for R2

R: no strict reservation for resource with any existing mechanism, this proposal provides a specific time allocation

C: no simulation results

C: not clear whether this is within BSS or can peer be associated to a different BSS?

R: the proposal does not make any requirements for the second peer - only the STA being given the allocation is affiliated with the granting AP

C: SFD defines mechanism for sharing P2P exchange, R1 v R2 TBD, prefer R2, which allows additional time for refinement

SP

* **Do you support that 11be defines in R1, a procedure for an AP to share a part of the obtained TXOP for peer-to-peer (non-AP STA to non-AP STA) frame exchanges by signaling in a trigger frame, a TBD field specifying the allocated time for the peer to peer communication, and an RU allocated only to one non-AP STA associated to that AP.**

* **Note :** 
  + Format of trigger frame is TBD.
  + Informing the AP of P2P traffic required resource, may be based on any existing mechanism (e.g. BSR on per packet level, TSPEC at stream level, or any TBD channel access/TWT/scheduling mechanism.)
  + Peer STA may not be allowed to use EDCA for some time for P2P transmissions after being triggered (e.g., by extending MU-EDCA rules).

Result:

Y: 53

N: 39

A: 53

1. **11-20-0123r1:**

[**https://mentor.ieee.org/802.11/dcn/20/11-20-0123-01-00be-channel-sounding-for-multi-ap-cbf.pptx**](https://mentor.ieee.org/802.11/dcn/20/11-20-0123-01-00be-channel-sounding-for-multi-ap-cbf.pptx)

SP discussed by Xiaogang Chen (Intel)

C: how is AID set for OBSS?

R: details are TBD

C: MAP coord set question, if any AP sends trigger, but STA does not know if the AP is in the set, then how does the STA know to whom to respond? which triggers to respond to?

R: details are TBD, there have been some discussions about how to form the AP set

C: does NDPA from each AP carry same information

R: each AP can put different client information in the frame

C: NDPA includes STA info fields, for my BSS and OBSS STA, NDPA might be different for each AP, but needs to be the same, right?

R: report is independent per AP, SP3 seems unneeded because SP1 passed

C: not harmful

R: does CSi report include compressed BF report? in 11ax does not include

C: no, in 11ax, CSi does include cBF

R: sounding for OBSS polling of FB for R1, right?

C: yes

R: would be helpful to add that to the SP

SP

* In sequential channel sounding sequence for multi-AP, do you support:
  + STA can process the NDPA frame and the BFRP Trigger frame received from OBSS AP
  + If polled by the BFRP trigger frame from OBSS AP, the STA responds with the corresponding channel state information (CSI) to OBSS AP

Note 1: the details of CSI report are TBD.

Note 2: the OBSS AP belongs to the multi-AP set serving the STA and the details regarding formulation of the multi-AP set are TBD.

Note 3: This feature is for R2

Result:

Y: 65

N: 3

A: 67

**Technical submissions**

1. **11-20-0617r2:**

[**https://mentor.ieee.org/802.11/dcn/20/11-20-0617-02-00be-multi-ap-operation-basic-definition.pptx**](https://mentor.ieee.org/802.11/dcn/20/11-20-0617-02-00be-multi-ap-operation-basic-definition.pptx)

PPT discussed by Oren Kedem (Huawei)

C: if APs have different admission control requirements, then how is this coordinated among the APs?

R: any information that is needed to correctly coordinate can be delivered during setup phase, and changes during operation should be indicated to allow coordination set changes/modifications, i.e. dynamic adjustment would be included

C: agree with the concept of establishing a coord AP set, do not need three candidates, do not believe that we want specific group formation procedure, this is implementation specific and should remain flexible

R: you first proposed the candidate set formation, and we agree with that, and believe that a definition is required, having 3 candidate sets v 1 set, AP might want to have different sets for different purposes

C: that’s fine, AP3 does not have to do anything with AP1 or AP2, it can decide what to do as it pleases

R: when there is a large number of APs, then we need to limit the sets, otherwise management becomes too large, need to define some specific procedures, otherwise interoperability and expected performance of the feature are unreliable

C: m-AP set is a list of shared and sharing AP, and you are just providing a name to that group

R: if there is more than one operational/coordination scheme, then there need to be specific, defined sets of APs each of which might employ different operational schemes

C: different STA support different triggers, but we do not create different groups, e.g. CBF, CSR, COFDMA, divide time on the air, no need for explicit groups

R: operation set is a dynamic group, created just before the TXOP, after the TXOP no longer valid, a new one is defined at the next TXOP - it is just a name for the set that is participating in the current TXOP

1. **11-20-0674r1:**

[**https://mentor.ieee.org/802.11/dcn/20/11-20-0674-01-00be-forward-compatible-ofdma.pptx**](https://mentor.ieee.org/802.11/dcn/20/11-20-0674-01-00be-forward-compatible-ofdma.pptx)

PPT discussed by Xiaogang Chen (Intel)

Previously presented in PHY adhoc, felt the need for MAC review, hence, bringing it into this call for review by MAC interested members

C: agree with concept, mixed TX of HE and EHT, for future, prefer to mandate how to TX only when we are creating the future standard - we do not need to define the future today

R: cannot mandate anything, but can try to make it future proof

C: slide 5, switching time, might not be able to do this in time - HE might need to be 160, maybe can do 80, but need discussion

R: agree

C: slide 5, not limited to DL or UL, can be used for both, figure is UL only

C: similar, HE and EHT BW, if HE and EHT structures are transmitted within 160, legacy preambles are different and existing HE STA might have a problem

C: switching for wideband STA can be fast, but is there value of this feature for a wideband STA?

R: might be some situations for mix

C: on SP, would prefer to acknowledge HE + EHT BW needs more discussion

C: this is really for forward and backward compatibility

R: if can do something simple to include HE, why not?

C: orthogonality between channels probably not possible

C: slide 5, DL announcement moving STAs to non-primary, will this be DUP on entire 320?

C: slide 5, this is mixed, so legacy OBSS on secondary 160 or S80, how to deal with legacy OBSS?

R: how is announcement sent

C: how does AP know that announcement was received and STA is moving to S160? do we need an ACK of some sort?

R: not an expert, this is why we want to have MAC review, details not yet determined

C: MAC not straightforward, we have TWT to help, semi-static, periodic, re-alignment to secondary, packet by packet scheme is difficult to do

R: we are not targeting packet by packet, as the signaling overhead would be significant

C: we like this for the case of narrow STAs, e.g. 80 only, SST and TWT are optional, no SST implementation exists today that I am aware of, need more than just SST on AP and STA to make this work, need more discussion on how to make this work

C: what is granularity, e.g. any RU or 20 MHz, should be >= 20 MHz, need clarification, prefer to have this in the SP, also time granularity, one PPDU or more? generally in favor of concept, but want more detail/clarification

R: in response to previous comment, I added BW consideration to the SP, now adding additional item to SP, for indication that it is one or more PPDU

C: post-11be, what future designs will be, pilots, interleaver, etc, something new will be created, can we be more careful about how to design this mechanism to allow for such future changes

R: we share that goal

C: what is the benefit? seems complicated at the MAC

R: my home has 11ax, one 80 MHz device, my phone, AP is 160, so only using ½ of BW, so if can mix, then AP can still use 160 and to more full utilization

C: slide 7, mention per 80 SIG and puncture, only for HE 80?

R: not limited, can do 2x 80 to get 160

C: SP comment: similar SP passed in PHY, on APPDU, HE + EHT, so what is new here?

R: adds MAC

C: can you remove “for now” from the last bullet?

R: ok

C: do not understand the details here, prefer to just have the concept discussed, and in that case, we already have a previously passed SP, APPDU with HE + EHT, so this is not needed, what we need is the details of the MAC operation, not certain what is meant by orthogonal PPDU, for example

R: question of granularity is not covered by existing passed SP, so it is needed in this SP

R: one or more PPDU or orthogonal PPDU bullet of SP, can also be removed

C: similar to previous comments on passed SP

C: 11be should be built to support design which allows multiplexing of STAs, but cannot be built to support future amendments, since we do not yet know what those are

R: ok

C: similar to others, previously passed SP already covers this concept

C: post-EHT STA, not clear

C: SP should not say “may”, instead use TBD, we cannot predict the future

R: that’s why I say “may”

1. **11-20-0548r1:**

[**https://mentor.ieee.org/802.11/dcn/20/11-20-0548-01-00be-discussion-on-coordinated-ul-mu-mimo.pptx**](https://mentor.ieee.org/802.11/dcn/20/11-20-0548-01-00be-discussion-on-coordinated-ul-mu-mimo.pptx)

PPT discussed by Gnadiy Tsodik (Huawei)

C: co-UL MU MIMO, joint receiver is complicated, need synchronization among APs, and for UL MU MIMO, very difficult, for AP joint receive, this is complicated, any simulation or consideration of the implication of imperfect synchronization and the impact on the proposal?

R: do not recall if these results include some synch error or not, but this is different from existing non-co UL MU MIMO, in that case, you need to receive all information because you are the receiver of everything, but for this scheme, some of the information is intended for other APs, so you do not need to receive it

R: accurate time synch is not needed, as all of your sources are using your CP, then you can have antennas to capture information from all of your sources, not same level as required for joint TX using BF, RX side BF requires less complexity, some complexity needed, but not worse than existing UL MU MIMO complexity

C: how do you do time, freq, power correction among the APs? If you meet the values for one AP, you cannot achieve them for another AP

R: the trigger frame is from one AP, so everything is synchronized to that one AP

Discussion ended due to meeting time limit

**13:01 Meeting adjourned.**

# Appendix 1

Here are the Motion results for joint telco Thursday 11 June 2020.

Motion 111: Approved by unanimous consent.

Motion 112: Approved by unanimous consent.

1.Motion 113: Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags: SP28

A.YES ~~69/182 ( 38%)~~  after update: **66**

B.NO ~~20/182 ( 11%)~~ after update: **19**

C.ABSTAIN ~~38/182 ( 21%)~~ after update: **35**

No Answer 55/182 ( 30%)

A B C

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[V]XIANDONG DONG(XIAOMI) | | X | |

[V] Carol Ansley (CommScope) | | | X |

[V] Jim Lansford (Qualcomm) | X | | |

Subir | X | | | [AA] Counted. Voter. IDed as Subir Das, Perspecta Labs, ExOfficio.

[V] Abhishek Patil (Qualcomm) | X | | |

[V] Yujin Noh (Newracom) | X | | |

[V] Girish Madpuwar (Broadcom) | X | | |

[V] Chao-Chun Wang (MediaTek) | | | X |

[V] Rui Yang (InterDigital) | | | X |

[V] Duncan Ho (Qualcomm) | X | | |

[V] osama aboul-magd ( Huawei) | | X | |

[V] Sang Kim (LGE) | X | | |

[V]Jarkko Kneckt (Apple) | X | | |

[V] Bin Tian (Qualcomm) | X | | |

[V] Lei Wang (Futurewei/Huawei) | | | X |

[V] Po-Kai Huang (Intel) | X | | |

[V] Li-Hsiang Sun (interdigital) | | | X |

[V] Wookbong Lee (Samsung) | X | | |

[V] Junghoon Suh (Huawei) | | X | |

[V] Chunyu Hu (FB) | | | X |

[V] Yan Xin (Huawei) | | X | |

[V] laurent cariou, Intel | X | | |

[V] Song H An (Independent) | | | X |

[V] Ryuichi Hirata (Sony) | | | X |

[V] Carl Kain (USDOT/Noblis) | | | X |

[V] Lily Lv (Huawei) | | X | |

[V] Huizhao Wang (Quantenna/ON Semi) | X | | |

[V] Ming Gan (Huawei) | | X | |

[V] dibakar das (Intel) | X | | |

[V] Youhan Kim (Qualcomm) | X | | |

[V] Chittabrata Ghosh (Intel) | | | X |

[V] Sindhu Verma (Broadcom) | X | | |

[V] Jinjing Jiang (Apple) | X | | |

David Xun Yang (Huawei) | | X | | [AA] Counted. Voter.

[V] Insun Jang (LGE) | X | | |

[V] Lei Huang (Panasonic) | | | X |

[V] Jinsoo Choi (LGE) | X | | |

[V] Steve TS Yang (MediaTek) | X | | |

[V] Kazuto Yano (ATR) | X | | |

[V] Taewon Song (LGE) | | | X |

~~[A] Sungjin Park (LGE) | X | | |~~ [AA] Not Counted. Aspirant voter.

Yusuke Tanaka | | | X | [AA] Counted. Voter.

[V] Dandan Liang (Huawei) | | X | |

[V] James Yee, MediaTek | X | | |

~~[N] Zhiqiang Han(ZTE) | | | X |~~  [AA] Not Counted. Non-voter.

[V] Kosuke Aio (Sony) | X | | |

[V] Jeongki Kim (LG Electronics) | | | X |

~~[P] Yifan Zhou (Huawei) | | X | |~~ [AA] Not Counted. Potential voter.

[V] Yoshio Urabe (Panasonic) | | | X |

[V] Ronny Yongho Kim (KNUT) | | | X |

[V]Chenhe Ji (Huawei) | | X | |

[V] Akira Kishida (NTT) | | | X |

[V] Yasuhiko Inoue (NTT) | X | | |

[V] Yang Bo (Huawei) | | X | |

[V] Ross Jian Yu (Huawei) | | X | |

[V] sachin godbole (broadcom) | X | | |

[V] Stephane Baron (Canon) | | | X |

[V] Oren Kedem (Huawei) | | X | |

[V] Patrice NEZOU (Canon) | | | X |

[V] Dennis Sundman (Ericsson) | X | | |

[V] Evgeny Khorov (IITP RAS) | | | X |

[V] Genadiy Tsodik (Huawei) | | X | |

[V] Allert van Zelst (Qualcomm) | X | | |

[V] Oded Redlich (Huawei) | | X | |

[V] Arik Klein (Huawei) | | | X |

[V] Albert Bredewoud (Broadcom) | X | | |

[V] Massinissa Lalam (Sagemcom) | | | X |

[V] Pascal VIGER (Canon) | | | X |

~~[NV] Hanadi Salman (IMU, VESTEL) | X | | |~~ [AA] Not Counted. Non-voter.

[V] Edward Au (Huawei) | X | | |

[V] Rui Cao (NXP) | X | | |

[V] Bill Carney (Sony) | X | | |

[V] Sigurd Schelstraete (ON/Quantenna) | | | X |

[V] Jianhan Liu (Meditak Inc.) | X | | |

[V] Rethna Pulikkoonattu (Broadcom) | X | | |

[V] Yongho Seok (MediaTek) | | | X |

[V] Matthew Fischer {Broadcom} | X | | |

[V] Mohamed Abouelseoud (Sony) | | | X |

[V] Yong Liu (Apple) | X | | |

[V] Jon Rosdahl (Qualcomm) | X | | |

[BRCM] kiwin | X | | | [AA] Counted. IDed as [V] Stephen Palm, Broadcom.

[V] Ron Porat (Broadcom) | X | | |

[V] Cheng Chen (Intel) | X | | |

[V] Srinivas Kandala (Samsung) | X | | |

[V] paul cheng (MediaTek) | X | | |

[v] Rolf de Vegt (Qualcomm) | X | | |

Qi Wang | X | | | [AA] Counted. Voter.

[V] Sudhir Srinivasa [NXP] | X | | |

[V] Robert Stacey (Intel) | X | | |

[V] Hanseul Hong (Yonsei Univ.) | | | X |

[V] Thomas Pare (Mediatek) | X | | |

[V] Thomas Derham | X | | |

[V] Jason Yuchen Guo (Huawei) | | X | |

~~[P]Chenchen LIU(Huawei) | | | X |~~ [AA] Not Counted. Potential voter.

HanGyu Cho (LGE) | | | X | [AA] Counted. Voter.

~~[N] Namyeong Kim (LGE) | | | X |~~ [AA] Not Counted. Non-voter.

[V] Yunbo Li (Huawei Technologies) | | X | |

~~[P]Ding Yanyi (Panasonic) | X | | |~~  [AA] Not Counted. Potential voter.

[V] Dongguk Lim (LGE) | X | | |

[V]Guogang Huang (Huawei) | | X | |

[V] Rojan Chitrakar (Panasonic) | | | X |

[V] Minyoung Park (Intel Corp.) | X | | |

[V]Manish Kumar (nxp)\_ | | | X |

[V] Shimi Shilo (Huawei) | | X | |

[V] Yanjun Sun (Qualcomm) | X | | |

[V] Gaurav Patwardhan (HPE) | | | X |

[V] Sharan Naribole (Samsung) | X | | |

[V] Peyush Agarwal (Broadcom) | X | | |

[V] George Cherian (Qualcomm) | X | | |

[V] Mao Yu (NXP) | X | | |

[V] Tianyu Wu (Apple) | X | | |

[V] Paul Strauch (Qualcomm) | X | | |

[V] Chris Young (Broadcom) | X | | |

[V] Xiaogang Chen (Intel) | X | | |

[V] Yan Zhang (NXP) | | | X |

[V] Payam Torab (Facebook) | X | | |

[V] Nehru Bhandaru {Broadcom} | X | | |

[V] Sameer Vermani (Qualcomm) | X | | |

[V] Noel Stott (Keysight Technologies) | X | | |

[V] Miguel Lopez (Ericsson) | | | X |

[V] Xiaofei Wang (InterDigital) | | | X |

[V] Shubhodeep Adhikari (Broadcom) | X | | |

[V] Lili Hervieu (CableLabs) | | | X |

[V] Vinko Erceg | X | | |

[V] Reza Hedayat (Charter) | | X | |

[v] Prabodh Varshney (Nokia) | X | | |

1. Motion 114: Move to add to the 11be SFD candidate specification text in 11-20/566r28 that is identified with the following tags: SP5

A.YES ~~71/179 ( 40%)~~ after update: **70**

B.NO ~~23/179 ( 13%)~~ after update: **21**

C.ABSTAIN ~~27/179 ( 15%)~~ after update: **25**

No Answer 58/179 ( 32%)

A B C

--------------------------------------------------------

[V} Zhou Lan (Broadcom) | X | | |

[V]XIANDONG DONG(XIAOMI) | | X | |

[V] Carol Ansley (CommScope) | | | X |

[V] Jim Lansford (Qualcomm) | X | | |

Subir | X | | | [AA] Counted. Voter. IDed as Subir Das, Perspecta Labs, ExOfficio.

[V] Abhishek Patil (Qualcomm) | X | | |

[V] Yujin Noh (Newracom) | | | X |

[V] Girish Madpuwar (Broadcom) | X | | |

[V] Chao-Chun Wang (MediaTek) | X | | |

[V] Rui Yang (InterDigital) | | X | |

[V] Duncan Ho (Qualcomm) | X | | |

[V] osama aboul-magd ( Huawei) | | X | |

[V] Sang Kim (LGE) | | | X |

[V]Jarkko Kneckt (Apple) | X | | |

[V] Bin Tian (Qualcomm) | X | | |

[V] Lei Wang (Futurewei/Huawei) | X | | |

[v] Liwen Chu(NXP) | X | | |

[V] Po-Kai Huang (Intel) | X | | |

[V] Li-Hsiang Sun (interdigital) | | | X |

[V] Wookbong Lee (Samsung) | X | | |

[V] Junghoon Suh (Huawei) | | X | |

[V] Chunyu Hu (FB) | | | X |

[V] Yan Xin (Huawei) | | X | |

[V] laurent cariou, Intel | X | | |

[V] Song H An (Independent) | | | X |

[V] Ryuichi Hirata (Sony) | X | | |

[V] Lily Lv (Huawei) | | X | |

[V] Huizhao Wang (Quantenna/ON Semi) | X | | |

[V] Ming Gan (Huawei) | | X | |

[v] kaiying lu (MediaTek) | X | | |

[V] dibakar das (Intel) | X | | |

[V] Youhan Kim (Qualcomm) | X | | |

[V] Chittabrata Ghosh (Intel) | | | X |

[V] Sindhu Verma (Broadcom) | X | | |

[V] Jinjing Jiang (Apple) | X | | |

[V] Insun Jang (LGE) | X | | |

[V] Jinsoo Choi (LGE) | X | | |

[V] Kazuto Yano (ATR) | X | | |

[V] Taewon Song (LGE) | X | | |

~~[A] Sungjin Park (LGE) | X | | |~~ [AA] Not Counted. Aspirant Voter.

~~[N] Masatomo OUCHI | | | X |~~ [AA] Not Counted. Non-voter.

Yusuke Tanaka | | | X | [AA] Counted. Voter.

[V] Dandan Liang (Huawei) | | X | |

[V] James Yee, MediaTek | X | | |

[V] Kosuke Aio (Sony) | X | | |

[V] Jeongki Kim (LG Electronics) | | | X |

~~[P] Yifan Zhou (Huawei) | | X | |~~ [AA] Not Counted. Potential Voter.

[V] Yoshio Urabe (Panasonic) | | | X |

[V]Chenhe Ji (Huawei) | | X | |

[V] Akira Kishida (NTT) | | | X |

[V] Yang Bo (Huawei) | | X | |

[V] Ross Jian Yu (Huawei) | | X | |

[V] sachin godbole (broadcom) | X | | |

[V] Stephane Baron (Canon) | X | | |

[V] Oren Kedem (Huawei) | | X | |

[V] Patrice NEZOU (Canon) | X | | |

[V] Dennis Sundman (Ericsson) | | | X |

[V] Allert van Zelst (Qualcomm) | X | | |

[V] Oded Redlich (Huawei) | | X | |

[V] Arik Klein (Huawei) | | X | |

[V] Albert Bredewoud (Broadcom) | X | | |

[V] Massinissa Lalam (Sagemcom) | | | X |

[V] Pascal VIGER (Canon) | X | | |

[V] Edward Au (Huawei) | | | X |

[V] Steve Shellhammer (Qualcomm) | X | | |

[V] Eunsung Park (LGE) | X | | |

[V] Rui Cao (NXP) | | | X |

[V] Sigurd Schelstraete (ON/Quantenna) | | | X |

[V] Jianhan Liu (Meditak Inc.) | X | | |

[V] Rethna Pulikkoonattu (Broadcom) | X | | |

[V] Yongho Seok (MediaTek) | X | | |

[V] Matthew Fischer {Broadcom} | X | | |

[V] Mohamed Abouelseoud (Sony) | | | X |

[V] Yong Liu (Apple) | | | X |

[V] Jon Rosdahl (Qualcomm) | X | | |

[V] Ron Porat (Broadcom) | X | | |

Saishankar Nandagopalan | X | | | [AA] Counted. Voter.

[V] Cheng Chen (Intel) | X | | |

[V] Srinivas Kandala (Samsung) | X | | |

[V] paul cheng (MediaTek) | X | | |

[V] Pooya Monajemi (Cisco) | X | | |

[v] Rolf de Vegt (Qualcomm) | X | | |

[V] Robert Stacey (Intel) | X | | |

[V] Hanseul Hong (Yonsei Univ.) | | X | |

[V] Thomas Pare (Mediatek) | X | | |

[V] Eugene Baik (Qualcomm) | X | | |

[V] Jason Yuchen Guo (Huawei) | | X | |

~~[P]Chenchen LIU(Huawei) | | X | |~~ [AA] Not Counted. Potential Voter.

HanGyu Cho (LGE) | | | X | [AA] Counted. Voter.

[V] Yunbo Li (Huawei Technologies) | | X | |

~~[P]Ding Yanyi (Panasonic) | | | X |~~ [AA] Not Counted. Potential Voter.

[V] Dongguk Lim (LGE) | X | | |

[V]Guogang Huang (Huawei) | | X | |

[V] Rojan Chitrakar (Panasonic) | X | | |

[V] Minyoung Park (Intel Corp.) | X | | |

[V]Manish Kumar (nxp)\_ | | | X |

[V] Shimi Shilo (Huawei) | | X | |

[V] Naveen Kakani (Qualcomm) | X | | |

[V] Yanjun Sun (Qualcomm) | X | | |

[V] Gaurav Patwardhan (HPE) | X | | |

[V] Sharan Naribole (Samsung) | X | | |

[V] Peyush Agarwal (Broadcom) | X | | |

Dave Cavalcanti | X | | | [AA] Counted. Voter.

[V] VK Jones | X | | |

[V] George Cherian (Qualcomm) | X | | |

[V] Xin Zuo -- Tencent | | | X |

[V] Mao Yu (NXP) | X | | |

[V] Tianyu Wu (Apple) | | | X |

[V] Paul Strauch (Qualcomm) | X | | |

[V] Chris Young (Broadcom) | X | | |

[V] Xiaogang Chen (Intel) | | | X |

[V] Yan Zhang (NXP) | | | X |

[V] Payam Torab (Facebook) | | | X |

[V] Nehru Bhandaru {Broadcom} | X | | |

[V] Sameer Vermani (Qualcomm) | X | | |

[V] Noel Stott (Keysight Technologies) | X | | |

[V] Miguel Lopez (Ericsson) | X | | |

[V] Xiaofei Wang (InterDigital) | | X | |

[V] Shubhodeep Adhikari (Broadcom) | X | | |

[v] Prabodh Varshney (Nokia) | X | | |

[V] Joseph Levy (InterDigital) | | X | |