IEEE P802.11  
Wireless LANs

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| **Compendium of straw polls and**  **potential changes to the Specification Framework Document** | | | | |
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Abstract

This document summarizes all the straw polls conducted since the end of the January 2020 interim, and the potential changes to the Specification Framework Document (19/1262r15). For reference, all passed motions in the Specification Framework Document (19/1262r15) are highlighted in grey.

Note to the readers:

* The straw poll results of the PDT texts are documented in 20/0997
* The list of straw polls conducted is shown in section 14.
  + Results highlighted in green means that the results of the straw polls exceed 75%.
  + Results highlighted in red means that the results of the straw polls were below 75%.
  + Results highlighted in blue are the straw polls that were run for information only.
* The potential changes to the Specification Framework Document because of the passed straw polls are highlighted in yellow in sections 1-13.
* SFD text contributions that do not have a request for further discussion, since the respective announcement and up to the end of the subsequent Joint conf call, are marked in green.
* SFD text contributions that do have a request for further discussion will be added as an item for discussion in the subsequent Joint conf call, if the straw poll passes then the respective text will be marked in green.

# Revision history

|  |  |  |
| --- | --- | --- |
| Revision | Date | Changes |
| 0 | April 2, 2020 | Initial version |
| 1 | April 3, 2020 | Added the straw poll results of the MAC ad-hoc call on March 30, 2020, and joint call on April 2, 2020. Updated the text in sections 6.5 and 9.4 according to the passed straw polls. |
| 2 | April 8, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 6, 2020. Updated the text in section 2.4.2 according to the passed straw polls. |
| 3 | April 10, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 9, 2020. Updated the text in section 2.4.2 according to the passed straw polls. |
| 4 | April 14, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 13, 2020. Updated the text in sections 2.2.1, 2.4.2, 2.4.3, and 2.6 according to the passed straw polls. |
| 5 | April 14, 2020 | Updated the straw poll text and the potential change to section 2.4.3 as per the discussion in the email reflector:  <http://www.ieee802.org/11/email/stds-802-11-tgbe/msg00750.html> |
| 6 | April 16, 2020 | Changed the highlight of the passed straw polls from grey to yellow, and added the unique tag “SP” to each of the passed straw polls, according to page 41 of the agenda slide deck <https://mentor.ieee.org/802.11/dcn/20/11-20-0425-25-00be-2020-mar-may-tgbe-teleconference-agendas.docx>. |
| 7 | April 18, 2020 | Added the straw poll results of the Joint call on April 16, 2020, and the MAC ad-hoc call on April 17, 2020. Updated the text in section 6.5 according to the passed straw polls. |
| 8 | April 22, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 20, 2020, and the results of two PHY-related straw polls conducted in the January 2020 interim meeting (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg00778.html>). Updated the text in sections 2.4.1 and 2.5 according to the passed straw polls. |
| 9 | April 24, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 23, 2020. Updated the text in sections 2.3.3, 2.4.3 and 6.2 according to the passed straw polls. |
| 10 | April 26, 2020 | Added the straw poll results of the MAC ad-hoc call on April 24, 2020. Updated the text in section 6.5 according to the passed straw polls. |
| 11 | April 28, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on April 27, 2020. Updated the text in sections 2.3.1, 2.3.2, 2.4.4, 2.4.5, 2.6, and 8.2 according to the passed straw polls. |
| 12 | April 29, 2020 | The 3 straw polls in Section 2.3.1 are essentially slight variants of the same poll. Removed the first two and keep the third one. |
| 13 | April 30, 2020 | Added the straw poll results on the request for candidate SFD texts. Changed all highlight of all passed straw polls up to revision 8 from yellow to green. |
| 14 | May 1, 2020 | Added the straw poll results of the joint call on April 30, 2020. Updated the text in sections 9.3 and 9.5 according to the passed straw polls. Added unique tags “Straw poll #[Number]” and “#SP[Number]# for each of the outstanding passed straw polls since revision 9. |
| 15 | May 5, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on May 4, 2020. Updated the text in sections 2.3.2.2, 2.5, and 6.4 according to the passed straw polls. |
| 16 | May 6, 2020 | Updated the reference of Motion 71 to the contribution 19/1822r4.  Updated the reference of Motion 75 to the contribution 20/0117r1.  Replaced “GLK” with “GTK” in Section 1.  Updated the reference of Straw Poll #26 to the contribution 20/0024r3. |
| 17 | May 8, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on May 7, 2020. Updated the text in sections 2.4.1, 2.4.2, 6.2, and 6.7 according to the passed straw polls. |
| 18 | May 10, 2020 | Added the straw poll results of the MAC ad-hoc call on May 8, 2020. Updated the text in sections 6.2 and 6.6 according to the passed straw polls. |
| 19 | May 13, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on May 11, 2020. Updated the text in sections 2.4.1 and 6.2 according to the passed straw polls. |
| 20 | May 15, 2020 | Added the straw poll result of the Joint call on May 14, 2020. |
| 21 | May 19, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on May 18, 2020. Updated the text in sections 2.2.1, 2.2.2, 2.3.2, 2.4.3, 2.4.5, 3.2, 6.3, 6.7, 6.8, and 8.2 according to the passed straw polls. |
| 22 | May 22, 2020 | Added the straw poll results of the MAC ad-hoc call on May 20, 2020. |
| 23 | May 23, 2020 | Added the straw poll results of the PHY ad-hoc call on May 21, 2020. |
| 24 | May 26, 2020 | Added the straw poll results of the MAC ad-hoc call on May 21, 2020. Updated the text in sections 3.2 and 6.5 according to the passed straw polls. |
| 25 | May 29, 2020 | Added the straw poll results of the MAC ad-hoc call on May 27, 2020, and the joint call on May 28, 2020.  Per the feedback received, all passed motions in the Specification Framework Document (19/1262r9) are highlighted in grey  Changed each green text from the question format to a statement format with track changes being enabled for review. Unique tag is added for each of these green texts. |
| 26 | June 1, 2020 | Changed each yellow text from the question format to a statement format with track changes being enabled for review.  Some of the green texts are updated based on the comments received. Note that all changes are editorial. |
| 27 | June 4, 2020 | Added the straw poll results of the PHY ad-hoc call on June 1, 2020, and the MAC ad-hoc calls on June 1 and June 3, 2020. Updated the text in sections 2.3.2, 2.4.4, 6.2, 6.4, and 6.5 according to the passed straw polls. |
| 28 | June 8, 2020 | Fixed a typo in Straw Poll #48 as per the author’s request (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01136.html>).  Moved Straw Poll #44, Straw Poll #57, and Straw Poll #58 to section 2.4.3.  Added the straw poll results of the PHY and MAC ad-hoc calls on June 4, 2020. Updated the text in sections 2.2.2, 2.3.2.2, 2.3.2.3, 2.3.2.4, 2.3.3, 6.2, and 6.5 according to the passed straw polls. |
| 29 | June 11, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on June 8, 2020. Updated the text in sections 2.4.1, 2.4.3, 2.4.4, 2.6.2, 6.2, and 6.4 according to the passed straw polls. |
| 30 | June 15, 2020 | Fixed a typo in Straw Poll #65 and Straw Poll #76 as per the author’s request (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01230.html>).  Added the straw poll results of the MAC ad-hoc call on June 10, 2020, and the joint call on June 11, 2020. Updated the text in sections 3.4 and 6.2 according to the passed straw polls.  Changed the highlight of Straw Poll #1 to Straw Poll #55 from yellow to green. |
| 31 | June 17, 2020 | Converted all green texts to grey. |
| 32 | June 22, 2020 | Moved Straw Poll #91, Straw Poll #92, and Straw Poll #93 to section 6.2 (a new section on Multi-link discovery)  Moved all contents in section 3.2 to section 12 (a new section on frame format).  Added the straw poll results of the MAC ad-hoc calls on June 15, June 17, and June 18, 2020. Updated the text in sections 6.2, 6.6, and 12.1 according to the passed straw polls. |
| 33 | June 27, 2020 | Reworded Straw Poll #55 to Straw Poll #78 and Straw Poll #80 to Straw Poll #102 from the question format to a statement format with track changes being enabled for review. |
| 34 | June 27, 2020 | Updated the table of Straw Poll #58 as per the author’s request on editorial changes (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01337.html>).  Added the straw poll results of the PHY ad-hoc call on June 22, 2020. Updated the text in section 2.4.3 according to the passed straw polls. |
| 35 | July 1, 2020 | Added the straw poll results of the MAC ad-hoc call on June 22, 2020. Updated the text in sections 6.2 and 6.3 according to the passed straw polls. |
| 36 | July 7, 2020 | Added the straw poll results of the joint call on June 29, 2020, and the PHY and MAC ad-hoc calls on July 2, 2020. Updated the text in sections 2.2.1, 6.8, and 9.2 according to the passed straw polls.  Added Section 6.10 (Quality of service for latency sensitive traffic) as per a member’s request (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01518.html>) and moved Straw Poll #110 to this new section.  Added the missing table in Straw Poll #103. |
| 37 | July 8, 2020 | For Straw Poll #55 to Straw Poll #78 and Straw Poll #80 to Straw Poll #102, changed the highlight from yellow to green.  Added the straw poll results the PHY and MAC ad-hoc calls on July 8, 2020. Updated the text in section 6.1 according to the passed straw polls. |
| 38 | July 9, 2020 | Added the straw poll results of the joint call on July 9, 2020. Updated the text in section 9.1 according to the passed straw polls.  Moved Straw Poll #102 to Section 3.2 (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01603.html>). |
| 39 | July 11, 2020 | Convered all green texts to grey. |
| 40 | July 16, 2020 | Added the straw poll results of the PHY ad-hoc call on July 13, 2020. Updated the text in section 2.4.3 according to the passed straw polls. |
| 41 | July 17, 2020 | Added the straw poll results of the MAC ad-hoc calls on July 13 and July 15, 2020. Updated the text in section 6.2 according to the passed straw polls. |
| 42 | July 18, 2020 | Incorporated the contents of the Straw Polls #103, #104, #105, and #106 to the RU allocation table for members’ review.  Fixed a cross reference for Motion #118. |
| 43 | July 20, 2020 | Added the straw poll results of the MAC ad-hoc calls on July 20, 2020. Updated the text in sections 3.4, 6.11, 12.2, 12.3, and 13.1 according to the passed straw polls. |
| 44 | July 23, 2020 | Moved Straw Polls #128 and #129 to Section 5 per a member’s request (<http://www.ieee802.org/11/email/stds-802-11-tgbe/msg01760.html>).  Reworded Straw Poll #103 to Straw Poll #130 from the question format to a statement format with track changes being enabled for review.  Added the straw poll results of the PHY ad-hoc call on July 20, 2020, and the MAC ad-hoc call on July 22, 2020. Updated the text in section 2.4.3 according to the passed straw polls. |
| 45 | July 24, 2020 | Added the straw poll results of the MAC ad-hoc call on July 24, 2020. Updated the text in section 6.3 according to the passed straw polls. |
| 46 | July 25, 2020 | Added the straw poll results of the PHY ad-hoc call on July 24, 2020. Updated the text in sections 2.4.1, 2.4.2, and 2.4.3 according to the passed straw polls. |
| 47 | July 28, 2020 | Added the straw poll result of the MAC ad-hoc call on July 27, 2020. Updated Figure 2 per the author’s request. |
| 48 | July 29, 2020 | For Straw Polls #103 to #111 and Straw Polls #113 to #130, converted all yellow texts to green.  Added the proposed text change of Straw Poll #112 as per the author’s request (<http://www.ieee802.org/11/email/stds-802-11/msg04678.html>).  Added the straw poll result of the PHY ad-hoc call on July 27, 2020 and the MAC ad-hoc call on July 29, 2020. Updated the text in sections 2.3.2.2, 2.3.3, 2.4.5, 2.5, 2.6.2, 6.7, and 6.8 according to the passed straw polls.  Updated the text corresponding to Figures 2, 3, and 4 as per the author’s request. |
| 49 | July 31, 2020 | Removed the text of Straw Poll #112 from Section 6.8 because of Motion 120.  Added the straw poll result of the joint call on July 30, 2020. Updated the text in section 2.2.2 according to the passed straw poll. |
| 50 | August 1, 2020 | Converted all green texts to grey. |
| 51 | August 3, 2020 | Added the straw poll result of the MAC call on August 3, 2020. Updated the text in sections 6.4.2, 6.6.1, 6.8.4, and 6.8.5 according to the passed straw polls. |
| 52 | August 5, 2020 | Added the straw poll result of the PHY call on August 3, 2020. Updated the text in sections 2.2.1, 2.4.2, and 2.5.3 according to the passed straw polls. |
| 53 | August 6, 2020 | Added the straw poll result of the MAC call on August 5, 2020. Updated the text in section 6.3.1 according to the passed straw poll.  Added the text corresponding to the remaining passed SP of the PHY call on August 3, 2020 into section 2.5.3, after receiving the confirmation from the author. |
| 54 | August 9, 2020 | Added the straw poll results of the MAC and PHY calls on August 6, 2020. Updated the text in sections 2.4.2, and 2.5.3, 6.8.4 according to the passed straw polls. |
| 55 | August 17, 2020 | Reworded Straw Poll #131 to Straw Poll #170 from the question format to a statement format with track changes being enabled for review. |
| 56 | August 19, 2020 | Added the straw poll results of the MAC call on August 17, 2020. Updated the text in section 5.3 according to the passed straw poll.  Merged the text of Straw Polls #134 and #135 with that of Straw Poll #136. |
| 57 | August 20, 2020 | Added the straw poll results of the PHY call on August 17, 2020, and the MAC call on August 19, 2020. Updated the text in sections 2.1.1, 2.3, 2.5.1, 2.6.2, 2.6.3, 2.7.1, 2.8, 6.2.1, and 6.12 according to the passed straw polls. |
| 58 | August 20, 2020 | Converted all green texts to grey.  Removed the text of Straw Poll #169 from Section 2 because of Motion 122. |
| 59 | August 21, 2020 | Added the straw poll results of the Joint call on August 20, 2020. Updated the text in section 9.4 according to the passed straw polls. |
| 60 | August 25, 2020 | Added the straw poll results of the MAC ad-hoc call on August 24, 2020. Updated the text in sections 6.2.2, 6.3.1, and 6.6.3 according to the passed straw polls. |
| 61 | August 27, 2020 | Added the straw poll results of the PHY ad-hoc call on August 24, 2020. Updated the text in section 2.6.2 according to the passed straw polls. |
| 62 | August 28, 2020 | Added the straw poll results of the MAC ad-hoc calls on August 26 and August 27, 2020. Updated the text in sections 3.2.3, 6.3.2, and 6.7 according to the passed straw polls. |
| 63 | September 1, 2020 | Added the straw poll results of the PHY ad-hoc call on August 27, 2020 and the PHY and MAC ad-hoc calls on August 31, 2020. Updated the text in sections 2.2.1, 2.6.3, 6.3.2, and 6.3.4 according to the passed straw polls. |
| 64 | September 2, 2020 | Added the straw poll results of the MAC ad-hoc call on September 2, 2020. Updated the text in sections 3.3, 6.3.2, 6.3.4, and 6.7 according to the passed straw polls.  For Straw Polls #171 to #174 and Straw Polls #176 to #189, converted all yellow texts to green. |
| 65 | September 5, 2020 | Converted all green texts to grey.  Removed the text of Straw Poll #175 from Section 2 because of Motion 127.  Added an additional straw poll of the PHY ad-hoc call on August 31, 2020. Updated the text in section 2.5.1 accordingly.  Added the straw poll result of the Joint call on September 3, 2020. Updated the text in section 9.4 accordingly. |
| 66 | September 10, 2020 | Yujin’s SP on MCS during the PHY ad-hoc call on August 31 is #SP209, rather than #SP208.  Added the straw poll result of the MAC ad-hoc call on September 9, 2020. |
| 67 | September 16, 2020 | Reworded Straw Poll #190 to Straw Poll #209 from the question format to a statement format with track changes being enabled for review. |
| 68 | September 20, 2020 | Converted all green texts to grey.  Removed the text of Straw Poll #198 from Section 3 because of Motion 132. |
| 69 | September 23, 2020 | Added the straw poll results of the MAC ad-hoc call on September 21, 2020. |
| 70 | September 29, 2020 | Added the straw poll results of the PHY ad-hoc calls on September 24 and September 28, 2020, and the result of the MAC ad-hoc call on September 28, 2020. Updated the text in section 2.5.2 accordingly. |
| 71 | Ocotober 7, 2020 | Editoral update. |
| 72 | Ocotober 10, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on October 8, 2020. Updated the text in sections 2.4, 2.6.3, 5.3, and 6.3.2 according to the passed straw polls. |
| 73 | Ocotober 13, 2020 | Added the straw poll results of the PHY and MAC ad-hoc calls on October 12, 2020. |

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[15.33 April 23 (MAC): 5 SPs 93](#_Toc53491678)

[15.34 April 24 (MAC): 3 SPs 94](#_Toc53491679)

[15.35 April 27 (PHY): 12 SPs 95](#_Toc53491680)

[15.36 April 27 (MAC): 2 SPs 98](#_Toc53491681)

[15.37 April 30 (Joint): 3 SPs on requests for candidate SFD texts 98](#_Toc53491682)

[15.38 April 30 (Joint): 3 SPs 99](#_Toc53491683)

[15.39 May 4 (PHY): 3 SPs 100](#_Toc53491684)

[15.40 May 4 (MAC): 8 SPs 101](#_Toc53491685)

[15.41 May 7 (PHY): 6 SPs 103](#_Toc53491686)

[15.42 May 7 (MAC): 7 SPs 104](#_Toc53491687)

[15.43 May 8 (MAC): 4 SPs 105](#_Toc53491688)

[15.44 May 11 (PHY): 1 SP 106](#_Toc53491689)

[15.45 May 11 (MAC): 2 SPs 107](#_Toc53491690)

[15.46 May 14 (Joint): 1 SP 107](#_Toc53491691)

[15.47 May 18 (PHY): 8 SPs 108](#_Toc53491692)

[15.48 May 18 (MAC): 9 SPs 110](#_Toc53491693)

[15.49 May 20 (MAC): 3 SPs 112](#_Toc53491694)

[15.50 May 21 (PHY): 3 SPs 113](#_Toc53491695)

[15.51 May 21 (MAC): 2 SPs 114](#_Toc53491696)

[15.52 May 27 (MAC): 1 SP 114](#_Toc53491697)

[15.53 May 28 (Joint): 1 SP 115](#_Toc53491698)

[15.54 June 1 (PHY): 5 SPs 115](#_Toc53491699)

[15.55 June 1 (MAC): 8 SPs 118](#_Toc53491700)

[15.56 June 3 (MAC): 5 SPs 120](#_Toc53491701)

[15.57 June 4 (PHY): 11 SPs 121](#_Toc53491702)

[15.58 June 4 (MAC): 5 SPs 124](#_Toc53491703)

[15.59 June 8 (PHY): 7 SPs 125](#_Toc53491704)

[15.60 June 8 (MAC): 6 SPs 127](#_Toc53491705)

[15.61 June 10 (MAC): 7 SPs 129](#_Toc53491706)

[15.62 June 11 (Joint): 2 SPs 131](#_Toc53491707)

[15.63 June 15 (MAC): 7 SPs 132](#_Toc53491708)

[15.64 June 17 (MAC): 2 SPs 134](#_Toc53491709)

[15.65 June 18 (MAC): 5 SPs 135](#_Toc53491710)

[15.66 June 22 (PHY): 6 SPs 136](#_Toc53491711)

[15.67 June 22 (MAC): 4 SPs 138](#_Toc53491712)

[15.68 June 29 (Joint): 4 SPs 139](#_Toc53491713)

[15.69 July 2 (PHY): 3 SPs 140](#_Toc53491714)

[15.70 July 2 (MAC): 3 SPs 141](#_Toc53491715)

[15.71 July 8 (MAC): 4 SPs 142](#_Toc53491716)

[15.72 July 9 (Joint): 2 SPs 143](#_Toc53491717)

[15.73 July 13 (PHY): 6 SPs 144](#_Toc53491718)

[15.74 July 13 (MAC): 3 SPs 145](#_Toc53491719)

[15.75 July 15 (MAC): 0 SP 146](#_Toc53491720)

[15.76 July 20 (MAC): 6 SPs 146](#_Toc53491721)

[15.77 July 20 (PHY): 2 SPs 148](#_Toc53491722)

[15.78 July 22 (MAC): 1 SP 149](#_Toc53491723)

[15.79 July 23 (MAC): 2 SPs 149](#_Toc53491724)

[15.80 July 23 (PHY): 12 SPs 150](#_Toc53491725)

[15.81 July 27 (MAC): 1 SP 153](#_Toc53491726)

[15.82 July 27 (PHY): 10 SPs 153](#_Toc53491727)

[15.83 July 29 (MAC): 7 SPs 156](#_Toc53491728)

[15.84 July 30 (Joint): 1 SP 158](#_Toc53491729)

[15.85 August 3 (MAC): 5 SPs 158](#_Toc53491730)

[15.86 August 4 (PHY): 6 SPs 160](#_Toc53491731)

[15.87 August 5 (MAC): 3 SPs 162](#_Toc53491732)

[15.88 August 6 (MAC): 5 SPs 163](#_Toc53491733)

[15.89 August 6 (PHY): 2 SPs 165](#_Toc53491734)

[15.90 August 17 (MAC): 4 SPs 166](#_Toc53491735)

[15.91 August 17 (PHY): 13 SPs 167](#_Toc53491736)

[15.92 August 19 (MAC): 5 SPs 170](#_Toc53491737)

[15.93 August 20 (Joint): 3 SPs 172](#_Toc53491738)

[15.94 August 24 (MAC): 5 SPs 173](#_Toc53491739)

[15.95 August 24 (PHY): 3 SPs 175](#_Toc53491740)

[15.96 August 26 (MAC): 3 SPs 176](#_Toc53491741)

[15.97 August 27 (MAC): 4 SPs 177](#_Toc53491742)

[15.98 August 27 (PHY): 2 SPs 178](#_Toc53491743)

[15.99 August 31 (PHY): 2 SPs 179](#_Toc53491744)

[15.100 August 31 (MAC): 3 SPs 180](#_Toc53491745)

[15.101 September 1 (MAC): 5 SPs 181](#_Toc53491746)

[15.102 September 3 (Joint): 1 SP 182](#_Toc53491747)

[15.103 September 9 (MAC): 1 SP 182](#_Toc53491748)

[15.104 September 10 (PHY): 0 SP 182](#_Toc53491749)

[15.105 September 10 (MAC): 0 SP 183](#_Toc53491750)

[15.106 September 14 (PHY): 0 SP 183](#_Toc53491751)

[15.107 September 14 (MAC): 0 SP 183](#_Toc53491752)

[15.108 September 15 (Joint): 0 SP 183](#_Toc53491753)

[15.109 September 16 (MAC): 0 SP 183](#_Toc53491754)

[15.110 September 17 (Joint): 0 SP 183](#_Toc53491755)

[15.111 September 21 (PHY): 0 SP 183](#_Toc53491756)

[15.112 September 21 (MAC): 2 SPs 184](#_Toc53491757)

[15.113 September 23 (MAC): 0 SP 184](#_Toc53491758)

[15.114 September 24 (PHY): 1 SP 185](#_Toc53491759)

[15.115 September 24 (MAC): 0 SP 185](#_Toc53491760)

[15.116 September 28 (PHY): 1 SP 186](#_Toc53491761)

[15.117 September 28 (MAC): 1 SP 186](#_Toc53491762)

[15.118 September 30 (Joint): 0 SP 186](#_Toc53491763)

[15.119 October 8 (PHY): 10 SPs 187](#_Toc53491764)

[15.120 October 8 (MAC): 8 SPs 189](#_Toc53491765)

[15.121 October 12 (PHY): 0 SP 192](#_Toc53491766)

[15.122 October 12 (MAC): 4 SPs 193](#_Toc53491767)

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# Abbreviations and acronyms

BIGTK beacon integrity group temporal key

BPSK binary phase shift keying

BU bufferable unit

BSS basic service set

BW bandwidth

CCA clear channel assessment

DL downlink

DS distribution system

EHT extremely high throughput

EP emergency preparedness

GTK group temporal key

HE high efficiency

IGTK integrity group temporal key

LLC logical link control

L-LTF Non-HT Long Training field

L-SIG Non-HT SIGNAL field

L-STF Non-HT Short Training field

LTF long training field

MAC medium access protocol

MCS modulation and coding scheme

MLD multi-link device

MU multi-user

MU-MIMO multi-user multiple input, multiple output

NDP null data PPDU

NS national security

OFDM orthogonal frequency division multiplexing

PHY physical layer

PN packet number

PPDU PHY protocol data unit

PSDU PHY service data unit

RA receiver address

RL-SIG Repeated Non-HT SIGNAL field

RU resource unit

RX receive or receiver

SAP service access point

STA station

SU single user

SU-MIMO single user multiple input, multiple output

TA transmitter address

TID traffic identifier

TX transmit or transmitter

TXOP transmission opportunity

UL Uplink

U-SIG Universal SIGNAL field

WM wireless medium

# EHT PHY



## General

This section describes the functional blocks in the EHT PHY.

802.11be AP is mandatory to support the following:

* 160 MHz operating channel width in 6 GHz band
* 80 MHz operating channel width in 5 GHz band
* 20 MHz operating channel width in 2.4 GHz band

NOTE – “soft AP” is TBD.

[Motion 124, #SP178, [1] and [2]]

It is mandatory for a non-AP STA to support 80 MHz operating channel width in 5 and 6 GHz bands.

* Except for 20 MHz only client (if defined in EHT)

[Motion 124, #SP179, [1] and [2]]

802.11be defines 20 MHz-only client in 2.4/5 GHz band only.

[Motion 124, #SP180, [1] and [2]]

## Subcarriers and resource allocation

### Wideband and noncontiguous spectrum utilization

802.11be supports 320 MHz and 160+160 MHz PPDU.

[Motion 10, [3] and [4]]

802.11be supports defining 320 MHz channels as any two adjacent 160 MHz channels.

[Motion 119, #SP115, [5] and [6]]

802.11be supports 240 MHz and 160+80 MHz transmission.

* Whether 240/160+80 MHz is formed by 80 MHz channel puncturing of 320/160+160 MHz is TBD.

[Motion 16, [7] and [8]]

No 240 MHz channelization is defined in 802.11be.

* NOTE – 240/160+80 MHz entry in BW field is TBD.

[Motion 119, #SP116, [5] and [9]]

There is no 240/160+80 MHz PPDU BW entry in the BW field of U-SIG in 802.11be.

* The 240 MHz transmission is defined as 320 MHz PPDU with 80 MHz punctured.

[Motion 122, #SP165, [10] and [11]]

240/160+80 MHz bandwidth is constructed from three 80 MHz channels which include primary 80 MHz.

[Motion 17, [7] and [12]]

802.11be reuses 802.11ax tone plan for 20/40 MHz PPDU and, with the exception of pilot locations, for 80/160/80+80 MHz in non-OFDMA PPDU. For 320 MHz and 160+160 MHz PPDU, 802.11be uses duplicated EHT160.

[Motion 33, [7] and [13]]

[Motion 118, [14] and [15]]

802.11be 240/160+80 MHz transmission consists of 3x80 MHz segments while the tone plan of each 80 MHz segment is the same as EHT80.

[Motion 35, [7] and [13]]

[Motion 118, [14] and [15]]

240/160+80 MHz transmission is subjected to 320/160+160 MHz PPDU mask plus additional puncturing mask.

320/160+160 MHz transmission is subjected to 320/160+160 MHz PPDU mask, additional puncturing mask can be applied according to the puncturing patterns and MRUs.

Details of the masks are TBD.

[Motion 119, #SP117, [5] and [16]]

802.11be supports the following toneplan for 802.11be 80 MHz OFDMA.

* 80 MHz OFDMA = 40 MHz DUP, Table 27-8 in 802.11ax D6.0 right/left shifted by 256 tones.



Figure 1 – Tone plan for 80 MHz OFDMA

* NOTE –
  + The 80MHz OFDMA design applies to any RU < 996 for all modes of transmission, SU, DL MU, TB PPDU, with and without puncturing.
  + Non-OFDMA full BW 80 MHz segment uses 996 RU design.
  + Any punctured 80 MHz segment uses the OFDMA tone plan.
  + For each 80 MHz segment in 160 MHz, 240 MHz or 320 MHz: if it is punctured or used for OFDMA the 80 MHz OFDMA tone plan is used, if it’s used for non-OFDMA and non-punctured the 996 RU tone plan is used.

[Motion 112, #SP42, [17] and [18]]

For 80 MHz NDP or each 80 MHz segment of > 80 MHz bandwidth NDP,

* If not punctured, non-OFDMA 80 MHz tone plan is used.
* If punctured, OFDMA 80 MHz tone plan is used.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **RU & Tone Indices** | **1x LTF Tones** | **2x LTF Tones** | **4x LTF Tones** |
| Non-punctured | RU996, [-500:-3, 3:500] | A=[-500:4:-4, 4:4:+500] | A=[-500:2:-4, 4:2:500] | A=[-500:-3, 3:500] |
| 1st 20MHz punctured | RU242+484, [-253:-12, 12:253, 259:500] | B1=[-252:4:-12, 12:4:252, 260:4:500] | B1=[-252:2:-12, 12:2:252, 260:2:500] | B1=[-253:-12, 12:253, 259:500] |
| 2nd 20MHz punctured | RU242+484, [-500:-259, 12:253, 259:500] | B2=[-500:4:-260, 12:4:252, 260:4:500] | B2=[-500:2:-260, 12:2:252, 260:2:500] | B2=[-500:-259, 12:253, 259:500] |
| 3rd 20MHz punctured | RU242+484, [-500:-259, -253:-12, 259:500] | B3=[-500:4:-260, -252:4:-12, 260:4:500] | B3=[-500:2:-260, -252:2:-12, 260:2:500] | B3=[-500:-259, -253:-12, 259:500] |
| 4th 20MHz punctured | RU242+484, [-500:-259, -253:-12, 12:253] | B4=[-500:4:-260, -252:4:-12, 12:4:252] | B4=[-500:2:-260, -252:2:-12, 12:2:252] | B4=[-500:-259, -253:-12, 12:253] |
| 1st 40MHz punctured | RU484, [12:253, 259:500] | C1=[12:4:252, 260:4:500] | C1=[12:2:252, 260:2:500] | C1=[12:253, 259:500] |
| 2nd 40MHz punctured | RU484, [-500:-259, -253:-12] | C2=[-500:4:-260, -252:4:-12] | C2=[-500:2:-260, -252:2:-12] | C2=[-500:-259, -253:-12] |

[Motion 131, #SP201, [19] and [20]]

In 160+80 MHz BSS, the 160 MHz and 80 MHz should be non-adjacent.

[Motion 111, #SP0611-01, [17] and [21]]

A 160 MHz tone plan is duplicated for the non-OFDMA tone plan of 320/160+160 MHz PPDU.

* The 160 MHz tone plan is TBD.

[Motion 18, [7] and [22]]

The 802.11be 320/160+160 MHz non-OFDMA tone plan uses duplicated tone plan of EHT160.

[Motion 34, [7] and [13]]

[Motion 118, [14] and [15]]

12 and 11 null tones are placed at the left and right edges in each 160 MHz segment for the non-OFDMA tone plan of 320/160+160 MHz PPDU.

[Motion 19, [7] and [22]]

802.11be uses the same subcarrier spacing for the data portion of EHT PPDU as 802.11ax data portion.

[Motion 11, [3] and [4]]

### Support for large bandwidth

802.11be supports that 80 MHz and 160 MHz operating STA shall be able to participate in a higher BW DL and UL OFDMA transmission.

* STA shall be able to decode the preamble and its assigned RU (some restrictions TBD).
* No capability bit as in 802.11ax.

[Motion 115, #SP75, [14] and [23]]

EHT defines frequency domain aggregation of aggregated PPDUs. Aggregated PPDU consists of multiple PPDUs.

* The PPDU format combination limits to EHT and HE.
* Other combinations are TBD.
* For the PPDU using HE format, the PPDU BW TBD.
* The number of PPDUs is TBD.
* A-PPDU will be R2 feature.

[Motion 112, #SP48, [17] and [24]]

802.11be supports the design of allowing multiplexing STAs of different amendments in one transmission with OFDMA using frequency domain A-PPDU.

* STAs of different amendments may include HE, EHT
  + Post-EHT STA is TBD;
  + The BW allocated to different STAs that can be mixed in one transmission is TBD;
* This feature is targeted for R2.

[Motion 122, #SP156, [10] and [25]]

### Single RU

For a single RU less than or equal to 242 tones (i.e., RU26, RU52, RU106, RU242), the BCC can be supported.

* Mandatory or Optional for BCC, TBD.
* Only for modulation up to 256 QAM (with or without DCM – if defined in 802.11be).
* Only for NSS <=4.

[Motion 112, #SP13, [17] and [26]]

### Multiple RU

#### **General**

802.11be shall allow more than one RUs to be assigned to a single STA.

Coding and interleaving schemes for multiple RUs assigned to a single STA are TBD.

Maximum number of RUs (>1) assigned to a single STA is also TBD.

[Motion 6, [3] and [27]]

Small-size RUs can only be combined with small-size RUs and large-size RUs can only be combined with large-size RUs.

RUs with equal to or more than 242 tones are defined as large-size RUs.

RUs with less than 242 tones are defined as small-size RUs.

[Motion 76, [28] and [29]]

In 802.11be, there is only one PSDU per STA for each link.

[Motion 91, [28] and [30]]

#### **Small-size RUs**

Combination of small-size RUs shall not cross 20 MHz channel boundary.

* The combination that includes RU106 plus center 26-tone RU case is TBD.

[Motion 69, [28] and [29]]

Only allowed small-size RU combinations are RU106+RU26 and RU52+RU26.

[Motion 78, [28] and [29]]

For 20 MHz and 40 MHz PPDU, within 20 MHz boundary, any contiguous RU26 and RU106 can be combined.

[Motion 79, [28] and [29]]

For 20 MHz and 40 MHz PPDU, combination of RU52 and RU26 are allowed only in locations shown in rows marked by RU78.



Figure 2 – Allowed combination of RU52+RU26 for 20 MHz and 40 MHz PPDU

[Motion 80, [28] and [29]]

[Motion 118, [14] and [15]]

For 80 MHz PPDU, combination of RU52 and RU26 are allowed only in locations shown in rows marked by RU78.



Figure 3 – Allowed combination of RU52+RU26 for 80 MHz PPDU

[Motion 81, [28] and [29]]

[Motion 118, [14] and [15]]

802.11be supports the following RU106+RU26 combinations as shown in the row marked RU132 for each 80 MHz segment in 80, 160, 240, and 320 MHz BW.



Figure 4 – Allowed combination of RU106+RU26 for each 80 MHz segment in 80, 160, 240, and 320 MHz bandwidth

[Motion 112, #SP21, [17] and [31]]

[Motion 118, [14] and [15]]

802.11be supports the following mandatory RU combinations for small-size RUs:

* {RU26+RU52, RU106+RU26} for non-AP STA only and in OFDMA only.

[Motion 115, #SP71, [14] and [32]]

#### **Large-size RUs**

For the OFDMA transmission in 320/160+160 MHz, for one STA large size RU aggregation is allowed only within primary 160 MHz or secondary 160 MHz, respectively.

* Note that primary 160 MHz is composed of primary 80 MHz and secondary 80 MHz and secondary 160 MHz is 160 MHz channel other than the primary 160 MHz in 320/160+160 MHz.

Exception: 3×996 is supported.

3×996+484 RU combinations is TBD.

[Motion 87, [28] and [33]]

For the OFDMA transmission in contiguous 240 MHz, for one STA large size RU aggregation is allowed only within 160 MHz which is composed of two adjacent 80 MHz channels.

For the OFDMA transmission in noncontiguous 160+80 MHz, for one STA large size RU aggregation is allowed only within contiguous 160 MHz or the other 80 MHz, respectively.

2×996+484 RU combinations is TBD.

[Motion 86, [28] and [33]]

In 160 MHz OFDMA the following large RU combinations are supported.

|  |  |  |
| --- | --- | --- |
| **RU size** | **Aggregate BW** | **Notes** |
| 484 + 996 | 120 MHz | 4 options |

[Motion 98, [28] and [34]]

In 80 MHz OFDMA the following large RU combinations are supported.

|  |  |  |
| --- | --- | --- |
| **RU size** | **Aggregate BW** | **Notes** |
| 484 + 242 | 60 MHz | 4 options |

[Motion 97, [28] and [34]]

For OFDMA, MRUs allowed in 80 MHz PPDU shall be allowed in each 80 MHz segment of 160 MHz/80 MHz + 80 MHz, 240 MHz/160 MHz + 80 MHz and 320 MHz/160 MHz + 160 MHz PPDU.

[Motion 115, #SP73, [14] and [35]]

For OFDMA, MRUs (996+484) are allowed in the following cases:

* Contiguous 160 MHz in 240 MHz/160 MHz + 80 MHz
* Primary 160 MHz and secondary 160 MHz in 320 MHz/160 MHz + 160 MHz

[Motion 115, #SP74, [14] and [35]]

802.11be supports the following mandatory RU combinations:

* Conditioned on device supporting 80, 160, 240 and 320 MHz transmissions
* BW support for 802.11be AP and non-AP STA is TBD
* NOTE – Currently in the SFD under OFDMA, 2×996+484 and 3×996+484 are TBD

|  |  |  |
| --- | --- | --- |
| **BW** | **RU** | **Mandatory in OFDMA for:** |
| 80 MHz | 484+242 | Non-AP STA only |
| 160 MHz | 996+484 | Non-AP STA only |
| 240 MHz | 2×996+484 | Non-AP STA only |
| 320 MHz | 3×996+484, 3×996 (any 3) | Non-AP STA only |

[Motion 115, #SP72, [14] and [32]]

802.11be supports the mandatory RU combinations for large-size MRUs as shown in the table below:

* Conditioned on device supporting 80, 160, 240 and 320 MHz transmissions
* BW support for 11be AP and non-AP STA is TBD

|  |  |  |
| --- | --- | --- |
| **BW** | **RU** | **Mandatory in Non-OFDMA for:** |
| 80 MHz | 484+242 | AP, STA |
| 160 MHz | 996+484 | AP, STA |
| 996+(484+242) | AP, STA |
| 240 MHz | 3×996, 2×996+484, 2×996 (any 2) | AP, STA |
| 320 MHz | 4×996, 3×996+484, 3×996 (any 3) | AP, STA |

[Motion 115, #SP71, [14] and [32]]

In 80 MHz non-OFDMA the following conditional mandatory (conditional on supporting puncturing) large RU combinations are supported.

* Any one of four 242 RUs can be punctured.

|  |  |  |
| --- | --- | --- |
| **RU size** | **Aggregate BW** | **Notes** |
| 484 + 242 | 60 MHz | 4 options |

[Motion 93, [28] and [34]]

In 160 MHz non-OFDMA the following conditional mandatory (conditional on supporting puncturing) large RU combinations are supported.

* Any one of eight 242 RUs can be punctured.
* Any one of four 484 RUs can be punctured.

|  |  |  |  |
| --- | --- | --- | --- |
| **80 MHz RU Size** | **80 MHz RU size** | **Aggregate BW** | **Notes** |
| 484 | 996 | 120 MHz | 4 options |
| 484 + 242 | 996 | 140 MHz | 8 options |

[Motion 94, [28] and [34]]

In 240 MHz non-OFDMA the following conditional mandatory (conditional on supporting puncturing) large RU combinations are supported.

* Any one of six 484 RUs can be punctured.
* Any one of three 996 RUs can be punctured.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **80 MHz RU size** | **80 MHz RU size** | **80 MHz RU size** | **Aggregate BW** | **Notes** |
| 484 | 996 | 996 | 200 MHz | 6 options |
| - | 996 | 996 | 160 MHz | 3 options |

[Motion 95, [28] and [34]]

In 320 MHz non-OFDMA the following conditional mandatory (conditional on supporting puncturing) large RU combinations are supported.

* Any one of eight 484 RUs can be punctured.
* Any one of four 996 RUs can be punctured.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **80 MHz**  **RU size** | **80 MHz**  **RU size** | **80 MHz**  **RU size** | **80 MHz**  **RU size** | **Aggregate BW** | **Notes** |
| 484 | 996 | 996 | 996 | 280 MHz | 8 options |
| - | 996 | 996 | 996 | 240 MHz | 4 options |

[Motion 96, [28] and [34]]

MRU 996×2 shall not straddle two 160 MHz channels.

[Motion 122, #SP164, [10] and [11]]

The table below defines 12 options for MRU 996×2+484 in 320 MHz BSS.

* 240/160+80 MHz BW entry is TBD
* NOTE – Shaded area in the table is punctured.



[Motion 122, #SP166, [10] and [11]]

## MU-MIMO

802.11be agrees with the following MU-MIMO support:

* DL MU-MIMO
  + Mandatory support for AP with >=4 antennas
  + Mandatory support for client
  + At least for full BW.  RU/M-RU support TBD
* UL MU-MIMO
  + Mandatory support for AP with >=4 antennas
  + Mandatory support for client
  + At least for full BW.  RU/M-RU support TBD

[Motion 124, #SP181, [1] and [2]]

Support of Nss\_total = 4 is mandatory for 802.11be STA in receiving both sounding NDP and DL MU-MIMO, i.e., beamformee STS capability.

[Motion 124, #SP182, [1] and [2]]

## EHT PPDU formats

The format of the EHT MU PPDU is configured as follow:

* L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-SIG, EHT-STF, EHT-LTF, DATA, PE.
* Additional fields are TBD.

****

NOTE –This PPDU format is used for 802.11be PPDU transmitted to a single user or multiple users. There is no EHT SU PPDU.

There are two modes in the EHT MU PPDU.

* Compressed mode:
  + Non-OFDMA
  + No RU Allocation subfield in the Common field of the EHT-SIG.
* Non-compressed mode:
  + OFDMA
  + RU Allocation subfield(s) in the Common field of the EHT-SIG.

[Motion 111, #SP0611-08, [17] and [36]]

[Motion 122, #SP140, [10] and [37]]

The format of the EHT TB PPDU is configured as follow:

* L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-STF, EHT-LTF, DATA, PE
* Additional fields are TBD

****

NOTE – This format is used for a transmission that is a response to a triggering frame from an AP.

[Motion 111, #SP0611-09, [17] and [36]]

[Motion 122, #SP141, [10] and [37]]

The EHT PPDU sent to a single user has the EHT-SIG field.

* A subfield that indicates preamble puncturing pattern can be present in the U-SIG and/or EHT-SIG field.

[Motion 112, #SP39, [17] and [38]]

**Straw poll #216**

Do you agree that for the EHT MU PPDU, only the following GI/LTF combinations will be supported?

* 2x LTF + 0.8us GI
* 2x LTF + 1.6us GI
* 4x LTF + 3.2us GI
* 4x LTF + 0.8us GI ***[#SP216]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), #SP13, Y/N/A: 44/1/14]

## EHT modulation and coding schemes (EHT-MCSs)

### OFDM modulation

802.11be shall define 4096 QAM as one of the optionally supported modulations.

[Motion 111, #SP0611-21, [17] and [39]]

The uniform constellation mapping for 4096 QAM shall be as given in 11-20/0111r0.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coordinate** | **Bits** | | | | | |
| -63 | 0 | 0 | 0 | 0 | 0 | 0 |
| -61 | 0 | 0 | 0 | 0 | 0 | 1 |
| -59 | 0 | 0 | 0 | 0 | 1 | 1 |
| -57 | 0 | 0 | 0 | 0 | 1 | 0 |
| -55 | 0 | 0 | 0 | 1 | 1 | 0 |
| -53 | 0 | 0 | 0 | 1 | 1 | 1 |
| -51 | 0 | 0 | 0 | 1 | 0 | 1 |
| -49 | 0 | 0 | 0 | 1 | 0 | 0 |
| -47 | 0 | 0 | 1 | 1 | 0 | 0 |
| -45 | 0 | 0 | 1 | 1 | 0 | 1 |
| -43 | 0 | 0 | 1 | 1 | 1 | 1 |
| -41 | 0 | 0 | 1 | 1 | 1 | 0 |
| -39 | 0 | 0 | 1 | 0 | 1 | 0 |
| -37 | 0 | 0 | 1 | 0 | 1 | 1 |
| -35 | 0 | 0 | 1 | 0 | 0 | 1 |
| -33 | 0 | 0 | 1 | 0 | 0 | 0 |
| -31 | 0 | 1 | 1 | 0 | 0 | 0 |
| -29 | 0 | 1 | 1 | 0 | 0 | 1 |
| -27 | 0 | 1 | 1 | 0 | 1 | 1 |
| -25 | 0 | 1 | 1 | 0 | 1 | 0 |
| -23 | 0 | 1 | 1 | 1 | 1 | 0 |
| -21 | 0 | 1 | 1 | 1 | 1 | 1 |
| -19 | 0 | 1 | 1 | 1 | 0 | 1 |
| -17 | 0 | 1 | 1 | 1 | 0 | 0 |
| -15 | 0 | 1 | 0 | 1 | 0 | 0 |
| -13 | 0 | 1 | 0 | 1 | 0 | 1 |
| -11 | 0 | 1 | 0 | 1 | 1 | 1 |
| -9 | 0 | 1 | 0 | 1 | 1 | 0 |
| -7 | 0 | 1 | 0 | 0 | 1 | 0 |
| -5 | 0 | 1 | 0 | 0 | 1 | 1 |
| -3 | 0 | 1 | 0 | 0 | 0 | 1 |
| -1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 3 | 1 | 1 | 0 | 0 | 0 | 1 |
| 5 | 1 | 1 | 0 | 0 | 1 | 1 |
| 7 | 1 | 1 | 0 | 0 | 1 | 0 |
| 9 | 1 | 1 | 0 | 1 | 1 | 0 |
| 11 | 1 | 1 | 0 | 1 | 1 | 1 |
| 13 | 1 | 1 | 0 | 1 | 0 | 1 |
| 15 | 1 | 1 | 0 | 1 | 0 | 0 |
| 17 | 1 | 1 | 1 | 1 | 0 | 0 |
| 19 | 1 | 1 | 1 | 1 | 0 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 0 |
| 25 | 1 | 1 | 1 | 0 | 1 | 0 |
| 27 | 1 | 1 | 1 | 0 | 1 | 1 |
| 29 | 1 | 1 | 1 | 0 | 0 | 1 |
| 31 | 1 | 1 | 1 | 0 | 0 | 0 |
| 33 | 1 | 0 | 1 | 0 | 0 | 0 |
| 35 | 1 | 0 | 1 | 0 | 0 | 1 |
| 37 | 1 | 0 | 1 | 0 | 1 | 1 |
| 39 | 1 | 0 | 1 | 0 | 1 | 0 |
| 41 | 1 | 0 | 1 | 1 | 1 | 0 |
| 43 | 1 | 0 | 1 | 1 | 1 | 1 |
| 45 | 1 | 0 | 1 | 1 | 0 | 1 |
| 47 | 1 | 0 | 1 | 1 | 0 | 0 |
| 49 | 1 | 0 | 0 | 1 | 0 | 0 |
| 51 | 1 | 0 | 0 | 1 | 0 | 1 |
| 53 | 1 | 0 | 0 | 1 | 1 | 1 |
| 55 | 1 | 0 | 0 | 1 | 1 | 0 |
| 57 | 1 | 0 | 0 | 0 | 1 | 0 |
| 59 | 1 | 0 | 0 | 0 | 1 | 1 |
| 61 | 1 | 0 | 0 | 0 | 0 | 1 |
| 63 | 1 | 0 | 0 | 0 | 0 | 0 |

[Motion 111, #SP0611-22, [17] and [39]]

802.11be supports -38 dB as the Tx EVM requirement for 802.11be 4096 QAM.

[Motion 112, #SP20, [17] and [40]]

802.11be devices shall mandatorily support the following modulation order:

* Up to 64 QAM for 20 MHz-only non-AP STA (if defined in EHT)
* Up to 256QAM for all other devices

[Motion 124, #SP176, [1] and [2]]

802.11be agrees that:

* MCS numbering for BSPK – 1024QAM is the same as 802.11ax
* 4096 QAM is defined with R=3/4 and R=5/6
* MCS numbering for 4096 QAM is 12 and 13.

[20/1290r1 (PDT-PHY-Parameters-for-EHT-MCSs, Yujin Noh, Newracom), SP#1, Y/N/A: 42/1/3]

[Motion 131, #SP209, [19] and [41]]

### DCM

DCM+MCS0 for Nss=1 as defined in 802.11ax is a MCS in 802.11be.

* The detailed MCS number for DCM+MCS0 is TBD.
* This is an R1 feature.

[Motion 122, #SP147, [10] and [42]]

802.11be agrees to define a DUP mode for non-punctured 80 MHz, 160 MHz and 320 MHz PPDUs transmitted to a single user, limited to {MCS0+DCM, Nss=1}.

* 80 DUP = 40 (RU 484) duplicated.
* 160 DUP = 80 (RU 996) duplicated.
* 320 DUP = 160 (RU 2×996) duplicated.
* PAPR reduction scheme is TBD.
* Additional diversity scheme is TBD.
* This is an R1 feature.

The mode defined above is limited to 6 GHz.

* NOTE – Whether to further limit this to LPI mode is TBD.

The duplication in the mode defined above is done only on the data tones of the payload portion and that EHT-STF/LTF are based on the total BW.

In this mode,

* For 80 MHz PPDU, the EHT-STF, EHT-LTF and pilot are same as transmitting both RU1 and RU2 of 484-tone RU.
* For 160/320 MHz PPDU, the EHT-STF, EHT-LTF and pilot are same as the non-OFDMA 160/320 MHz PPDU.

PAPR reduction scheme is TBD.

NOTE – pre-EHT modulated fields are TBD.

[Motion 122, #SP162, [10] and [43]]

[Motion 122, #SP163, [10] and [43]]

[Motion 122, #SP170, [10] and [44]]

**Straw poll #210**

Do you support that the PAPR reduction scheme for the DUP mode consists of flipping the sign of data tones only, as shown in red?

* BW80 and BW160 PPDU data-tone processing:
  + Pre-DCM freq-domain signal: 𝒙
  + DCM-encoded freq-domain signal: 𝒚 = [𝒙 𝒙𝐷𝐶𝑀 ]
  + DUP freq-domain signal: [𝒚 −𝒙 𝒙𝐷𝐶𝑀 ]
* BW320 PPDU data-tone processing:
  + Pre-DCM freq-domain signal split into two halves:
    - 𝒙𝐿 over lower 𝑁𝑆𝐷/2 sub-carriers, 𝒙𝑈 over upper 𝑁𝑆𝐷/2 sub-carriers.
  + DCM-encoded freq-domain signal: 𝒚 = [𝒙𝐿 𝒙𝐿,𝐷𝐶𝑀 𝒙𝑈 𝒙𝑈,𝐷𝐶𝑀]
  + DUP freq-domain signal: [𝒚 −𝒙𝐿 −𝒙𝐿,𝐷𝐶𝑀 𝒙𝑈 𝒙𝑈,𝐷𝐶𝑀 ] ***[#SP210]***

[20/1191r1 (DUP Mode PAPR Reduction, Ron Porat, Broadcom), SP#1, Y/N/A: 51/13/5]

## EHT preambles

### L-STF, L-LTF, L-SIG, and RL-SIG

For EHT PPDU, L-STF, L-LTF and L-SIG shall be transmitted at the beginning of the EHT PPDU.

For EHT PPDU, the first symbol after L-SIG shall be BPSK modulated.

[Motion 1, [3] and [45]]

The LENGTH field in L-SIG set to a value *N* such that mod(*N*, 3) = 0.

[Motion 29, [7] and [46]]

Phase rotation is applied to the legacy preamble part of EHT PPDU.

Coefficients applied to each 20 MHz channel are TBD.

Application to the other fields is TBD.

[Motion 41, [7] and [47]]

Phase rotation is applied to legacy preamble, RL-SIG, U-SIG and EHT-SIG in EHT PPDU.

[Motion 112, #SP30, [17] and [48]]

802.11be supports the following phase rotation sequence for legacy preamble, RL-SIG, U-SIG and EHT-SIG in 320/160+160 MHz PPDU:

* + [1 -1 -1 -1 1 -1 -1 -1 -1 1 1 1 -1 1 1 1]

[Motion 115, #SP81, [14] and [49]]

802.11be reuses the phase rotation sequence defined in 802.11ax for 20/40/80/160/80+80 MHz PPDU.

[Motion 112, #SP31, [17] and [48]]

EHT PPDU shall have a RL-SIG field, which is a repeat of the L-SIG field, immediately following the L-SIG field.

[Motion 49, [7] and [50]]

The extra 4 subcarriers are applied to L-SIG and RL-SIG.

The indices for extra subcarriers are [-28, -27, 27, 28].

The extra subcarriers are BPSK modulated.

The coefficients [-1 -1 -1 1] as in 802.11ax are mapped to the extra subcarriers.

[Motion 107, [28] and [36]]

### U-SIG

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

* The U-SIG will contain version independent fields. The intent of the version independent content is to achieve better coexistence among future 802.11 generations.
* In addition, the U-SIG can have some version dependent fields.
* The size of the U-SIG for the case of an Extended Range Mode (if such a mode were to be adopted) is TBD.
* The U-SIG will be sent using 52 data tones and 4 pilot tones per-20 MHz.

[Motion 27, [7] and [51]]

The U-SIG is modulated in the same way as the HE-SIG-A field of 802.11ax.

* Extended range SU mode is TBD.

[Motion 45, [7] and [52]]

The U-SIG includes Version-independent bits followed by Version-dependent bits.



Figure 5 – U-SIG

* Version-independent bits have static location and bit definition across different generations/PHY versions.
* Version-dependent bits may have variable bit definition in each PHY version.

[Motion 47, [7] and [53]]

The U-SIG shall contain the following version independent fields:

* PHY version identifier: 3 bits.
* UL/DL flag: 1 bit.

[Motion 42, [7] and [52]]

PHY version identifier field shall be one of the version independent fields in the U-SIG.

* Purpose is to simplify autodetection for future 802.11 generations, i.e., value of this field is used to identify the exact PHY version starting with 802.11be.
* Exact location of this field is TBD.

[Motion 28, [7] and [54]]

The U-SIG field includes the following bits in Version-independent bits portion:

* BSS color, number of bits TBD.
* TXOP duration, number of bits TBD.

[Motion 48, [7] and [53]]

The U-SIG shall contain Bandwidth Information, carried as a version independent field.

* This field may also convey some puncturing information.
* Number of bits for this field is TBD.

[Motion 88, [28] and [55]]

802.11be supports that U-SIG in each 80 MHz shall carry puncturing channel info for at least the specific 80 MHz where it is transmitted.

* NOTE – Within each 80 MHz segment, U-SIG is duplicated in every non-punctured 20 MHz.
* Whether BW/Puncturing info can be different for different 80 MHz is TBD.
* Whether BW and puncturing info in U-SIG are carried as a combined or a separate field is TBD.

[Motion 111, #SP0611-10, [17] and [56]]

802.11be signaling in U-SIG for BW/puncturing information in every non-punctured 20 MHz of an 80 MHz segment shall allow even an OBSS or unassociated device to decode the puncturing pattern of at least the specific 80 MHz that contains the 20 MHz.

[Motion 113, [17] and [57]]

802.11be supports BW field which does not include puncturing information.

[Motion 112, #SP29, [17] and [57]]

The preamble puncture indication field in U-SIG of an OFDMA transmission in an EHT MU PPDU indicates the preamble puncturing patterns of only the 80 MHz where the U-SIG is being sent.

[Motion 131, #SP194, [19] and [58]]

Regarding preamble puncture flexibility for OFDMA, up to one hole per 80 MHz segments is supported. If punctured, the puncture pattern of each segment shall be one of the followings:

* X212
* 1X12
* 12X2
* 121X
* XX12
* 12XX
* 1XX2

NOTE – Left-to-right represents low-to-high 20MHz channels.

[Motion 131, #SP195, [19] and [58]]

Within one EHT PPDU, the BW field in U-SIG shall indicate the same PPDU bandwidth across different 80MHz segments.

[Motion 122, #SP142, [10] and [59]]

The U-SIG shall contain a PPDU type field, carried as a version dependent field.

* Number of bits for this field is TBD.

[Motion 89, [28] and [55]]

A subfield for indication of compressed mode is included in U-SIG as version dependent field.

[Motion 124, #SP183, [1] and [60]]

The following subfields exist in U-SIG of an EHT PPDU sent to multiple users:

* EHT-SIG MCS
* Number of EHT-SIG Symbols

[Motion 59, [28] and [61]]

The following subfield exists in U-SIG or EHT-SIG of an EHT PPDU sent to multiple users:

* GI+EHT-LTF Size

[Motion 100, [28] and [61]]

The following subfields exist in U-SIG and/or EHT-SIG of an EHT PPDU sent to single user:

* MCS
* NSTS
* GI+EHT-LTF Size
* Coding

[Motion 99, [28] and [61]]

The following subfields exist in U-SIG and/or EHT-SIG of an EHT PPDU sent to single user:

* LDPC Extra Symbol
* Beamformed
* Pre-FEC Padding Factor
* PE Disambiguity

[Motion 111, #SP0611-11, [17] and [62]]

A subfield for preamble puncturing pattern information that separates from the BW field is included in U-SIG and/or EHT-SIG for the 802.11be PPDU transmitted to a single user.

[Motion 111, #SP0611-12, [17] and [63]]

802.11be STA can recognize the preamble puncturing pattern it needs by using the BW field and puncturing information of U-SIG and/or EHT-SIG field in multiple user transmission.

* Details for how to convey the puncturing information is TBD.

[Motion 111, #SP0611-18, [17] and [64]]

802.11be supports that preamble of primary 20 MHz channel shall not be punctured in any PPDU (except TB PPDU).

[Motion 111, #SP0611-13, [17] and [56]]

The following indication shall be the same considering symbol alignment within each segment from PHY point of view, if the fields are present in U-SIG:

* Number of EHT-SIG symbols
* GI+EHT-LTF Size
* Number of EHT-LTF symbols
* PE related parameters

[Motion 111, #SP0611-14, [17] and [65]]

The Number of EHT-SIG Symbols field always exists in U-SIG of a PPDU that is not an EHT TB PPDU.

* The field is not reinterpreted as the number of MU-MIMO users.

[Motion 122, #SP138, [10] and [66]]

The bitwidth of the Number of EHT-SIG Symbols field is 5 in U-SIG of a PPDU that is not an EHT TB PPDU.

[Motion 122, #SP139, [10] and [66]]

A STA only needs to process up to one 80 MHz segment of the pre-EHT preamble (up-to and including EHT-SIG) to get all the assignment information for itself.

* No 80 MHz segment change is needed while processing L-SIG, U-SIG and EHT-SIG.

[Motion 111, #SP0611-15, [17] and [67]]

Information in U-SIG is allowed to vary from one 80 MHz to the next in an EHT PPDU of bandwidth > 80 MHz.

* NOTE –
  + - Each STA still needs to decode only one 80 MHz segment in U-SIG.
    - Within each 80MHz, U-SIG is still duplicated in every non-punctured 20 MHz.
    - SST operation using TWT is one potential applicable scenario, other scenarios are TBD (Needs MAC discussion).

[Motion 111, #SP0611-16, [17] and [67]]

### EHT-SIG

There shall be a variable MCS and variable length EHT-SIG, immediately after the U-SIG, in an EHT PPDU sent to multiple users.

[Motion 43, [7] and [52]]

**Straw poll #215**

Do you agree that EHT-SIG will support the following MCSs?

* MCS0, MCS1, MCS3 and ‘MCS0+DCM’ ***[#SP215]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#12, Y/N/A: 36/10/9]

**Straw poll #217**

Do you agree that 11be will not have Doppler bit in EHT-SIG for R1?

* No midamble support in R1 ***[#SP217]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#14, Y/N/A: 39/1/18]

**Straw poll #218**

Do you agree that 11be shall not support STBC? ***[#SP218]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#15, Y/N/A: 37/2/15]

The EHT-SIG (immediately after the U-SIG) in an EHT PPDU sent to multiple users shall have a common field and user-specific field(s).

* Special case compressed modes (e.g., full BW MU-MIMO) are TBD.

[Motion 44, [7] and [52]]

**Straw poll #214**

Do you agree for the EHT-SIG common field in the uncompressed mode, we will have the following coding structure for various BWs

* In case of 20/40/80 MHz, just 1 code block is present
* In case of 160/320MHz, 2 code blocks are present
  + 1st code block has fixed size (U-SIG overflow + 2 RUA fields)
  + 2nd code block includes all remaining RU allocation subfields (2 RUA fields in 160MHz, 6 RUA fields in 320MHz) ***[#SP214]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#8, Y/N/A: 33/1/17]

A 3-bit subfield for the indication of the number of non-OFDMA users is included in EHT-SIG common field of an EHT MU PPDU for the compressed mode.

[Motion 124, #SP184, [1] and [60]]

**Straw poll #213**

Do you agree to encode the EHT-SIG common field together with the first user field for the non-OFDMA compressed modes?

* Applicable only if EHT-SIG field exists. ***[#SP213]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#6, Y/N/A: 41/0/11]

The common field of EHT SIG in EHT PPDU that is sent to multiple user includes the CRC and tail bits.

* The number of bits for CRC is TBD.
* The number of tail bits is 6.
* The configuration of the common field is TBD.

[Motion 119, #SP107, [5] and [68]]

**Straw poll #212**

Do you agree that the EHT-SIG common field will include the following?

* U-SIG overflow
  + Repeated in each content channel to be friendly to 20MHz operating devices
* Total number of non-OFDMA users (3 bits for 1-8 users)
  + Only present in the non-OFDMA compressed mode
  + Repeated in each content channel (just like 11ax where the number of MU-MIMO users in the compressed mode was carried in HE-SIG-A)
* RU allocation subfields (RUA)
  + Only present in the uncompressed mode
  + Contents are sent parallelized into two content channels ***[#SP212]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#3, Y/N/A: 47/1/4]

There is STA-ID related information in the EHT PPDU preamble sent to a single user and multiple users. TB PPDU is TBD.

[Motion 111, #SP0611-19, [17] and [56]]

The user-specific field of EHT SIG in EHT PPDU that is sent to multiple user consists of the user block field(s) that is made up of 2 user fields except for the last user block.

* The last user block may have one or two user field(s).
* The user block field includes the CRC and tail bits. The number of bits for CRC is 4. The number of tail bits is 6.

[Motion 119, #SP108, [5] and [68]]

The user field in EHT PPDU that is sent to multiple user includes the subfield that indicates the number of spatial streams for each user.

* For MU-MIMO allocation
  + Spatial Configuration
    - Indicates the number of spatial streams for a user in MU-MIMO allocation.
* For non-MU-MIMO allocation
  + NSTS

[Motion 119, #SP120, [5] and [69]]

**Straw poll #211**

Do you agree with the EHT-SIG User Field Design shown below?

* The ordering of the fields will be as shown below.
* User field for a non-MU-MIMO allocation:

|  |  |
| --- | --- |
| Subfield | Number of bits |
| STA-ID | 11 |
| MCS | 4 |
| Reserved | 1 |
| NSTS | 4 |
| Beamformed | 1 |
| Coding | 1 |

* User field for an MU-MIMO allocation:

|  |  |
| --- | --- |
| Subfield | Number of bits |
| STA-ID | 11 |
| MCS | 4 |
| Coding | 1 |
| Spatial Configuration | 6 |

***[#SP211]***

[20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm), SP#2, Y/N/A: 41/2/8]

**Straw poll #219**

Do you support defining the meaning of the coding bit in MU-MIMO per-user field for RU>242 as reserved? ***[#SP219]***

[20/1310r0 (Coding bit in MU-MIMO, Ron Porat, Broadcom), SP#1, Y/N/A: 38/0/10]

The spatial configuration subfield of the user field for MU-MIMO allocation consists of 6 bits.

[Motion 119, #SP122, [5] and [69]]

The spatial configuration subfield is defined as described in slide 17~19 of 20/0930r3.







[Motion 119, #SP123, [5] and [69]]

Do you agree that the Nsts subfield of user field for non-MU-MIMO allocation consist of four bits and can indicate 1 to 16 streams consists of 4 bits.

[Motion 119, #SP121, [5] and [69]]

An RU Allocation subfield is present in the Common field of the EHT-SIG field of an EHT PPDU sent to multiple users.

* Compressed modes are TBD.
* Contents of the RU Allocation subfield are TBD.

[Motion 57, [28] and [61]]

N RU allocation subfields are present in an EHT-SIG content channel,

* where N is the number of RU allocation subfield in common field of EHT-SIG content channel,
* N = 1 if a 20 MHz or 40 MHz EHT PPDU sent to multiple users is used,
* N = 2 if an 80 MHz EHT PPDU sent to multiple users is used,
* N = TBD for other cases.
* The compressed modes are TBD.

[Motion 112, #SP46, [17] and [70]]

The number of RU Allocation subfields, when present, in a common field in the EHT-SIG field of EHT PPDU sent to multiple users is 4 and 8 in each content channel for 160 MHz and 320 MHz PPDU, respectively.

[Motion 122, #SP132, [10] and [71]]

The RU allocation subfield in the EHT-SIG field of an EHT-PPDU sent to multiple users includes the RU allocation for Multiple RUs as well as Single RU.

[Motion 112, #SP45, [17] and [72]]

An RU Allocation subfield that is present in the Common field of the EHT-SIG field of an EHT PPDU sent to multiple users (except EHT TB PPDU), indicates RU assignment, including the size of the RU(s) and their placement in the frequency domain, to be used in the EHT modulated fields of the PPDU in the frequency domain.

* Compressed modes are TBD.

[Motion 112, #SP43, [17] and [73]]

There exists at least one compressed mode in which RU Allocation subfield does not exist in the Common field of the EHT-SIG field of an EHT PPDU sent to multiple users.

* Signaling method is TBD.

[Motion 58, [28] and [61]]

The minimum RU size for EHT to support MU-MIMO shall be 242-tone RU.

[Motion 112, #SP44, [17] and [73]]

The RU allocation subfield includes large size of RU aggregation for OFDMA transmission as follows:

* For 80 MHz
  + 484 + 242
* For 160 MHz
  + 484 + 996
* For 320 MHz
  + 3x996
* Other cases are TBD.
* NOTE – Specific RU allocation indication is TBD

[Motion 115, #SP57, [14] and [74]]

For non-compressed mode, each RU Allocation subfield in an EHT-SIG content channel corresponding to a 20 MHz frequency segment indicates the RU assignment, including the size of the RU(s) and their placement in the frequency domain, to be used in the EHT modulated fields of the EHT PPDU sent to multiple users in the frequency domain, also indicates information needed to compute the number of users allocated to each RU.

[Motion 115, #SP84, [14] and [75]]

The mapping from the TBD-bit RU Allocation subfield to the RU assignment contains the following entries:

* Other entries TBD
* Compressed mode TBD
* NOTE – Not all the 106+26-tone and 52+26 tone MRU are applicable when PPDU BW is greater than or equal to 80 MHz.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **order** | **#1** | | **#2** | | **#3** | **#4** | **#5** | **#6** | **#7** | | **#8** | **#9** | **Number of entries** |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 26 | 26 | | 52 | | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 52 | | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 52 | | | 52 | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 26 | 26 | | 52 | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 52 | | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 52 | | | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 26 | 26 | | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52 | | | 26 | 26 | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52 | | | 52 | | 1 |
| TBD | 52 | | | | 52 | | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | | 52 | | | 52 | | 26 | 26 | 26 | | 52 | | 1 |
| TBD | | 52 | | | 52 | | 26 | 52 | | | 26 | 26 | 1 |
| TBD | | 52 | | | 52 | | 26 | 52 | | | 52 | | 1 |
| TBD | | 26 | | 26 | 26 | 26 | 26 | 106 | | | | | 1 |
| TBD | | 26 | | 26 | 52 | | 26 | 106 | | | | | 1 |
| TBD | | 52 | | | 26 | 26 | 26 | 106 | | | | | 1 |
| TBD | | 52 | | | 52 | | 26 | 106 | | | | | 1 |
| TBD | | 106 | | | | | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | | 106 | | | | | 26 | 26 | 26 | | 52 | | 1 |
| TBD | | 106 | | | | | 26 | 52 | | | 26 | 26 | 1 |
| TBD | | 106 | | | | | 26 | 52 | | | 52 | | 1 |
| TBD | | 52 | | | 52 | | -- | 52 | | | 52 | | 1 |
| TBD | | Punctured 242-tone RU | | | | | | | | | | | 1 |
| TBD | | Unassigned 242-tone RU | | | | | | | | | | | 1 |
| TBD | | 242-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated | | | | | | | | | | | 1 |
| TBD | | 484-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated | | | | | | | | | | | 1 |
| TBD | | 996-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated | | | | | | | | | | | 1 |
| TBD | | 106 | | | | | 26 | 106 | | | | | 1 |
| TBD | | 242 | | | | | | | | | | | 8 |
| TBD | | 484 | | | | | | | | | | | 8 |
| TBD | | 996 | | | | | | | | | | | 8 |
| TBD | | 2\*996 | | | | | | | | | | | 8 |
| TBD | 26 | | | 26 | 26 | 26 | 26 | 52+26 | | | | 26 | 1 |
| TBD | 26 | | | 26+52 | | | 26 | 26 | 26 | | 26 | 26 | 1 |
| TBD | 26 | | | 26+52 | | | 26 | 26 | 26 | | 52 | | 1 |
| TBD | 26 | | | 26+52 | | | 26 | 52 | | | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 52+26 | | | | 26 | 1 |
| TBD | 26 | | | 26+52 | | | 26 | 52+26 | | | | 26 | 1 |
| TBD | 26 | | | 26+52 | | | 26 | 52 | | | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52+26 | | | | 26 | 1 |
| TBD | 52 | | | | 52 | | 26 | 52+26 | | | | 26 | 1 |
| TBD | 52 | | | | 52+26 | | | 52 | | 52 | | | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26+106 | | | | | | 1 |
| TBD | 26 | | 26+52 | | | | 26 | 106 | | | | | 1 |
| TBD | 26 | | 26 | | 52 | | 26+106 | | | | | | 1 |
| TBD | 26 | | 26+52 | | | | 26+106 | | | | | | 1 |
| TBD | 52 | | | | 26 | 26 | 26+106 | | | | | | 1 |
| TBD | 52 | | | | 52 | | 26+106 | | | | | | 1 |
| TBD | 106+26 | | | | | | | 26 | 26 | | 26 | 26 | 1 |
| TBD | 106+26 | | | | | | | 26 | 26 | | 52 | | 1 |
| TBD | 106+26 | | | | | | | 52 | | | 26 | 26 | 1 |
| TBD | 106 | | | | | | 26 | 52+26 | | | | 26 | 1 |
| TBD | 106+26 | | | | | | | 52+26 | | | | 26 | 1 |
| TBD | 106+26 | | | | | | | 52 | | | 52 | | 1 |
| TBD | 106+26 | | | | | | | 106 | | | | | 1 |
| TBD | 106 | | | | | | 26+106 | | | | | | 1 |

* STA ID 2046 is indicating unallocated RU for smaller than 242-tone RU.
* Whether STA ID 2046 can be used to indicated unallocated RU for equal or larger than 242-tone RU or not is TBD

NOTE – Punctured RU 242 shall be used when the preamble portion of corresponding 20 MHz is punctured.

[Motion 115, #SP58, [14] and [76]]

[Motion 119, #SP103, [5] and [77]]

[Motion 119, #SP104, [5] and [77]]

[Motion 119, #SP105, [5] and [77]]

[Motion 119, #SP106, [5] and [78]]

[Motion 122, #SP134, [10] and [79]]

[Motion 122, #SP135, [10] and [79]]

[Motion 122, #SP136, [10] and [80]]

[Motion 131, #SP200, [19] and [81]]

RU996+484 is not supported in two contiguous 80 MHz segments that cross two 160MHz channels.

[Motion 122, #SP137, [10] and [80]]

No entry in the RU allocation subfield table is defined for 4×996 RU.

[Motion 131, #SP131, [10] and [82]]

For the PPDU transmitted to MU, the User field having TBD bits is contained in the user-specific field of EHT-SIG

* The User field indicates user information assigned to each RU similar to that used in HE MU PPDU.
* Detailed descriptions are TBD.

[Motion 85, [28] and [83]]

In BW ≤ 160 MHz, the EHT-SIG content channel for multiple user transmission is configured as follows:

* An EHT-SIG content channel is composed of a 20 MHz frequency segment.
* EHT-SIG content channels carry EHT-SIG common information and user-specific information.
* The EHT-SIG field consists of two EHT-SIG content channels in each 80 MHz.

The content channels (i.e., CC1 and CC2) per each 80 MHz may carry different information.

* + Where, SST operation using TWT is one potential applicable scenario, other scenarios are TBD.

[Motion 111, #SP0611-17, [17] and [64]]

EHT-SIG may carry different content in each 80 MHz.

* For PPDU BW larger than 80 MHz.
* SST operation using TWT is one applicable scenario, other scenarios are TBD.

[Motion 112, #SP1, [17] and [84]]

### STF

EHT PPDU has EHT-STF immediately after EHT-SIG.

* If EHT PPDU does not have EHT-SIG, EHT-STF is positioned immediately after U-SIG.

[Motion 112, #SP8, [17] and [85]]

802.11be supports 1× EHT-STF and 2× EHT-STF:

* 1× EHT-STF is used in EHT SU/MU PPDU.
  + Whether SU and MU PPDU format is the same is TBD.
* 2× EHT-STF is used in EHT TB PPDU.
* TBD for any new EHT PPDU formats.

[Motion 112, #SP9, [17] and [85]]

802.11be reuses 1× HE-STF and 2× HE-STF in 20/40/80/160/80+80 MHz PPDU.

[Motion 112, #SP10, [17] and [85]]

1× and 2× 320/160+160 MHz EHT-STF sequences are designed by repeating 1× and 2× 80 MHz HE-STF sequences, respectively.

* Additional coefficients for phase rotation are TBD.

[Motion 115, #SP56, [14] and [86]]

1× EHT-STF sequence for contiguous 320 MHz PPDU

* *EHTS*-2032:16:2032 = {*M*, 1, -*M*, 0, -*M*, 1, -*M*, 1\*(0, *M*, 1, -*M*, 0, -*M*, 1, -*M*) , -1\*(0, *M*, 1, -*M*, 0, -*M*, 1, -*M*), -1\*(0, *M*, 1, -*M*, 0, -*M*, 1, -*M*)} \* (1+j) / sqrt(2)

1× EHT-STF sequence for non-contiguous 160+160 MHz PPDU

* Low 160 MHz: *EHTS*-1008:16:1008 = {*M*, 1, -*M*, 0, -*M*, 1, -*M*, 0, *M*, 1, -*M*, 0, -*M*, 1, -*M* }\*(1+j) / sqrt(2)
* High 160 MHz: *EHTS*-1008:16:1008 = {-*M*, -1, *M*, 0, *M*, -1, *M*, 0, -*M*, -1, *M*, 0, *M*, -1, *M* }\*(1+j) / sqrt(2)

where *M* = {-1, -1, -1, +1, +1, +1, -1, +1, +1, +1, -1, +1, +1, -1, +1}

[Motion 115, #SP82, [14] and [86]]

2× EHT-STF sequence for contiguous 320 MHz PPDU

* *EHTS*-2040:8:2040 = {*M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M*, 1\*(0, *M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M*), -1\*(0, *M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M*), -1\*(0, *M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M*)}\*(1+j) / sqrt(2)
  + *EHTS*-2040 = *EHTS*-1032 = *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = *EHTS*1032 = *EHTS*2040 = 0

2× EHT-STF sequence for non-contiguous 160+160 MHz PPDU

* Low 160 MHz: *EHTS*-1016:8:1016 = {*M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M*, 0, *M*, -1, *M*, -1, -*M*, -1, *M*, 0, -*M*, 1, *M*, 1, -*M*, 1, -*M* }\*(1+j) / sqrt(2)
  + *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = 0
* High 160 MHz: *EHTS*-1016:8:1016 = {-*M*, 1, -*M*, 1, *M*, 1, -*M*, 0, *M*, -1, -*M*, -1, *M*, -1, *M*, 0, -*M*, 1, -*M*, 1, *M*, 1, -*M*, 0, *M*, -1, -*M*, -1, *M*, -1, *M*}\*(1+j) / sqrt(2)
  + *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = 0

where *M* = {-1, -1, -1, +1, +1, +1, -1, +1, +1, +1, -1, +1, +1, -1, +1}

[Motion 115, #SP83, [14] and [86]]

### LTF

802.11be shall include 1× EHT-LTF and 2× EHT-LTF.

[Motion 74, [28] and [87]]

802.11be shall include 4× EHT-LTF.

[Motion 75, [28] and [88]]

802.11be supports EHT-LTF for 16 spatial streams.

[Motion 83, [28] and [89]]

802.11be supports reusing 1/2/4× HE-LTF sequences for 1/2/4× EHT-LTF sequences in 20/40/80 MHz PPDU transmission.

[Motion 112, #SP11, [17] and [90]]

802.11be supports reusing 1/2/4× HE-LTF sequences for 1/2/4× EHT-LTF sequences in 80+80/160 MHz.

[Motion 112, #SP41, [17] and [90]]

P-matrix based modulation of EHT-LTFs is adopted for all spatial multiplexing modes (both UL and DL) defined in EHT.

* All spatial streams are active during EHT-LTFs on every non-zero LTF tone.
* Applicable to multi-AP transmission modes as well.

[Motion 111, #SP0611-20, [17] and [91]]

In a 320 MHz transmission using 1× EHT-LTF, the 1× EHT-LTF sequence is given as below.

*EHTLTF*-2036,2036= {*LTF*80MHz\_1st\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_2nd\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_3rd\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_4th\_1x}

*LTF*80MHz\_1st\_1x = { *LTF*80MHz\_left\_1x, 0, *LTF*80MHz\_right\_1x}

*LTF*80MHz\_2nd\_1x = { *LTF*80MHz\_left\_1x, 0, *LTF*80MHz\_right\_1x}

*LTF*80MHz\_3rd\_1x = { -*LTF*80MHz\_left\_1x, 0, -*LTF*80MHz\_right\_1x}

*LTF*80MHz\_4th\_1x = { -*LTF*80MHz\_left\_1x, 0, -*LTF*80MHz\_right\_1x}

*LTF*80MHz\_left\_1x and *LTF*80MHz\_right\_1x are used as it is in 802.11ax.

[Motion 122, #SP146, [10] and [92]]

### Preamble puncture

CCA minimum BW resolution is 20 MHz.

Preamble puncturing resolution is 20 MHz.

[Motion 90, [28] and [30]]

The 802.11be amendment shall support a preamble puncture mechanism for an EHT PPDU transmitted to multiple STAs.

[Motion 30, [7] and [93]]

The 802.11be amendment shall support a preamble puncture mechanism for an EHT PPDU transmitted to a single STA.

[Motion 31, [7] and [93]]

## Data field

### Scrambler

The following generator polynomial to generate the PPDU synchronous scrambler is used for EHT PPDU:

• The 11 bits used for the scrambler initialization are randomly assigned by the transmitter.

• The polarity of the pilot subcarrier is derived from the same sequence as 802.11ax.

[Motion 112, #SP16, [17] and [94]]

802.11be supports using the first 11 LSB bits in SERVICE field for 802.11be scrambling seed initialization and keeping the remaining 5 bits as reserved.



Figure 6 – SERVICE field

[Motion 124, #SP172, [1] and [95]]

802.11be supports using the first 7 LSB bits of the SERVICE field in MU-RTS to scramble the CTS data and fill in the first 7 LSB bits of the SERVICE field of the CTS, when MU-RTS is transmitted using an EHT PPDU.

[Motion 124, #SP173, [1] and [95]]

802.11be supports to disallow the 7 LSB bits of the SERVICE field in MU-RTS transmitted using an EHT PPDU to be all zeros.

[Motion 124, #SP174, [1] and [95]]

### Pilot subcarriers

802.11be supports the following pilot indices for 26/52/106/242/484 RU in 80/160/320 MHz PPDU:

* in a OFDMA/non-OFDMA with puncturing 80MHz EHT PPDU
  + [Pilot indices in 40 MHz]-256, [Pilot indices in 40 MHz]+256
* in a OFDMA/non-OFDMA with puncturing 160MHz EHT PPDU
  + [Pilot indices in 80 MHz]-512, [Pilot indices in 80 MHz]+512
* in a OFDMA/non-OFDMA with puncturing 320MHz EHT PPDU
  + [Pilot indices in 160 MHz]-1024, [Pilot indices in 160 MHz]+1024

[Motion 116, [14] and [96]]

802.11be supports the following pilot indices for n×996RUs (n ≥ 1):

* In a OFDMA/non-OFDMA 80 MHz EHT PPDU
  + Pilot indices of 996-tone RU: P996 = {-468, -400, -334, -266, -220, -152, -86, -18, 18, 86, 152, 220, 266, 334, 400, 468}
* In a OFDMA/non-OFDMA 160 MHz EHT PPDU
  + Pilot indices of 996-tone RU: {P996 -512}, {P996 + 512}
  + Pilot indices of 2×996-tone RU: {P996 -512, P996 + 512}
* In a OFDMA/non-OFDMA 320 MHz EHT PPDU
  + Pilot indices of 996-tone RU: {P996 -1536}, {P996 -512}, {P996 + 512}, {P996 + 1536}
  + Pilot indices of 2×996-tone RU: {P996 -1536, P996 -512}, {P996 + 512, P996 + 1536}
  + Pilot indices of 4×996-tone RU: {P996 -1536, P996 -512, P996 + 512, P996 + 1536}

[Motion 115, #SP78, [14] and [97]]

802.11be supports that pilot subcarriers for small/large RU combinations includes the pilot subcarriers of each RU.

[Motion 115, #SP80, [14] and [97]]

All 802.11be PPDUs use single stream pilots in the data section for SU, DL/UL OFDMA as well as DL/UL MU-MIMO transmissions.

[Motion 122, #SP143, [10] and [98]]

802.11be pilot values are shifted on pilot tones in the data section from symbol to symbol for each RU, which is the same as 802.11ax.

[Motion 122, #SP144, [10] and [98]]

802.11be supports to define the following pilot mapping and values.

* For all size of RUs under 2×996-tone RU, pilot mapping and values of 802.11ax are reused.
* For 3×996-tone RU, pilot mapping and values for 996-tone RU are triplicated
* For 4×996-tone RU, pilot mapping and values for 2×996-tone RU are duplicated
* Pilot mapping and values of RU combinations follow each RU’s.

[Motion 122, #SP145, [10] and [98]]

### Segment parser

802.11be uses 80 MHz segment parser with proportional round robin scheme.

[Motion 111, #SP0611-07, [17], [99], and [100]]

802.11be uses 80 MHz segment parser with the following parameters for the proportional round robin scheme:

|  |  |  |  |
| --- | --- | --- | --- |
| **RU Aggregation** | **Nsd\_total** | **Proportional Ratio (m1:m2:m3:m4)** | **Leftover bits (per symbol)** |
| 484+996 | 1448 | 1s:2s | 44×Nbpscs on ru996 |
| 484+2\*996 | 2428 | 1s:2s:2s | 44×Nbpscs on ru996 |
| 484+3\*996 | 3408 | 1s:2s:2s:2s | 44×Nbpscs on ru996 |
| 2\*996 | 1960 | 1s:1s | 0 |
| 3\*996 | 2940 | 1s:1s:1s | 0 |
| 4\*996 | 3920 | 1s:1s:1s:1s | 0 |

where

[Motion 111, #SP2, [17] and [101]]

The same proportional round robin is applied to left-over bits

* The same ratios are used in the entire segment parsing process except the ratios of those already filled segment becomes 0.



Leftover bits

To 1st RU

To 2nd RU

Figure 7 – Propotional round robin parser

[Motion 111, #SP3, [17] and [101]]

802.11be uses 80 MHz segment parser with the following parameters for (242+484)+996:

|  |  |  |  |
| --- | --- | --- | --- |
| **RU Aggregation** | **Nsd\_total** | **Proportional Ratio (m1:m2:m3:m4)** | **Leftover bits (per symbol)** |
| (242+484)+996 | 1682 | 3s:4s | 44×Nbpscs on RU996 |

where

[Motion 115, #SP70, [14] and [102]]

802.11be supports the following DCM scheme for RU/M-RU size > 80 MHz.

* Use segment parser to distribute coded bits to each 80 MHz segment.
* Within each 80 MHz, perform DCM mapping using per 80 MHz Nsd\_k, k is the index of 80 MHz segment.
* This is for R1.

[Motion 122, #SP150, [10] and [103]]

## Coding

In 802.11be, for LDPC encoding each PSDU only uses one encoder.

[Motion 92, [28] and [30]]

Mandatory support requirement of LDPC in 802.11be is the same as in 802.11ax.

[Motion 124, #SP177, [1] and [2]]

For the combined multiple RU with the combined RU size less than 242 tones, the BCC can be supported.

* Mandatory or Optional for BCC, TBD.
* Only for modulation up to 256 QAM (with or without DCM – if defined in 802.11be).
* Only for NSS <=4.

[Motion 112, #SP12, [17] and [26]]

In case of small size MRU transmission, 802.11be supports applying a common BCC encoder and joint bit Interleaver for the combined RU.

[Motion 112, #SP14, [17] and [26]]

## Interleaving for RUs and aggregated RUs

For LDPC coding, for combined RUs sent to a user with RU size less than 242-tone, a single tone mapper shall be used.

[Motion 82, [28] and [104]]

For aggregated RUs and PPDU BW larger than 80 MHz, a separate LDPC tone mapper is applied in each 80 MHz segment.

[Motion 111, #SP0611-06, [17] and [99]]

802.11be supports the following BCC interleaver parameters for RU78:

* NOTE – The parameters are defined without considering DCM.

|  |  |
| --- | --- |
| **RU78** | **Parameters** |
| Nsd | 72 |
| Ncol | 18 |
| Nrow | 4\*Nbpscs |

[Motion 115, #SP66, [14] and [105]]

802.11be supports the following BCC interleaver parameters for RU132:

* NOTE – The parameters are defined without considering DCM.

|  |  |
| --- | --- |
| **RU132** | **Parameters** |
| Nsd | 126 |
| Ncol | 21 |
| Nrow | 6\*Nbpscs |

[Motion 115, #SP67, [14] and [105]]

802.11be supports the following BCC interleaver parameters for RU52+RU26:

* NOTE – The parameters are defined without considering DCM.

|  |  |
| --- | --- |
| **RU52+RU26** | **Parameters** |
| Nrot | 18 |

[Motion 115, #SP68, [14] and [105]]

802.11be supports the following BCC interleaver parameters for RU106+RU26:

* NOTE – The parameters are defined without considering DCM.

|  |  |
| --- | --- |
| **RU106+RU26** | **Parameters** |
| Nrot | 31 |

[Motion 115, #SP69, [14] and [105]]

The following BCC interleaver and LDPC DTM parameters are defined for DCM.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NSD | | BCC NCOL | | BCC NROT | | LDPC DTM | |
|  | No DCM | DCM | No DCM | DCM | No DCM | DCM | No DCM | DCM |
| RU78 | 72 | 36 | 18 | **12** | 18 | - | 4 | **3** |
| RU132 | 126 | 63 | 21 | 21 | 31 | - | 6 | 3 |
| RU726 | 702 | 351 | - | - | - | - | 18 | 9 |

* This is for R1.

[Motion 122, #SP149, [10] and [103]]

802.11be supports one padding bit is added after 2 × NDBPS coded bit when BCC is used for RU132 with DCM.

* This is for R1.

[Motion 122, #SP151, [10] and [103]]

802.11be supports define DCM for RU/M-RU size <= 996×2 plus RU 996×3 and 996×4.

* This is for R1.

[Motion 122, #SP148, [10] and [103]]

802.11be supports joint interleaving for BCC and joint tone mapper for LDPC for RU and aggregated RU size <= 80 MHz.

[Motion 111, #SP0611-02, [17] and [106]]

The segment parser bit distribution sequence starts from the lowest frequency location to the highest frequency, just like in 802.11ac/802.11ax.

[Motion 111, #SP0611-03, [17] and [106]]

802.11be supports the following LDPC tone mapper parameters:

* for RU52+RU26: D\_TM = 4
* for RU106+RU26: D\_TM = 6
* Existing RUs: identical to 802.11ax

[Motion 111, #SP0611-04, [17] and [106]]

802.11be supports the following LDPC tone mapper parameters:

* for RU484+RU242: D\_TM = 18

[Motion 111, #SP0611-05, [17] and [106]]

## Beamforming

802.11be supports defining a compressed beamforming feedback in 802.11be for following cases:

* Number of streams: 1-16
* Number of antennas: 2-16
* NOTE – Compressed beamforming feedback is the same as defined in 802.11ax except for the new parameter values of Nc and Nr.

[Motion 111, #SP0611-23, [17] and [107]]

# EHT MAC



## General

This section describes the functional blocks in the EHT MAC.

The 802.11be amendment shall define mechanism(s) for an AP to assist a STA that communicates with another STA.

[Motion 22, [7] and [108]]

802.11be supports defining a procedure for an AP to share time resource obtained in a TXOP for peer to peer (STA-TO-STA) frame exchanges.

* Whether it is in R1 or R2 is TBD.

[Motion 111, #SP0611-24, [17] and [109]]

## TXOP

### Bandwidth signaling

802.11be supports defining a MAC mechanism to protect TXOP for PPDUs with > 160 MHz and/or PPDUs with preamble puncturing.

[Motion 111, #SP0611-26, [17] and [110]]

802.11be supports indicating BW larger than 160 MHz through scrambler sequence in non-HT or non-HT duplicated frames.

[Motion 115, #SP102, [14] and [111]]

### Preamble puncturing

802.11be supports transmitting the MU-RTS/RTS and CTS frames in a non-HT duplicate PPDU on 20 MHz subchannels which are not punctured.

[Motion 111, #SP0611-27, [17] and [112]]

## Priority access support for NS/EP services

The 802.11be amendment shall define mechanism(s) in support of priority access to a non-AP STA for national security (NS)/emergency preparedness (EP) priority service

NOTE – A non-AP STA for NS/EP priority service is a regular non-AP STA authorized to NS/EP service.

[Motion 50, [28] and [113]]

The NS/EP Priority Service if supported by a non-AP STA, shall use an action frame to indicate the need for priority access to its associated AP STA and to be included in Release 1 specification.

NOTE 1 – The identification of the need is outside the scope of this specification.

NOTE 2 – The container of the TID is TBD.

[Motion 115, #SP90, [14] and [114]]

[Motion 126, [1] and [115]]

The Priority Service Information shall be defined in EHT MAC Capability Information Element to exchange the NS/EP Priority Service capability information between AP STA and non-AP STA.

NOTE – It is an R1 feature.

[Motion 131, #SP207, [19] and [115]]

# Coexistence and regulatory rules



## General

This section describes the functional blocks that support coexistence. It additionally describes, if needed, adaption to regulatory rules specific to 6 GHz spectrum.

## Coexistence feature #1

Description for coexistence feature #1

# Wideband and noncontiguous spectrum utilization



## General

This section describes features related to the support of wider bandwidth and utilization of noncontiguous spectrum.

## Subchannel selective transmission

802.11be supports extending the SST mechanism so that an 80 MHz/160 MHz (20 MHz TBD) operating STA can operate in the secondary 160 MHz channel in R2.

[Motion 119, #SP129, [5] and [116]]

## A-control subfield

802.11be supports indicating the channel availability up to 320 MHz channel in the A-control subfield.

* NOTE – The detailed solution is TBD.

[Motion 119, #SP128, [5] and [117]]

802.11be supports to indicate the channel availability of 320 MHz channel by carrying two BQR Control subfields in A-control subfield in R2.

[Motion 124, #SP171, [1] and [118]]

**Straw poll #220**

Do you support below indications of BQR Control subfields in A-Control subfield in R2?

* When there are two BQR control subfields in A-Control subfield, the 1st BQR Control is used to indicate the primary 160MHz, the 2nd BQR Control is used to indicate the secondary 160MHz
* When there is one BQR control subfield in A-Control subfield, the BQR Control is used to indicate the primary 160MHz ***[#SP220]***

[20/0712r5 (BQR for 320MHz, Yunbo Li, Huawei), SP#3, Approved with unanimous consent]

# Multi-link operation



## General

This section describes features related to multi-link operation.

Multi-link device (MLD): A device that has more than one affiliated STA and has one MAC SAP to LLC, which includes one MAC data service.

NOTE 1 – The device can be logical.

NOTE 2 – It is TBD for a MLD to have only one STA.

NOTE 3 – Whether the WM MAC address of each STA affiliated with the MLD is the same or different is TBD.

[Motion 23, [7] and [119]]

AP multi-link device (AP MLD): A MLD, where each STA affiliated with the MLD is an AP.

Non-AP multi-link device (non-AP MLD): A MLD, where each STA affiliated with the MLD is a non-AP STA.

[Motion 24, [7] and [119]]

## Multi-link discovery

### Discovery procedures and RNR

802.11be shall define mechanism(s) for an AP of an AP MLD to advertise complete or partial information of other links:

* Partial information to prevent frame bloating.
* For example, frames exchanged during ML setup are expected to carry complete information while Beacon frame is expected to carry partial information.
* The exact set of elements/fields that constitute partial information is TBD.

[Motion 115, #SP93, [14] and [120]]

All APs that are part of the same MLD as a reporting AP and that are collocated with the reporting AP shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP when the reporting AP is either not part of a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set.

* NOTE 1 – An AP is not included if it is not discoverable.
* NOTE 2 – RNR provides basic information (e.g., operating class, channel, BSSID, short SSID).

[Motion 115, #SP95, [14] and [121]]

802.11be agrees to include in a TBTT Information field of the RNR, corresponding to a reported AP that is part of the same MLD as the reporting AP, an indication that the reported AP is part of the same MLD as the reporting AP when the reporting AP is either not part of a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set.

* NOTE – Signaling of that indication is TBD.

[Motion 115, #SP96, [14] and [121]]

All APs that are part of the same MLD as a non-transmitted BSSID and that are collocated with the non-transmitted BSSID shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the transmitted BSSID that is in the same Multiple BSSID set as the non-transmitted BSSID.

If a reporting AP is part of an AP MLD and is in the same collocated set as APs affiliated with another AP MLD for which there are no affiliated APs operating on the same channel as the reporting AP, each AP of the other AP MLD shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP if at least one AP of the other AP MLD is in the same multiple BSSID set as an AP affiliated with the AP MLD of the reporting AP, unless the APs of the other AP MLDs are already reported in beacons and the broadcast probe responses transmitted by an AP in the same collocated set as the reporting AP on the same channel as the reporting AP.

[Motion 119, #SP127, [5] and [122]]

802.11be agrees to define a mechanism for a STA of a non-AP MLD to send a probe request frame to an AP belonging to an AP MLD, which enables to request a probe response from the AP that includes the complete set of capabilities, parameters and operation elements of other APs affiliated to the same MLD as the AP

* The complete information is defined as all elements that would be provided if the reported AP was transmitting that same frame (exceptions TBD).
* It is TBD if the AP is mandated or not to respond with the requested information.
* NOTE 1 – Such a directed probe request requesting complete MLO information for one or more APs of the MLD is referred to as an ML probe request.
* NOTE 2 – A probe response sent in response to an ML probe request containing complete MLO Information for the requested AP(s) is referred to as an ML probe response.

[Motion 115, #SP97, [14] and [121]]

[Motion 119, #SP109, [5] and [123]]

802.11be agrees to add MLD-index to the TBTT Information field of the RNR element, which is used to indicate the ID of the AP MLD in which the reported AP is if the reported AP in an AP MLD.

* MLD-Index is set to BSSID Index of a non-transmitted BSSID if the reported AP is the in the same MLD as the non-transmitted BSSID and the reporting AP is the same multiple BSSID set as the non-transmitted BSSID.
* MLD-Index is set to zero if the reported AP is in the same MLD as the reporting AP.
* MLD-Index of the AP MLD in which the reported AP is shall be unique in the frame sent by the reporting AP.

[Motion 124, #SP185, [1] and [124]]

802.11be agrees to carry Link ID in the TBTT Information field of the RNR element, which is used to indicate the identifier of the reported AP if the reported AP is in an AP MLD.

* The link identifier (Link ID) uniquely identifies a link (tuple consisting of Operational Class, Channel, BSSID) within an MLD.

[Motion 124, #SP186, [1] and [124]]

### ML element structure

802.11be defines mechanism(s) to include MLO information that a STA of an MLD provides in its mgmt. frames, during discovery and ML setup, as described below:

* MLD (common) Information
  + Information common to all the STAs of the MLD.
* Per-link information
  + Capabilities and Operational parameter of other STAs of the MLD other than the advertising STA.

[Motion 115, #SP91, [14] and [120]]

802.11be supports that the MLO framework should follow an inheritance model when advertising complete information of other link(s):

* NOTE – Inheritance mechanism is similar to that defined in 802.11ax for multiple BSSID feature.

[Motion 115, #SP92, [14] and [120]]

802.11be agrees to define a new Multi-Link element (MLE) to report/describe multiple STAs of an MLD with at least the following characteristics:

* MLD-level information may be included
* A STA profile subelement is included for each reported STA (if any) and is made of a variable number of elements describing this STA

NOTE 1 – A control field for the element is not considered as MLD-level information.

NOTE 2 – Name can be changed.

[Motion 115, #SP98, [14] and [125]]

802.11be supports that, for the ML element, an inheritance model is defined to prevent frame bloating when advertising complete information of other links.

* Define the inheritance mechanism, similar to 802.11ax, so that the value of an element of a reported STA that is not present in a STA profile of a ML element in a frame sent by a reporting STA is the same as the element of the reporting STA, present elsewhere in the frame.
* Define the inheritance mechanism, similar to 802.11ax, so that the value of an element of a reported STA that is not present in a STA profile of a ML element, if any, included in a non-transmitted BSSID profile of a non-transmitted BSSID in a multiple BSSID element in a frame sent by a reporting STA is the same as the element of the non-transmitted BSSID, present elsewhere in the frame or as the element of the reporting STA, present elsewhere in the frame.
* Note: an “element of a STA” refers in the text above to the instance of the element describing the capabilities/operation/functionalities of that STA, in a frame where multiple instances of the element can be found for other STAs.
* NOTE – Some elements may not be inherited, signaling TBD.

[Motion 115, #SP99, [14] and [125]]

An AP shall not include a RNR element in a STA profile subelement of a Multi-Link element.

An AP shall not include a MBSSID element in a STA profile subelement of a Multi-Link element.

An ML element shall not be included in a STA profile subelement of another Multi-Link element.

NOTE – It is an R1 feature.

[Motion 131, #SP193, [19] and [126]]

802.11be agrees to include a Control field in Multi-Link element to indicate the presence of certain fields.

[Motion 119, #SP124, [5] and [127]]

### Usage and rules of ML information element in the context of discovery

The Multi-Link element when included in a Beacon or non-ML Probe Response frame should carry only MLD-level/common information.

* NOTE 1 – Exact name for the element is TBD.
* NOTE 2 – Whether the Multi-Link element is always present in the Beacon and non-ML Probe Response frames or is optionally present is TBD.
* NOTE 3 – MLD-Level/Common information includes at least MLD Address, and other information (TBD).

[Motion 119, #SP111, [5] and [123]]

## Multi-link setup

### Procedure

A MLD has a MAC address that singly identifies the MLD management entity.

For example, the MAC address can be used in multi-link setup between a non-AP MLD and an AP MLD.

[Motion 40, [7] and [119]]

[Motion 111, #SP0611-28, [17] and [128]]

802.11be supports that if different affiliated APs of an AP MLD have different MAC addresses, then different affiliated non-AP STAs of a non-AP MLD with more than one affiliated STA have different MAC addresses.

[Motion 112, #SP38, [17] and [128]]

The value of the RA/TA fields sent over-the-air in the MAC header of a frame is the MAC address of the STA affiliated with the MLD corresponding to that link.

[Motion 108, [28] and [129]]

The MAC address of each affiliated AP within an AP MLD shall be different from each other unless the affiliated APs cannot perform simultaneous TX/RX operation (e.g., due to near band in-device interference), in which case the MAC address properties are TBD.

NOTE – It is TBD whether we allow the operation of an AP MLD without simultaneous TX/RX operation.

[Motion 109, [28] and [129]]

802.11be supports that a non-AP MLD may update its ability to perform simultaneous transmission and reception on a pair of setup links after multi-link setup.

* This update for any pair of setup links can be announced by non-AP MLD on any enabled link.

NOTE 1 – Specific signaling for update indication is TBD.

NOTE 2 – Limitations on dynamic updating is TBD.

[Motion 112, #SP4, [17] and [130]]

A MLD that supports multiple links can announce whether it can support transmission on one link concurrent with reception on the other link for each pair of links.

NOTE 1 – The 2 links are on different channels.

NOTE 2 – Whether to define a capability of announcing the support transmission on one link concurrent with transmission on the other link is TBD.

[Motion 38, [7] and [131]]

If a MLD can support transmission on link 1 concurrent with reception on link2, but cannot support transmit on link2 concurrent with reception on link1, this pair of links will be non-STR.

[Motion 122, #SP167, [10] and [132]]

A MLD can indicate capability to support exchanging frames simultaneously on a set of affiliated STAs to another MLD.

[Motion 26, [7] and [133]]

802.11be defines a multi-link setup signaling exchange executed over one link initiated by a non-AP MLD with an AP MLD as follows:

* Capability for one or more links can be exchanged during the multi-link setup.
* The AP MLD serves as the interface to the DS for the non-AP MLD after successful multi-link setup.

NOTE 1 – The link identification is TBD.

NOTE 2 – Details for non-infrastructure mode of operation TBD.

[Motion 25, [7] and [133]]

802.11be agrees to define the following mechanism:

* A STA of a non-AP MLD can request a peer AP of AP MLD a part of complete information of other APs of the same AP MLD.
* The signaling for requesting the part of complete information is TBD.
* NOTE – As an example, the part of complete information may be information that is not included on the beacon frame sent from the peer AP.

[Motion 131, #SP190, [19] and [134]]

802.11be supports the following:

* Existing frames are reused for discovering APs that are affiliated with AP MLD.
* Association Request and Association Response frames are reused for multi-link setup.
* NOTE – After association, new signaling to query AP link specific parameters or AP MLD parameters by using Protected Management Frames (PMF) encrypted Management frames is TBD.

[Motion 115, #SP76, [14] and [135]]

802.11be shall define a mechanism to teardown an existing multi-link setup agreement.

[Motion 70, [28] and [136]]

802.11be supports the following:

* Reuse disassociation frame for multi-link teardown.
* Reuse authentication frame for multi-link SAE exchange and multi-link Open System authentication.

[Motion 115, #SP88, [14] and [137]]

Between two MLDs, 802.11be supports using the MLD MAC addresses to derive PMK under SAE method and PTK in 802.11be SFD.

[Motion 112, #SP40, [17] and [138]]

TGbe shall define a multi-link resetup mechanism to resetup with another AP MLD or changing configuration of existing multi-link setup with an AP MLD.

* Reassociation Request/Response frame is used for this purpose.

[Motion 115, #SP86, [14] and [139]]

When a non-AP MLD that has multi-link setup with current AP MLD sends a Reassociation Request frame to a new AP MLD, AP MLD MAC address of the current AP MLD is used in Current AP Address field of the frame.

[Motion 115, #SP87, [14] and [139]]

When a STA of a non-AP MLD that has multi-link setup with current AP MLD sends a Reassociation Request frame to a new AP that is not affiliated with an AP MLD, AP MLD MAC address of the current AP MLD is used in Current AP Address field of the frame.

* NOTE – Only the STA that sends the Reassociation Request frame can associate with the new AP.

[Motion 115, #SP94, [14] and [139]]

### ML transition

After a successful multi-link (re)setup between a non-AP MLD and an AP MLD, the non-AP MLD is in associated state and is (re)associated with the AP MLD, and the non-AP MLD to the AP MLD mapping is provided to the DS by the AP MLD.

* For each setup link, the corresponding non-AP STA affiliated with the non-AP MLD is in the same associated state as the non-AP MLD and is associated with the corresponding AP affiliated with the AP MLD, without providing the corresponding non-AP STA to the corresponding AP mapping to the DS, and enables the functionalities between a non-AP STA and its associated AP unless the functionalities have been extended to MLD level and specified otherwise.

After a successful multi-link tear down between a non-AP MLD and an AP MLD, the non-AP MLD is in unassociated state and is disassociated with the AP MLD.

* All the non-AP STAs affiliated with the non-AP MLD are in the unassociated state.

NOTE – A non-AP MLD needs to perform successful multi-link (re)setup with AP MLD before the non-AP MLD is allowed to send/receive MSDU(s) via the AP MLD to the DS.

[Motion 131, #SP192, [19] and [140]]

Define ML transition\* as follows:

* A non-AP MLD movement from being associated with one AP MLD in one ESS to be reassociated with another AP MLD within the same ESS.
* A non-AP MLD movement from being associated with one AP MLD in one ESS to become a non-AP STA that is reassociated with an AP within the same ESS.
* A non-AP STA movement from being associated with one AP in one ESS to become a non-AP MLD that is reassociated with an AP MLD with the same ESS.

Define fast ML transition\* as follows:

* A ML transition\* that establishes the state necessary for data connectivity before the reassociation rather than after the reassociation.

NOTE 1 – \* the name can be changed.

NOTE 2 – It is an R1 feature.

[Motion 131, #SP196, [19] and [141]]

802.11be supports to reuse existing frame exchange of over-the-air fast BSS transition (FT) for fast ML transition in R1.

[Motion 131, #SP197, [19] and [141]]

For a non-AP MLD and an AP MLD in a FT initial mobility domain operation, use non-AP MLD address as S1KH-ID and S0KH-ID and AP MLD address as R1KH-ID. Use AP MLD address and non-AP MLD address to compute PMKID, PTK, and PTKName.

For a non-AP MLD and a target AP MLD in an over-the-air FT operation, use non-AP MLD address as S1KH-ID and AP MLD address as R1KH-ID. Use AP MLD address and non-AP MLD address to compute PMKID, PTK, and PTKName.

NOTE – It is an R1 feature.

[Motion 131, #SP203, [19] and [142]]

For a non-AP MLD and an AP MLD in a FT initial mobility domain operation, different GTK/IGTK/BIGTK of different setup links are delivered in one FT 4-way handshake.

For a non-AP MLD and a target AP MLD in an over-the-air FT operation, different GTK/IGTK/BIGTK of different setup links are delivered in FTE of reassociation response of the over-the-air FT protocol.

NOTE – It is an R1 feature.

[Motion 131, #SP204, [19] and [142]]

**Straw poll #221**

Do you support the following in R1?

* For a ML transition from a legacy AP to an AP MLD, the MAC address of the non-AP STA that is associated with the legacy AP shall be used as the MLD MAC address of the non-AP MLD that is reassociated with the AP MLD
* For a ML transition from an AP MLD to a legacy AP, the non-AP MLD MAC address of the non-AP MLD that is associated with the AP MLD shall be used as the MAC address of the non-AP STA that is reassociated with the legacy AP
* Note: Tear down of previous association and have a new association is not an ML transition ***[#SP221]***

[20/0669r5 (MLD transition, Po-Kai Huang, Intel), SP#6, Approved with unanimous consent]

### Security

After multi-link setup between two MLDs, different GTK/IGTK/BIGTK in different links with different PN spaces are used.

* GTK/IGTK/BIGTK in different links can be delivered in one 4-way handshake.

[Motion 71, [28] and [143]]

802.11be supports that after multi-link setup between two MLDs, the same PMK and the same PTK across links are used with the same PN space for a PTKSA.

[Motion 111, #SP0611-29, [17] and [144]]

### Usage and rules of ML Information element

802.11be supports the following:

* An AP that is part of an AP MLD that supports SAE authentication shall include the MLD address in beacon and probe response frames it transmits.
* EHT MLD shall indicate its MLD MAC address during authentication request/response exchange.

[Motion 115, #SP89, [14] and [137]]

An EHT MLD shall indicate its MLD MAC address during ML setup.

[Motion 112, #SP32, [17] and [145]]

802.11be supports that a non-AP MLD may initiate multi-link setup with an AP MLD to setup more than one link with subset of APs affiliated with the AP MLD. This is for R1.

[Motion 122, #SP133, [10] and [146]]

During multi-link setup, a non-AP MLD includes in a Multi-Link element included in Association Request frame the complete information of affiliated non-AP STAs corresponding to the links requested for setup.

NOTE – It is an R1 feature.

[Motion 131, #SP202, [19] and [147]]

During multi-link setup, when an AP MLD accepts the association request of a non-AP MLD, the AP MLD provides in a Multi-Link element included in Association Response frame the complete information of affiliated APs corresponding to the links that are accepted by the AP MLD and requested by the non-AP MLD.

NOTE – It is an R1 feature.

[Motion 131, #SP205, [19] and [147]]

802.11be defines mechanism(s) for multi-link operation that enables the following:

* Indication of capabilities and operating parameters for multiple links of an AP MLD.
* Negotiation of capabilities and operating parameters for multiple links during a single setup signaling exchange.

[Motion 32, [7] and [148]]

802.11be supports a mechanism for multi-link operation:

* An AP affiliated with an AP MLD can indicate the capabilities and operational parameters for one or more STAs of the multi-link device.
* A non-AP STA affiliated with a non-AP MLD can indicate the capabilities for one or more non-AP STAs of the non-AP MLD.
* Specific information of capabilities and operational parameters of multi-link device is TBD.

[Motion 21, [7] and [149]]

A new element will be defined as a container to advertise and exchange capability information for multi-link setup.

[Motion 68, [28] and [150]]

802.11be supports that an STA of an MLD can provide MLD-level information that is common to all STAs affiliated with the MLD and per-link information that is specific to the STA on each link in management frames during multi-link setup.

* The specific information is TBD.

[Motion 115, #SP65, [14] and [135]]

802.11be supports that each STA of an MLD may independently select and manage its operational parameters unless specified otherwise in the 802.11be standard.

[Motion 112, #SP33, [17] and [151]]

## TID-to-link mapping and link management

### Default mode and enablement

At any point in time, a TID shall always be mapped to at least one link that is set up, unless admission control is used.

[Motion 101, [28] and [152]]

A link, that is setup as part of a multi-link setup, is defined as Enabled if that link can be used for frame exchange and at least one TID is mapped to that link.

NOTE – Frame exchange on a link is subject to the power state of the corresponding non-AP STA.

[Motion 105, [28] and [153]]

Management frames are allowed on all enabled links, following baseline.

[Motion 102, [28] and [152]]

If a TID is mapped in UL to a set of enabled links for a non-AP MLD, then the non-AP MLD can use any link within this set of enabled links to transmit data frames from that TID.

If a TID is mapped in DL to a set of enabled links for a non-AP MLD, then:

* The non-AP MLD can retrieve buffered BUs corresponding to that TID on any links within this set of enabled links.
* The AP MLD can use any link within this set of enabled links to transmit data frames from that TID, subject to existing restrictions for transmissions of frames that apply to those enabled links.
* An example of restriction is if the STA is in doze state.

[Motion 103, [28] and [152]]

802.11be supports adjusting the setting of More Data subfield to fit MLD scenario.

[Motion 112, #SP51, [17] and [154]]

802.11be define mechanism(s) for multi-link operation that enables the following:

* An operational mode for concurrently exchanging frames on more than one link for one or more TID(s).
* An operational mode for restricting exchanging frames of one or more TID(s) to be on one link at a time.

[Motion 9, [3] and [155]]

802.11be supports setting the More Data subfield as follows:

* When AP MLD transmit a BU in one link to a non-AP MLD, if there is at least one additional buffered BU of any TID or management frames that is mapped to this link by TID-to-link mapping or default mapping for the same non-AP MLD, the More Data subfield is set to 1, otherwise the More Data subfield is set to 0.

[Motion 112, #SP52, [17] and [154]]

### TID-to-link mapping

802.11be defines a directional-based TID-to-link mapping mechanism among the setup links of a MLD.

* By default, after the multi-link setup, all TIDs are mapped to all setup links.
* The multi-link setup may include the TID-to-link mapping negotiation.
  + TID-to-link mapping can have the same or different link-set for each TID unless a non-AP MLD indicates that it requires to use the same link-set for all TIDs during the multi-link setup phase.

NOTE – Such indication method by the non-AP MLD is TBD (implicit or explicit).

* The TID-to-link mapping can be updated after multi-link setup through a negotiation, which can be initiated by any MLD.
  + Format TBD.

NOTE – When the responding MLD cannot accept the update, it can reject the TID-to- link mapping update.

[Motion 54, [28] and [156]]

### Individual addressed data delivery

After multi-link setup, the following is enabled to deliver individual addressed QoS traffic of a TID without BA negotiation across links, where the TID is mapped, in R1.

* For Transmitter:
  + Expand Table 10-5—Transmitter sequence number spaces to have a new entry Indexed by <destined MLD Address, TID> .
  + Continue to transmit the failed QoS Data frame until the retry counter is met.
  + Cannot transmit other QoS Data frame from the same TID in any link until the current frame finish transmission or dropped.
* For Receiver:
  + Maintain at least the most recent record of <peer MLD address, TID, sequence number>.
  + Drop the frame with retry bit set and record match.

[Motion 122, #SP158, [10] and [157]]

### Retransmission

The established block ack agreement allows the QoS Data frames of the TID, aggregated within the A-MPDUs, to be exchanged between the two MLDs on any available link.

NOTE – QoS Data frames that are not fragments might be retransmitted on any available link.

[Motion 61, [28] and [158]]

[Motion 115, #SP85, [14] and [159]]

## Multi-link block ack

### Procedures

A single block ack agreement is negotiated between two MLDs for a TID that may be transmitted over one or more links.

NOTE – The format of the setup frames is TBD.

[Motion 36, [7] and [160]]

Setup a block ack agreement for multi-link operation by using ADDBA request and ADDBA response frames.

[Motion 67, [28] and [161]]

For each block ack agreement, there exists one receive reordering buffer based on MPDUs in the MLD which is the recipient of the QoS Data frames for that block ack agreement.

The receive reordering buffer operation is based on the Sequence Number space that is shared between the two MLDs.

[Motion 62, [28] and [158]]

The receive status of QoS Data frames of a TID received on a link shall be signaled on the same link and may be signaled on other available link(s)

[Motion 63, [28] and [158]]

802.11be supports allowing an EHT STA to use HE SU PPDU to carry the solicited BA if the transmit time of HE SU PPDU is less than the PPDU duration of a non-HT PPDU containing the Control frame sent at the primary rate.

[Motion 115, #SP63, [14] and [162]]

802.11be supports allowing an EHT SU PPDU to carry the solicited BA if the transmit time of EHT SU PPDU is less than the PPDU duration of a non-HT PPDU containing the Control frame sent at the primary rate and the soliciting PPDU is EHT PPDU.

[Motion 115, #SP64, [14] and [162]]

802.11be shall define mechanism for multi-link operation that enables the following:

* A STA of a recipient MLD shall provide receive status for MPDUs received on the link that it is operating on and may provide (if available) information on successful reception of MPDUs received by another STA of that MLD.

[Motion 114, [17] and [163]]

An originator MLD of a BA agreement:

* shall update the receive status for an MPDU corresponding to the BA agreement if the received status indicates successful reception.
* shall not update the receive status for an MPDU corresponding to the BA agreement that has been already positively acknowledged.

[Motion 112, #SP26, [17] and [164]]

### Sharing and extension of SN space

Sequence numbers are assigned from a common sequence number space shared across multiple links of a MLD, for a TID that may be transmitted to a peer MLD over one or more links.

[Motion 37, [7] and [160]]

After the BA agreement of a TID between two MLDs, the common reordering buffer of the TID are applied on all setup links.

[Motion 112, #SP27, [17] and [165]]

For each block ack agreement between two MLDs, there exists one transmit buffer control to submit MPDUs for transmission across links.

* TBD for separate transmit buffer control.

[Motion 112, #SP6, [17] and [166]]

802.11be extends the negotiated Block Ack buffer size to be smaller than or equal to 1024 and define 512-bits and 1024-bits BA bitmap in R1.

[Motion 112, #SP7, [17] and [166]]

802.11be extends Table 26-1 in 802.11ax D6.0 as shown below:

|  |  |  |
| --- | --- | --- |
| **Negotiated buffer size** | **Bitmap in compressed BA** | **Bitmap in multi-STA BA** |
| 1-64 | 64 | 32 or 64 |
| 65-128 | 64 or 256 | 32, 64, 128 |
| 129-256 | 64 or 256 | 32, 64, 128, or 256 |
| 257-512 | 64 or 256 or 512 | 32, 64, 128, 256, 512 |
| 513-1024 | 64 or 256 or 512 or 1024 | 32, 64, 128, 256, 512, or 1024 |

[Motion 112, #SP25, [17] and [167]]

For an M-BlockAck frame, add support for 512/1024 bitmap lengths by:

* Including new BA Bitmap lengths (of 512 and 1024 bits), where the length of the BA Bitmap field is signaled in the Per AID TID Info field addressed to an EHT STA
* The M-BA frame containing these Per AID TID Info fields is not sent as a response to an HE TB PPDU generated by at least one HE STA.

[Motion 112, #SP22, [17] and [168]]

For a Compressed BlockAck frame, use some of the reserved values of the Fragment Number field of the BlockAck frame to indicate the added bitmap lengths (512 and 1024).

[Motion 112, #SP23, [17] and [168]]

802.11be uses B3 equal to 1, B2 B1 equal to 0 and B0 equal to 0 in Fragment Number field to indicate 512 BA bitmap length and to use B3 equal to 1, B2-B1 equal to 1 and B0 equal to 0 in Fragment Number field to indicate 1024 BA bitmap length in compressed BA and multi-STA BA.

[Motion 112, #SP24, [17] and [169]]

[Motion 133, [19]]

## Power save

### Traffic indication

An AP of an AP MLD may transmit on a link a frame that carries an indication of buffered data for transmission on other enabled link(s).

[Motion 52, [28] and [170]]

An AP MLD can recommend a non-AP MLD to use one or more enabled links.

* The AP’s indication could be carried in a broadcast or a unicast frame.

[Motion 106, [28] and [171]]

A bit in a partial virtual bitmap of a TIM element that corresponds to a non-AP MLD is set to 1 if any individually addressed BUs for the non-AP MLD are buffered by the AP MLD.

[Motion 115, #SP61, [14] and [172]]

When a non-AP MLD made a multi-link setup with an AP MLD, one AID is assigned to the non-AP MLD across all links.

[Motion 115, #SP62, [14] and [172]]

A non-AP MLD shall have the same U-APSD Flag value for each AC across all links that multi-link is setup. This is for R1.

[Motion 122, #SP157, [10] and [173]]

### Power state indication

For a link setup between an AP MLD and a non-AP MLD, a non-AP STA operating on that link can send to an AP operating on that link an indication that (an)other non-AP STA(s) within the same non-AP MLD that has(have) transition to doze state is(are) in awake state.

[Motion 84, [28] and [174]]

### BSS parameter update

A non-AP MLD monitors and performs basic operations (such as traffic indication, BSS parameter updates, etc.) on one or more link(s).

[Motion 104, [28] and [175]]

A non-AP MLD shall maintain a record of the most recently received change sequence number for each reported APs in the AP MLD with which it has multi-link setup.

[20/0503r2 (BSS parameter update for Multi-link Operation, Ming Gan, Huawei), SP#2, Y/N/A: 51/7/14]

[Motion 115, #SP101, [14] and [176]]

An AP in an AP MLD shall provide BSS specific parameters update indication for one or more other APs in the same AP MLD.

* The detail for BSS specific parameters update indication is TBD.

[Motion 115, #SP59, [14] and [177]]

802.11be supports that an AP within an AP MLD shall include in the Beacon and Probe Response frames it transmits the Change Sequence fields that indicate changes of system information for the transmitting AP and other APs within the same AP MLD, where the change sequence field value for each AP is initialized to 0, and is incremented when there is a critical update to the operational parameters for that AP.

* TBD field(s) to carry the change sequence(s) of the transmitting AP and of non-transmitted BSSIDs (if any).
* The change sequence information for another AP of the MLD shall be carried in a field in the TBTT Information field of the Reduced Neighbor Report element corresponding to that AP.
* A TBD subfield in the Capability Information field of the Beacon frame shall provide an early indication of an update to change sequence information in the RNR for any AP of the reporting AP’s MLD.
  + NOTE – For an AP corresponding to nontransmitted BSSID in a multiple BSSID set, the early indication is carried in the Nontransmitted BSSID Capability field (which has the same structure as the Capability Information field) and signals the update to change sequence information in RNR for APs corresponding to the MLD to which the nontransmitted BSSID is affiliated with.
* The critical updates are defined in 11.2.3.15 (TIM Broadcast) and the additional update can be added if needed.
* The field is at most 1 octet in length and the value carried in the field is modulo of the maximum value.
* NOTE – It is optional for non-AP MLD to decode the subfield in the Capability Information field carrying the early indication.

[Motion 115, #SP77, [14] and [178]]

[Motion 131, #SP191, [19] and [179]]

### TWT

Individual TWT agreement(s) could be set up on a setup link for more than one setup link.

[Motion 115, #SP60, [14] and [177]]

### Other procedures

For each of the enabled links, frame exchanges are possible when the corresponding non-AP STA of the enabled link is in the awake state.

NOTE 1 – A link is enabled when that link can be used to exchange frames subject to STA power states.

NOTE 2 – When a link is disabled (i.e., not enabled) by an MLD the frame exchanges are not possible.

[Motion 51, [28] and [170]]

Each non-AP STA affiliated with a non-AP MLD that is operating on an enabled link maintains its own power state/mode.

[Motion 110, [28] and [153]]

Not every STA operating in PS mode in a non-AP MLD is required to receive the beacon frames periodically.

* This is an exemption besides the existing ones, such as individual TWT agreement, WNM sleep mode and NonTIM mode.

[Motion 112, #SP55, [17] and [180]]

The MLD Max Idle Period of an AP MLD applies at the MLD level and not at the STA level.

The MLD Max Idle Period of an AP MLD indicates, for a non-AP MLD, the time period during which a non-AP MLD can be inactive (i.e., refrain from transmitting frames to the AP MLD on any of the setup links) without the Multi-link setup to be torn down.

A non-AP MLD is considered inactive if none of the APs of the AP MLD have received a Data frame, PS-Poll frame, or Management frame (protected or unprotected) of a frame exchange sequence initiated by a STA from the non-AP MLD for a time period greater than or equal to the time specified by the MLD Max Idle Period of the AP MLD.

If the non-AP MLD is inactive for a duration greater than the MLD Max Idle Period, then the AP MLD may tear down the multi-link setup for that non-AP MLD.

[Motion 115, #SP100, [14] and [181]]

## Multi-link group addressed frame delivery

For R1, each AP affiliated with an STR AP MLD shall follow the baseline rules for scheduling Beacon frame transmissions.

[Motion 112, #SP37, [17] and [182]]

802.11be supports the following group addressed frames delivery mechanism in R1:

* An AP MLD should not cause a STA affiliated to a non-STR non-AP MLD to transmit an MPDU that overlaps with group addressed frames in a constrained link if another STA affiliated to the same non-STR non-AP MLD is expected to be receiving group addressed frames.

[Motion 122, #SP155, [10] and [183]]

802.11be supports the following loopback prevention mechanism of the group address frame in the MLO in R1.

* An AP MLD that broadcasts the group addressed MPDU received from a non-AP MLD with which it has done multi-link setup shall set the SA field of the broadcast group addressed MPDU to the MLD MAC address of the non-AP MLD.
* A non-AP MLD filters out the group addressed MPDU with the SA field set to the MLD MAC address of the non-AP MLD.

[Motion 131, #SP199, [19] and [184]]

802.11be agrees that each AP in an AP MLD shall independently transmit all bufferable group addressed Management frames after every DTIM beacon in R1.

[Motion 131, #SP206, [19] and [185]]

## Multi-link channel access

### STR: General

802.11be shall allow the following asynchronous multi-link channel access:

* Each of STAs belonging to a MLD performs a channel access over their links independently in order to transmit frames.
* Downlink and uplink frames can be transmitted simultaneously over the multiple links.

[Motion 20, [7] and [186]]

### Non-STR: General

802.11be supports the following cases in R1:

* STR AP MLD with STR non-AP MLD
* STR AP MLD with non-STR non-AP MLD
* NOTE – All the other cases are TBD.

[Motion 111, #SP0611-30, [17] and [187]]

802.11be supports the following constrained multi-link operation:

* When a STA in a non-STR MLD receives an RTS addressed to itself, if the NAV of the STA indicates idle but another STA in the same MLD is either a TXOP holder or a TXOP responder, the STA may not respond with a CTS frame.

[Motion 111, #SP0611-32, [17] and [188]]

### Capability signaling

802.11be shall allow a MLD that has constraints to simultaneously transmit and receive on a pair of links to operate over this pair of links.

* Signaling of these constraints is TBD.

[Motion 46, [7] and [189]]

### End PPDU alignment

802.11be supports the following PPDU transmission restriction for the constrained multi-link operation:

* If an AP MLD intends to align the ending time of DL PPDUs carrying a frame soliciting an immediate response simultaneously sent to the same non-STR non-AP MLD on multiple links, the AP MLD shall ensure that the difference between the ending times of transmitting DL PPDUs is less than or equal to 8 μs ((aSIFSTime + aSignalExtension)/2).
  + Where the reference of the ending time of the PPDU is not including the Signal Extension field.

[Motion 111, #SP0611-31, [17] and [190]]

[Motion 122, #SP152, [10] and [191]]

802.11be supports the following Trigger frame transmission rule in the MLO:

* An AP in the AP MLD shall not send a Trigger frame with the CS Required subfield set to 1 to a STA in a non-STR non-AP MLD, when at least one PPDU from other STAs affiliated to the same non-STR non-AP MLD is scheduled for transmission before (aSIFSTime + aSignalExtention – aRxTxTurnaroundTime) has expired after the PPDU containing the Trigger frame.
  + NOTE 1 – In the above, aRxTxTurnaroundTime is 4 μs.
  + NOTE 2 – The ending time of a first PPDU that carrying a frame soliciting an immediate response frame cannot be earlier more than aRxTxTurnaroundTime of the ending time of a second PPDU containing a Trigger frame with the CS Required subfield set to 1.
  + NOTE 3 – The AP STA still follows the CS Required rule defined in 802.11ax.

[Motion 122, #SP153, [10] and [192]]

802.11be supports the following Trigger frame transmission rule in the MLO in R1:

* When an AP MLD triggers simultaneously TB PPDUs from more than one STAs affiliated to the same non-STR non-AP MLD and allows the frames in the TB PPDUs to solicit control response frames from the AP MLD, then the UL Length subfield values in the soliciting Trigger frames shall be set to the same value.

[Motion 122, #SP154, [10] and [192]]

An AP MLD shall align the end of DL PPDUs (that contain QoS data soliciting an immediate UL response) that are sent simultaneously on multiple links to the same non-STR non-AP MLD, in such a way that the response to any of the PPDUs will not overlap with any of the DL PPDUs in R1.An exception is that a high priority DL PPDU sent on one link may not be aligned with another DL PPDU sent on the other link.

[Motion 122, #SP159, [10] and [193]]

802.11be supports that the padding procedures of 802.11ax can be used when transmitting a Trigger frame to extend the frame length to meet the ending time requirement of the PPDU carrying the Trigger frame in the MLO.

* NOTE – The Padding field in the Trigger frame is also included in the padding procedure.

[Motion 122, #SP168, [10] and [194]]

### STA ID indication

802.11be supports that the STA ID field in a downlink EHT SU PPDU sent from an EHT AP to an EHT STA identifies the recipient EHT STA.

* NOTE – The size and encoding of the STA ID field in the downlink EHT SU PPDU is TBD.

[Motion 122, #SP160, [10] and [195]]

802.11be supports that the STA ID field in an uplink EHT SU PPDU sent from an EHT STA to an EHT AP identifies the transmitter EHT STA.

* NOTE – The size and encoding of the STA ID field in the uplink EHT SU PPDU is TBD.

[Motion 122, #SP161, [10] and [195]]

## Multi-BSSID operation

An AP of an AP MLD can correspond to a transmitted BSSID or a nontransmitted BSSID in a multiple BSSID set on a link.

[Motion 112, #SP34, [17] and [196]]

APs belonging to the same multiple BSSID set cannot be part of the same AP MLD.

* NOTE – APs within a multiple BSSID set are, by definition, operating on the same channel.

[Motion 112, #SP35, [17] and [196]]

APs belonging to the same co-hosted BSSID set cannot be part of the same AP MLD.

* NOTE – APs within a co-hosted BSSID set are, by definition, operating on the same channel.

[Motion 112, #SP36, [17] and [196]]

802.11be supports that each AP of an AP MLD is independently configured to operate as transmitted or nontransmitted BSSID of a multiple BSSID set or as an AP of a co-hosted BSSID set or not part of either a multiple BSSID set or co-hosted BSSID set.

[Motion 112, #SP50, [17] and [197]]

## Quality of service for latency sensitive traffic

An MLD AP may offer differentiated quality of service over different links.

[Motion 112, #SP49, [17] and [198]]

802.11be supports to define a mechanism so that an EHT AP MLD can provide information about traffic conditions of each link (e.g., DL transmit Delay, BSS load).

* Signaling details is TBD.

[Motion 119, #SP110, [5] and [199]]

## Multi-link single radio operation

Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only receive, or transmit frames on one link at a time.

[Motion 119, #SP118, [5] and [200]]

[Motion 119, #SP125, [5] and [201]]

802.11be supports the multi-link operation for a non-AP MLD that is defined as follows to be included in R1.

* A non-AP MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links.
  + The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS).
  + The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type.
  + Link switch delay may be indicated by the non-AP MLD.

[Motion 119, #SP126, [5] and [202]]

## Enhanced multi-link operation mode

802.11be shall define a mechanism that in R1 a non-AP MLD indicates maximum number of spatial streams that it is capable of transmitting or receiving at a time, while operating in any of the links within the specified set of links in which the enhanced multi-link operation mode is applied.

* Each STA in the non-AP MLD operating in any of the links within the specified set of links shall support the indicated maximum number of spatial streams.
* The enhanced multi-link operation mode is optional mechanism.

NOTE – The name of the enhanced multi-link operation mode can be changed.

[Motion 124, #SP187, [1] and [203]]

## Soft AP for MLD operation

802.11be defines mechanisms to support the operation of a Non-STR AP MLD in R1. The mechanisms are limited to instantiate a Non-STR Non-AP MLD as a Soft AP that could utilize all its links under TBD conditions. The exact language to govern such scope is TBD.

[Motion 125, [1] and [204]]

# Multi-band and multichannel aggregation and operation



## General

This section describes features related to multi-band and multichannel aggregation and operation.

## Feature #1

Description for feature #1

# Spatial stream and MIMO protocol enhancement



## General

This section describes features related to 16 spatial stream operation and MIMO protocol enhancement.

## 16 spatial stream operation

802.11be supports a maximum of 16 spatial streams (total across all the scheduled STAs) for MU-MIMO.

[Motion 65, [28] and [205]]

802.11be defines a maximum of 16 spatial streams for SU-MIMO.

[Motion 66, [28] and [205]]

For an EHT MU-MIMO transmission, the maximum number of spatial streams allocated to each MU-MIMO scheduled non-AP STA is limited to 4.

[Motion 112, #SP15, [17] and [206]]

The maximum number of users that can be spatially multiplexed in EHT for DL transmissions is 8 per RU/MRU.

* Applicable to all transmission modes in 802.11be.

[Motion 112, #SP47, [17] and [207]]

# Multi-AP operation



## General

This section describes features related to multi-AP operation.

## Setup

An EHT AP supporting the Multi-AP coordination can send a frame (e.g., Beacon or other management frame) including capabilities of Multi-AP transmission schemes.

NOTE – Multi-AP transmission schemes are TBD (e.g., Coordinated OFDMA).

[Motion 72, [28] and [208]]

An EHT AP which obtains a TXOP and initiates the Multi-AP coordination is the Sharing AP.

An EHT AP which is coordinated for the Multi-AP transmission by the Sharing AP is the Shared AP.

NOTE – The name of the Sharing AP and the Shared AP can be modified.

[Motion 73, [28] and [208]]

802.11be supports 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.

[Motion 119, #SP113, [5] and [209]]

802.11be supports 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.

[Motion 119, #SP114, [5] and [209]]

## Channel sounding

802.11be shall provide a joint NDP sounding scheme as optional mode for multiple-AP systems.

* Sequential sounding scheme that each AP transmits NDP independently and sequentially without overlapped sounding period of each AP can also be used in multi-AP systems.

[Motion 14, [7] and [210]]

Joint NDP sounding scheme for multi-AP system with less or equal to total 8 antennas at AP has all antennas active on all LTF tones and uses 802.11ax P matrix across OFDM symbols.

[Motion 15, [7] and [210]]

Multiple APs can sequentially use an 802.11ax-like sounding sequence to collect CSI from the in-BSS STAs and OBSS STAs.

* The sounding sequence of each AP is similar to the 802.11ax sounding protocol with multiple STAs (NDPA + NDP + BFRP TF + CSI report).

[Motion 112, #SP18, [17] and [211]]

In sequential channel sounding sequence for multi-AP, the NDPA frame and BFRP TF frame will include ID info for OBSS STA.

* The details of the NDPA, BFRP TF and the ID info are TBD.

[Motion 112, #SP19, [17] and [211]]

In sequential channel sounding sequence for multi-AP, 802.11be supports the following:

* STA can process the NDPA frame and the BFRP Trigger frame received from the OBSS AP.
* If polled by the BFRP trigger frame from the OBSS AP, the STA responds with the corresponding channel state information (CSI) to the OBSS AP

NOTE 1 – Details of the 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.

[Motion 119, #SP119, [5] and [212]]

## Coordinated transmission

802.11be shall define an AP candidate set\* as follows:

* An AP candidate set is a set of APs that can initiate or participate in Multi-AP Coordination.
* An AP in an AP candidate set can participate as a shared AP in Multi-AP Coordination initiated by a sharing AP in the same AP candidate set.
* At least one AP in an AP candidate set shall be capable of being a sharing AP.
* NOTE – The name\* can be changed.

[Motion 55, [28] and [213]]

[Motion 124, #SP188, [1] and [214]]

Define a procedure for an AP to share its frequency/time resources of an obtained TXOP with a set of APs.

* Set of APs is TBD.

[Motion 56, [28] and [215]]

An AP that intends to use the resource (i.e., frequency or time) shared by another AP shall be able to indicate its resource needs to the AP that shared the resource.

[Motion 53, [28] and [216]]

In all modes of operation wherein an AP shares its frequency/time resource of an obtained TXOP with a set of APs:

* Define a mechanism for the sharing AP to optionally solicit feedback from one or more APs from the AP candidate set to learn the resource needs and the intent to participate in a coordinated AP transmission.

[Motion 111, #SP0611-33, [17] and [215]]

In all modes of operation wherein an AP shares its frequency resource with a set of APs, the AP shall share its frequency resource in multiples of 20 MHz channels with a set of APs in an obtained TXOP.

* PPDU format of the transmission on the shared resource is TBD.

[Motion 111, #SP0611-34, [17] and [215]]

Coordinated OFDMA is supported in 11be, and in a coordinated OFDMA, both DL OFDMA and its corresponding UL OFDMA acknowledgement are allowed.

[Motion 60, [28] and [217]]

802.11be will adopt Coordinated UL MU-MIMO as a Multi-AP Coordination scheme for UL transmissions in R2.

* NOTE – Not for joint reception.

[Motion 124, #SP189, [1] and [218]]

802.11be believes the hidden node problem in multi-AP environments (e.g. coordinated AP transmission) should be addressed.

[20/0933r1 (Hidden Node Protection in Coordinated AP Transmissions, Dennis Sundman, Ericsson), SP#1, Y/N/A: 87/4/24]

[Motion 131, #SP208, [19] and [219]]

## Other Multi-AP coordination schemes

802.11be supports introducing a coordinated spatial reuse operation in 802.11be.

* Whether it is in R1 or R2 is TBD.

[Motion 111, #SP0611-35, [17] and [220]]

802.11be supports adding to 802.11be SFD “Joint transmission for single and multi user” under the multi-AP topic.

* NOTE – This feature is for R2

[Motion 111, #SP0611-36, [17] and [221]]

802.11be supports adding “Multi-AP Coordinated BF” to 802.11be SFD as one of the multi-AP coordination schemes.

* NOTE – This feature is for R2.

[Motion 112, #SP17, [17] and [222]]

# Link adaptation and retransmission protocols



## General

This section describes features related to enhanced link adaptation and retransmission protocols.

## Feature #1

Description for feature #1

# Low latency



## General

This section describes features related to low latency.

## Feature #1

Description for feature #1

# Frame Format

## General

This section describes features related to frame format.

## EHT Operation Element

802.11be supports defining an EHT Operation element with the following fields to indicate 320/160+160 MHz BSS bandwidth:

* Channel Width field
* CCFS field

[Motion 111, #SP0611-25, [17] and [223]]

802.11be supports that in 6 GHz band, an EHT AP may announce different BSS operating bandwidth to non-EHT STAs than the BSS operating bandwidth it announces to EHT STAs when EHT BW covers disallowed 20 MHz channels and/or when the announced EHT BW is not supported by non-EHT amendments. The advertised BSS operating bandwidth to EHT STA shall include the advertised BSS operating bandwidth to non-EHT STA.

[Motion 112, #SP53, [17] and [122]]

802.11be supports defining an EHT operation element to indicate the channel configuration for EHT STA, which does not need to combine with the indication of CCFS0 and CCFS1 in HE operation elements at 6 GHz.

[Motion 112, #SP54, [17] and [224]]

# Security

## General

This section describes features related to security.

An EHT RSNA STA shall support GCMP-256.

[Motion 119, #SP130, [5] and [225]]

# Bibliography

|  |  |
| --- | --- |
| [1] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r8,* September 2020. |
| [2] | Bin Tian (Qualcomm), “Discussion on 11be PHY capabilities,” *20/0975r0,* July 2020. |
| [3] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r0,* October 2019. |
| [4] | Alice Chen (Qualcomm), “320MHz channelization and tone plan,” *19/0797r1,* September 2019. |
| [5] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r6,* August 2020. |
| [6] | Ron Porat (Broadcom), “320 Channelization,” *20/0953r0,* June 2020. |
| [7] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework,” *19/1755r1,* November 2019. |
| [8] | Eunsung Park (LGE), “Tone plan discussion,” *19/1066r3,* November 2019. |
| [9] | Xiaogang Chen (Intel), “240MHz transmission,” *20/0954r0,* June 2020. |
| [10] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r7,* August 2020. |
| [11] | Xiaogang Chen (Intel), “240MHz transmission,” *20/0954r3,* July 2020. |
| [12] | Eunsung Park (LGE), “Discussion on 240MHz bandwidth,” *19/1889r2,* November 2019. |
| [13] | Bin Tian (Qualcomm), “Further thoughts on 11be tone plan,” *19/1521r2,* November 2019. |
| [14] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r5,* July 2020. |
| [15] | Ron Porat (Broadcom), “Tone plan related corrections,” *20/0955r1,* June 2020. |
| [16] | Eunsung Park (LGE), “Consideration on 240MHz,” *20/0960r0,* June 2020. |
| [17] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r4,* June 2020. |
| [18] | Ron Porat (Broadcom), “80MHz OFDMA tone plan,” *20/0666r2,* May 2020. |
| [19] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework document,” *19/1755r9,* September 2020. |
| [20] | Bin Tian (Qualcomm), “EHT punctured NDP and partial bandwidth feedback,” *20/1161r0,* August 2020. |
| [21] | Sigurd Schelstraete (Quantenna/ON Semiconductor), “240 MHz channelization,” *20/0479r0,* March 2020. |
| [22] | Eunsung Park (LGE), “Non-OFDMA tone plan for 320MHz,” *19/1492r3,* November 2019. |
| [23] | Ron Porat (Broadcom), “Mandatory larger BW support,” *20/0796r1,* June 2020. |
| [24] | Rui Cao (NXP), “Aggregated PPDU for large BW,” *20/0693r1,* May 2020. |
| [25] | Xiaogang Chen (Intel), “Forward compatible OFDMA,” *20/0674r3,* July 2020. |
| [26] | Junghoon Suh (Huawei), “Small size MRU with different MCS and BCC,” *20/0470r1,* April 2020. |
| [27] | Jianhan Liu (MediaTek), “Enhanced resource allocation schemes for 11be,” *19/1126r1,* September 2019. |
| [28] | TGbe, “Compendium of motions related to the contents of the TGbe specification framework,” *19/1755r2,* January 2020. |
| [29] | Jianhan Liu (MediaTek), “Multiple RU combinations for EHT,” *19/1907r2,* January 2020. |
| [30] | Bin Tian (Qualcomm), “Preamble puncturing and RU aggregation,” *19/1869r2,* January 2020. |
| [31] | Ron Porat (Broadcom), “Small RU combinations,” *20/0667r1,* April 2020. |
| [32] | Ron Porat (Broadcom), “Mandatory M-RU support,” *20/0791r5,* June 2020. |
| [33] | Eunsung Park (LGE), “Multiple RU aggregation,” *20/0023r2,* January 2020. |
| [34] | Ron Porat (Broadcom), “Multi-RU support,” *19/1908r4,* January 2020. |
| [35] | Jianhan Liu (MediaTek), “MRU support in 11be,” *20/0793r2,* June 2020. |
| [36] | Dongguk Lim (LGE), “11be PPDU format,” *20/0019r1,* January 2020. |
| [37] | Wook Bong Lee (Samsung), “Thoughts on U-SIG contents,” *20/0959r1,* July 2020. |
| [38] | Dongguk Lim (LGE), “11be PPDU format,” *20/0019r4,* May 2020. |
| [39] | Sigurd Schelstraete (Quantenna/ON Semiconductor), “4096 QAM Straw Polls,” *20/0480r0,* March 2020. |
| [40] | Qinghua Li (Intel), “Tx EVM requirement for 4k QAM,” *20/0456r0,* March 2020. |
| [41] | Yujin Noh (Newracom), “PDT-PHY-Parameters-for-EHT-MCSs,” *20/1290r1,* August 2020. |
| [42] | Jianhan Liu (MediaTek), “DCM for range extension in 6GHz LPI band,” *20/0986r1,* July 2020. |
| [43] | Ron Porat (Broadcom), “6GHz LPI range extension,” *20/0965r3,* July 2020. |
| [44] | Ron Porat (Broadcom), “6GHz LPI range extension,” *20/0965r4,* August 2020. |
| [45] | Ross Yu (Huawei), “Preamble structure,” *19/1099r2,* September 2019. |
| [46] | Dongguk Lim (LGE), “Further discussion for 11be preamble,” *19/1486r9,* November 2019. |
| [47] | Eunsung Park (LGE), “Phase rotation for 320MHz,” *19/1493r1,* November 2019. |
| [48] | Eunsung Park (LGE), “Phase rotation proposal follow-up,” *20/0699r0,* May 2020. |
| [49] | Eunsung Park (LGE), “Phase rotation proposal follow-up,” *20/0699r1,* May 2020. |
| [50] | Xiaogang Chen (Intel), “11be preamble structure,” *19/1516r4,* November 2019. |
| [51] | Sameer Vermani (Qualcomm), “Forward compatibility for WiFi preamble design,” *19/1519r5,* November 2019. |
| [52] | Sameer Vermani (Qualcomm), “Further ideas on EHT preamble design,” *19/1870r4,* November 2019. |
| [53] | Rui Cao (Marvell), “EHT preamble design,” *19/1540r7,* November 2019. |
| [54] | Dongguk Lim (LGE), “Further discussion for 11be preamble,” *19/1486r8,* November 2019. |
| [55] | Sameer Vermani (Qualcomm), “PPDU types and U-SIG content,” *20/0049r2,* January 2020. |
| [56] | Wook Bong Lee (Samsung), “SU PPDU SIG contents considerations,” *20/0285r5,* April 2020. |
| [57] | Wook Bong Lee (Samsung), “Further discussion on bandwidth and puncturing information,” *20/0606r2,* May 2020. |
| [58] | Ross Yu (Huawei), “Preamble puncture discussion in EHT PPDU,” *20/1150r2,* August 2020. |
| [59] | Ross Yu (Huawei), “Bandwidth indication for EHT PPDU,” *20/0969r3,* July 2020. |
| [60] | Dongguk Lim (LGE), “Consideration on compressed mode in 11be,” *20/1064r1,* August 2020. |
| [61] | Mengshi Hu (Huawei), “Preamble structure and SIG contents,” *20/0029r3,* January 2020. |
| [62] | Dongguk Lim (LGE), “11be PPDU format,” *20/0019r3,* April 2020. |
| [63] | Dongguk Lim (LGE), “Signaling of preamble puncturing in SU transmission,” *20/0524r2,* April 2020. |
| [64] | Dongguk Lim (LGE), “Consideration for EHT-SIG transmission,” *20/0020r3,* April 2020. |
| [65] | Ross Yu (Huawei), “Multi-segment EHT-SIG design discussion,” *20/0545r1,* April 2020. |
| [66] | Ross Yu (Huawei), “EHT-SIG compression format,” *20/0783r4,* July 2020. |
| [67] | Sameer Vermani (Qualcomm), “U-SIG structure and preamble processing,” *20/0380r0,* March 2020. |
| [68] | Dongguk Lim (LGE), “Consideration on user-specific field in EHT-SIG,” *20/0930r1,* June 2020. |
| [69] | Dongguk Lim (LGE), “Consideration on user-specific field in EHT-SIG,” *20/0930r3,* July 2020. |
| [70] | Dongguk Lim (LGE), “Evaluation of signaling overhead for EHT-SIG,” *20/0738r2,* May 2020. |
| [71] | Dongguk Lim (LGE), “Management of RU allocation field,” *20/0839r2,* July 2020. |
| [72] | Dongguk Lim (LGE), “Signaling of RU allocation in 11be,” *20/0652r0,* April 2020. |
| [73] | Ross Yu (Huawei), “Further discussion on RU allocation subfield in EHT-SIG,” *20/0609r3,* May 2020. |
| [74] | Dongguk Lim (LGE), “Signaling of RU allocation follow-up,” *20/0798r1,* May 2020. |
| [75] | Dongguk Lim (LGE), “Management of RU allocation field,” *20/0839r1,* June 2020. |
| [76] | Ross Yu (Huawei), “Further discussion on RU allocation subfield in EHT-SIG,” *20/0609r7,* June 2020. |
| [77] | Ross Yu (Huawei), “RU allocation subfield in EHT-SIG follow up II,” *20/0922r2,* June 2020. |
| [78] | Ron Porat (Broadcom), “On 52 plus 26 M-RU,” *20/0925r1,* June 2020. |
| [79] | Jianhan Liu (MediaTek), “Zero user RUs for Per-80MHz resource unit allocation signaling,” *20/1102r1,* July 2020. |
| [80] | Ross Yu (Huawei), “Multi-RU indication in RU allocation subfield,” *20/0970r1,* July 2020. |
| [81] | Myeongjin Kim (Samsung), “RU allocation subfield design in EHT-SIG follow up,” *20/0985r6,* August 2020. |
| [82] | Dongguk Lim (LGE), “Signaling of RU allocation follow-up,” *20/0798r4,* July 2020. |
| [83] | Eunsung Park (LGE), “Consideration on 240/160+80 MHz and preamble puncturing,” *20/0022r1,* January 2020. |
| [84] | Jianhan Liu (MediaTek), “Further discussions on efficient EHT preamble,” *20/0605r0,* April 2020. |
| [85] | Eunsung Park (LGE), “Consideration on EHT-STF,” *20/0585r0,* April 2020. |
| [86] | Eunsung Park (LGE), “EHT-STF sequences,” *20/0782r2,* June 2020. |
| [87] | Dandan Liang (Huawei), “EHT P matrices discussion,” *19/1980r2,* January 2020. |
| [88] | Dandan Liang (Huawei), “EHT-LTFs design for wideband,” *20/0117r1,* January 2020. |
| [89] | Jinmin Kim (LGE), “Consideration of EHT-LTF,” *19/1925r2,* January 2020. |
| [90] | Jinyoung Chun (LGE), “Consideration on EHT-LTF,” *20/0608r0,* April 2020. |
| [91] | Sameer Vermani (Qualcomm), “P-matrix based LTFs for EHT,” *20/0382r0,* March 2020. |
| [92] | Jinyoung Chun (LGE), “1x EHT LTF sequence,” *20/0962r3,* July 2020. |
| [93] | Oded Redlich (Huawei), “Improved preamble puncturing in 802.11be,” *19/1190r3,* November 2019. |
| [94] | Xiaogang Chen (Intel), “EHT PPDU scrambler,” *20/0563r1,* April 2020. |
| [95] | Bin Tian (Qualcomm), “Remaining issues with new 11be scrambler,” *20/1107r0,* July 2020. |
| [96] | Jinyoung Chun (LGE), “Pilot subcarriers for new tone plan,” *20/0838r3,* June 2020. |
| [97] | Jinyoung Chun (LGE), “Pilot subcarriers for new tone plan,” *20/0838r2,* June 2020. |
| [98] | Jinyoung Chun (LGE), “Pilot mapping and sequences for data section in 11be,” *20/0961r0,* July 2020. |
| [99] | Jianhan Liu (MediaTek), “Segment parser and tone interleaver for 11be,” *20/0440r1,* March 2020. |
| [100] | Tianyu Wu (Apple), “Discussions on multi-RU aggregation,” *20/0495r1,* March 2020. |
| [101] | Jianhan Liu (MediaTek), “Update on segment parser and tone interleaver for 11be,” *20/0579r3,* April 2020. |
| [102] | Jianhan Liu (MediaTek), “On TBD segment parser and tone interleaver for specific MRU,” *20/0789r1,* May 2020. |
| [103] | Bin Tian (Qualcomm), “Remaining TBDs for DCM,” *20/1119r0,* July 2020. |
| [104] | Ross Yu (Huawei), “Multiple RU discussion,” *19/1914r4,* January 2020. |
| [105] | Ross Yu (Huawei), “BCC interleaver parameters for multiple RU,” *20/0773r2,* June 2020. |
| [106] | Bin Tian (Qualcomm), “Thoughts on RU aggregation and interleaving,” *20/0394r1,* March 2020. |
| [107] | Wook Bong Lee (Samsung), “Further discussion on feedback overhead reduction,” *19/1495r2,* March 2020. |
| [108] | Stephane Baron (Canon), “Direct link MU transmissions,” *19/1117r2,* November 2019. |
| [109] | Dibakar Das (Intel), “EHT direct link transmission,” *19/1604r1,* January 2020. |
| [110] | Liwen Chu (NXP), “Protection with more than 160MHz PPDU and puncture operation,” *20/0062r0,* January 2020. |
| [111] | Yunbo Li (Huawei), “Bandwidth indication of 320MHz for non-HT and non-HT duplicate frames,” *20/0616r0,* April 2020. |
| [112] | Yongho Seok (MediaTek), “EHT RTS and CTS procedure,” *19/2125r2,* March 2020. |
| [113] | Subir Das (Perspecta Labs), “Priority access support in IEEE 802.11be: what and why?,” *19/1901r4,* January 2020. |
| [114] | Subir Das (Perspecta Labs), “Priority access support options for NS/EP serveices,” *20/0463r3,* June 2020. |
| [115] | Subir Das (Perspecta Labs), “Priority service capability information,” *20/0948r3,* September 2020. |
| [116] | Yongho Seok (MediaTek), “EHT SST operation,” *20/0736r2,* July 2020. |
| [117] | Yunbo Li (Huawei), “BQR for 320MHz,” *20/0712r1,* July 2020. |
| [118] | Yunbo Li (Huawei), “BQR for 320MHz,” *20/0712r3,* August 2020. |
| [119] | Po-Kai Huang (Intel), “Extremely efficient multi-band operation,” *19/0822r9,* November 2019. |
| [120] | Abhishek Patil (Qualcomm), “MLO: discovery and beacon-bloating,” *20/0356r3,* June 2020. |
| [121] | Laurent Cariou (Intel), “Multi-link discovery part 1,” *20/0389r2,* June 2020. |
| [122] | Liwen Chu (NXP), “EHT BSS with wider bandwidth,” *20/0398r3,* May 2020. |
| [123] | Abhishek Patil (Qualcomm), “MLO: container structure for capability advertisement,” *20/0357r3,* June 2020. |
| [124] | Ming Gan (Huawei), “Discovery mechanism for MLD,” *20/0615r3,* August 2020. |
| [125] | Laurent Cariou (Intel), “Multi-link discovery part 2,” *20/0390r3,* June 2020. |
| [126] | Young Hoon Kwon (NXP), “MLD discovery follow up,” *20/0898r2,* August 2020. |
| [127] | Abhishek Patil (Qualcomm), “MLO: container structure for capability advertisement,” *20/0357r5,* July 2020. |
| [128] | Po-Kai Huang (Intel), “MLD MAC address and WM address,” *20/0054r3,* March 2020. |
| [129] | Duncan Ho (Qualcomm), “MLA MAC addresses considerations,” *19/1899r7,* January 2020. |
| [130] | Sharan Naribole (Samsung), “MLO constraint indication and operating mode,” *20/0226r5,* April 2020. |
| [131] | Liwen Chu (Marvell), “Multiple link operation capability announcement,” *19/1159r5,* November 2019. |
| [132] | Yunbo Li (Huawei), “Discussion about STR capabilities indication,” *20/0921r1,* August 2020. |
| [133] | Po-Kai Huang (Intel), “Multi-link operation framework,” *19/0773r8,* November 2019. |
| [134] | Namyeong Kim (LGE), “MLO: information exchange for link switching,” *20/0411r4,* August 2020. |
| [135] | Insun Jang (LGE), “Indication of multi-link Information,” *20/0028r5,* June 2020. |
| [136] | Po-Kai Huang (Intel), “Multi-link setup follow up,” *19/1823r3,* January 2020. |
| [137] | Po-Kai Huang (Intel), “Multi-link setup follow up II,” *20/0387r3,* June 2020. |
| [138] | Po-Kai Huang (Intel), “Multi-link security consideration,” *19/1822r9,* May 2020. |
| [139] | Young Hoon Kwon (NXP), “Multi-link association follow up,” *20/0386r4,* June 2020. |
| [140] | Po-Kai Huang (Intel), “MLD transition,” *20/0669r1,* August 2020. |
| [141] | Po-Kau Huang (Intel), “MLD transition,” *20/0669r3,* August 2020. |
| [142] | Po-Kai Huang (Intel), “MLD transition,” *20/0669r4,* August 2020. |
| [143] | Po-Kai Huang (Intel), “Multi-link security consideration,” *19/1822r4,* January 2020. |
| [144] | Po-Kai Huang (Intel), “Multi-link security consideration,” *19/1822r7,* March 2020. |
| [145] | Xiaofei Wang (InterDigital), “Follow up discussion on multi-link operations,” *20/0119r2,* May 2020. |
| [146] | Insun Jang (LGE), “Indication of multi-link information: follow-up,” *20/0741r2,* July 2020. |
| [147] | Insung Jang (LGE), “Indication of multi-link information: follow-up,” *20/0741r3,* August 2020. |
| [148] | Abhishek Patil (Qualcomm), “Multi-link association setup,” *19/1525r2,* November 2019. |
| [149] | Insun Jang (LGE), “Discussion on multi-link setup,” *19/1509r5,* November 2019. |
| [150] | Yunbo Li (Huawei), “Multi-link association,” *19/1549r5,* January 2020. |
| [151] | Abhishek Patil (Qualcomm), “MLO: BSS color,” *20/0314r1,* May 2020. |
| [152] | Laurent Cariou (Intel), “Multi-link: steps for using a link,” *19/1924r1,* January 2020. |
| [153] | Abhishek Patil (Qualcomm), “Multi-link: link management,” *19/1528r5,* January 2020. |
| [154] | Yunbo Li (Huawei), “Discussion of More Data subfield for multi-link,” *20/0472r2,* May 2020. |
| [155] | Abhishek Patil (Qualcomm), “Multi-link operation: dynamic TID transfer,” *19/1082r3,* September 2019. |
| [156] | Yongho Seok (MediaTek), “Multi-link operation management,” *19/1358r4,* January 2020. |
| [157] | Po-Kai Huang (Intel), “Multi-link individual addressed data delivery without BA,” *20/0688r1,* August 2020. |
| [158] | Liwen Chu (NXP), “A-MPDU and BA,” *19/1856r3,* January 2020. |
| [159] | Rojan Chitrakar (Panasonic), “Multi-link secured retransmissions,” *20/0434r3,* June 2020. |
| [160] | Rojan Chitrakar (Panasonic), “Multi-link acknowledgment,” *19/1512r6,* November 2019. |
| [161] | Yuchen Guo (Huawei), “BA setup for multi-link aggregation,” *19/1591r5,* January 2020. |
| [162] | Liwen Chu (NXP), “BA consideration,” *20/0061r2,* June 2020. |
| [163] | Abhishek Patil (Qualcomm), “MLO: acknowledgement procedure,” *20/0024r2,* April 2020. |
| [164] | Abhishek Patil (Qualcomm), “MLO: acknowledgement procedure,” *20/0024r3,* May 2020. |
| [165] | Yongho Seok (MediaTek), “Multi-link BA clarification,” *20/0460r3,* May 2020. |
| [166] | Po-Kai Huang (Intel), “Multi-link BA,” *20/0053r3,* April 2020. |
| [167] | Po-Kai Huang (Intel), “Multi-link BA,” *20/0053r4,* May 2020. |
| [168] | Duncan Ho (Qualcomm), “MLA: BA format,” *20/0441r3,* April 2020. |
| [169] | Liwen Chu (NXP), “Sequence number and BA operation with large BA buffer size,” *20/0397r4,* May 2020. |
| [170] | Alexander Min (Intel), “Multi-link power save operation,” *19/1544r5,* January 2020. |
| [171] | Abhishek Patil (Qualcomm), “MLO: link management – follow up,” *19/1904r3,* January 2020. |
| [172] | Young Hoon Kwon (NXP), “Multi-link TIM,” *20/0066r3,* May 2020. |
| [173] | Young Hoon Kwon (NXP), “TIM follow up,” *20/0899r1,* August 2020. |
| [174] | Jeongki Kim (LGE), “EHT power saving considering multi-link,” *19/1510r6,* January 2020. |
| [175] | Abhishek Patil (Qualcomm), “Multi-link operation: anchor channel,” *19/1526r3,* January 2020. |
| [176] | Ming Gan (Huawei), “BSS parameter update for Multi-link Operation,” *20/0503r2,* June 2020. |
| [177] | Ming Gan (Huawei), “Power save for multi-link,” *19/1988r3,* June 2020. |
| [178] | Yongho Seok (MediaTek), “Multi-link BSS parameter update,” *20/0337r2,* June 2020. |
| [179] | Abhishek Patil (Qualcomm), “MLO: signaling of critical updates,” *20/0586r7,* August 2020. |
| [180] | Ming Gan (Huawei), “Power save for multi-link,” *19/1988r2,* May 2020. |
| [181] | Laurent Cariou (Intel), “MLD max BSS idle period,” *20/0392r2,* March 2020. |
| [182] | Duncan Ho (Qualcomm), “MLA: group addressed frames delivery,” *20/0442r1,* May 2020. |
| [183] | Yongho Seok (MediaTek), “Group addressed frame transmission in constrained multi-link operation follow-up,” *20/0672r0,* July 2020. |
| [184] | Yongho Seok (MediaTek), “Group addressed frame transmission in constrained multi-link operation follow-up,” *20/0672r3,* August 2020. |
| [185] | Ming Gan (Huawei), “Group addressed frames delivery for MLO,” *20/0661r4,* September 2020. |
| [186] | Insun Jang (LGE), “Channel access for multi-link operation,” *19/1144r6,* November 2019. |
| [187] | Duncan Ho (Qualcomm), “MLO: Sync PPDUs,” *20/0026r4,* April 2020. |
| [188] | Yongho Seok (MediaTek), “Constrained multi-link operation,” *19/1959r1,* March 2020. |
| [189] | Sharan Naribole (Samsung), “Multi-link channel access discussion,” *19/1405r7,* November 2019. |
| [190] | Yongho Seok (MediaTek), “Synchronous multi-link operation,” *19/1305r4,* April 2020. |
| [191] | Yongho Seok (MediaTek), “Synchronous multi-link operation follow-up,” *20/0670r1,* July 2020. |
| [192] | Yongho Seok (MediaTek), “Multi-link triggered uplink access follow-up,” *20/0671r1,* July 2020. |
| [193] | Ming Gan (Huawei), “Sync transmission for non-STR MLD,” *20/0505r1,* August 2020. |
| [194] | Yongho Seok (MediaTek), “RTS and CTS procedure in synchronous multi-link operation,” *20/0577r3,* August 2020. |
| [195] | Yongho Seok (MediaTek), “STA ID indication for constrained multi-link operation,” *20/0762r1,* August 2020. |
| [196] | Abhishek Patil (Qualcomm), “Multi-BSSID operation with MLO,” *20/0358r1,* May 2020. |
| [197] | Abhishek Patil (Qualcomm), “Multi-BSSID operation with MLO,” *20/0358r3,* May 2020. |
| [198] | Chunyu Hu (Facebook), “Prioritized EDCA channel access over latency sensitive links in MLO,” *20/0408r4,* May 2020. |
| [199] | Frank Hsu (MediaTek), “Link latency statistics of multi-band operations in EHT,” *20/0105r6,* June 2020. |
| [200] | Taewon Song (LGE), “Multi-link management,” *19/1943r8,* July 2020. |
| [201] | Taewon Song (LGE), “Multi-link management,” *19/1943r9,* July 2020. |
| [202] | Minyoung Park (Intel), “Enhanced multi-link single radio operation,” *20/0562r7,* July 2020. |
| [203] | Yongho Seok (MediaTek), “Multi-link spatial multiplexing,” *20/0883r6,* August 2020. |
| [204] | Jinjing Jiang (Apple), “Non-STR AP operation,” *20/0755r1,* June 2020. |
| [205] | Wook Bong Lee (Samsung), “16 Spatial Stream Support,” *19/1877r1,* January 2020. |
| [206] | Junghoon Suh (Huawei), “Restrictions for 16 SS based MU-MIMO scheduling,” *20/0067r1,* April 2020. |
| [207] | Ron Porat (Broadcom), “Number of users in MU-MIMO,” *20/0767r0,* May 2020. |
| [208] | Sungjin Park (LGE), “Setup for Multi-AP coordination,” *19/1895r2,* January 2020. |
| [209] | Po-Kai Huang (Intel), “Multi-AP configuration and resource allocation,” *20/0560r0,* April 2020. |
| [210] | Jianhan Liu (MediaTek), “Joint sounding for multi-AP systems,” *19/1593r3,* November 2019. |
| [211] | Feng Jiang (Intel), “Channel sounding for Multi-AP CBF,” *20/0123r0,* January 2020. |
| [212] | Feng Jiang (Intel), “Channel sounding for Multi-AP CBF,” *20/0123r2,* July 2020. |
| [213] | Cheng Chen (Intel), “Multi-AP group formation follow-up,” *19/1931r2,* January 2020. |
| [214] | Cheng Chen (Intel), “AP candidate set follow up,” *20/0596r1,* July 2020. |
| [215] | Lochan Verma (Qualcomm), “Coordinated AP time/frequency sharing in a transmit opportunity in 11be,” *19/1582r2,* January 2020. |
| [216] | Yongho Seok (MediaTek), “Coordinated OFDMA operation,” *19/1788r1,* January 2020. |
| [217] | Liwen Chu (NXP), “Coordinated OFDMA,” *19/1919r3,* January 2020. |
| [218] | Genadiy Tsodik (Huawei), “Discussion on coordinated UL MU-MIMO,” *20/0548r2,* July 2020. |
| [219] | Dennis Sundman (Ericsson), “Hidden node protection in coordinated AP transmissions,” *20/0933r1,* September 2020. |
| [220] | Jason Yuchen Guo (Huawei), “Coordinated spatial reuse operation,” *20/0033r1,* February 2020. |
| [221] | Ron Porat (Broadcom), “Joint transmission for 11be,” *20/0071r1,* April 2020. |
| [222] | Roya Doostnejad (Intel), “Coordinated beamforming for 802.11be,” *20/0099r1,* April 2020. |
| [223] | Po-Kai Huang (Intel), “320 MHz BSS configuration,” *20/0384r1,* March 2020. |
| [224] | Guogang Huang (Huawei), “Operating bandwidth indication for EHT BSS,” *20/0680r0,* April 2020. |
| [225] | Laurent Cariou (Intel), “GCMP for 11be,” *20/0866r0,* July 2020. |

# List of straw polls since the end of the January 2020 interim

## January interim (PHY): 2 SPs

**20/0019r1 (11be PPDU format, Dongguk Lim, LGE)**

SP#1

Do you agree that one PPDU that is sent to multiple user is configured as following?

* L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-SIG, EHT-STF, EHT-LTF, DATA
* Additional fields are TBD



Y/N/A: 33/0/1

SP#2

Do you agree that EHT TB PPDU format is configured as following?

* EHT TB PPDU consist of L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-STF, EHT-LTF, DATA
* Additional fields are TBD

Y/N/A: 19/2/7

## January 30 (PHY): No SP

No straw polls where conducted.

Reference: 11-20-0266-00-00be-11be-phy-ad-hoc-minutes-january-2020

## January 30 (MAC): No SP

No straw polls were conducted.

Reference: 11-20-0258-00-00be-11be-mac-ad-hoc-teleconference-minutes-jan-2020-to-mar-2020

## February 6 (Joint): No SP

No straw polls were conducted.

Reference: 11-20-0287-03-00be-telephone-conference-meeting-minutes-february-and-march-2020

## February 13 (Joint): No SP

No straw polls were conducted.

Reference: 11-20-0287-03-00be-telephone-conference-meeting-minutes-february-and-march-2020

## February 20 (MAC): No SP

No straw polls were conducted.

Reference: 11-20-0258-00-00be-11be-mac-ad-hoc-teleconference-minutes-jan-2020-to-mar-2020

## February 27 (Joint): No SP

No straw polls were conducted.

Reference: 11-20-0287-03-00be-telephone-conference-meeting-minutes-february-and-march-2020

## March 5 (MAC): No SP

No straw polls were conducted.

Reference: 11-20-0258-00-00be-11be-mac-ad-hoc-teleconference-minutes-jan-2020-to-mar-2020

## March 13 (MAC): No SP

No straw polls were conducted.

Reference: 11-20-0467-01-00be-mac-ad-hoc-teleconference-minutes-march2020-april2020

## March 16 (PHY): No SP

No straw polls were conducted.

Reference: 11-20-0500-01-00be-minutes-for-802-11be-phy-ad-hoc-telephone-conferences-march-2020

## March 16 (MAC): 2 SPs

**19/1822r7 (Multi-link security consideration, Po-Kai Huang, Intel)**

SP#2

After multi-link setup between two MLDs, do you support to use same PMK and same PTK across links with same PN space for a PTKSA?

Y/N/A/No answer: 35/10/22/15

**20/0054r3 (MLD MAC address and WM address, Po-Kai Huang, Intel)**

SP#1

Do you agree to revise the 11be SFD as follows:

A MLD has a MAC address that singly identifies the MLD management entity.

Y/N/A/No answer: 42/3/17/19

Reference: 11-20-0511-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## March 18 (PHY): 5 SPs

**20/404r0 (Further Proposals for Multiple RU Aggregation, Eunsung Park, LG Electronics)**

SP#1

Do you agree to add the following text to the TGbe SFD?

For the OFDMA transmission in the bandwidth larger than or equal to 80MHz, combinations of middle 26-tone RU and one of its adjacent 106-tone RUs are allowed within 20MHz boundary

Y/N/A: 26/24/10

SP#2

Do you agree to add the following text to the TGbe SFD?

For the OFDMA transmission in the bandwidth larger than or equal to 80MHz, combinations of center 26-tone RU and one of its adjacent 106-tone RUs are allowed

Y/N/A: 20/30/11

SP#3

Do you agree to add the following text to the TGbe SFD?

For the 80MHz non-OFDMA transmission, the following RU combinations are allowed

242+242, 4 options



Y/N/A: 12/28/16

SP#4

Do you agree to add the following text to the TGbe SFD?

For the 320MHz non-OFDMA transmission, the following RU combinations are allowed

(484)+(484)+(996)+(996), 3 options.

Note that () means the RU used in each 80MHz channel



Y/N/A: 15/33/12

**20/0380r0 (U-SIG structure and Preamble Processing, Sameer Vermani. Qualcomm)**

SP

Do you agree that a STA only needs to process up to one 80MHz segment of the pre-EHT preamble (up-to and including EHT-SIG) to get all the assignment information for itself?

* No 80MHz segment change is needed while processing L-SIG, U-SIG and EHT-SIG

Y/N/A: 31/8/14

Reference: 11-20-0500-01-00be-minutes-for-802-11be-phy-ad-hoc-telephone-conferences-march-2020

## March 18 (MAC): 3 SPs

**19/1604r1 (EHT Direct Link Transmission, Dibakar Das, Intel)**

SP

Do you agree to add the following to SFD?

* Do you support that 11be defines a procedure for an AP to share time resource obtained in a TXOP for peer to peer (STA-TO-STA) frame exchanges?

Y/N/A/No answer: 33/11/18/30

**20/0062r0 (Protection with more than 160MHz PPDU and puncture operation, Liwen Chu, NXP)**

SP#1

Do you support that 11be defines a MAC mechanism to protect TXOP for PPDUs with >160MHz and/or PPDUs with preamble puncturing?

Y/N/A/No answer: 41/5/17/31

**19/2125r2 (EHT RTS and CTS procedure, Yongho Seok, MediaTek)**

SP#1

Do you support to transmit the MU-RTS/RTS and CTS frames in a non-HT duplicate PPDU on 20 MHz subchannels which are not punctured?

Y/N/A/No answer: 35/2/18/26

Reference: 11-20-0511-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## March 19 (Joint): 4 SPs

**19/1582r2 (Coordinated AP Time and Frequency Sharing in a Transmit Opportunity in 11be, George Cherian, Qualcomm)**

SP (new text)

In all modes of operation wherein an AP shares its frequency/time resource of an obtained TXOP with a set of APs,

* Define a mechanism for the sharing AP to optionally solicit feedback from one or more APs from the AP candidate set to learn the resource needs and the intend to participate in a coordinated AP transmission.

Y/N/A: 76/7/32

SP#3

In all modes of operation wherein an AP shares its frequency resource with a set of APs, the AP shall share its frequency resource in multiples of 20MHz channels with a set of APs in an obtained TXOP?

* PPDU format of the transmission on the shared resource is TBD

Y/N/A: 68/12/37

**19/1961r3 (Multi-AP Group Establishment, Bo Sun, ZTE)**

SP

Do you support that any AP may deliver the information of the AP candidate set for coordinated AP transmission?

* Note: whether or not delivery of AP candidate set information for coordinated OFDMA transmission is FFS.

Y/N/A: 22/29/46

**20/0033r1 (Coordinated spatial reuse operation, Jason Yuchen Guo, Huawei)**

SP

Do you support to introduce a coordinated spatial reuse operation in TGBe?

* Whether it is in R1 or R2 is TBD.

Y/N/A: 97/6/25

Reference: 11-20-0287-03-00be-telephone-conference-meeting-minutes-february-and-march-2020

## March 23 (PHY): 3 SPs

**20/0474r0 (Remarks on the content channels, Miguel Lopez, Ericsson)**

SP

Do you agree that TGbe should consider the use of low complexity erasure codes in the design of the content channels?

Y/N/A: 9/14/22

**20/0382r0 (P-matrix based LTFs for EHT, Sameer Vermani, Qualcomm)**

SP#2

Do you agree to adopt P-matrix based modulation of EHT-LTFs for all spatial multiplexing modes (both UL and DL) defined in EHT?

* All spatial streams are active during EHT-LTFs on every non-zero LTF tone
* Applicable to multi-AP transmission modes as well

Y/N/A: 30/0/11

**20/0486r0 (Decoupling Channel Training from NSTS, Abhishek Agrawal, Quantenna/ON Semiconductor)**

SP#3

Do you support to optionally allow flexible NEHT-LTF and include NEHT-LTF in EHT packets sent to a single user?

Y/N/A: 11/12/16

Reference: 11-20-0526-01-00be-minutes-for-802-11be-phy-ad-hoc-conf-call-in-march-2020

## March 23 (MAC): 1 SP

**20/0384r1 (320 MHz BSS Configuration, Po-Kai Huang, Intel)**

SP#1

Do you support to define EHT operation element with the following fields to indicate 320/160+160 MHz BSS bandwidth?

* Channel Width field
* CCFS field

Y/N/A/No answer: 26/3/21/19

Reference: 11-20-0511-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## March 26 (PHY): No SP

No straw polls were conducted.

Reference: 11-20-0526-01-00be-minutes-for-802-11be-phy-ad-hoc-conf-call-in-march-2020

## March 26 (MAC): 1 SP

**19/1305r2 (Synchronous Multi-link Operation, Yongho Seok, MediaTek)**

SP

Do you support the following PPDU transmission restriction for the constrained multi-link operation?

* If an AP MLD intends to align the ending time of the DL PPDUs simultaneously sent on the multiple links, the AP MLD shall ensure that the difference between the ending times of transmitting PPDUs is less than SIFS – margin time.
  + Where the reference of the ending time of the PPDU is TBD and the margin time (< SIFS) is TBD.

Y/N/A/No answer: 29/10/27/20

Reference: 11-20-0511-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## March 30 (PHY): 6 SPs

**20/0394r1 (Thoughts on RU Aggregation and Interleaving, Bin Tian, Qualcomm)**

SP#1

Do you support joint interleaving for RU and aggregated RU size <=80 MHz?

Y/N/A: 38/9/11

SP#4

Do you agree the segment parser bit distribution sequence starts from the lowest frequency location to the highest frequency, just like in 11ac/ax?

Y/N/A: 53/0/8

SP#2.1

Do you support the following LDPC tone mapper parameters:

* for RU52+26: D\_TM = 4
* for RU106+26: D\_TM = 6
* Existing RUs: identical to 11ax

Y/N/A: 54/0/7

SP#2.2

Do you support the following LDPC tone mapper parameters:

* for RU484+242: D\_TM = 18

Y/N/A: 53/9/10

**20/0440r1 (Segment Parser and Tone Interleaver for 11be, Jianhan Liu, MediaTek)**

SP#1

Do you agree with the following LDPC tone mapper scheme for multi-RU aggregation in 11be?

* For aggregated RUs and PPDU BW larger than 80MHz, separate LDPC tone mapper is applied in each 80MHz segment.

Y/N/A: 44/8/9

**20/0440r1 (Segment Parser and Tone Interleaver for 11be, Jianhan Liu, MediaTek)**

**20/0495r1 (Discussions on multi-RU aggregation, Tianyu Wu, Apple)**

Joint SP#2

Do you agree that 11be uses 80MHz segment parser with proportional round robin scheme?

Y/N/A: 48/0/10

Reference: 11-20-0526-01-00be-minutes-for-802-11be-phy-ad-hoc-conf-call-in-march-2020

## March 30 (MAC): 1 SP

**19/1959r1 (Constrained Multi-Link Operation, Yongho Seok, MediaTek)**

SP

Do you support the following constrained multi-link operation?

* When a STA in a non-STR MLD receives an RTS addressed to itself, if the NAV of the STA indicates idle but another STA in the same MLD is either a TXOP holder or a TXOP responder, the STA may not respond with a CTS frame.

Y/N/A/No answer: 26/6/35/19

Reference: 11-20-0511-02-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 2 (Joint): 2 SPs

**20/0056r2 (Preparations for coordinated OFDMA, Rojan Chitrakar, Panasonic)**

SP

Do you support to add the following to the 11be SFD:

The sharing AP may solicit feedback from one or more APs from the AP candidate set to learn the frequency resources preferred for Coordinated OFDMA transmissions.

Note: AP Candidate set is TBD.

Y/N/A: 38/28/53

**20/0071r1 (Joint Transmission for 11be, Ron Porat, Broadcom)**

SP

Do you support adding to 11be SFD Joint Transmission for single and multi user under the multi-AP topic?

* Note: this feature is for rel. 2

Y/N/A: 89/10/28

Reference: 11-20-0570-00-00be-telephone-conference-meeting-minutes-april-2020

## April 6 (PHY): 8 SPs

**20/0380r0 (U-SIG structure and Preamble Processing, Sameer Vermani, Qualcomm)**

SP#1

Do you agree with allowing information in U-SIG to vary from one 80MHz to the next in an EHT PPDU of bandwidth >80MHz?

* Notes:
  + Each STA still needs to decode only one 80MHz segment in U-SIG
  + Within each 80MHz, U-SIG is still duplicated in every non-punctured 20MHz

Y/N/A: 25/15/15

**20/0439r0 (Efficient EHT Preamble Design, Jianhan Liu, MediaTek)**

SP#2

Do you agree that EHT-SIG may carry different content in each 80MHz?

* For PPDU BW larger than 80MHz.
* SST operation using TWT is one applicable scenario, other scenarios are TBD.

Y/N/A: 35/15/10

SP2 (modified text)

Do you agree that EHT-SIG may carry different content in each 80MHz?

* For PPDU BW larger than 80MHz.

Y/N/A: 35/15/10

**20/0380r0 (U-SIG structure and Preamble Processing, Sameer Vermani, Qualcomm)**

SP#1 (modified text)

Do you agree with allowing information in U-SIG to vary from one 80MHz to the next in an EHT PPDU of bandwidth >80MHz?

* Notes:
  + Each STA still needs to decode only one 80MHz segment in U-SIG
  + Within each 80MHz, U-SIG is still duplicated in every non-punctured 20MHz
  + SST operation using TWT is one potential applicable scenario, other scenarios are TBD (Needs MAC discussion).

Y/N/A: 34/8/16

**20/0545r1 (Multi-segment EHT-SIG design discussion, Ross Yu, Huawei)**

SP#3

Do you agree that the following indication shall be the same considering symbol alignment within each segment from PHY point of view, if the fields are present in U-SIG:

* Number of EHT-SIG symbols
* GI+EHT-LTF Size
* Number of EHT-LTF symbols
* PE related parameters

Y/N/A: 40/6/12

**20/0524r2 (Signaling of preamble puncturing in SU transmission, Dongguk Lim, LGE)**

SP

Do you agree that EHT-SIG field included in EHT-PPDU sent to a single user is duplicated per 20MHz in BW?

Y/N/A: 12/29/17

**20/0285r5 (SU PPDU SIG Contents Considerations, Wook Bong Lee, Samsung)**

SP#1

Do you support following in 11be?

* Preamble of primary 20MHz channel shall not be punctured in any PPDU (Except TB PPDU)

Y/N/A: 45/1/10

SP#3

Do you agree to have STA-ID related information in the EHT PPDU preamble sent to a single user and multiple users? TB PPDU is TBD.

Y/N/A: 42/2/13

Reference: 11-20-0587-00-00be-minutes-april-phy-cc

## April 6 (MAC): 0 SP

No straw polls were conducted.

Reference: 11-20-0511-03-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 9 (PHY): 6 SPs

**20/0483r2 (Preamble Puncturing for PPDUs Transmitted to Multiple STAs, Oded Redlich, Huawei)**

SP#1

Do you agree to allow puncturing structure 1001 in a given 80MHz segment for OFDMA PPDUs transmitted to STAs operating at BW>=80MHz?

* Assuming 2 content channels are used
* Puncturing signaling may be different for different 80MHz channels
* In 802.11ax in such cases the BW drops to 20MHz

Y/N/A: 31/13/16

SP#2

Do you agree to allow puncturing structure 1010 in a given 80MHz segment for OFDMA PPDUs transmitted to STAs operating at BW>=80MHz?

* Assuming 2 content channels are used (Signaling TBD)
* Puncturing signaling may be different for different 80MHz channels
* In 802.11ax in such cases the BW drops to 20MHz

Y/N/A: 17/34/9

SP#3

Do you agree that U-SIG may include puncturing signaling/info about both 80MHz channels within each 160MHz channel?

* Will be used only by devices that can decode pre-EHT on 160MHz
* Will NOT affect the operation of STAs that decode pre-EHT on 80MHz
* Applicable for BW=160,320MHz. For BW=240MHz applicable for P160 only
* Signaling content is TBD

Y/N/A: 16/30/10

**20/285r5 (SU PPDU SIG Contents Considerations, Wook Bong Lee, Samsung)**

SP#2

Do you support that U-SIG in each 80MHz shall carry puncturing channel info for at-least the specific 80MHz where it is transmitted?

* Note: Within each 80MHz segment, U-SIG is duplicated in every non-punctured 20MHz
* Whether BW/Puncturing info can be different for different 80MHz is TBD
* Whether BW and puncturing info in U-SIG are carried as a combined or a separate field is TBD

Y/N/A: 42/9/6

**20/0524r2 (Signaling of preamble puncturing in SU transmission, Dongguk Lim, LGE)**

SP#2

Do you agree that a subfield for preamble puncturing pattern information separate from the BW field is included in U-SIG and/or EHT-SIG for the 11be PPDU transmitted to a single user?

Y/N/A: 36/4/14

SP#3

Which option do you prefer to configure the preamble puncturing information for transmission to a single user?

* Approach. 1: BW field includes some puncturing information
* Approach. 2: BW field doesn’t include puncturing information. Puncturing information is a separate field.
* Abs

Y/N/A: 17/30/10

Reference: 11-20-0587-01-00be-minutes-april-phy-cc

## April 9 (MAC): 0 SP

No straw polls were conducted.

Reference: 11-20-0511-04-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 13 (PHY): 8 SPs

**19/1495r2 (Further Discussion on Feedback Overhead Reduction, Wook Bong Lee, Samsung)**

SP#1

Do you support to define a compressed beamforming feedback in 11be for following cases?

* Number of streams: 1-16
* Number of antennas: 2-16
* Note: Compressed beamforming feedback is the same as defined in 11ax except for the new parameter values of Nc and Nr.

Y/N/A: 51/1/10

SP#2

Do you support to define a mechanism to reduce the explicit beamforming feedback overhead for 9-16 antennas in 11be compared to the compressed beamforming feedback defined in 19.3.12.3.6 of 802.11-2016?

* Focusing on MU-MIMO feedback with maximum 4 streams
* SU case TBD

Y/N/A: 22/23/18

**20/0065r3 (Implicit Sounding Scheme, Lily Yunping Lyu, Huawei)**

SP#1

Do you support to investigate implicit sounding as an optional mode in TGbe (for R2)?

Y/N/A: 47/8/10

**20/0019r3 (11be PPDU format, Dongguk Lim, LGE)**

SP#1

Do you agree to add the following into the 11be SFD?

* The following subfields exist in U-SIG and/or EHT-SIG of an EHT PPDU sent to single user:
  + LDPC Extra symbol
  + Beamformed
  + Pre-FEC padding factor
  + PE Disambiguity

Y/N/A: 41/5/11

**20/0020r3 (Consideration for EHT-SIG transmission, Dongguk Lim, LGE)**

SP#1

Do you agree that in BW ≤ 160MHz, the EHT-SIG content channel for Multiple user transmission is configured as following?

* A EHT-SIG content channel is composed of a 20 MHz frequency segment.
* EHT-SIG content channels carry EHT-SIG common information and the user-specific information.
* The EHT-SIG field consists of the two EHT-SIG content channels in each 80MHz

The content channels (i.e., CC1 and CC2) per each 80MHz may carry different information.

* + Where, SST operation using TWT is one potential applicable scenario, other scenarios are TBD

Y/N/A: 42/3/6

SP#3

Do you agree that 11be STA can recognize the preamble puncturing pattern it needs by using the BW field and puncturing information of U-SIG and/or EHT-SIG field in Multiple user transmission?

* Details for how to convey the puncturing information is TBD.

Y/N/A: 33/2/24

**20/0479r0 (240 MHz channelization, Sigurd Schelstraete, Quantenna/ON Semiconductor)**

SP#1

In 160+80 MHz BSS, should the 160 and 80 MHz be non-adjacent?

Y/N/A: 25/5/24

**20/0456r0 (Tx EVM Requirement for 4k QAM, Qinghua Li, Intel)**

SP#2

Do you support -38 dB as the Tx EVM requirement for 11be 4k QAM?

Y/N/A: 27/12/18

Reference: 11-20-0587-03-00be-minutes-april-phy-cc

## April 13 (MAC): 0 SP

No straw polls were conducted.

Reference: 11-20-0511-05-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 16 (Joint): 0 SP

No straw polls were conducted.

Reference: 11-20-0570-01-00be-telephone-conference-meeting-minutes-april-2020

## April 17 (MAC): 9 SPs

**19/1305r4 (Synchronous Multi-link Operation, Yongho Seok, MediaTek)**

SP#1

Do you support the following PPDU transmission restriction for the constrained multi-link operation?

* If an AP MLD intends to align the ending time of DL PPDUs carrying a frame soliciting an immediate response simultaneously sent to the same non-STR non-AP MLD on multiple links, the AP MLD shall ensure that the difference between the ending times of transmitting DL PPDUs is less than TBD (< SIFS).
  + Where the reference of the ending time of the PPDU is TBD.

Y/N/A/No answer: 50/4/35/10

**20/0026r4 (MLO: Sync PPDUs, Duncan Ho, Qualcomm)**

SP#1

Do you agree to the following?

* In R1 of the spec, supporting the following cases:
  + STR AP MLD with STR non-AP MLD
  + STR AP MLD with non-STR non-AP MLD
  + Note: All the other cases are TBD.

Y/N/A: 71/3/15

SP#2

Do you agree to the following?

* An STR AP MLD shall align the end of DL PPDUs that are sent simultaneously on multiple links to the same non-STR non-AP MLD, in such a way that the response to any of the PPDUs will not overlap with any of the DL PPDUs?

Y/N/A: 41/35/17

**20/0081r3 (MLO-Synch-Transmission, Matthew Fischer, Broadcom)**

SP#2

Do you support the inclusion of the following in the SFD:

* 802.11be shall define a trigger message that may be transmitted by an AP or a non-AP STA and elicits an SU PPDU, for example, as a means to assist in creating an alignment of PPDU start and or end times on different links

Y/N/A/No answer: 32/36/24/11

**20/0082r2 (Synchronous-Transmitter-Medium-State-Information, Matthew Fischer, Broadcom)**

SP#0

Do you support the inclusion of the following in the SFD:

* 802.11be shall include a mechanism for the exchange of Medium State Information and rules for the use of that information by an NSTR STA

Y/N/A/No answer: 28/38/29/10

**20/0291r1 (MLO Async. and Sync. Operation Discussion, Zhou Lan, Broadcom)**

SP#2

Do you agree a mode of MLO operation that supports NON STR NON AP MLD to initiate transmit and receive frames to a NON STR AP MLD concurrently (PPDUs on multiple links overlapping in time domain) on multiple available links and solicit response is not in the scope of R1. Note-whether to define NON STR AP MLD is TBD

Y/N/A/No answer: 39/29/22/14

**20/0329r3 (Group addressed frame transmission in constrained multi-link operation, Yongho Seok, MediaTek)**

SP

Do you support the following group addressed frames delivery mechanism?

* The non-STR STA MLD may configure one link with the AP MLD to receive group addressed frames, then during the group addressed delivery in the configured link, then the AP MLD may not schedule frames soliciting an immediate response to this non-STR STA MLD on other links that overlap with group address frame. NOTE- The condition to signal the configured link is TBD.

Y/N/A: 36/21/35

**20/0414r4 (Method for Handling Constrained MLD, Insun Jang, LGE)**

SP#1

Do you agree that 11be shall define mechanism(s) for enabling a non-AP MLD with constraints to transmit PPDUs overlapping on multiple links?

NOTE: whether it is for R1 or R2 is TBD.

Y/N/A: 37/27/24

**20/0415r4 (Multi-link Aggregation: Synchronized PPDUs on Multiple Links, Insun Jang, LGE)**

Do you agree that 11be shall allow the following multi-link operation?

* When at least one STA of non-AP MLD with constraints transmits a PPDU, the other STA(s) in the non-AP MLD defers (defer) the channel access without performing CCA during the transmission of PPDU

Y/N/A: 12/52/22

Reference: 11-20-0511-06-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 20 (PHY): 3 SPs

**20/0480r0 (4096 QAM Straw Polls, Sigurd Schelstraete, Quantenna/ON Semiconductor)**

SP#1

Do you support adding the following to 11be SFD?

* 11be shall define 4096 QAM as one of the optionally supported modulations

Y/N/A: 54/0/6

SP#2

Do you support adding the following to 11be SFD?

* The uniform constellation mapping for 4096 QAM shall be as given in 11-20/0111r0

Y/N/A: 45/0/19

**20/0565r0 (Smoothing Indication in 11be, Shimi Shilo, Huawei)**

SP#3

Do you support indicating within the PHY preamble of 11be if smoothing is recommended to be applied at the receiver for MU-MIMO allocation?

Y/N/A/Need further study: 21/15/6/19

Reference: 11-20-0587-04-00be-minutes-april-phy-cc

## April 20 (MAC): 5 SPs

**19/1547r5 (Multi-link operation and channel access discussion, Kaiying Lu, MediaTek)**

SP#1

Do you support that an AP MLD may transmit Beacon only on a subset of multiple links?

* eg. Transmit Beacon on one link of a pair of links
* How to choose the link to transmit Beacon is TBD.

Note: when the AP MLD has TX/RX constraints.

Y/N/A/No answer: 26/34/13/8

SP#2

Do you support that an AP MLD is capable to enable or disable a contention based channel access for each STA within a non-AP MLD?

Y/N/A/No answer: 28/37/12/5

**20/0026r6 (MLO: Sync PPDUs, Duncan Ho, Qualcomm)**

SP#3

Do you agree to the make the following an optional or mandatory feature?

* An AP MLD aligns the end of DL PPDUs that are sent simultaneously on multiple links to the same non-STR non-AP MLD, in such a way that the response to any of the PPDUs will not overlap with any of the DL PPDUs

Mandatory/Optional/Neither/Abstain/No Answer: 29/6/26/15/8

**20/0188r3 (Multi-link Triggered Uplink Access, Yongho Seok, MediaTek)**

SP#1

Do you support the following PPDU transmission restriction in the MLO?

* When an AP MLD aligns the ending time of DL PPDUs, the alignment requirement (i.e., the difference restriction between the ending times of transmitting DL PPDUs) is determined independent of the frame contained in the DL PPDUs.

Y/N/A/No answer: 24/22/29/14

**20/0433r4 (PPDU alignment in STR constrained multi-link, Yunbo Li, Huawei)**

SP#1

Do you support below synchronization requirement?

* When a MLD1 transmit PPDU1 and PPDU2 in link 1 and link 2 respectively to a MLD2 which is STR constrained, if PPDU1 and PPDU2 has time domain overlapping, then the offset of ending time of PPDU2 compare with ending time of PPDU1 should follows below table
  + T1 = SIFS – TBD value;
  + T2 < T1, and the value of T2 is TBD.



Y/N/A/No Answer: 31/11/28/13

Reference: 11-20-0511-07-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 23 (PHY): 5 SPs

**20/0605r0 (Further Discussions On Efficient EHT Preamble, Jianhan Liu, MediaTek)**

SP#1

Do you agree that EHT-SIG may carry different content in each 80MHz?

* For PPDU BW larger than 80MHz.
* SST operation using TWT is one applicable scenario, other scenarios are TBD.

Y/N/A: 51/1/4

**Straw poll #1 *[#SP1]***

**20/0604r2 (New Parser Discussion in 11be, Dandan Liang, Huawei)**

SP#1

Do you agree that 11be uses RU Parser with the following proportional round robin scheme for RU242+484+996?

* (242+484)+996: 1s:2s:4s

Y/N/A: 11/29/14

**20/0579r3 (update on segment parser and tone interleaver for 11be, Jianhan Liu, MediaTek)**

SP#1

Do you agree that 11be uses 80MHz segment parser with the following parameters for the proportional round robin scheme?

|  |  |  |  |
| --- | --- | --- | --- |
| **RU Aggregation** | **Nsd\_total** | **Proportional Ratio (m1:m2:m3:m4)** | **Leftover bits (per symbol)** |
| 484+996 | 1448 | 1s:2s | 44\*Nbpscs on ru996 |
| 484+2\*996 | 2428 | 1s:2s:2s | 44\*Nbpscs on ru996 |
| 484+3\*996 | 3408 | 1s:2s:2s:2s | 44\*Nbpscs on ru996 |
| 2\*996 | 1960 | 1s:1s | 0 |
| 3\*996 | 2940 | 1s:1s:1s | 0 |
| 4\*996 | 3920 | 1s:1s:1s:1s | 0 |

where

Y/N/A: 43/1/8

**Straw poll #2 *[#SP2]***

SP#2

Do you agree the same proportional round robin is applied to left-over bits?

* The same ratios are used in the entire segment parsing process except the ratios of those already filled segment becomes 0.



Leftover bits

To 1st RU

To 2nd RU

Y/N/A: 44/0/11

**Straw poll #3 *[#SP3]***

**20/0603r0 (EHT-SIG Contents for SU transmission, Ross Yu, Huawei)**

SP#1

Which option do you prefer regarding EHT-SIG contents for SU transmission when BW>20MHz.?

* Opt a: 1111 (CC1 and CC2 have the same contents)
* Opt b: 1212 (CC1 and CC2 have different contents)
* Neither
* Abstain

Opt a/Opt b/Neither/Abstain: 18/12/0/21

Reference: 11-20-0587-05-00be-minutes-april-phy-cc

## April 23 (MAC): 5 SPs

**20/0487r5 (Multiple Link Operation Follow Up, Liwen Chu, NXP)**

SP#1

Do you support that in non-STR STA MLD, the simultaneous transmission in two links through backoff in one link (link 1) and enhanced PIFS idle/busy check in another link (link 2) is allowed:

* NAV checking in primary 20MHz channel of link2 besides PIFS checking in other secondary channels of link2,
* The further method to guarantee fairness is TBD.

Y/N/A/No answer: 19/26/27/14

SP#2

Do you support to define a mode that when doing simultaneous frame exchanges with STA MLD without STR capability, the inter-frame space between the ending time of the short responding PPDU and the starting time of the following soliciting PPDU may be more than SIFS and no more than TBD time?

* Note: it may be required to do ED sensing when the IFS is longer than SIFS according to EU regulation.

Y/N/A/No answer: 12/36/33/16

**20/0226r5 (MLO Constraint Indication and Operating Mode, Sharan Naribole, Samsung)**

SP#1

Do you support the addition of the following text to TGbe SFD?

* A non-AP MLD may update its ability to perform simultaneous transmission and reception on a pair of setup links after multi-link setup.
  + This update for any pair of setup links can be announced by non-AP MLD on any enabled link.

NOTE – Specific signaling for update indication is TBD

NOTE - Limitations on dynamic updating is TBD

Y/N/A/No answer: 43/7/29/19

**Straw poll #4 *[#SP4]***

**20/0433r5 (PPDU alignment in STR constrained multi-link, Yunbo Li, Huawei)**

SP

Do you support below synchronization requirement?

* When a MLD1 transmit PPDU1 and PPDU2 in link 1 and link 2 respectively to a MLD2 which is STR constrained, if PPDU1 and PPDU2 has time domain overlapping, then the offset of ending time of PPDU2 compare with ending time of PPDU1 should follow below table
  + T1 = SIFS – non-negative TBD value;
  + 0< T2 < T1, and the value of T2 is TBD.



Y/N/A/No answer: 37/16/28/15

**20/0329r6 (Group addressed frame transmission in constrained multi-link operation, Yongho Seok, Mediatek)**

SP#2

Do you support the following group addressed frames delivery mechanism?

* The non-STR non-AP MLD may configure one link with the AP MLD to receive non-GCR group addressed frames, then during the non-GCR group addressed delivery in the configured link, then the AP MLD and non-STR non-AP MLD may not schedule frames soliciting an immediate response to each other on other links that overlap with the non-GCR group address frames.

Y/N/A/No answer: 26/15/37/20

Reference: 11-20-0511-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 24 (MAC): 3 SPs

**20/0024r2 (MLO: Acknowledgement procedure, Abhishek Patil, Qualcomm)**

SP#1

Do you support that the 802.11be amendment shall define mechanism for multi-link operation that enables the following:

* A STA of a recipient MLD shall provide receive status for MPDUs received on the link that it is operating on and may provide (if available) information on successful reception of MPDUs received by another STA of that MLD

Y/N/A/No answer: 48/5/23/8

**Straw poll #5 *[#SP5]***

**20/0053r3 (Multi-link BA, Po-Kai Huang, Intel)**

SP#1

Do you support that for each block ack agreement between two MLDs, there exists one transmit buffer control to submit MPDUs for transmission across links?

* TBD for separate transmit buffer control

Y/N/A/No answer: 48/1/41/7

**Straw poll #6 *[#SP6]***

SP#2

Do you support to extend the negotiated Block Ack buffer size to be smaller than or equal to 1024 and define 512-bits and 1024-bits BA bitmap in R1?

Y/N/A/No answer: 45/0/43/9

**Straw poll #7 *[#SP7]***

Reference: 11-20-0511-09-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 27 (PHY): 12 SPs

**20/0578r0 (On RU Allocation Singling in EHT-SIG, Jianhan Liu, MediaTek)**

SP#1

Which option do you prefer to EHT-SIG RU allocation signaling (not for 11be SFD)?

* Option 1: 11ax HE-SIGB Common Field-based schemes
* Option 2: New Self-contained schemes based on RU allocation being sent in per-user field.

Note: for information only – Not for SFD.

Option 1/Option 2/Absent: 38/22/2

**20/0585r0 (Consideration on EHT-STF, Eunsung Park, LGE)**

SP#1

Do you agree to add the following text to the TGbe SFD?

* EHT PPDU has EHT-STF immediately after EHT-SIG
  + If EHT PPDU doesn’t have EHT-SIG, EHT-STF is positioned immediately after U-SIG

Y/N/A: 52/0/6

**Straw poll #8 *[#SP8]***

SP#2

Do you agree to add the following text to the TGbe SFD?

* 802.11be supports 1x EHT-STF and 2x EHT-STF
  + 1x EHT-STF is used in EHT SU/MU PPDU
    - Whether SU and MU PPDU format is the same is TBD
  + 2x EHT-STF is used in EHT TB PPDU
  + TBD for any new EHT PPDU formats

Y/N/A: 51/1/8

**Straw poll #9 *[#SP9]***

SP#3

Do you agree to add the following text to the TGbe SFD?

* 802.11be reuses 1x HE-STF and 2x HE-STF in 20/40/80/160/80+80 MHz PPDU

Y/N/A: 51/0/8

**Straw poll #10 *[#SP10]***

**20/0608r0 (Consideration on EHT-LTF, Jinyoung Chun, LGE)**

SP#1

Do you support to reuse 1/2/4x HE-LTF sequences for 1/2/4x EHT-LTF sequences in 20/40/80MHz PPDU transmission?

Y/N/A: 51/0/9

**Straw poll #11 *[#SP11]***

**20/0470r1 (Small Size MRU with Different MCS and BCC, Junghoon Suh, Huawei)**

SP#1

Do you agree that, for a single RU less than or equal to 242 tones (i.e. RU26, RU52, RU106, RU242), the BCC can be supported?

* Mandatory or Optional for BCC, TBD
* Only for MCS0 to 9.
* Only for NSS <=4

Y/N/A: 49/2/13

SP#1a

Do you agree that, for a single RU less than or equal to 242 tones (i.e. RU26, RU52, RU106, RU242), the BCC can be supported?

* Mandatory or Optional for BCC, TBD
* Only for MCS0 to 9 (with or without DCM – if defined in 11be)
* Only for NSS <=4

Y/N/A: 37/6/14

SP#2

Do you agree that, for the combined multiple RU with the combined RU size less than 242 tones, the BCC can be supported?

* Mandatory or Optional for BCC, TBD
* Only for modulation up to 256QAM (with or without DCM – if defined in 11be)
* Only for NSS <=4

Y/N/A: 41/12/10

**Straw poll #12 *[#SP12]***

SP#1b

Do you agree that, for a single RU less than or equal to 242 tones (i.e. RU26, RU52, RU106, RU242), the BCC can be supported?

* Mandatory or Optional for BCC, TBD
* Only for modulation up to 256QAM (with or without DCM – if defined in 11be)
* Only for NSS <=4

Y/N/A: 48/3/12

**Straw poll #13 *[#SP13]***

SP#3

In case of small size MRU transmission, do you support to apply a common BCC encoder and joint bit Interleaver for the combined RU?

Y/N/A: 60/0/3

**Straw poll #14 *[#SP14]***

**20/0067r1 (Restrictions for 16 SS based MU-MIMO Scheduling, Junghoon Suh, Huawei)**

SP#1

For an EHT MU-MIMO transmission, do you agree to limit the maximum number of Spatial Streams allocated to each MU-MIMO scheduled non-AP STA to 4?

Y/N/A: 56/1/9

**Straw poll #15 *[#SP15]***

**20/0563r1 (EHT PPDU Scrambler, Xiaogang Chen, Intel)**

SP#1

Do you agree to use the following generator polynomial to generate the PPDU synchronous scrambler for EHT PPDU?

• The 11 bits used for the scrambler initialization are randomly assigned by the transmitter.

• The polarity of the pilot subcarrier is derived from the same sequence as 11ax.

Y/N/A: 36/12/12

**Straw poll #16 *[#SP16]***

Reference: 11-20-0587-06-00be-minutes-april-phy-cc

## April 27 (MAC): 2 SPs

**20/0055r2 (Multi-link block ack architecture, Rojan Chitrakar, Panasonic)**

SP#1

Do you support to add the following to the 11be SFD:

Different scoreboard sizes may be negotiated for different links of an MLD during negotiation of a block ack agreement for a TID that may be transmitted over one or more links.

Y/N/A/No Answer: 14/22/34/17

SP#2

Do you support to add the following to the 11be SFD:

An MLD may maintain a common scoreboard to record the receipt status of MPDUs of a TID received via different links?

Y/N/A/No Answer: 16/15/43/21

Reference: 11-20-0511-10-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## April 30 (Joint): 3 SPs on requests for candidate SFD texts

**20/0394r1 (Thoughts on RU Aggregation and Interleaving, Bin Tian, Qualcomm)**

Modified SP#1

Do you support joint interleaving for BCC and joint tone mapper for LDPC for RU and aggregated RU size <=80 MHz?

Y/N/A/No answer: 64/6/62/23

**19/1604r1 (EHT Direct Link Transmission, Dibakar Das, Intel)**

Modified SP

Do you agree to add the following to SFD?

* Do you support that 11be defines a procedure for an AP to share time resource obtained in a TXOP for peer to peer (STA-TO-STA) frame exchanges?
  + Whether it is in R1 or R2 is TBD.

Passed with unanimous consent

**20/0380r0 (U-SIG structure and Preamble Processing, Sameer Vermani. Qualcomm)**

SP to keep existing text in the SFD

Do you agree that a STA only needs to process up to one 80MHz segment of the pre-EHT preamble (up-to and including EHT-SIG) to get all the assignment information for itself?

* No 80MHz segment change is needed while processing L-SIG, U-SIG and EHT-SIG

Passed with unanimous consent to keep the existing text

Reference: 11-20-0570-02-00be-telephone-conference-meeting-minutes-april-2020

## April 30 (Joint): 3 SPs

**20/0099r1 (Coordinated Beamforming for 802.11be, Roya Doostnejad, Intel)**

SP

Do you support adding “Multi-AP Coordinated BF” to 802.11be SFD as one of the multi-AP coordination schemes?

Note: This feature is for rel. 2

Y/N/A/No answer: 88/1/41/26

**Straw poll #17 *[#SP17]***

**20/0123r0 (Channel Sounding for Multi-AP CBF, Feng Jiang, Intel)**

SP#1

Do you support that multiple APs can sequentially use an 11ax-like sounding sequence to collect CSI from the in-BSS STAs and OBSS STAs?

* Each AP’s sounding sequence is similar to the 11ax sounding protocol with multiple STAs (NDPA + NDP + BFRP TF + CSI report).

Y/N/A/No answer: 81/4/43/30

**Straw poll #18 *[#SP18]***

SP#2

In sequential channel sounding sequence for multi-AP, do you support that the NDPA frame and BFRP TF frame will include ID info for OBSS STA?

* The details of the NDPA, BFRP TF and the ID info are TBD.

Y/N/A/No answer: 75/9/45/26

**Straw poll #19 *[#SP19]***

Reference: 11-20-0570-02-00be-telephone-conference-meeting-minutes-april-2020

## May 4 (PHY): 3 SPs

**20/0456r0 (Tx EVM Requirement for 4k QAM, Qinghua Li, Intel)**SP#1

Do you support -38 dB as the Tx EVM requirement for 11be 4k QAM?

Y/N/A: 32/0/11

**Straw poll #20 *[#SP20]***

**20/0667r1 (Small RU Combinations, Ron Porat, Broadcom)**

SP#1

Do you support the following 106+26 combinations as shown in orange for each 80MHz segment in 80, 160, 240 and 320MHz BW?

A picture containing screenshot, different, computer, clock

Description automatically generated

Y/N/A: 35/7/10

**Straw poll #21 *[#SP21]***

**20/0686r0 (Considerations on the Scrambler design for 11be, Chenchen Liu, Huawei)**

SP#1

Do you agree to use higher degree scrambler only for user with large RU size and high MCS in EHT PPDU?

* The exact high degree scrambler is TBD
* The condition when the high degree scrambler should be used is TBD

Y/N/A: 11/31/7

Reference: 11-20-0708-00-00be-minutes-for-tgbe-phy-ad-hoc-cc-march-to-may-2020

## May 4 (MAC): 8 SPs

**20/0441r3 (MLA: BA Format, Duncan Ho, Qualcomm)**

SP#3

Do you agree to add to the TGbe SFD:

* For a M-BlockAck frame, add support for 512/1024 bitmap lengths by:
  + Including new BA Bitmap lengths (of 512 and 1024 bits), where the length of the BA Bitmap field is signaled in the Per AID TID Info field addressed to an EHT STA
  + The M-BA frame containing these Per AID TID Info fields is not sent as a response to an HE TB PPDU generated by at least one HE STA.

Y/N/A/No answer: 36/1/35/6

**Straw poll #22 *[#SP22]***

SP#2

Do you agree to add to the TGbe SFD:

* For a Compressed BlockAck frame, use some of the reserved values of the Fragment Number field of the BlockAck frame to indicate the added bitmap lengths (512 and 1024).

Y/N/A/No answer: 46/0/29/5

**Straw poll #23 *[#SP23]***

**20/0122r4 (A BAR Variant For Multi-Link Operation, Chunyu Hu, Facebook)**

SP#1

Do you agree to define a new type of BAR used in the multi-link operation that can be used to notify the A-MPDU responder that it has skipped a range of sequence numbers and/or a subset of sequence numbers, and that the responder shall not move its BA window as result?

Y/N/A/No answer: 5/44/26/13

**20/0397r4 (Sequence number and BA operation with large BA buffer size, Liwen Chu, NXP)**

SP#1

Do you support to use B3 equal to 1, B2 B1 equal to 0 and B0 equal to 0 in Fragment Number field to indicate 512 BA bitmap length and to use B3 equal to 1, B2 B1 equal to 0 and B0 equal to 1 in Fragment Number field to indicate 1024 BA bitmap length in compressed BA and multi-STA BA?

Approved with unanimous consent

**Straw poll #24 *[#SP24]***

**20/0053r4, (Multi-link BA, Po-Kai Huang, Intel)**

SP#3

Do you support to extend table 26-1 as shown below?

|  |  |  |
| --- | --- | --- |
| **Negotiated buffer size** | **Bitmap in compressed BA** | **Bitmap in multi-STA BA** |
| 1-64 | 64 | 32 or 64 |
| 65-128 | 64 or 256 | 32, 64, 128 |
| 129-256 | 64 or 256 | 32, 64, 128, or 256 |
| 257-512 | 64 or 256 or 512 | 32, 64, 128, 256, 512 |
| 513-1024 | 64 or 256 or 512 or 1024 | 32, 64, 128, 256, 512, or 1024 |

Approved with unanimous consent

**Straw poll #25 *[#SP25]***

**20/0024r3 (MLO: Acknowledgement procedure, Abhishek Patil, Qualcomm)**

SP#2

Do you agree that an originator MLD of an BA agreement:

* shall update the receive status for an MPDU corresponding to the BA agreement if the received status indicates successful reception.
* shall not update the receive status for an MPDU corresponding to the BA agreement that has been already positively acknowledged.

Y/N/A/No answer: 34/0/33/13

**Straw poll #26 *[#SP26]***

**20/0432r1 (Bug fix for Acknowledgement rule in multi-link, Yunbo Li, Huawei)**

SP#1

Do you agree to modify acknowledgement rule in multi-link as below:

* The receive status of a MSDU or A-MSDU in a QoS Data frames of a TID received on a link shall be signaled on the same link unless at least one of following conditions is true:
  + The receive status of the MSDU or A-MSDU has already be signaled in other available link(s) with corresponding bit in the BA be set to 1;
  + The corresponding Ack Policy of the MSDU or A-MSDU is set to No Ack.

Y/N/A/No answer: 15/21/27/18

**20/0460r3 (Multi-link BA Clarification, Yongho Seok, MediaTek)**  
SP#1

Do you support that, after the BA agreement of a TID between two MLDs, the common reordering buffer of the TID are applied on all setup links?

Approved with unanimous consent

**Straw poll #27 *[#SP27]***

Reference: 11-20-0511-11-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## May 7 (PHY): 6 SPs

**20/0606r2 (Further discussion on bandwidth and puncturing information, Wook Bong Lee, Samsung)**

SP#1

Do you agree that 11be signaling in U-SIG for BW/puncturing information in every non-punctured 20MHz of an 80MHz segment shall allow even an OBSS or unassociated device to decode the puncturing pattern of at least the specific 80MHz that contains the 20MHz?

Y/N/A: 34/10/8

**Straw poll #28 *[#SP28]***

SP#4

Do you support BW field which doesn’t include puncturing information?

Y/N/A: 44/10/5

**Straw poll #29 *[#SP29]***

**20/0699r0 (Phase Rotation Proposal Follow-up, Eunsung Park, LGE)**

SP#1

Do you agree to add the following text to the TGbe SFD?

* Phase rotation is applied to legacy preamble, RL-SIG, U-SIG and EHT-SIG in EHT PPDU

Y/N/A: 48/3/9

**Straw poll #30 *[#SP30]***

SP#2

Do you agree to define a new phase rotation sequence which is different from the 11ax one for 40/80/160/80+80 MHz PPDU?

* It is not intended for SFD

Y/N/A: 7/27/23

SP#3

Do you agree to add the following text to the TGbe SFD?

* 11be reuses the phase rotation sequence defined in 11ax for 20/40/80/160/80+80 MHz PPDU

Y/N/A: 51/3/5

**Straw poll #31 *[#SP31]***

**20/0373r1 (RU Allocation Subfield Design for Multi-RU Support, Myeongjin Kim, Samsung)**

SP#1

Do you agree to the RU allocation signaling in EHT-SIG is based on RU allocation signaling as defined in HE-SIGB of 11ax?

Y/N/A: 35/13/8

Reference: 11-20-0708-00-00be-minutes-for-tgbe-phy-ad-hoc-cc-march-to-may-2020

## May 7 (MAC): 7 SPs

**20/0136r2 (Virtual Carrier Sense in Multi-Link, Thomas Handte, Sony)**  
SP

Do you support that an AP entity which is part of a AP MLD may transmit network state information of the other AP entities which are part of the same AP MLD?

* Note 1: Definition of network state information is TBD
* Note 2: R1 or R2 is TBD

Y/N/A/No Answer: 32/23/25/19

**19/1930r3 (AP assisted Multi-link operation, Dibakar Das, Intel)**

SP#1

Do you agree that an AP that is part of an AP MLD can transmit the BSS load information of other APs that are part of the same MLD?

* whether we use existing or new mechanism is TBD

Y/N/A/No answer: 38/15/27/17

**20/0119r2 (Follow Up Discussion on Multi-link Operations, Xiaofei Wang, InterDigital)**

SP#2

Do you agree that an EHT MLD shall indicate its MLD MAC address during ML setup?

Approved with unanimous consent

**Straw poll #32 *[#SP32]***

**20/0314r1 (MLO: BSS Color, Abhishek Patil, Qualcomm)**

SP

Do you support that each STA of an MLD may independently select and manage its operational parameters unless specified otherwise in the 11be standard?

Y/N/A/No answer: 51/8/22/15

**Straw poll #33 *[#SP33]***

**20/0358r1 (Multi-BSSID Operation with MLO, Abhishek Patil, Qualcomm)**

SP#1

Do you agree that an AP of an AP MLD can correspond to a transmitted BSSID or a nontransmitted BSSID in a multiple BSSID set on a link?

Approved with unanimous consent

**Straw poll #34 *[#SP34]***

SP#2

Do you agree that APs belonging to the same multiple BSSID set cannot be part of the same AP MLD?

* Note: APs within a multiple BSSID set are, by definition, operating on the same channel

Approved with unanimous consent

**Straw poll #35 *[#SP35]***

SP#3

Do you agree that APs belonging to the same co-hosted BSSID set cannot be part of the same AP MLD?

* Note: APs within a co-hosted BSSID set are, by definition, operating on the same channel

Approved with unanimous consent

**Straw poll #36 *[#SP36]***

Reference: 11-20-0511-12-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## May 8 (MAC): 4 SPs

**20/0430r3 (RTS/CTS for multi-link, Taewon Song, LGE)**

SP#1

A STA may indicate whether each recipient STA commences the transmission of a CTS frame response or not via MU-RTS frame.

* A detailed method is TBD.

Y/N/A/No answer: 14/23/37/7

**20/0442r1 (MLA: Group addressed frames delivery, Duncan Ho, Qualcomm)**

SP#1

Do you agree to add to the TGbe SFD the following:

* For R1, each AP affiliated with an STR AP MLD shall follow the baseline rules for scheduling Beacon frame transmissions

Y/N/A/No answer: 44/4/32/15

**Straw poll #37 *[#SP37]***

**20/0488r1 (Multi-link group addressed data delivery, Po-Kai Huang, Intel)**

SP#1

Do you support that different SN space for group addressed data frame are used in different links?

Y/N/A: 21/28/29

**20/0054r3 (MLD MAC address and WM address, Po-Kai Huang, Intel)**  
SP#3

Do you support that if different affiliated APs of an AP MLD have different MAC addresses, then different affiliated non-AP STAs of a non-AP MLD with more than one affiliated STA have different MAC addresses?

Approved with unanimous consent

**Straw poll #38 *[#SP38]***

Reference: 11-20-0511-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-march-and-may-2020

## May 11 (PHY): 1 SP

**20/0019r4 (11be PPDU format, Dongguk Lim, LGE)**

SP#1

Do you agree to add the following into the 11be SFD?

* The EHT PPDU sent to a single user has the EHT-SIG field.
  + A subfield that indicates preamble puncturing pattern can be present in the U-SIG and/or EHT-SIG field.

Y/N/A: 36/0/11

**Straw poll #39 *[#SP39]***

Reference: 11-20-0708-02-00be-minutes-for-tgbe-phy-ad-hoc-cc-march-to-may-2020

## May 11 (MAC): 2 SPs

**19/1822r9 (Multi-link security consideration, Po-Kai Huang, Intel)**  
SP#3

Between two MLDs, do you support to use the MLD MAC addresses to derive PMK under SAE method and PTK in 11be SFD?

Approved with unanimous consent

**Straw poll #40 *[#SP40]***

**20/0069r5 (multi-link communication mode definition, Yonggang Fang, ZTE TX)**

SP#1 (modified text)

Do you support to define the following in SFD?

* STR: simultaneous transmission and reception
* STR Operation: is the operation of which a transmission on one link is independent to (i.e. non-interruptible on) the operation on another link of MLD.
* STR-constraint Operation: is the operation on a link may depend on the operation of another link of MLD.
  + i.e. a transmission on a link may be constrained if it causes the reception interruption on another link, or a reception on a link may be constrained if a transmission is on anther link of MLD.
* STR-constraint links: A pair or group of links are in the STR-constraint Operation.

Y/N/A: 16/25/29

Reference: 11-20-0748-00-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-march-and-may-2020

## May 14 (Joint): 1 SP

**20/0416r0 (MRU signaling in trigger frame, Ross Jian Yu, Huawei)**

SP#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

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

Reference: 11-20-0775-00-00be-may-july-tgbe-teleconference-minutes

## May 18 (PHY): 8 SPs

**20/0608r0 (Consideration on EHT-LTF, Jinyoung Chun, LGE)**

SP#2

Do you support to reuse 1/2/4x HE-LTF sequences for 1/2/4x EHT-LTF sequences in 80+80/160MHz?

Y/N/A: 41/0/4

**Straw poll #41 *[#SP41]***

**20/0666r2 (80MHz OFDMA Tone Plan, Ron Porat, Broadcom)**

SP#1

Do you support the following toneplan for 11be 80 MHz OFDMA?

* 80 MHz OFDMA = 40 MHz DUP, Table 27-8 in 11ax D6 right/left shifted by 256 tones.



* Note
  + The 80MHz OFDMA design applies to any RU<996 for all modes of transmission, SU, DL MU, TB PPDU, with and without puncturing
  + Non-OFDMA full BW 80MHz segment uses 996RU design
  + Any punctured 80MHz segment uses the OFDMA tone plan
  + For each 80MHz segment in 160MHz, 240MHz or 320MHz: if it’s punctured or used for OFDMA the 80MHz OFDMA tone plan is used, if it’s used for non-OFDMA and non-punctured the 996RU tone plan is used

Y/N/A: 44/1/5

**Straw poll #42 *[#SP42]***

**20/0609r3 (Further discussion on RU allocation subfield in EHT-SIG, Ross Jian Yu, Huawei)**

SP#1

Do you agree to add the following to the 11be SFD:

* An RU Allocation subfield that is present in the Common field of the EHT-SIG field of an EHT PPDU sent to multiple users (except EHT TB PPDU), indicates RU assignment, including the size of the RU(s) and their placement in the frequency domain, to be used in the EHT modulated fields of the PPDU in the frequency domain.
  + Compressed modes are TBD.

Y/N/A: 37/0/8

**Straw poll #43 *[#SP43]***

SP#3 (modified text)

Do you agree that the minimum RU size for EHT to support MU-MIMO shall be 242-tone RU?

Y/N/A: 31/6/13

**Straw poll #44 *[#SP44]***

**20/0652r0 (Signaling of RU allocation in 11be, Dongguk Lim, LGE)**

SP#1

Do you agree that the RU allocation subfield in the EHT-SIG field of an EHT-PPDU sent to multiple users includes the RU allocation for Multiple RUs as well as Single RU?

Y/N/A: 38/0/10

**Straw poll #45 *[#SP45]***

**20/0738r2 (Evaluation of signaling overhead for EHT-SIG, Dongguk Lim, LGE)**

SP#1

Do you agree that N RU allocation subfields are present in an EHT-SIG content channel?

* Where, N is the number of RU allocation subfield in common field of EHT-SIG content channel.
* N = 1 if a 20MHz or 40MHz EHT PPDU sent to multiple users is used.
* N = 2 if a 80MHz EHT PPDU sent to multiple users is used.
* N = TBD for other cases.
* The compressed modes are TBD.

Y/N/A: 38/1/10

**Straw poll #46 *[#SP46]***

**20/0767r0 (Number of Users in MU-MIMO, Ron Porat, Broadcom)**

SP#1

Do you agree that the max number of users that can be spatially multiplexed in EHT for DL transmissions is 8 per RU/MRU?

* Applicable to all transmission modes in 11be

Y/N/A: 45/1/6

**Straw poll #47 *[#SP47]***

**20/0693r1 (Aggregated PPDU for Large BW, Rui Cao, NXP)**  
SP#1

Do you agree to define frequency domain aggregation of aggregated PPDUs for EHT?

* Aggregated PPDU consists of multiple sub-PPDUs.
  + The PPDU format combination limits to EHT and HE.
  + Other combinations are TBD.
  + For the PPDU using HE format, the PPDU BW TBD.
  + The number of PPDUs is TBD.
* A-PPDU will be R2 feature.

Y/N/A: 31/0/7

**Straw poll #48 *[#SP48]***

Reference: 11-20-0787-00-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## May 18 (MAC): 9 SPs

**20/0408r4 (Prioritized EDCA Channel Access Over Latency Sensitive Links in MLO, Chunyu Hu, Facebook)**

SP#1

Do you support that the TGbe SFD shall include that

* An MLD AP may offer differentiated quality of service over different links

Y/N/A: 61/8/17

**Straw poll #49 *[#SP49]***

SP#2

Do you support that the TGbe SFD shall include:

* An optional mechanism of dividing medium time into slots of duration TBD during which prioritized EDCA access operates for specifically allowed STAs

Y/N/A: 15/30/39

**20/0358r3 (Multi-BSSID Operation with MLO, Abhishek Patil, Qualcomm)**

SP#4

Do you support that each AP of an AP MLD is independently configured to operate as transmitted or nontransmitted BSSID of a multiple BSSID set or as an AP of a co-hosted BSSID set or not part of either a multiple BSSID set or co-hosted BSSID set?

Y/N/A: 52/2/33

**Straw poll #50 *[#SP50]***

**20/0105r4 (Link Latency Statistics of Multi-band Operations in EHT, Frank Hsu, MediaTek)**  
SP#1

Do you support that EHT AP should provide BSS transmit delay statistics carried in an information element?

* Transmit delay statistics details are TBD?

Y/N/A: 30/25/27

SP#2

Do you support that EHT AP MLD should provide transmit delay statistics of each link carried in an information element?

* Transmit delay statistics details are TBD

Y/N/A: 38/24/22

**20/0472r2 (Discussion of More Data subfield for multi-link, Yunbo Li, Huawei)**

SP#1

Do you support to adjust the setting of More Data subfield to fit MLD scenario?

Y/N/A: 45/8/25

**Straw poll #51 *[#SP51]***

SP#2

Do you support below setting of More Data subfield?

* When AP MLD transmit a BU in one link to a non-AP MLD, if there is at least one additional buffered BU of any TID or management frames that is mapped to this link by TID-to-link mapping or default mapping for the same non-AP MLD, the More Data subfield is set to 1, otherwise the More Data subfield is set to 0.

Y/N/A: 43/7/28

**Straw poll #52 *[#SP52]***

SP#3

Do you support below setting of More Data subfield?

* A QoS Null frame with More Data subfield sets to 0 may be transmitted in one link to indicate no more additional buffered BU of any TID or management frames that mapping to this link present?

Y/N/A: 29/16/37

**20/0398r3 (EHT BSS with wider bandwidth, Liwen Chu, NXP)  
  
SP#1**

Do you support that in 6GHz band, an EHT AP may announce different BSS operating bandwidth to non-EHT STAs than the BSS operating bandwidth it announces to EHT STAs when EHT BW covers disallowed 20MHz channels and/or when the announced EHT BW is not supported by non-EHT amendments. The advertised BSS operating bandwidth to EHT STA shall include the advertised BSS operating bandwidth to non-EHT STA?

Y/N/A: 31/1/33

**Straw poll #53 *[#SP53]***

Reference: 11-20-0777-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## May 20 (MAC): 3 SPs

**20/0569r1 (11be TXOP protection and coexistence with 11ax, Chunyu Hu, Facebook)**

SP#1

Do you support defining new MAC-level mechanism for TXOP protection in 11be as HE capability?

Notes

* Examples of MAC-level mechanisms include modified or new RTS, MU-RTS and CTS frames, and NAV set/reset procedures to the extent that they are independent of EHT PHY header
* A feature can be defined as an HE capability through using bits/fields in HE Capabilities element (9.4.2.247), Extended Capabilities element (9.4.2.26), or similar fields/elements accessible to HE STAs

Y/N/A: 17/40/37

SP#2

Do you support requiring formats for new RTS, MU-RTS and CTS frames (if defined) to be forward compatible?

Notes

* One examples of forward compatibility is using a version field; see 802.11-19-1519/r5 for “forward compatibility” discussion
* Combination of Straw Polls #1 and #2 means “forward compatibility” to start from 11ax, but for 11ax as optional (capability)

Y/N/A: 24/20/40

SP#3

Do you support defining new control frames in 11be using the existing “Control Frame Extension” subtype (6) and using bits 8-11 in Frame Control field?

Notes

* This means different definitions for control frames under “Control Frame Extension” subtype (6) in 2.4/5/6 GHz and in 60 GHz)

Y/N/A: 10/26/49

Reference: 11-20-0777-02-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## May 21 (PHY): 3 SPs

**20/0782r0 (EHT-STF Sequences, Eunsung Park, LGE)**

SP#3

Do you agree to unify the EHT-STF sequence between contiguous and non-contiguous modes for one given BW indicated in BW subfield in U-SIG?

* It is not intended for SFD

Y/N/A: 34/1/5

**20/0778r0 (MU-MIMO Simplifications for EHT, Sameer Vermani, Qualcomm)**

SP#1

Do you agree that for EHT PPDUs where MU-MIMO is happening on part of the PPDU BW 80MHz is the minimum PPDU BW ?

* The limitation is also applicable to the case where the PPDU has multiple MU-MIMO RUs which collectively span the entire PPDU BW

Y/N/A: 25/12/10

**20/0699r1 (Phase Rotation Proposal Follow-up, Eunsung Park, LGE)**

SP#7

Which phase rotation do you prefer for 320/160+160 MHz PPDU?

* Option 2: repeating conventional 11ax phase rotation and applying an additional binary coefficient to each 80MHz segment
* Option 4: alternative phase rotation with binary coefficients
* Note: This is not intended for SFD

Option2/Option4/None/Abstain: 15/11/2/12

Reference: 11-20-0787-01-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## May 21 (MAC): 2 SPs

**20/0680r0 (Operating Bandwidth Indication for EHT BSS, Guogang Huang, Huawei)**  
SP#1

Do you support to define EHT operation element to indicate the channel configuration for EHT STA, which does not need to combine with the indication of CCFS0 and CCFS1 in HE operation elements at 6 GHz?

Approved with unanimous consent

**Straw poll #54 *[#SP54]***

**19/1988r2 (Power save for multi-link, Ming Gan, Huawei)**

SP#1

Do you agree that not every STA operating in PS mode in a non-AP MLD is required to receive the beacon frames periodically?

* This is an exemption besides the existing ones, such as individual TWT agreement, WNM sleep mode and NonTIM mode

Y/N/A: 26/6/40

**Straw poll #55 *[#SP55]***

Reference: 11-20-0777-03-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## May 27 (MAC): 1 SP

**20/0070r1 (Multi-link power saving operation, Yonggang Fang, ZTE TX)**

SP#1

Do you support to include the following in SFD ?

* A non-AP MLD may negotiate with the associated AP MLD a link as the anchored link for the power saving operation.

Y/N/A: 13/28/38

Reference: 11-20-0777-04-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## May 28 (Joint): 1 SP

**20/0687r0 (R1-R2 discussion for AP coordination, Laurent Cariou, Intel)**

SP#1

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

Y/N/A/No answer: 58/55/20/39

Reference: 11-20-0775-01-00be-may-july-tgbe-teleconference-minutes

## June 1 (PHY): 5 SPs

**20/0782r2 (EHT-STF Sequences, Eunsung Park, LGE)**

SP#3

Do you agree to add the following text to the TGbe SFD?

* 1x and 2x 320/160+160MHz EHT-STF sequences are designed by repeating 1x and 2x 80MHz HE-STF sequences, respectively
  + Additional coefficients for phase rotation are TBD

Y/N/A/No answer: 27/0/14/25

**Straw poll #56 *[#SP56]***

**20/0651r2 (Further Thoughts on EHT-LTF PAPR in 802.11be, Genadiy Tsodik, Huawei)**

SP#1

Do you support that 802.11be will define a solution which minimizes PAPR of EHT-LTF field in following scenarios?

* For BW = 80MHz cases mentioned on slide 10
* For BW > 80MHz TBD

Note: For information collection

Y/N/A/No answer: 15/17/16/18

**20/0798r1 (Signaling of RU allocation follow-up, Dongguk Lim, LGE)**

SP#1

Do you agreed that the RU allocation subfield includes large size of RU aggregation for OFDMA transmission defined in 11be SFD?

* For 80MHz
  + 484 + 242
* For 160MHz
  + 484 + 996
* For 320MHz
  + 3x996
* Other cases are TBD.
* Note: Specific RU allocation indication is TBD

Y/N/A/No answer: 30/5/8/22

**Straw poll #57 *[#SP57]***

**20/0609r7 (Further discussion on RU allocation subfield in EHT-SIG, Ross Yu, Huawei)**

SP#3

Do you agree that for RU242, RU484 or RU996, in the RU allocation table, 9 entries per RU size will be used to indicate: contributes 0~8 User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield?

* Compressed modes are TBD.

Y/N/A/No answer: 24/10/13/19

SP#2

Do you agree that the mapping from the TBD-bit RU Allocation subfield to the RU assignment, contains the following entries?

* The RUs highlighted in orange means combination.
* Other entries TBD
* Compressed mode TBD
* Note: Not all the 106+26-tone and 52+26 tone MRU are applicable when PPDU BW is greater than or equal to 80 MHz.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **order** | **#1** | | **#2** | | **#3** | **#4** | **#5** | **#6** | **#7** | **#8** | **#9** | **Number of entries** |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 26 | 26 | 52 | | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 52 | | 52 | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 26 | 26 | 52 | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 52 | | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 26 | 26 | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52 | | 26 | 26 | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52 | | 52 | | 1 |
| TBD | 52 | | | | 52 | | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | | 52 | | | 52 | | 26 | 26 | 26 | 52 | | 1 |
| TBD | | 52 | | | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | | 52 | | | 52 | | 26 | 52 | | 52 | | 1 |
| TBD | | 26 | | 26 | 26 | 26 | 26 | 106 | | | | 1 |
| TBD | | 26 | | 26 | 52 | | 26 | 106 | | | | 1 |
| TBD | | 52 | | | 26 | 26 | 26 | 106 | | | | 1 |
| TBD | | 52 | | | 52 | | 26 | 106 | | | | 1 |
| TBD | | 106 | | | | | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | | 106 | | | | | 26 | 26 | 26 | 52 | | 1 |
| TBD | | 106 | | | | | 26 | 52 | | 26 | 26 | 1 |
| TBD | | 106 | | | | | 26 | 52 | | 52 | | 1 |
| TBD | | 52 | | | 52 | | -- | 52 | | 52 | | 1 |
| TBD | | 242-tone RU empty (with zero users) | | | | | | | | | | 1 |
| TBD | | 106 | | | | | 26 | 106 | | | | 1 |
| TBD | | 242 | | | | | | | | | | TBD |
| TBD | 26 | | | 26 | 26 | 26 | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 26 | 26 | 52 | | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | | 26 | 52 | | 26 | 52 | | 52 | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 52 | | 26 | 26 | 1 |
| TBD | 52 | | | | 52 | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 26 | | 26 | | 26 | 26 | 26 | 106 | | | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 106 | | | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 106 | | | | 1 |
| TBD | 26 | | 26 | | 52 | | 26 | 106 | | | | 1 |
| TBD | 52 | | | | 26 | 26 | 26 | 106 | | | | 1 |
| TBD | 52 | | | | 52 | | 26 | 106 | | | | 1 |
| TBD | 106 | | | | | | 26 | 26 | 26 | 26 | 26 | 1 |
| TBD | 106 | | | | | | 26 | 26 | 26 | 52 | | 1 |
| TBD | 106 | | | | | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 106 | | | | | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 106 | | | | | | 26 | 52 | | 26 | 26 | 1 |
| TBD | 106 | | | | | | 26 | 52 | | 52 | | 1 |
| TBD | 106 | | | | | | 26 | 106 | | | | 1 |
| TBD | 106 | | | | | | 26 | 106 | | | | 1 |

Y/N/A/No answer: 37/0/8/21

**Straw poll #58 *[#SP58]***

Reference: 11-20-0787-02-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## June 1 (MAC): 8 SPs

**20/0391r0 (Multi-link power save state after enablement, Laurent Cariou, Intel)**

SP#1

Do you agree to add to the 11be SFD:

* When a link becomes enabled for a STA that is part of a non-AP MLD through multi-link setup sent on that link, the initial power management mode of the STA, immediately after the signaling exchange, is active mode
* When a link is enabled for a STA that is part of a non-AP MLD through signaling (multi-link setup or TID to link mapping update) send on another link, the initial power management mode of the STA, immediately after the exchange, is power save mode, and its power state is doze

Y/N/A: 23/18/25

**20/0280r2 (Link Enablement Considerations, Frank Hsu, MediaTek)**

SP#1

Do you agree that the response frame corresponds to the link TID-mapping update should be able to carry operational parameters of the link to be enabled?

Y/N/A: 12/13/40

**19/1988r3 (Power save for multi-link, Ming Gan, Huawei)**

SP#2

Do you agree that an AP in an AP MLD shall provide BSS specific parameters update indication for one or more other APs in the same AP MLD?

* The detail for BSS specific parameters update indication is TBD

Y/N/A: 39/6/25

**Straw poll #59 *[#SP59]***

SP#3

Do you agree that an AP in an AP MLD shall provide DL traffic notification for one or more other APs in the same AP MLD if TID-to-Link Mapping is established?

* The detail for DL traffic notification is TBD

Y/N/A: 26/10/32

SP#4

Do you agree that the individual TWT agreement(s) could be set up on a setup link for more than one setup link?

Y/N/A: 34/8/21

**Straw poll #60 *[#SP60]***

SP#5

Do you agree that each non-AP MLD should select one link to monitor DL traffic indication and BSS parameter update?

* Whether the non-AP MLD provides the notification of the selected link to the AP MLD and the detailed notification are TBD

Y/N/A: 17/20/27

**20/0066r3 (Multi-link TIM, Young Hoon Kwon, NXP)**

SP#1

Do you agree to add the following to 11be SFD:

* A bit in a partial virtual bitmap of a TIM element that corresponds to a non-AP MLD is set to 1 if any individually addressed BUs for the non-AP MLD are buffered by the AP MLD.

Y/N/A: 41/1/19

**Straw poll #61 *[#SP61]***

SP#2

Do you agree to add the following to 11be SFD:

* When a non-AP MLD made a multi-link setup with an AP MLD, one AID is assigned to the non-AP MLD across all links.

Y/N/A: 35/4/26

**Straw poll #62 *[#SP62]***

Reference: 11-20-0777-05-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 3 (MAC): 5 SPs

**20/0462r0 (11be BA Indication, Po-Kai Huang, Intel)**

SP#1

Do you support to design a mechanism for the originator of a BlockAck negotiation of a TID to indicate to the recipient the range of reported received status of a solicited BA?

* if supported by the recipient, it is supported for all negotiated buffer sizes

Y/N/A: 25/12/34

**20/0061r2 (BA Consideration, Liwen Chu, NXP)**

SP#1

Do you support to allow an EHT STA to use HE SU PPDU to carry the solicited BA if the transmit time of HE SU PPDU is less than the PPDU duration of a non-HT PPDU containing the Control frame sent at the primary rate?

Approved with unanimous consent

**Straw poll #63 *[#SP63]***

SP#2

Do you support to allow EHT SU PPDU to carry the solicited BA if the transmit time of EHT SU PPDU is less than the PPDU duration of a non-HT PPDU containing the Control frame sent at the primary rate and the soliciting PPDU is EHT PPDU?

Approved with unanimous consent

**Straw poll #64 *[#SP64]***

19/1943r4 (Multi-link Management, Taewon Song, LGE)

SP#1

Do you agree to add the following text to the TGbe SFD?

A non-AP MLD may send its associated AP MLD a frame to request to switch link to other link among enabled links of the AP MLD.

Y/N/A: 17/18/37

**20/0028r5 (Indication of Multi-link Information, Insun Jang, LGE)**

SP#1

Do you support that an STA of an MLD can provide MLD-level information that is common to all STAs affiliated with the MLD and per-link information that is specific to the STA on each link in management frames during multi-link setup?

* The specific information is TBD

Approved with unanimous consent

**Straw poll #65 *[#SP65]***

Reference: 11-20-0777-06-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 4 (PHY): 11 SPs

**20/0773r2 (BCC Interleaver Parameters for Multiple RU, Ross Yu, Huawei)**

SP#1

Do you support the following BCC interleaver parameters for RU78?

* Note: the parameters are for w/o DCM case

|  |  |
| --- | --- |
| **RU78** | **Parameters** |
| Nsd | 72 |
| Ncol | 18 |
| Nrow | 4\*Nbpscs |

Y/N/A: 37/0/9

**Straw poll #66 *[#SP66]***

SP#2

Do you support the following BCC interleaver parameters for RU132?

* Note: the parameters are for w/o DCM case

|  |  |
| --- | --- |
| **RU132** | **Parameters** |
| Nsd | 126 |
| Ncol | 21 |
| Nrow | 6\*Nbpscs |

Y/N/A: 40/0/6

**Straw poll #67 *[#SP67]***

SP#3

Do you support the following BCC interleaver parameters for RU52+26?

* Note: the parameters are for w/o DCM case

|  |  |
| --- | --- |
| **RU52+26** | **Parameters** |
| Nrot | 18 |

Y/N/A: 43/0/5

**Straw poll #68 *[#SP68]***

SP#4

Do you support the following BCC interleaver parameters for RU106+RU26?

* Note: the parameters are for w/o DCM case

|  |  |
| --- | --- |
| **RU106+RU26** | **Parameters** |
| Nrot | 31 |

Y/N/A: 41/0/4

**Straw poll #69 *[#SP69]***

**20/0789r1 (On TBD segment parser and tone interleaver for specific MRU, Jianhan Liu, MediaTek)**

SP#1

Do you agree that 11be uses 80HMz segment parser with the following parameters for (242+484)+996?

|  |  |  |  |
| --- | --- | --- | --- |
| **RU Aggregation** | **Nsd\_total** | **Proportional Ratio (m1:m2:m3:m4)** | **Leftover bits (per symbol)** |
| (242+484)+996 | 1682 | 3s:4s | 44\*Nbpscs on RU996 |

where

Y/N/A: 43/0/6

**Straw poll #70 *[#SP70]***

**20/0791r5 (Mandatory M-RU Support, Ron Porat, Broadcom)**

SP#1

Do you support the following mandatory RU combinations?

* Small: {26+52, 106+26} for non-AP STA only and in OFDMA only
* Large: as in the table below
  + Conditioned on device supporting 80, 160, 240 and 320MHz transmissions
  + BW support for 11be AP and non-AP STA is TBD

|  |  |  |
| --- | --- | --- |
| **BW** | **RU** | **Mandatory in Non-OFDMA for:** |
| 80 MHz | 484+242 | AP, STA |
| 160 MHz | 996+484 | AP, STA |
| 996+(484+242) | AP, STA |
| 240 MHz | 3×996, 2×996+484, 2×996 (any 2) | AP, STA |
| 320 MHz | 4×996, 3×996+484, 3×996 (any 3) | AP, STA |

Y/N/A: 42/4/6

**Straw poll #71 *[#SP71]***

SP#2

Do you support the following mandatory RU combinations?

* Conditioned on device supporting 80, 160, 240 and 320MHz transmissions
* BW support for 11be AP and non-AP STA is TBD
* Note: currently in the SFD under OFDMA 2x996+484 and 3x996+484 are TBD

|  |  |  |
| --- | --- | --- |
| **BW** | **RU** | **Mandatory in OFDMA for:** |
| 80 MHz | 484+242 | Non-AP STA only |
| 160 MHz | 996+484 | Non-AP STA only |
| 240 MHz | 2×996+484 | Non-AP STA only |
| 320 MHz | 3×996+484, 3×996 (any 3) | Non-AP STA only |

Y/N/A: 48/4/5

**Straw poll #72 *[#SP72]***

**20/0793r2 (MRU Support in 11be, Jianhan Liu, MediaTek)**

SP#3

Do you agree that for OFDMA, MRUs allowed in 80MHz PPDU shall be allowed in each 80MHz segment of 160MHz/80MHz+80MHz, 240MHz/160MHz+80MHz and 320MHz/160MHz+160MHz PPDU?

Y/N/A: 47/1/7

**Straw poll #73 *[#SP73]***

SP#4

Do you agree that for OFDMA, MRUs (996+484) is allowed in the following cases?

* Contiguous 160MHz in 240MHz/160MHz+80MHz
* Primary 160MHz and secondary 160MHz in 320MHz/160MHz+160MHz

Y/N/A: 49/0/5

**Straw poll #74 *[#SP74]***

**20/0768r0 (Further Discussion about Preamble Puncturing, Oded Redlich, Huawei)**

SP#1

Do you agree to allow puncturing structure 1001 in a given 80MHz segment for OFDMA PPDUs transmitted to STAs operating at BW>80MHz?

* Assuming 2 content channels are used.
* Puncturing signaling may be different for different 80MHz channels.

Y/N/A: 15/10/22

**20/796r1 (Mandatory Larger BW Support, Ron Porat, Broadcom)**SP#1

Do you support that in 11be, 80MHz and 160MHz operating STA shall be able to participate in a higher BW DL and UL OFDMA transmission?

* STA shall be able to decode the preamble and its assigned RU (some restrictions TBD)
* No capability bit as in 11ax

Y/N/A: 46/0/7

**Straw poll #75 *[#SP75]***

Reference: 11-20-0787-02-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## June 4 (MAC): 5 SPs

**20/0512r3 (MLD Address Management Discussion, Harry Wang, Tencent)**

SP#1

Should 11be consider a mechanism to configure the Link addresses of the MLDs within a BSS?

* Note: the link address is the MAC address assigned for each STA affiliated with a MLD.

Y/N/A: 16/25/32

SP#2

Should AP MLD assign link address for each AP affiliated with AP MLD?

Y/N/A: 19/28/27

SP#3

May the link addresses assignment in a Non-AP MLD be assisted by AP-MLD?

Y/N/A: 14/34/24

**20/0028r6 (Indication of Multi-link Information, Insun Jang, LGE)**

SP#2

Do you support that the following?

* Existing frames are reused for discovering APs that are affiliated with AP MLD
* Association Request and Association Response frames are reused for multi-link setup
* NOTE: After association, new signaling to query AP link specific parameters or AP MLD parameters by using Protected Management Frames (PMF) encrypted Management frames is TBD

Approved with unanimous consent

**Straw poll #76 *[#SP76]***

**20/0337r2 (Multi-link BSS Parameter Update, Yongho Seok, MediaTek)**

SP#1

Do you support that an AP within an AP MLD shall include in the Beacon and Probe Response frames it transmits the Change Sequence fields that indicate changes of system information for other APs within the same AP MLD, where the change sequence field value for the reported AP is initialized to 0, that increments as the critical update of the reported AP is occurred?

* The signaling of the Change Sequence field is TBD.
* The critical updates are defined in 11.2.3.15 TIM Broadcast and the additional update can be added if needed.

Approved with unanimous consent

**Straw poll #77 *[#SP77]***

Reference: 11-20-0777-07-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 8 (PHY): 7 SPs

**20/0838r2 (Pilot subcarriers for new tone plan, Jinyoung Chun, LGE)**

SP#6

Do you support to use the below pilot indices for n\*996RUs (n ≥ 1) in 11be?

* In a OFDMA/non-OFDMA 80MHz EHT PPDU
  + Pilot indices of 996-tone RU: P996 = {-468, -400, -334, -266, -220, -152, -86, -18, 18, 86, 152, 220, 266, 334, 400, 468}
* In a OFDMA/non-OFDMA 160MHz EHT PPDU
  + Pilot indices of 996-tone RU: {P996 -512}, {P996 + 512}
  + Pilot indices of 2\*996-tone RU: {P996 -512, P996 + 512}
* In a OFDMA/non-OFDMA 320MHz EHT PPDU
  + Pilot indices of 996-tone RU: {P996 -1536}, {P996 -512}, {P996 + 512}, {P996 + 1536}
  + Pilot indices of 2\*996-tone RU: {P996 -1536, P996 -512}, {P996 + 512, P996 + 1536}
  + Pilot indices of 4\*996-tone RU: {P996 -1536, P996 -512, P996 + 512, P996 + 1536}

Y/N/A: 44/0/9

**Straw poll #78 *[#SP78]***

SP#2

Do you support the below pilot indices for 26/52/106/242/484RU in 80/160/320MHz PPDU of 11be?

* 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

Y/N/A: 49/0/5

**Straw poll #79 *[#SP79]***

SP#3

Do you support that pilot subcarriers for small/large RU combinations includes the pilot subcarriers of each RU?

Y/N/A: 49/0/3

**Straw poll #80 *[#SP80]***

**20/0699r1 (Phase Rotation Proposal Follow-up, Eunsung Park, LGE)**

SP#8

Do you agree to add the following text to the TGbe SFD?

* 11be supports the following phase rotation sequence for legacy preamble, RL-SIG, U-SIG and EHT-SIG in 320/160+160 MHz PPDU
  + [1 -1 -1 -1 1 -1 -1 -1 -1 1 1 1 -1 1 1 1]

Y/N/A: 37/4/14

**Straw poll #81 *[#SP81]***

**20/0782r2 (EHT-STF Sequences, Eunsung Park, LGE)**

SP#7

Do you agree to add the following text to the TGbe SFD?

* *M* = {-1 -1 -1 +1 +1 +1 -1 +1 +1 +1 -1 +1 +1 -1 +1}
* 1x EHT-STF sequence for contiguous 320MHz PPDU
  + *EHTS*-2032:16:2032 = {*M* 1 -*M* 0 -*M* 1 -*M* 1\*(0 *M* 1 -*M* 0 -*M* 1 -*M*) -1\*(0 *M* 1 -*M* 0 -*M* 1 -*M*) -1\*(0 *M* 1 -*M* 0 -*M* 1 -*M*)} \* (1+j) / sqrt(2)
* 1x EHT-STF sequence for non-contiguous 160+160MHz PPDU
  + Low 160MHz: *EHTS*-1008:16:1008 = {*M* 1 -*M* 0 -*M* 1 -*M* 0 *M* 1 -*M* 0 -*M* 1 -*M* } \* (1+j) / sqrt(2)
  + High 160MHz: *EHTS*-1008:16:1008 = {-*M* -1 *M* 0 *M* -1 *M* 0 -*M* -1 *M* 0 *M* -1 *M* } \* (1+j) / sqrt(2)

Y/N/A: 32/0/13

**Straw poll #82 *[#SP82]***

SP#8

Do you agree to add the following text to the TGbe SFD?

* *M* = {-1 -1 -1 +1 +1 +1 -1 +1 +1 +1 -1 +1 +1 -1 +1}
* 2x EHT-STF sequence for contiguous 320MHz PPDU
  + *EHTS*-2040:8:2040 = {*M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M* 1\*(0 *M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M*) -1\*(0 *M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M*) -1\*(0 *M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M*)} \* (1+j) / sqrt(2)
    - *EHTS*-2040 = *EHTS*-1032 = *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = *EHTS*1032 = *EHTS*2040 = 0
* 2x EHT-STF sequence for non-contiguous 160+160MHz PPDU
  + Low 160MHz: *EHTS*-1016:8:1016 = {*M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M* 0 *M* -1 *M* -1 -*M* -1 *M* 0 -*M* 1 *M* 1 -*M* 1 -*M* } \* (1+j) / sqrt(2)
    - *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = 0
  + High 160MHz: *EHTS*-1016:8:1016 = {-*M* 1 -*M* 1 *M* 1 -*M* 0 *M* -1 -*M* -1 *M* -1 *M* 0 -*M* 1 -*M* 1 *M* 1 -*M* 0 *M* -1 -*M* -1 *M* -1 *M*} \* (1+j) / sqrt(2)
    - *EHTS*-1016 = *EHTS*-8 = *EHTS*8 = *EHTS*1016 = 0

Y/N/A: 27/0/12

**Straw poll #83 *[#SP83]***

**20/0839r1 (Management of RU allocation field, Dongguk Lim, LGE)**  
SP#1

Do you agree that for non-compressed mode, each RU Allocation subfield in an EHT-SIG content channel corresponding to a 20 MHz frequency segment indicates the RU assignment, including the size of the RU(s) and their placement in the frequency domain, to be used in the EHT modulated fields of the EHT PPDU sent to multiple users in the frequency domain, also indicates information needed to compute the number of users allocated to each RU?

Y/N/A: 41/0/15

**Straw poll #84 *[#SP84]***

Reference: 11-20-0787-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## June 8 (MAC): 6 SPs

**20/0434r3 (Multi-link Secured Retransmissions, Rojan Chitrakar, Panasonic)**

SP#1

Do you agree to revise Motion 61 of the 11be SFD as follows:

* The established block ack agreement allows the QoS Data frames of the TID, aggregated within the A-MPDUs, to be exchanged between the two MLDs on any available link.
* Note – QoS Data frames that are not fragments might be retransmitted on any available link.

Approved with unanimous consent

**Straw poll #85 *[#SP85]***

**20/0386r4 (Multi-link association follow up, Young Hoon Kwon, NXP)**

SP#1

Do you agree to add the following to 11be SFD:

* TGbe shall define a multi-link resetup mechanism to resetup with another AP MLD or changing configuration of existing multi-link setup with an AP MLD.
  + Reassociation Request/Response frame is used for this purpose.

Approved with unanimous consent

**Straw poll #86 *[#SP86]***

SP#2

Do you agree to add the following to 11be SFD:

* When a non-AP MLD that has multi-link setup with current AP MLD sends a Reassociation Request frame to either a new AP or a new AP MLD, AP MLD MAC address of the current AP MLD is used in Current AP Address field of the frame.

Y/N/A: 35/7/20

SP#2 (amended)

Do you agree to add the following to 11be SFD:

* When a non-AP MLD that has multi-link setup with current AP MLD sends a Reassociation Request frame to a new AP MLD, AP MLD MAC address of the current AP MLD is used in Current AP Address field of the frame.

Y/N/A: 46/3/19

**Straw poll #87 *[#SP87]***

**20/0387r3 (Multi-link setup follow up II, Po-Kai Huang, Intel)**

SP#1

Do you support the following?

* Reuse disassociation frame for multi-link teardown
* Reuse authentication frame for multi-link SAE exchange and multi-link Open System authentication

Approved with unanimous consent

**Straw poll #88 *[#SP88]***

SP#2

Do you support the following?

* An AP that is part of an AP MLD that supports SAE authentication shall include the MLD address in beacon and probe response frames it transmits.
* EHT MLD shall indicate its MLD MAC address during authentication request/response exchange

Approved with unanimous consent

**Straw poll #89 *[#SP89]***

Reference: 11-20-0777-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 10 (MAC): 7 SPs

**20/0463r3 (Priority Access Support Options for NS/EP Serveices, Subir Das, Perspecta Labs)**

SP#1

Do you support the addition of following text to TGbe SFD?

* The NS/EP Priority Service if supported by a non-AP STA, shall use a TID value (TBD) that is greater than 7 to indicate the need for priority access to its associated AP STA
* Note: The identification of the need is outside the scope of this specification.
* Note: The container of the TID is TBD.

Y/N/A: 40/12/41

**Straw poll #90 *[#SP90]***

**19/1943r5 (Multi-link Management, Taewon Song, LGE)**

SP#3

Do you agree to define the following?

* Single-link non-AP MLD: A non-AP MLD that transmits or receives frames to/from another MLD on a single link at a time.

Y/N/A: 37/21/37

**20/0562r3 (Enhanced multi-link single radio operation, Minyoung Park, Intel)**

SP#2

Do you support the concept of the multi-link operation for an enhanced single-link/radio (TBD) non-AP MLD that is defined as follows for R1?

* An MLD that can: 1) transmit or receive data/management frames to another MLD on one link, and 2) listening on one or more links.
  + The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
  + Link switch delay may be indicated by the non-AP MLD

Y/N/A: 56/23/16

**20/0356r3 (MLO: Discovery and beacon-bloating, Abhishek Patil, Qualcomm)**

SP#1

Do you agree to define mechanism(s) to include MLO information that a STA of an MLD provides in its mgmt. frames, during discovery and ML setup, as described below?

* MLD (common) Information
  + Information common to all the STAs of the MLD
* Per-link information
  + Capabilities and Operational parameter of other STAs of the MLD other than the advertising STA

Y/N/A: 54/17/21

**Straw poll #91 *[#SP91]***

SP#2

Do you support that the MLO framework should follow an inheritance model when advertising complete information of other link(s)?

* Note: inheritance mechanism is similar to that defined in 11ax for multiple BSSID feature

Approved with unanimous consent

**Straw poll #92 *[#SP92]***

SP#3

Do you support that 11be shall define mechanism(s) for an AP of an AP MLD to advertise complete or partial information of other links?

* Partial information to prevent frame bloating
* For example, frames exchanged during ML setup are expected to carry complete information while Beacon frame is expected to carry partial information
* The exact set of elements/fields that constitute partial information is TBD

Y/N/A: 54/5/25

**Straw poll #93 *[#SP93]***

**20/0386r4 (Multi-link association follow up, Young Hoon Kwon, NXP)**

SP#3

Do you agree to add the following to 11be SFD:

* When a STA of a non-AP MLD that has multi-link setup with current AP MLD sends a Reassociation Request frame to a new AP that is not affiliated with an AP MLD, AP MLD MAC address of the current AP MLD is used in Current AP Address field of the frame.
* Note: Only the STA that sends the Reassociation Request frame can associate with the new AP.

Y/N/A: 43/5/24

**Straw poll #94 *[#SP94]***

Reference: 11-20-0777-09-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 11 (Joint): 2 SPs

**20/0697r3 (Supporting latency-sensitive applications in 11be, Chunyu Hu, Facebook)**

SP#1

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

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

**20/0292r1 (MLO typical operating scenarios and sub-feature prioritization, Zhou Lan, Broadcom)**

SP#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)







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

Reference: 11-20-0775-02-00be-may-july-tgbe-teleconference-minutes

## June 15 (MAC): 7 SPs

**20/0389r2 (Multi-link discovery part 1, Laurent Cariou, Intel)**

SP#1

Do you agree that all APs that are part of the same MLD as a reporting AP and that are collocated with the reporting AP shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP when the reporting AP is either not part of a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set.

Do you agree that all APs that are part of the same MLD as a non-transmitted BSSID and that are collocated with the non-transmitted BSSID shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the transmitted BSSID that is in the same Multiple BSSID set as the non-transmitted BSSID

* Note: an AP is not included if it is not discoverable
* Note: RNR provides basic information (operating class, channel, BSSID, short SSID, …)
* Note: 11ax rules also apply, and any AP in other AP MLDs can optionally be reported.

Y/N/A: 37/24/31

SP#1 (amended)

Do you agree that all APs that are part of the same MLD as a reporting AP and that are collocated with the reporting AP shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP when the reporting AP is either not part of a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set.

* Note: an AP is not included if it is not discoverable
* Note: RNR provides basic information (operating class, channel, BSSID, short SSID, …)

Y/N/A: 42/9/35

**Straw poll #95 *[#SP95]***

SP#2

Do you agree:

* to include in a TBTT Information field of the RNR, corresponding to a reported AP that is part of the same MLD as the reporting AP, an indication that the reported AP is part of the same MLD as the reporting AP when the reporting AP is either not part of a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set

Note: signaling of that indication is TBD

Approved with unanimous consent

**Straw poll #96 *[#SP96]***

SP#4

Do you agree to define a mechanism for a STA of a non-AP MLD to send a probe request frame to an AP belonging to an AP MLD, that enables to request a probe response from the AP that includes the complete set of capabilities, parameters and operation elements of other APs affiliated to the same MLD as the AP

* The complete information is defined as all elements that would be provided if the reported AP was transmitting that same frame (exceptions TBD)
* It’s TBD if the AP is mandated or not to respond with the requested information

Approved with unanimous consent

**Straw poll #97 *[#SP97]***

**20/0390r3 (Multi-link discovery part 2, Laurent Cariou, Intel)**

SP#1

Do you agree to define a new Multi-Link element (MLE) to report/describe multiple STAs of an MLD with at least the following characteristics?

* MLD-level information may be included
* A STA profile subelement is included for each reported STA (if any) and is made of a variable number of elements describing this STA

Note: a control field for the element is not considered as MLD-level information

Note: Name can be changed

Y/N/A: 51/3/30

**Straw poll #98 *[#SP98]***

SP#2

Do you support that, for the ML element, we define an inheritance model to prevent frame bloating when advertising complete information of other links?

* Define the inheritance mechanism, similar to 11ax, so that the value of an element of a reported STA that is not present in a STA profile of a ML element in a frame sent by a reporting STA is the same as the element of the reporting STA, present elsewhere in the frame.
* Define the inheritance mechanism, similar to 11ax, so that the value of an element of a reported STA that is not present in a STA profile of a ML element, if any, included in a non-transmitted BSSID profile of a non-transmitted BSSID in a multiple BSSID element in a frame sent by a reporting STA is the same as the element of the non-transmitted BSSID, present elsewhere in the frame or as the element of the reporting STA, present elsewhere in the frame.
* Note: an “element of a STA” refers in the text above to the instance of the element describing the capabilities/operation/functionalities of that STA, in a frame where multiple instances of the element can be found for other STAs.
* Note: some elements may not be inherited, signaling TBD

Y/N/A: 33/3/49

**Straw poll #99 *[#SP99]***

**20/0392r0 (MLD max BSS idle period, Laurent Cariou, Intel)**

SP#1

Do you agree to add to the 11be SFD:

* The MLD Max Idle Period of an AP MLD applies at the MLD level and not at the STA level
* The MLD Max Idle Period of an AP MLD indicates, for a non-AP MLD, the time period during which a non-AP MLD can be inactive (i.e. refrain from transmitting frames to the AP MLD on any of the setup links) without the Multi-link setup to be torn down
* A non-AP MLD is considered inactive if none of the APs of the AP MLD have received a Data frame, PS-Poll frame, or Management frame (protected or unprotected) of a frame exchange sequence initiated by a STA from the non-AP MLD for a time period greater than or equal to the time specified by the MLD Max Idle Period of the AP MLD
* If the non-AP MLD is inactive for a duration greater than the MLD Max Idle Period, then the AP MLD may tear down the multi-link setup for that non-AP MLD

Approved with unanimous consent

**Straw poll #100 *[#SP100]***

Reference: 11-20-0777-10-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 17 (MAC): 2 SPs

**20/0503r2 (BSS parameter update for Multi-link Operation, Ming Gan, Huawei)**

SP#1

Do you agree to amend the SP#77 by adding the following subbullet:

* BSS specific parameters update indication includes Link ID and Change Sequence Number for each reported AP, where Link ID is an identifier of the reported AP in the AP MLD

Note: the signaling for Link ID is TBD

Y/N/A: 33/18/19

SP#2

Do you agree that a non-AP MLD shall maintain a record of the most recently received change sequence number for each reported APs in the AP MLD with which it has multi-link setup?

Y/N/A: 51/7/14

**Straw poll #101 *[#SP101]***

Reference: 11-20-0777-10-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 18 (MAC): 5 SPs

**20/0562r4 (Enhanced multi-link single radio operation, Minyoung Park, Intel)**

SP#2

Do you support the concept of the multi-link operation for an enhanced single-link/radio (TBD) non-AP MLD that is defined as follows for R1?

* An MLD that can: 1) transmit or receive data/management frames to another MLD on one link, and 2) listening on one or more links.
  + The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
  + Link switch delay may be indicated by the non-AP MLD

Y/N/A: 59/29/21

SP#3

Do you agree to define the following?

* Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only transmit frames to or receive frames from another MLD on one link at a time.

Y/N/A: 46/18/33

**20/0411r3 (MLO: Information Exchange for Link Switching, Namyeong Kim, LGE)**

SP#1

Do you support that 802.11be allows the following operation:

* A STA of non-AP MLD may request the peer AP of AP MLD the specific information of one or more APs of the same AP MLD after multi-link setup.
  + NOTE 1: The specific information can be information which didn’t obtain from beacon frame or to be updated by change sequence field. The detail of specific information is TBD (e.g., other AP’s BSS parameter (BSS load, latency info, TWT info), updated parameters, etc.).
  + NOTE 2: The signaling for requesting the specific information is TBD.
  + NOTE 3: The request frame is TBD (e.g., Probe request).

Y/N/A: 31/20/46

**20/0616r0 (Bandwidth indication of 320MHz for non-HT and non-HT duplicate frames, Yunbo Li, Huawei)**

SP#1

Do you support to indicate BW larger than 160MHz through scrambler sequence in non-HT or non-HT duplicated frames?

Y/N/A: 46/15/32

**Straw poll #102 *[#SP102]***

SP#2

Do you support to use one more bit in scrambler sequence, which is B3, to indicate bandwidth larger than 160MHz in non-HT or non-HT duplicated frames?

Y/N/A: 43/15/38

Reference: 11-20-0777-10-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 22 (PHY): 6 SPs

**20/0922r2 (RU allocation subfield in EHT-SIG Follow up II, Ross Yu, Huawei)**

SP#1

Do you agree that for RU242, in the RU allocation table, 8 entries per RU size will be used to indicate: contributes 1~8 User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield?

* Make the following change in the baseline table in the SFD
* Compressed modes are TBD.

Y/N/A: 41/0/9

**Straw poll #103 *[#SP103]***

SP#2

Do you agree that for RU484 or RU996, in the RU allocation table, 8 entries per RU size will be used to indicate: contributes 1~8 User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield?

* Add the following entries in the baseline table in the SFD

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **order** | **#1** | **#2** | **#3** | **#4** | **#5** | **#6** | **#7** | **#8** | **#9** | **Number of entries** |
| TBD | 484 | | | | | | | | | 8 |
| TBD | 996 | | | | | | | | | 8 |

* Zero user field cases TBD
* Compressed modes are TBD.

Y/N/A: 44/0/7

**Straw poll #104 *[#SP104]***

SP#3

Do you agree that for RU 2\*996, in the RU allocation table, 8 entries per RU size will be used to indicate: contributes 1~8 User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield?

* Add the following entries in the baseline table in the SFD

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **order** | **#1** | **#2** | **#3** | **#4** | **#5** | **#6** | **#7** | **#8** | **#9** | **Number of entries** |
| TBD | 2\*996 | | | | | | | | | 8 |

* Zero user field cases TBD
* Compressed modes are TBD.

Y/N/A: 43/0/9

**Straw poll #105 *[#SP105]***

**20/0925r1 (On 52 plus 26 M-RU, Ron Porat, Broadcom)**

SP#1

Do you support adding the following combination [52, 52+26, 52, 52] to the RU table to be used in 20MHz, 40MHz and 80MHz PPDU?

Y/N/A: 36/1/15

**Straw poll #106 *[#SP106]***

**20/930r1 (Consideration on User-specific field in EHT-SIG, Dongguk Lim, LGE)**

SP#1

Do you agree that the common field of EHT SIG in EHT PPDU that is sent to multiple user includes the CRC and tail bits?

* The number of bits for CRC is TBD.
* The number of tail bits is 6.
* The configuration of the common field is TBD.

Y/N/A: 41/3/7

**Straw poll #107 *[#SP107]***

SP#2

Do you agree that the user-specific field of EHT SIG in EHT PPDU that is sent to multiple user consists of the user block field(s) that is made up of 2 user fields except for the last user block?

* The last user block may have one or two user field(s).
* The user block field includes the CRC and tail bits. The number of bits for CRC is 4. The number of tail bits is 6.

Y/N/A: 44/0/6

**Straw poll #108 *[#SP108]***

Reference: 11-20-0787-05-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## June 22 (MAC): 4 SPs

**20/0408r6 (Prioritized EDCA Channel Access Over Latency Sensitive Links in MLO, Chunyu Hu, Facebook)**

SP#3

Do you support that the TGbe SFD shall include:

* A definition of Latency Sensitive Link in Multi-Link Operation as a link over which the AP MLD defines TBD QoS mechanisms to provide the latency sensitive traffic streams improved latency and reliability performance.

Notes

* There can be multiple latency sensitive links in a BSS.
* The regular traffic streams can be served over the latency sensitive links as well subject to the AP MLD’s link management.

Y/N/A: 29/17/34

**20/0357r3 (MLO: Container Structure for Capability Advertisement, Abhishek Patil, Qualcomm)**

SP#3

Do you agree to amend SP #97 as following:

Do you agree to define a mechanism for a STA of a non-AP MLD to send a probe request frame to an AP belonging to an AP MLD, that enables to request a probe response from the AP that includes the complete set of capabilities, parameters and operation elements of other APs affiliated to the same MLD as the AP

* The complete information is defined as all elements that would be provided if the reported AP was transmitting that same frame (exceptions TBD)
* It’s TBD if the AP is mandated or not to respond with the requested information
* Note: Such a directed probe request requesting complete MLO information for one or more APs of the MLD is referred to as an ML probe request.
* Note: A probe response sent in response to an ML probe request containing complete MLO Information for the requested AP(s) is referred to as an ML probe response

Y/N/A: 48/1/30

**Straw poll #109 *[#SP109]***

**20/0105r6 (Link Latency Statistics of Multi-band Operations in EHT, Frank Hsu, MediaTek)**

SP#1

Do you support to define a mechanism so that an EHT AP MLD can provide information about traffic conditions of each link (e.g., DL transmit Delay, BSS load)?

* Signaling details is TBD.

Y/N/A: 36/12/29

**Straw poll #110 *[#SP110]***

**20/0357r3 (MLO: Container Structure for Capability Advertisement, Abhishek Patil, Qualcomm)**

SP#4

Do you agree that the Multi-Link element when included in a Beacon or non-ML Probe Response frame should carry only MLD-level/common information?

* NOTE: Exact name for the element TBD
* NOTE: Whether the Multi-Link element is always present in the Beacon and non-ML Probe Response frames or is optionally present is TBD.
* NOTE: MLD-Level/Common information includes at least MLD Address, and other information (TBD)

Approved with unanimous consent

**Straw poll #111 *[#SP111]***

Reference: 11-20-0777-11-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## June 29 (Joint): 4 SPs

**20/0755r1 (Non-STR AP Operation, Jinjing Jiang, Apple)**

SP#1

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.

Y/N/A: 70/17/38

**Straw poll #112 *[#SP112]***

Editor’s note: The motion to approve Straw Poll #112 was failed on July 30, 2020. Per Chair’s ruling, the straw poll text is now removed from Section 6.8.

**20/0574r0 (C-TDMA definition, Laurent Carious, Intel)**

SP#1

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

Y/N/A: 48/31/33

**20/0560r0 (Multi-AP Configuration and Resource Allocation, Po-Kai Huang, Intel)**

SP#1

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

Y/N/A: 58/11/34

**Straw poll #113 *[#SP113]***

SP#2

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

Y/N/A: 50/7/43

**Straw poll #114 *[#SP114]***

Reference: 11-20-0775-04-00be-may-july-tgbe-teleconference-minutes

## July 2 (PHY): 3 SPs

**20/0953r0 (320 Channelization, Ron Porat, Broadcom)**

SP#1

Do you support defining 320MHz channels as any two adjacent 160MHz channels?

Y/N/A: 44/0/6

**Straw poll #115 *[#SP115]***

**20/0954r0 (240MHz transmission, Xiaogang Chen, Intel)**

SP (modified)

Do you agree that no 240 MHz channelization is defined in 11be.

* Note: 240/160+80 MHz entry in BW field is TBD

Y/N/A: 38/0/12

**Straw poll #116 *[#SP116]***

**20/0960r0 (Consideration on 240MHz, Eunsung Park, LGE)**

SP#2 (modified)

Do you agree to add the following text to TGbe SFD?

* 240/160+80MHz transmission is subjected to 320/160+160MHz PPDU mask plus additional puncturing mask.
* 320/160+160MHz transmission is subjected to 320/160+160MHz PPDU mask, additional puncturing mask can be applied according to the puncturing patterns and MRUs.

The masks TBD.

Y/N/A: 37/3/14

**Straw poll #117 *[#SP117]***

Reference: 11-20-0787-06-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-may-july-2020

## July 2 (MAC): 3 SPs

**20/0442r2 (MLA: Group addressed frames delivery, Duncan Ho, Qualcomm)**

SP#2

Do you agree to add to the TGbe SFD the following:

* A non-AP MLD shall follow the baseline rules to receive the group addressed data frames on one link selected by the non-AP MLD
* The non-AP MLD may change the selected link at any time except during an ongoing group addressed delivery period
* The non-AP MLD shall discard any group addressed data frames that are not received in the selected link

Y/N/A: 21/17/27

**20/0026r7 (MLO: Sync PPDUs, Duncan Ho, Qualcomm)**

SP#2 (modified)

Do you agree to add to the TGbe SFD:

* Define signaling for an AP MLD to advertise whether it can align the end of DL PPDUs that are sent simultaneously on multiple links to the same non-STR non-AP MLD:
  + If not capable, the AP MLD is not capable of such feature
  + If capable, the AP MLD shall perform the following:
    - The AP MLD aligns the end of DL PPDUs (that contain QoS data soliciting an immediate UL response) that are sent simultaneously on multiple links to the same non-STR non-AP MLD, in such a way that the response to any of the PPDUs will not overlap with any of the DL PPDUs
    - Except for a high priority DL PPDU sent on one link, which may not be aligned with another DL PPDU sent on the other link

Y/N/A: 36/13/24

**20/0688r0 (Multi-link individual addressed data delivery without BA, Po-Kai Huang, Intel)**

After multi-link setup, do you support the following to enable delivery of individual addressed QoS traffic without BA negotiation across links?

* For Transmitter:
  + Expand Table 10-5—Transmitter sequence number spaces to have a new entry Indexed by <destined MLD Address, TID>
  + Continue to transmit the failed QoS Data frame until retry counter is met
  + Cannot transmit other QoS Data frame from the same TID in any link until the current frame finish transmission or dropped
* For Receiver:
  + Maintain at least the most recent record of <peer MLD address, TID, sequence number>.
  + Drop the frame with retry bit set and record match

Y/N/A: 24/15/21

Reference: 11-20-0777-12-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## July 8 (MAC): 4 SPs

**20/0357r4 (MLO: Container Structure for Capability Advertisement, Abhishek Patil, Qualcomm)**

SP#3

Do you agree that Multi-Link element if included in a non-ML Probe Request frame shall carry only the MLD-level/common information of the non-AP MLD?

* NOTE: Whether the Multi-Link element is always present in the non-ML Probe Request frames or is optionally present is TBD.

Y/N/A: 34/28/46

**20/0562r5 (Enhanced multi-link single radio operation, Minyoung Park, Intel)**

SP#2

Do you support the multi-link operation for a non-AP MLD that is defined as follows for R1?

* An MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links.
* The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
* The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type
* Link switch delay may be indicated by the non-AP MLD

Y/N/A: 70/28/21

**19/1943r8 (Multi-link Management, Taewon Song, LGE)**

SP#3

**Do you agree to define the following?**

* Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only listen, receive, or transmit frames on one link at a time.

Y/N/A: 53/12/40

**Straw poll #118 *[#SP118]***

**20/0659r3 (TDM Multilink Operation, Shubhodeep Adhikari, Broadcom)**

SP#1

Do you support the following addition to the SFD:

* A mode of multi-link operation shall be supported in R1 wherein a non-AP MLD can simultaneously listen on N links and can simultaneously transmit/receive data on M links, where M is a subset of N; M>=1,N>=1
  + The “listen” operation includes CCA as well as receiving initial control messages with specified parameters (e.g., RTS/MU-RTS).
    - The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type
  + Link switch delay between listen only and transmit/receive operation may be indicated by the non-AP MLD.

Y/N/A: 42/56/19

Reference: 11-20-0777-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-may-and-july-2020

## July 9 (Joint): 2 SPs

**20/0813r6 (Triggered-p2p-transmissions follow up, Stephane Baron, Canon)**

SP#1

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).

Y/N/A: 53/39/53

**20/0123r2 (Channel Sounding for Multi-AP CBF, Feng Jiang, Intel)**

SP#3

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.

Y/N/A: 65/3/67

**Straw poll #119 *[#SP119]***

Reference: 11-20-0775-05-00be-may-july-tgbe-teleconference-minutes

## July 13 (PHY): 6 SPs

**20/0960r1 (Consideration on 240MHz, Eunsung Park, LGE)**

SP#3

Which option do you agree with for the BW field?

* Option 1: no 240/160+80MHz entry
* Option 2: one 240/160+80MHz entry
* Note: It is not intended for SFD

Option 1/Option 2/Abstain: 31/40/13

SP#6

Do you agree that a separate phase rotation / EHT-STF / EHT-LTF sequence is defined in each 240/160+80 MHz and 320/160+160 MHz transmission?

* It is not intended for SFD

Y/N/A: 24/47/16

**20/0930r3 (Consideration on User-specific field in EHT-SIG, Dongguk Lim, LGE)**

SP#3

Do you agree that the user field in EHT PPDU that is sent to multiple user includes the subfield that indicates the number of spatial streams for each user?

* For MU-MIMO allocation
  + Spatial Configuration
    - Indicates the number of spatial streams for a user in MU-MIMO allocation
* For non-MU-MIMO allocation
  + NSTS

Y/N/A: 71/1/12

**Straw poll #120 *[#SP120]***

SP#4

Do you agree that the Nsts subfield of user field for non-MU-MIMO allocation consist of four bits and can indicate 1 to 16 streams consists of 4bits?

Y/N/A: 72/0/11

**Straw poll #121 *[#SP121]***

SP#5

Do you agree that the spatial configuration subfield of user field for MU-MIMO allocation consists of 6bits?

Y/N/A: 59/10/11

**Straw poll #122 *[#SP122]***

SP#6

Do you agree that the spatial configuration subfield is defined as described in slide 17~19 of 20/0930r3?

Y/N/A: 46/0/30

**Straw poll #123 *[#SP123]***

Reference: 11-20-1093-00-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## July 13 (MAC): 3 SPs

**20/0357r5 (MLO: Container Structure for Capability Advertisement, Abhishek Patil, Qualcomm)**

SP#7

Do you agree to include a Control field in Multi-Link element to indicate the presence of certain fields?

Approved with unanimous consent

**Straw poll #124 *[#SP124]***

**20/0396r5 (MLO BSS Information Transmission and Multiple BSSID Support, Liwen Chu, NXP)**

SP#3

Do you agree that AP’s Beacon and probe response shall not include ML element for MLD with no affiliated APs operating on this link?

Y/N/A/No answer: 35/27/62/68

**20/0770r1 (MLO: AID allocation, Young Hoon Kwon, NXP)**

SP

Do you support in TGbe SFD that

* The AID assigned to a non-AP MLD shall be unique and shall be set to a value greater than or equal to 2^n where n is the maximum value of the MaxBSSID Indicator amongst the multiple BSSID set(s) operating on any link of the AP MLD.

Y/N/A/No answer: 54/19/44/76

Reference:

11-20-1079-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 15 (MAC): 0 SP

No straw polls were conducted.

Reference:

11-20-1079-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 20 (MAC): 6 SPs

**19/1943r9 (Multi-link Management, Taewon Song, LGE)**

SP#4

**Do you agree to revise the SP text as follows?**

* [SP#118]
  + Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only receive, or transmit frames on one link at a time.

Y/N/A: 46/6/23

**Straw poll #125 *[#SP125]***

**20/0562r7 (Enhanced multi-link single radio operation, Minyoung Park, Intel)**

SP#2

Do you support the multi-link operation for a non-AP MLD that is defined as follows to be included in R1?

* A non-AP MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links
  + The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
  + The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type
  + Link switch delay may be indicated by the non-AP MLD

Y/N/A: 52/2/26

**Straw poll #126 *[#SP126]***

**20/0398r3 (EHT BSS with wider bandwidth, Liwen Chu, NXP)**

SP#1 extension

Do you agree that all APs that are part of the same MLD as a non-transmitted BSSID and that are collocated with the non-transmitted BSSID shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the transmitted BSSID that is in the same Multiple BSSID set as the non-transmitted BSSID?

Do you agree that if a reporting AP is part of an AP MLD and is in the same collocated set as APs affiliated with another AP MLD for which there are no affiliated APs operating on the same channel as the reporting AP, each AP of the other AP MLD shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP if at least one AP of the other AP MLD is in the same multiple BSSID set as an AP affiliated with the AP MLD of the reporting AP, unless the APs of the other AP MLDs are already reported in beacons and the broadcast probe responses transmitted by an AP in the same collocated set as the reporting AP on the same channel as the reporting AP?

Approved with unanimous consent

**Straw poll #127 *[#SP127]***

**20/0712r1 (BQR for 320MHz, Yunbo Li, Huawei)**

SP#1

Do you support to indicate the channel availability upto 320MHz channel in A-control subfield?

* Note: the detailed solution is TBD

Approved with unanimous consent

**Straw poll #128 *[#SP128]***

**20/0736r2 (EHT SST Operation, Yongho Seok, MediaTek)**

SP#1

Do you support to extend SST mechanism so that an 80MHz/160 MHz (20MHz TBD) operating STA can operate in the secondary 160 MHz channel in R2?

Y/N/A: 40/2/25

**Straw poll #129 *[#SP129]***

**20/0866r0 (GCMP for 11be, Laurent Cariou, Intel)**

SP#1

**Do you agree to add to the 11be SFD the following:**

* an EHT RSNA STA shall support GCMP-256?

Y/N/A: 34/2/32

**Straw poll #130 *[#SP130]***

Reference:

11-20-1079-02-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 20 (PHY): 2 SPs

**20/0798r4 (Signaling of RU allocation follow-up, Dongguk Lim, LGE)**

SP#1

Do you agree that no entry in the RU allocation subfield table is defined for 4x996 RU?

Y/N/A: 40/0/6

**Straw poll #131 *[#SP131]***

**20/0839r2 (Management of RU allocation field, Dongguk Lim, LGE)**

SP#3

Do you agree that the number of RU allocation subfields, when present, in a common field in the EHT-SIG field of EHT PPDU sent to multiple users is 4 and 8 in each content channel for 160MHz and 320MHz PPDU, respectively?

Y/N/A: 42/0/4

**Straw poll #132 *[#SP132]***

Reference: 11-20-1093-01-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## July 22 (MAC): 1 SP

**20/0669r0 (MLD transition, Po-Kai Huang, Intel)**

SP#1

Do you support the following definition in R1:

* Define MLD transition\* as follows:
  + A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to having multi-link resetup with another AP MLD within the same ESS.
  + A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to become a non-AP STA having reassociation with another AP within the same ESS.
  + A non-AP STA movement from a non-AP STA having association with one AP in one ESS to become a non-AP MLD having multi-link resetup with another AP MLD with the same ESS.
* Define fast MLD transition\* as follows:
  + A MLD transition that establishes the state necessary for data connectivity before the multi-link resetup or reassociation rather than after the multi-link resetup or reassociation.
* NOTE - \*Name can be changed

Y/N/A: 31/19/33

Reference:

11-20-1079-03-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 23 (MAC): 2 SPs

**20/0741r2 (Indication of Multi-link Information: Follow-up, Insun Jang, LGE)**

SP#1

Do you support to add to the 11be SFD in R1 that a non-AP MLD may initiate multi-link setup with an AP MLD to setup more than one link with subset of APs affiliated with the AP MLD?

Y/N/A: 48/7/15

**Straw poll #133 *[#SP133]***

**20/0810r1 (Dynamic Link Set, Pooya Monajemi, Cisco)**

SP#1

Do you agree to define mechanisms to add links to, and remove links from, an MLD setup without disruption in traffic, initiated by any one of AP or non-AP STA?

Note: This SP is not meant for spec text.

Y/N/A: 32/18/22

Reference:

11-20-1079-04-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 23 (PHY): 12 SPs

**20/1102r1 (Zero User RUs for Per-80MHz Resource Unit Allocation Signaling, Jianhan Liu, MediaTek)**

SP#1

Do you agree to add zero user RU996 to 11be RU allocation subfield?

Y/N/A: 39/0/3

**Straw poll #134 *[#SP134]***

SP#2

Do you agree to add zero user RU484 to 11be RU allocation subfield?

* Note: Multi-RU case is TBD

Y/N/A: 39/1/1

**Straw poll #135 *[#SP135]***

**20/0970r1 (Multi-RU indication in RU allocation subfield, Ross Yu, Huawei)**

SP#1

Do you agree to add the following rows to the RU allocation table?

* 484-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield
  + Note: multi-RU is TBD
* 996-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield

|  |  |  |
| --- | --- | --- |
| TBD | 484-tone RU; contributes zero User fields to the User Specific field in the  same EHT-SIG content channel as this RU Allocation subfield | 1 |
| TBD | 996-tone RU; contributes zero User fields to the User Specific field in the  same EHT-SIG content channel as this RU Allocation subfield | 1 |

Y/N/A: 39/1/2

**Straw poll #136 *[#SP136]***

**20/0985r0 (RU Allocation Subfield Design in EHT-SIG Follow up, Myeongjin Kim, Samsung)**

SP#4

Do you agree to:

* Add an entry in the RU allocation table to indicate that RU242 is punctured
* Modify the existing entry “RU242 empty (with zero user)” to “RU242; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not punctured”.

Y/N/A: 12/13/18

**20/0970r1 (Multi-RU indication in RU allocation subfield, Ross Yu, Huawei)**

SP#3

Do you agree that

* 996+484 is not supported in two contiguous 80 MHz segments that cross two 160MHz channels

Y/N/A: 30/4/6

**Straw poll #137 *[#SP137]***

SP#4

Which option do you prefer for RU 2\*996+484 in a 240MHz OFDMA transmission?

* Opt1: Assuming 2\*996 must be contiguous, then 4 cases
* Opt2: Assuming 2\*996 can also be non-contiguous, 6 cases
* Abs
* Note: not for SFD

Opt1/Opt2/A: 10/21/7

**20/1027r1 (Indication of large-size RU combinations, Lei Huang, Panasonic)**

SP#1

Do you agree to make the following change in the baseline RU allocation table in 11be SFD for RU484+2\*RU996, 3\*RU996 and RU484+3\*RU996?

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B7….B1B0** | **#1** | **#2** | **#3** | **#4** | **#5** | **#6** | **#7** | **#8** | **#9** | **# of Entries** |
| TBD | 484+2\*996 | | | | | | | | | 8 |
| TBD | 3\*996 | | | | | | | | | 8 |
| TBD | 484+3\*996 | | | | | | | | | 8 |

Y/N/A: 9/25/2

**20/0783r4 (EHT-SIG Compression Format, Ross Yu, Huawei)**

SP#2

Do you agree that the number of EHT-SIG symbols field always exist in U-SIG of a PPDU that is not a EHT TB PPDU?

* The field is not reinterpreted as the number of MU-MIMO users

Y/N/A: 36/0/3

**Straw poll #138 *[#SP138]***

SP#1

Do you agree that the bitwidth of number of EHT-SIG symbols field is 5 in U-SIG of a PPDU that is not a EHT TB PPDU?

Y/N/A: 34/0/5

**Straw poll #139 *[#SP139]***

**20/0959r1 (Thoughts on U-SIG Contents, Wook Bong Lee, Samsung)**

SP#4

Do you support to modify SFD text as follows?

* The format of the EHT MU PPDU is configured as follow:
  + L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-SIG, EHT-STF, EHT-LTF, DATA, PE
  + Additional fields are TBD

****

* Note: This PPDU format is used for 802.11be PPDU transmitted to a single user or multiple users. There is no EHT SU PPDU.
* There are two modes in the EHT MU PPDU.
  + Compressed mode:
    - Non-OFDMA
    - No RU Allocation subfield in the Common field of the EHT-SIG.
  + Non-compressed mode:
    - OFDMA
    - RU Allocation subfield(s) in the Common field of the EHT-SIG.

Y/N/A: 35/0/2

**Straw poll #140 *[#SP140]***

SP#5

Do you support to modify SFD text as follows?

* The format of the EHT TB PPDU is configured as follow:
  + L-STF, L-LTF, L-SIG, RL-SIG, U-SIG, EHT-STF, EHT-LTF, DATA, PE
  + Additional fields are TBD

****

* Note: This format is used for a transmission that is a response to a triggering frame from an AP.

Y/N/A: 35/1/1

**Straw poll #141 *[#SP141]***

**20/0969r3 (Bandwidth Indication for EHT PPDU, Ross Yu, Huawei)**

SP#1

Do you agree to add the following text in the TGbe SFD:

* Within one EHT PPDU, BW field in U-SIG shall indicate the same PPDU bandwidth across different 80MHz segments.

Y/N/A: 37/0/4

**Straw poll #142 *[#SP142]***

Reference: 11-20-1093-02-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## July 27 (MAC): 1 SP

**20/0843r1 (MLO BSS Information Transmission with and without Multiple BSSID, Liwen Chu, NXP)**

SP#1

Do you support to add the following text in R1?

* The reported AP’s profile in the ML element in Association Response frame shall carry the following information if the reported AP is a non-transmitted BSSID: the non-transmitted BSSID index, the MaxBSSID Indicator?
  + Signaling TBD

Y/N/A: 29/12/26

Reference:

11-20-1079-05-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 27 (PHY): 10 SPs

**20/0961r0 (Pilot mapping and sequences for data section in 11be, Jinyoung Chun, LGE)**

SP#1

Do you support that all 802.11be PPDUs use single stream pilots in the data section for SU, DL/UL OFDMA as well as DL/UL MU-MIMO transmissions?

Y/N/A: 34/0/3

**Straw poll #143 *[#SP143]***

SP#2

Do you support that 11be pilot values are shifted on pilot tones in the data section from symbol to symbol for each RU, same as 11ax?

Y/N/A: 41/0/1

**Straw poll #144 *[#SP144]***

SP#3

Do you support to define pilot mapping and values as below in 11be?

* For all size of RUs under 2\*996-tone RU, pilot mapping and values of 11ax are reused.
* For 3\*996-tone RU, pilot mapping and values for 996-tone RU are triplicated
* For 4\*996-tone RU, pilot mapping and values for 2\*996-tone RU are duplicated
* Pilot mapping and values of RU combinations follow each RU’s.

Y/N/A: 44/0/2

**Straw poll #145 *[#SP145]***

**20/0962r3 (1x EHT LTF sequence, Jinyoung Chun, LGE)**

SP#1

Do you agree to add the below text in 11be SFD?

* In a 320MHz transmission using 1x EHT-LTF, the 1x EHT-LTF sequence is given as below.

*EHTLTF*-2036,2036= {*LTF*80MHz\_1st\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_2nd\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_3rd\_1x, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, *LTF*80MHz\_4th\_1x}

*LTF*80MHz\_1st\_1x = { *LTF*80MHz\_left\_1x, 0, *LTF*80MHz\_right\_1x}

*LTF*80MHz\_2nd\_1x = { *LTF*80MHz\_left\_1x, 0, *LTF*80MHz\_right\_1x}

*LTF*80MHz\_3rd\_1x = { -*LTF*80MHz\_left\_1x, 0, -*LTF*80MHz\_right\_1x}

*LTF*80MHz\_4th\_1x = { -*LTF*80MHz\_left\_1x, 0, -*LTF*80MHz\_right\_1x}

*LTF*80MHz\_left\_1x and *LTF*80MHz\_right\_1x are used as it is in 11ax.

Y/N/A: 34/0/14

**Straw poll #146 *[#SP146]***

**20/0986r1 (DCM for range extension in 6GHz LPI band, Jianhan Liu, MediaTek)**

SP#1

Do you agree that DCM+MCS0 for Nss=1 as defined in 11ax is a MCS in 11be?

* The detailed MCS # for DCM+MCS0 is TBD.
* This is an R1 feature.

Y/N/A: 53/0/5

**Straw poll #147 *[#SP147]***

**20/1119r0 (Remaining TBDs for DCM, Bin Tian, Qualcomm)**

SP#1

Do you support 11be to define DCM for RU/M-RU size <= 996x2 plus RU 996x3 and 996x4

* This is for R1.

Y/N/A: 39/3/5

**Straw poll #148 *[#SP148]***

New SP

Which DTM parameter value do you prefer for RU78 with DCM?

* DTM = 2
* DTM = 3
* Abstain

Opt1/Opt2/A: 12/18/11

SP#2

Do you agree with the following BCC interleaver and LDPC DTM parameters for DCM?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NSD | | BCC NCOL | | BCC NROT | | LDPC DTM | |
|  | No DCM | DCM | No DCM | DCM | No DCM | DCM | No DCM | DCM |
| RU78 | 72 | 36 | 18 | **12** | 18 | - | 4 | **3** |
| RU132 | 126 | 63 | 21 | 21 | 31 | - | 6 | 3 |
| RU726 | 702 | 351 | - | - | - | - | 18 | 9 |

* This is for R1.

Y/N/A: 28/0/12

**Straw poll #149 *[#SP149]***

SP#3

Do you support the following DCM scheme for RU/M-RU size > 80 MHz?

* Use segment parser to distribute coded bits to each 80MHz segment
* Within each 80MHz, perform DCM mapping using per 80MHz Nsd\_k, k is the index of 80MHz segment
* This is for R1

Y/N/A: 33/0/9

**Straw poll #150 *[#SP150]***

SP#4

Do you support one padding bit is added after 2 x NDBPS coded bit when BCC is used for RU132 with DCM?

* This is for R1.

Y/N/A: 36/0/6

**Straw poll #151 *[#SP151]***

Reference: 11-20-1093-03-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## July 29 (MAC): 7 SPs

**20/0670r1 (Synchronous Multi-link Operation Follow-up, Yongho Seok, MediaTek)**

SP#1

Do you support to amend the SFD texts as the following?

* 802.11be supports the following PPDU transmission restriction for the constrained multi-link operation:
  + If an AP MLD intends to align the ending time of DL PPDUs carrying a frame soliciting an immediate response simultaneously sent to the same non-STR non-AP MLD on multiple links, the AP MLD shall ensure that the difference between the ending times of transmitting DL PPDUs is less than or equal to 8 μs ((aSIFSTime + aSignalExtension)/2).
    - Where the reference of the ending time of the PPDU is not including the Signal Extension field.

Approved with unanimous consent

**Straw poll #152 *[#SP152]***

**20/0834r7 (Tentative Re(Association) for Non-AP MLD, Guogang Huang, Huawei)**

SP#1

**Do you support Tentative Reassociation operation for multi-radio non-AP MLD?**

* NOTE. For the tentative reassociation operation, the multi-radio non-AP MLD needs to send a defined frame to trigger AP sending DS-STA-NOTIFY.request primitive to the DS, rather than AP automatically sending DS-STA-NOTIFY.request primitive to the DS after successfully exchange Association Request/Response frames with Status Code SUCCESS.

Y/N/A: 25/21/43

**20/0671r1 (Multi-link Triggered Uplink Access Follow-up, Yongho Seok, MediaTek)**

SP#1

Do you support the following Trigger frame transmission rule in the MLO?

* An AP in the AP MLD shall not send a Trigger frame with the CS Required subfield set to 1 to a STA in a non-STR non-AP MLD, when at least one PPDU from other STAs affiliated to the same non-STR non-AP MLD is scheduled for transmission before (aSIFSTime + aSignalExtention – aRxTxTurnaroundTime) has expired after the PPDU containing the Trigger frame.
  + Note– In the above, aRxTxTurnaroundTime is 4 μs.
  + Note– The ending time of a first PPDU that carrying a frame soliciting an immediate response frame cannot be earlier more than aRxTxTurnaroundTime of the ending time of a second PPDU containing a Trigger frame with the CS Required subfield set to 1. Note– The AP STA still follows the CS Required rule defined in 802.11ax spec.

Y/N/A: 42/11/39

**Straw poll #153 *[#SP153]***

SP#2

Do you support the following Trigger frame transmission rule in the MLO in R1?

* When an AP MLD triggers simultaneously TB PPDUs from more than one STAs affiliated to the same non-STR non-AP MLD and allows the frames in the TB PPDUs to solicit control response frames from the AP MLD, then the UL Length subfield values in the soliciting Trigger frames shall be set to the same value.

Y/N/A: 43/11/31

**Straw poll #154 *[#SP154]***

**20/0689r1 (Single STA Trigger, Young Hoon Kwon, NXP)**

SP#1

Do you support in R1 of TGbe SFD that

* A STA can include an indication in a PPDU that enables a peer STA to transmit a control response frame in an SU PPDU whose duration is indicated by the indication.

Y/N/A: 25/25/33

**20/0672r0 (Group addressed frame transmission in constrained multi-link operation follow-up, Yongho Seok, MediaTek)**

SP#1

Do you support the following group addressed frames delivery mechanism in R1?

* An AP MLD should not cause a STA affiliated to a non-STR non-AP MLD to transmit an MPDU that overlaps with group addressed frames in a constrained link if another STA affiliated to the same non-STR non-AP MLD is expected to be receiving group addressed frames.

Y/N/A: 39/1/26

**Straw poll #155 *[#SP155]***

SP#2

Do you support the following loopback prevention mechanism of the group address frame in the MLO?

* An AP MLD that broadcasts the group addressed MPDU received from a non-AP MLD with which it has done multi-link setup shall set the SA field of the broadcast group addressed MPDU to the MLD MAC address of the non-AP MLD.
* A non-AP MLD filters out the group addressed MPDU with the SA field set to the MLD MAC address of the non-AP MLD.

Y/N/A: 23/19/27

Reference:

11-20-1079-06-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## July 30 (Joint): 1 SP

**20/0674r3 (Forward compatible OFDMA, Xiaogang Chen, Intel)**

SP

Do you agree that 11be support the design of allowing multiplexing STAs of different amendments in one transmission with OFDMA using frequency domain A-PPDU?

* STAs of different amendments may include HE, EHT
  + post-EHT STA is TBD;
  + The BW allocated to different STAs that can be mixed in one transmission is TBD;
* This feature is targeted for R2.

Y/N/A/No answer: 88/1/36/51

**Straw poll #156 *[#SP156]***

Reference: 11-20-1109-01-00be-july-september-tgbe-teleconference-minutes

## August 3 (MAC): 5 SPs

**20/0899r1 (TIM follow up, Young Hoon Kwon, NXP)**

SP#1

Do you agree to add the following to R1 of 11be SFD:

* A non-AP MLD shall have the same U-APSD Flag value for each AC across all links that multi-link is setup.

Approved with unanimous consent

**Straw poll #157 *[#SP157]***

**20/0688r1 (Multi-link individual addressed data delivery without BA, Po-Kai Huang, Intel)**

SP#1

After multi-link setup, do you support the following to enable delivery of individual addressed QoS traffic of a TID without BA negotiation across links, where the TID is mapped, in R1?

* For Transmitter:
  + Expand Table 10-5—Transmitter sequence number spaces to have a new entry Indexed by <destined MLD Address, TID>
  + Continue to transmit the failed QoS Data frame until retry counter is met
  + Cannot transmit other QoS Data frame from the same TID in any link until the current frame finish transmission or dropped
* For Receiver:
  + Maintain at least the most recent record of <peer MLD address, TID, sequence number>.
  + Drop the frame with retry bit set and record match

Approved with unanimous consent

**Straw poll #158 *[#SP158]***

**20/0505r1 (Sync transmission for non-STR MLD, Ming Gan, Huawei)**

SP#1

Do you agree that an AP MLD shall align the end of DL PPDUs (that contain QoS data soliciting an immediate UL response) that are sent simultaneously on multiple links to the same non-STR non-AP MLD, in such a way that the response to any of the PPDUs will not overlap with any of the DL PPDUs in R1?Exception: a high priority DL PPDU sent on one link may not be aligned with another DL PPDU sent on the other link

Y/N/A: 53/4/24

**Straw poll #159 *[#SP159]***

**20/0762r1 (STA ID Indication for Constrained Multi-Link Operation, Yongho Seok, MediaTek)**

SP#1

Do you support that the STA ID field in a downlink EHT SU PPDU sent from an EHT AP to an EHT STA identifies the recipient EHT STA?

* NOTE- The size and encoding of the STA ID field in the downlink EHT SU PPDU is TBD.

Approved with unanimous consent

**Straw poll #160 *[#SP160]***

SP#2

Do you support that the STA ID field in an uplink EHT SU PPDU sent from an EHT STA to an EHT AP identifies the transmitter EHT STA?

* NOTE- The size and encoding of the STA ID field in the uplink EHT SU PPDU is TBD.

Approved with unanimous consent

**Straw poll #161 *[#SP161]***

Reference:

11-20-1079-07-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 4 (PHY): 6 SPs

**20/0965r3 (6GHz LPI Range Extension, Ron Porat, Broadcom)**

SP#1

Do you agree to define a DUP mode for non-punctured 80MHz, 160MHz and 320MHz PPDUs transmitted to a single user, limited to {MCS0+DCM, Nss=1}?

* 80 DUP = 40 (RU 484) duplicated
* 160 DUP = 80 (RU 996) duplicated
* 320 DUP = 160 (RU 2x996) duplicated
* PAPR reduction scheme is TBD
* Additional Diversity scheme is TBD.
* For rel. 1

Y/N/A: 36/0/8

**Straw poll #162 *[#SP162]***

SP#3

Do you agree that the mode defined in SP #1 is limited to 6GHz?

* Note: Whether to further limit this to LPI mode is TBD.

Y/N/A: 41/0/9

**Straw poll #163 *[#SP163]***

**20/1100r0 (Discussions on EHT non-contigeous PPDU, Rui Cao, NXP)**

SP#1

Do you agree that 11be does NOT define PPDU with non-contiguous signal bandwidth?

* Non-contiguous signal bandwidth includes 80+80MHz, 160+80MHz or 160+160MHz.
* This does not include punctured modes within 160, 240 or 320MHz BW.
* 160+80 MHz PPDU is TBD within 320MHz.

Y/N/A: 32/16/7

**20/0954r3 (240MHz transmission, Xiaogang Chen, Intel)**

SP#2b

Do you agree that MRU 996x2 shall not straddle two 160MHz channels?

Y/N/A: 24/4/11

**Straw poll #164 *[#SP164]***

SP#1

Do you agree that no 240/160+80MHz PPDU BW entry is included in the BW field of U-SIG in 11be.

* The 240Mhz transmission is defined as 320MHz PPDU with 80Mhz punctured.

Y/N/A: 21/7/8

**Straw poll #165 *[#SP165]***

SP#2d

Which table defines the options for MRU 996x2+484 in 320MHz BSS?

* 240/160+80 MHz BW entry is TBD
* Note: Shaded area in pictures is punctured.

Tab.I: 12 options.  


Tab.II: 24 options.



Tab.I/Tab.II/Abstain: 21/5/8

**Straw poll #166 *[#SP166]***

Reference: 11-20-1093-04-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 5 (MAC): 3 SPs

**20/0865r2 (AP MLD Beaconing and Discovery, Jarkko Kneckt, Apple)**

SP#1

TGbe SFD already has the following passed motion. This SP requests to remove "NOTE" and "is TBD" in the motion 115.

802.11be supports the following:

* Existing frames are reused for discovering APs that are affiliated with AP MLD.
* Association Request and Association Response frames are reused for multi-link setup.
* After association, 802.11be supports new signaling to query AP link specific parameters or AP MLD parameters by using Protected Management Frames (PMF) encrypted Management frames if PMF is enabled by AP.

[Motion 115, #SP76, [7] and [94]]

Y/N/A: 19/16/38

**20/0427r3 (Synchronous multi link operation, Young Hoon Kwon, NXP)**

SP#1

Do you support the following transmission sequence for the constrained multi-link operation in R1?

* When an AP MLD obtains TXOPs on multiple links and transmits frames to a non STR non-AP MLD soliciting immediate response on the multiple links, and intends to align the ending time of DL PPDUs during the obtained TXOPs:
  + If the AP MLD does not receive an immediate response successfully on a link that is not a first frame exchange within the obtained TXOP of the link, and if the AP MLD receives an immediate response on at least one another link, the AP MLD can continue its transmission on the link within the obtained TXOP TBD (e.g., SIFS or PIFS) time after the failed reception of the immediate response if the channel is idle.
  + CCA mechanism on the link is TBD.

Y/N/A: 24/11/47

**20/0921r1 (Discussion about STR capabilities indication, Yunbo Li)**

Do you agree that if a MLD can support transmission on link 1 concurrent with reception on link2, but can not support transmit on link2 concurrent with reception on link1, this pair of links will be non-STR?

Y/N/A: 36/10/27

**Straw poll #167 *[#SP167]***

Reference:

11-20-1079-08-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 6 (MAC): 5 SPs

**20/0761r1 (Multi Link Group Addressed Frame delivery for non-STR MLD, Jason Yuchen Guo, Huawei)**

SP#2

Do you support the following rule?

* When a non-STR MLD intends to receive Beacon frames on more than one link, if it successfully contends the channel on one link before the TBTT of the other link, then it should end its TXOP before the TBTT of the other link

Y/N/A: 25/18/31

**20/0411r4 (MLO: Information Exchange for Link Switching, Namyeong Kim, LGE)**

SP#1

Do you agree to define the following mechanism:

* A STA of a non-AP MLD can request a peer AP of AP MLD a part of complete information of other APs of the same AP MLD.
* The signaling for requesting the part of complete information is TBD.
* NOTE: As an example, the part of complete information may be information that is not included on the beacon frame sent from the peer AP.

Y/N/A: 30/12/38

**20/0586r5 (MLO: Signaling of critical updates, Abhishek Patil, Qualcomm)**

SP#2

Do you agree to update the text in Motion #115, #SP77 as following:

* Do you support that an AP within an AP MLD shall include in the Beacon and Probe Response frames it transmits the Change Sequence fields that indicate changes of system information for the transmitting AP and other APs within the same AP MLD, where the change sequence field value for each AP is initialized to 0, and is incremented when there is a critical update to the operational parameters for that AP?
  + The EHT Operation element shall include field(s) to carry the change sequence(s) of the transmitting AP and of non-transmitted BSSIDs (if any)
  + The change sequence information for another AP of the MLD shall be carried in a field in the TBTT Information field of the Reduced Neighbor Report element corresponding to that AP.
  + A TBD subfield in the Capability Information field of the Beacon frame shall provide an early indication of an update to change sequence information in the RNR for any AP of the reporting AP’s MLD.
    - NOTE: For an AP corresponding to nontransmitted BSSID in a multiple BSSID set, the early indication is carried in the Nontransmitted BSSID Capability field (which has the same structure as the Capability Information field) and signals the update to change sequence information in RNR for APs corresponding to the MLD to which the nontransmitted BSSID is affiliated with.
  + The critical updates are defined in 11.2.3.15 (TIM Broadcast) and the additional update can be added if needed.
  + The field is at most 1 octet in length and the value carried in the field is modulo of the maximum value

Y/N/A: 29/17/28

**20/0577r3 (RTS and CTS Procedure in Synchronous Multi-link Operation, Yongho Seok, MediaTek)**

SP#1

Do you support that the padding procedures of 11ax can be used when transmitting a Trigger frame to extend the frame length to meet the ending time requirement of the PPDU carrying the Trigger frame in the MLO?

* NOTE- The Padding field in the Trigger frame is also included in the padding procedure.

Approved with unanimous consent

**Straw poll #168 *[#SP168]***

**20/0523r1 (Discussion on Channels for Multi-link Operation, Geonjung Ko, WILUS)**

SP#2

Do you support that an AP MLD shall configure a multi-link using channels that are not overlapped each other?

Y/N/A: 27/19/21

Reference:

11-20-1079-09-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 6 (PHY): 2 SPs

**20/1138r2 (Large M-RU Table, Ron Porat, Broadcom)**

SP#1

Do you agree to add the following entries to the RU Allocation table?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 242 | 484 | |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
| 242 |  | 484 | |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
| 484 | |  | 242 |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
| 484 | | 242 |  |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
|  |  | 484 | | 996 | | | |  |  |  |  |  |  |  |  | 8 |
| 484 | |  |  | 996 | | | |  |  |  |  |  |  |  |  | 8 |
| 996 | | | |  |  | 484 | |  |  |  |  |  |  |  |  | 8 |
| 996 | | | | 484 | |  |  |  |  |  |  |  |  |  |  | 8 |
|  |  | 484 | | 996 | | | | 996 | | | |  |  |  |  | 8 |
| 484 | |  |  | 996 | | | | 996 | | | |  |  |  |  | 8 |
| 996 | | | |  |  | 484 | | 996 | | | |  |  |  |  | 8 |
| 996 | | | | 484 | |  |  | 996 | | | |  |  |  |  | 8 |
| 996 | | | | 996 | | | |  |  | 484 | |  |  |  |  | 8 |
| 996 | | | | 996 | | | | 484 | |  |  |  |  |  |  | 8 |
|  |  |  |  | 996 | | | | 996 | | | | 996 | | | | 8 |
| 996 | | | |  |  |  |  | 996 | | | | 996 | | | | 8 |
| 996 | | | | 996 | | | |  |  |  |  | 996 | | | | 8 |
| 996 | | | | 996 | | | | 996 | | | |  |  |  |  | 8 |
|  |  | 484 | | 996 | | | | 996 | | | | 996 | | | | 8 |
| 484 | |  |  | 996 | | | | 996 | | | | 996 | | | | 8 |
| 996 | | | |  |  | 484 | | 996 | | | | 996 | | | | 8 |
| 996 | | | | 484 | |  |  | 996 | | | | 996 | | | | 8 |
| 996 | | | | 996 | | | |  |  | 484 | | 996 | | | | 8 |
| 996 | | | | 996 | | | | 484 | |  |  | 996 | | | | 8 |
| 996 | | | | 996 | | | | 996 | | | |  |  | 484 | | 8 |
| 996 | | | | 996 | | | | 996 | | | | 484 | |  |  | 8 |

Y/N/A: 25/5/12

**Straw poll #169 *[#SP169]***

Editor’s note: The motion to approve Straw Poll #169 was failed on August 20, 2020. Per Chair’s ruling, the straw poll text is now removed from Section 2.

**20/0965r4 (6GHz LPI Range Extension, Ron Porat, Broadcom)**

SP#2a

Do you agree that duplication in the mode defined in SP #1 is done only on the data tones of the payload portion and that EHT-STF/LTF are based on the total BW?

In this mode,

* For 80MHz PPDU, the EHT-STF, EHT-LTF and pilot are same as transmitting both RU1 and RU2 of 484-tone RU
* For 160/320MHz PPDU, the EHT-STF, EHT-LTF and pilot are same as the non-OFDMA 160/320MHz PPDU.

PAPR reduction scheme is TBD.

Note: pre-EHT modulated fields are TBD

Y/N/A: 36/3/5

**Straw poll #170 *[#SP170]***

Reference: 11-20-1093-05-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 17 (MAC): 4 SPs

**20/0712r3 (BQR for 320MHz, Yunbo Li, Huawei)**

SP#2

Do you support to indicate the channel availability of 320MHz channel by carrying two BQR Control subfields in A-control subfield in R2?

Y/N/A: 34/8/45

**Straw poll #171 *[#SP171]***

**20/0883r5 (Multi-link Spatial Multiplexing, Yongho Seok, MediaTek)**

SP#1

Do you support the TGbe spec shall define a mechanism that in R1 a non-AP MLD indicates maximum number of spatial streams that it is capable of transmitting or receiving at a time, while operating in any of the links within the specified set of links in which the enhanced multi-link operation mode is applied?

* Each STA in the non-AP MLD operating in any of the links within the specified set of links shall support the indicated maximum number of spatial streams.
* The enhanced multi-link operation mode is optional.

Note- The name of the enhanced multi-link operation mode can be changed.

Y/N/A: 36/13/29

**20/0993r4 (Sync ML operations of non-STR device, Dmitry Akhmetov, Intel)**

SP

An MLD that intends to align the start time of the PPDUs sent on more than one link shall ensure that EDCA count down procedure is completed on all the links

* Note: An MLD is the sole originator of an intended sync transmission

Y/N/A: 35/16/26

**20/0702r0 (Fragmentation in MLO, Abhishek Patil, Qualcomm)**

SP

Do you support to have a capability bit “Fragmentation At MLD Support” in EHT Capabilities element?

* If the bit is set to 0 by a STA affiliated with an MLD, the MLD does not support reception of a fragment from a peer MLD
* A STA affiliated with an MLD shall not fragment frames and send fragment to another STA affiliated with another MLD that has set the Fragmentation at MLD Support bit to 0.

Note 1: Name of field can be changed

Note 2: the bit is set to 0 for R1

Y/N/A: 26/20/31

Reference:

11-20-1079-10-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 17 (PHY): 13 SPs

**20/1107r0 (Remaining Issues with new 11be Scrambler, Bin Tian, Qualcomm)**

SP#1

Do you support using the first 11 LSB bits in SERVICE field for 11be scrambling seed initialization and keeping the remaining 5 bits as reserved?



Y/N/A: 47/0/4

**Straw poll #172 *[#SP172]***

SP#2

Do you support using the first 7 LSB bits of the SERVICE field in MU-RTS to scramble the CTS data and fill in the first 7 LSB bits of the SERVICE field of the CTS, when MU-RTS is transmitted using an EHT PPDU?

Y/N/A: 36/0/9

**Straw poll #173 *[#SP173]***

SP#3

Do you support in 11be to disallow the 7 LSB bits of the SERVICE field in MU-RTS transmitted using an EHT PPDU to be all zeros?

Y/N/A: 35/1/14

**Straw poll #174 *[#SP174]***

**20/1138r4 (Large M-RU Table, Ron Porat, Broadcom)**

SP#3

Do you agree to the proposed RU table as attached on slide 5 of 1138r4?

Y/N/A: 30/9/8

**Straw poll #175 *[#SP175]***

Editor’s note: The motion to approve Straw Poll #175 was failed on September 3, 2020. Per Chair’s ruling, the straw poll text is now removed from Section 2.

**20/0975r0 (Discussion on 11be PHY Capabilities, Bin Tian, Qualcomm)**

SP#1

Do you agree that 11be device shall mandatorily support the following modulation order

* Up to 64 QAM for 20MHz-only non-AP STA (if defined in EHT)
* Up to 256QAM for all other devices

Y/N/A: 44/0/3

**Straw poll #176 *[#SP176]***

SP#2

Do you agree that the mandatory support requirement of LDPC in 11be is the same as in 11ax?

Y/N/A: 45/0/1

**Straw poll #177 *[#SP177]***

SP#3

Do you agree in 11be AP is mandatory to support

* 160 MHz operating channel width in 6GHz band
* 80MHz operating channel width in 5 GHz band
* 20 MHz operating channel width in 2.4 GHz band

Note: “soft AP” is TBD

Y/N/A: 42/1/0

**Straw poll #178 *[#SP178]***

SP#4

Do you agree in 11be it is mandatory for a non-AP STA to support 80MHz operating channel width in 5 and 6 GHz bands?

* Except for 20 MHz only client (if defined in EHT)

Y/N/A: 47/0/0

**Straw poll #179 *[#SP179]***

SP#5

Do you agree that 11be defines 20MHz-only client in 2.4/5GHz band only?

Y/N/A: 29/1/15

**Straw poll #180 *[#SP180]***

SP#6

Do you agree with the following MU-MIMO support in 11be

* DL MU-MIMO
  + Mandatory support for AP with >=4 antennas
  + Mandatory support for client
  + At least for full BW.  RU/M-RU support TBD
* UL MU-MIMO
  + Mandatory support for AP with >=4 antennas
  + Mandatory support for client
  + At least for full BW.  RU/M-RU support TBD

Y/N/A: 35/1/4

**Straw poll #181 *[#SP181]***

SP#7

Do you agree the support of Nss\_total=4 is mandatory for 11be STA in receiving both sounding NDP and DL MU-MIMO, i.e. Beamformee STS capability?

Y/N/A: 39/2/3

**Straw poll #182 *[#SP182]***

**20/1064r1 (Consideration on compressed mode in 11be, Dongguk Lim, LGE)**

SP#1

Do you agree that a subfield for indication of compressed mode is included in U-SIG as version dependent field?

Y/N/A: 35/4/6

**Straw poll #183 *[#SP183]***

SP#2

Do you agree that a 3-bit subfield for the indication of the number of non-OFDMA users is included in EHT-SIG common field of an EHT MU PPDU for the compressed mode?

Y/N/A: 30/1/5

**Straw poll #184 *[#SP184]***

Reference: 11-20-1093-06-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 19 (MAC): 5 SPs

**20/0615r3 (Discovery mechanism for MLD, Ming Gan, Huawei)**

SP#1

Do you agree to add MLD-index to the TBTT Information field of the RNR element, which is used to indicate the ID of the AP MLD in which the reported AP is if the reported AP in an AP MLD?

* MLD-Index is set to BSSID Index of a non transmitted BSSID if the reported AP is the in the same MLD as the non-transmitted BSSID and the reporting AP is the same Multiple BSSID set as the non-transmitted BSSID
* MLD-Index is set to zero if the reported AP is in the same MLD as the reporting AP
* MLD-Index of the AP MLD in which the reported AP is shall be unique in the frame sent by the reporting AP

Approved with unanimous consent

**Straw poll #185 *[#SP185]***

SP#2

Do you agree to carry Link ID in the TBTT Information field of the RNR element, which is used to indicate the identifier of the reported AP if the reported AP is in an AP MLD?

* The link identifier (Link ID) uniquely identifies a link (tuple consisting of Operational Class, Channel, BSSID) within an MLD

Approved with unanimous consent

**Straw poll #186 *[#SP186]***

**20/0883r6 (Multi-link Spatial Multiplexing, Yongho Seok, MediaTek)**

SP#1

Do you support the TGbe spec shall define a mechanism that in R1 a non-AP MLD indicates maximum number of spatial streams that it is capable of transmitting or receiving at a time, while operating in any of the links within the specified set of links in which the enhanced multi-link operation mode is applied?

* Each STA in the non-AP MLD operating in any of the links within the specified set of links shall support the indicated maximum number of spatial streams.
* The enhanced multi-link operation mode is optional mechanism.

Note- The name of the enhanced multi-link operation mode can be changed.

Y/N/A: 43/8/39

**Straw poll #187 *[#SP187]***

**20/0328r2 (MSDU Fragmentation and Aggregation in Multi-link Operation, Yongho Seok, MediaTek)**

SP#1

In the MLO, which option is preferred to determine the common capabilities for the maximum MPDU length and the maximum number of MSDUs in an A-MSDU?Option 1) A recipient MLD declares the MLD-level common capability.Option 2) A originator MLD chooses the minimum of the maximum MPDU length values and the minimum of the max number of MSDUs in A-MSDU values of all STAs affiliated to the recipient MLD.

Option 3) need more time

Option 1/Option 2/Option 3: 22/15/53

**20/0993r5 (Sync ML operations of non-STR device, Dmitry Akhmetov, Intel)**

SP#1’

A non-STR MLD that intends to align the start time of the PPDUs sent on more than one link shall ensure that EDCA count down procedure is completed on all the links

* Note: An MLD is the sole originator of an intended sync transmission
* Note: Whether to extend this mechanism to STR MLD is TBD

Y/N/A: 54/19/26

Reference:

11-20-1079-11-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 20 (Joint): 3 SPs

**20/0596r1 (AP candidate set follow up, Cheng Chen, Intel)**

SP#1

Do you agree to use the following text to replace Motion 55 text for better clarification?

* 11be shall define an AP candidate set\* as follows:
  + An AP candidate set is a set of APs that can initiate or participate in Multi-AP Coordination.
  + An AP in an AP candidate set can participate as a shared AP in Multi-AP Coordination initiated by a sharing AP in the same AP candidate set.
  + At least one AP in an AP candidate set shall be capable of being a sharing AP.
  + \*Note: The name can be changed.

Y/N/A: 95/1/36

**Straw poll #188 *[#SP188]***

**20/0617r3 (Multi-AP Operation - Basic Definition, Oren Kedem, Huawei)**

SP#1

Which of the options do you prefer with regards to Multi-AP set definition?

* Option 1 – One Static group “Multi-AP Candidate Set”
* Option 2 – Two groups, one static “Multi-AP Candidate Set” and one Dynamic group “Multi-AP Operation/Active Set”
* Abstain

Option 1/Option 2/Abstain: 38/54/27

**20/0548r2 (Discussion on Coordinated UL MU-MIMO, Genadiy Tsodik, Huawei)**

SP#1

Do you support that 802.11be will adopt Coordinated UL MU-MIMO as an Multi-AP Coordination scheme for UL transmissions in R2?

* Note: Not for joint reception.

Y/N/A: 76/6/43

**Straw poll #189 *[#SP189]***

Reference: 11-20-1109-03-00be-july-september-tgbe-teleconference-minutes

## August 24 (MAC): 5 SPs

**20/0411r4 (MLO: Information Exchange for Link Switching, Namyeong Kim, LGE)**

SP#1

Do you agree to define the following mechanism:

* A STA of a non-AP MLD can request a peer AP of AP MLD a part of complete information of other APs of the same AP MLD.
* The signaling for requesting the part of complete information is TBD.
* NOTE: As an example, the part of complete information may be information that is not included on the beacon frame sent from the peer AP.

Approved with unanimous consent

**Straw poll #190 *[#SP190]***

**20/0586r7 (MLO: Signaling of critical updates, Abhishek Patil, Qualcomm)**

SP#2

Do you agree to update the text in SFD (Motion #115, #SP77) as following:

* Do you support that an AP within an AP MLD shall include in the Beacon and Probe Response frames it transmits the Change Sequence fields that indicate changes of system information for the transmitting AP and other APs within the same AP MLD, where the change sequence field value for each AP is initialized to 0, and is incremented when there is a critical update to the operational parameters for that AP?
  + TBD field(s) to carry the change sequence(s) of the transmitting AP and of non-transmitted BSSIDs (if any)
  + The change sequence information for another AP of the MLD shall be carried in a field in the TBTT Information field of the Reduced Neighbor Report element corresponding to that AP.
  + A TBD subfield in the Capability Information field of the Beacon frame shall provide an early indication of an update to change sequence information in the RNR for any AP of the reporting AP’s MLD.
    - NOTE: For an AP corresponding to nontransmitted BSSID in a multiple BSSID set, the early indication is carried in the Nontransmitted BSSID Capability field (which has the same structure as the Capability Information field) and signals the update to change sequence information in RNR for APs corresponding to the MLD to which the nontransmitted BSSID is affiliated with.
  + The critical updates are defined in 11.2.3.15 (TIM Broadcast) and the additional update can be added if needed.
  + The field is at most 1 octet in length and the value carried in the field is modulo of the maximum value
  + NOTE: It is optional for non-AP MLD to decode the subfield in the Capability Information field carrying the early indication

Approved with unanimous consent

**Straw poll #191 *[#SP191]***

**20/0669r1 (MLD transition, Po-Kai Huang, Intel)**

Do you support the following?

* After a successful multi-link (re)setup between a non-AP MLD and an AP MLD, the non-AP MLD is in associated state and is (re)associated with the AP MLD, and the non-AP MLD to the AP MLD mapping is provided to the DS by the AP MLD
  + For each setup link, the corresponding non-AP STA affiliated with the non-AP MLD is in the same associated state as the non-AP MLD and is associated with the corresponding AP affiliated with the AP MLD, without providing the corresponding non-AP STA to the corresponding AP mapping to the DS, and enables the functionalities between a non-AP STA and its associated AP unless the functionalities have been extended to MLD level and specified otherwise.
* After a successful multi-link tear down between a non-AP MLD and an AP MLD, the non-AP MLD is in unassociated state and is disassociated with the AP MLD
  + All the non-AP STAs affiliated with the non-AP MLD are in the unassociated state
* NOTE - A non-AP MLD needs to perform successful multi-link (re)setup with AP MLD before the non-AP MLD is allowed to send/receive MSDU(s) via the AP MLD to the DS

Y/N/A: 48/2/31

**Straw poll #192 *[#SP192]***

**20/0615r3 (Discovery mechanism for MLD, Ming Gan, Huawei)**

SP#3

Do you agree that a nontransmitted BSSID profile in the Multiple BSSID element shall carry the MLD related parameters, such as Link ID, if the nontransmitted BSSID is in an AP MLD?

* The container for Link ID is TBD

Y/N/A: 27/23/35

**20/0898r2 (MLD discovery follow up, Young Hoon Kwon, NXP)**

SP#1

Do you agree to add the following to R1 of 11be SFD:

* An AP shall not include a RNR element in a STA profile subelement of a Multi-Link (ML) element.
* An AP shall not include a MBSSID element in a STA profile subelement of a Multi-Link (ML) element.
* An ML element shall not be included in a STA profile subelement of another ML element.

Y/N/A: 46/5/25

**Straw poll #193 *[#SP193]***

Reference:

11-20-1079-12-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 24 (PHY): 3 SPs

**20/1072r2 (2x EHT-LTF Sequences Design, Dandan Liang, Huawei)**

Do you support to limit 2x 320MHz EHT-LTF to sequences that are created based on the 2x 80MHz HE-LTF?

Y/N/A: 22/20/18

**20/1150r2 (Preamble Puncture Discussion in EHT PPDU, Ross Yu, Huawei)**

SP#2b

Do you agree to add the following text in the TGbe SFD:

* The preamble puncture indication field in U-SIG of an OFDMA transmission in an EHT MU PPDU indicates the preamble puncturing patterns of only the 80MHz where the U-SIG is being sent.

Y/N/A: 35/0/9

**Straw poll #194 *[#SP194]***

SP#5

Do you agree to add the following text in the TGbe SFD:

* Regarding preamble puncture flexibility for OFDMA, supports up to one hole per 80MHz segments. If punctured, the puncture pattern of each segment shall be one of the following:
  + X212
  + 1X12
  + 12X2
  + 121X
  + XX12
  + 12XX
  + 1XX2
* Note: Left-to-right represents low-to-high 20MHz channels.

Y/N/A: 34/1/17

**Straw poll #195 *[#SP195]***

Reference: 11-20-1093-07-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 26 (MAC): 3 SPs

**20/0669r3 (MLD transition, Po-Kai Huang, Intel)**

SP#2

Do you support to add the following in 11be SFD in R1:

* Define ML transition\* as follows:
  + A non-AP MLD movement from being associated with one AP MLD in one ESS to be reassociated with another AP MLD within the same ESS.
  + A non-AP MLD movement from being associated with one AP MLD in one ESS to become a non-AP STA that is reassociated with an AP within the same ESS.
  + A non-AP STA movement from being associated with one AP in one ESS to become a non-AP MLD that is reassociated with an AP MLD with the same ESS.
* Define fast ML transition\* as follows:
  + A ML transition\* that establishes the state necessary for data connectivity before the reassociation rather than after the reassociation.
* Note\* – the name can be changed

Approved with unanimous consent

**Straw poll #196 *[#SP196]***

SP#3

Do you support to reuse existing frame exchange of over-the-air fast BSS transition (FT) for fast ML transition in R1?

Y/N/A: 41/8/46

**Straw poll #197 *[#SP197]***

**20/0427r4 (Synchronous multi link operation, Young Hoon Kwon, NXP)**

SP#1

**Do you support the following transmission sequence for the constrained multi-link operation in R1:**

* When an AP MLD obtains TXOPs on multiple links and transmits frames to a non STR non-AP MLD soliciting immediate response on the multiple links, and intends to align the ending time of DL PPDUs during the obtained TXOPs:
  + If the AP MLD does not receive an immediate response successfully on a link that is not a first frame exchange within the obtained TXOP of the link, and if the AP MLD receives an immediate response on at least one another link, the AP MLD can continue its transmission on the link within the obtained TXOP TBD (e.g., SIFS or PIFS) time after the failed reception of the immediate response if the channel is idle.
  + CCA mechanism on the link is TBD.
  + If needed, conditions on the duration of the immediate response is TBD.

Y/N/A: 40/16/32

Reference:

11-20-1079-13-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 27 (MAC): 4 SPs

**20/0363r3 (Proposals on unused bandwidth utilizations, Sindhu Verma, Broadcom)**

Do you support the inclusion of the following in the SFD for R2:

* Non-primary transmission: The concept in which an AP that finds the primary channel to be busy under TBD conditions, can employ techniques to access and transmit on the idle non-primary channels under TBD conditions

Y/N/A: 52/16/25

**Straw poll #198 *[#SP198]***

Editor’s note: The motion to approve Straw Poll #198 was failed on September 17, 2020. Per Chair’s ruling, the straw poll text is now removed from Section 3.

**20/0105r7 (Link Latency Statistics of Multi-band Operations in EHT, Frank Hu, MediaTek)**

SP#2

Do you support that “Link latency measurement and report in MLO” is in R1?

Y/N/A: 37/22/31

**20/0661r3 (Group addressed frames delivery for MLO, Ming Gang, Huawei)**

SP#1

Do you agree that each AP in an AP MLD shall independently transmit all buffered group addressed Management frames after every DTIM beacon in R1

Y/N/A: 39/16/34

**20/0672r3 (Group addressed frame transmission in constrained multi-link operation follow-up, Yongho Seok, MediaTek)**

SP#2

Do you support the following loopback prevention mechanism of the group address frame in the MLO in R1?

* An AP MLD that broadcasts the group addressed MPDU received from a non-AP MLD with which it has done multi-link setup shall set the SA field of the broadcast group addressed MPDU to the MLD MAC address of the non-AP MLD.
* A non-AP MLD filters out the group addressed MPDU with the SA field set to the MLD MAC address of the non-AP MLD.

Y/N/A: 36/8/35

**Straw poll #199 *[#SP199]***

Reference:

11-20-1079-14-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## August 27 (PHY): 2 SPs

**20/0985r6 (RU Allocation Subfield Design in EHT-SIG Follow up, Myeongjin Kim, Samsung)**

SP#1

Do you agree to:

* Add two entries in the RU Allocation subfield table to indicate that
  + Punctured 242-tone RU
  + Unassigned 242-tone RU
* Modify the existing entry “242-tone RU empty (with zero users)” to “242-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated”
* Modify the existing entry “484-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield” to “484-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated”
* Modify the existing entry “996-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not punctured” to “996-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated”
* Add following
  + STA ID 2046 is indicating unallocated RU for smaller than 242-tone RU.
  + Whether STA ID 2046 can be used to indicated unallocated RU for equal or larger than 242-tone RU or not is TBD
  + Note: Punctured RU 242 shall be used when the preamble portion of corresponding 20MHz is punctured.

Y/N/A: 29/2/9

**Straw poll #200 *[#SP200]***

SP#2

Do you agree to add the following text to the TGbe SFD?

* The RU Allocation subfield corresponding to RU242 in large-size MRU combinations of 484+242 is set to x (TBD) to indicate the zero users.
  + x is a value corresponding to the entry of ‘242-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated’ in RU Allocation subfield table.
* The RU Allocation subfield corresponding to RU484 or RU484 in large-size MRU combinations of 484+242, 996+484, 2×996+484, and 3×996+484 is set to y (TBD) to indicate the zero users.
  + y is a value corresponding to the entry of ‘484-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated’ in RU Allocation subfield table.
* The RU Allocation subfield corresponding to RU996 or RU996 in large-size MRU combinations of 996+484, 2×996+484, 3×996+484, 3×996, and 2×996 is set to z to indicate the zero users.
  + z is a value corresponding to the entry of ‘996-tone RU; contributes zero User fields to the User Specific field in the same EHT-SIG content channel as this RU Allocation subfield and is not unallocated’ in RU Allocation subfield table.

Y/N/A: 23/10/14

Reference: 11-20-1093-08-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 31 (PHY): 2 SPs

**20/1161r0 (EHT Punctured NDP and Partial Bandwidth feedback, Bin Tian)**

SP#1

Do you support that for 80MHz NDP or each 80 MHz segment of >80MHz bandwidth NDP

* If not punctured, using non-OFDMA 80 MHz tone plan
* If punctured, using OFDMA 80MHz tone plan

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **RU & Tone Indices** | **1x LTF Tones** | **2x LTF Tones** | **4x LTF Tones** |
| Non-punctured | RU996, [-500:-3, 3:500] | A=[-500:4:-4, 4:4:+500] | A=[-500:2:-4, 4:2:500] | A=[-500:-3, 3:500] |
| 1st 20MHz punctured | RU242+484, [-253:-12, 12:253, 259:500] | B1=[-252:4:-12, 12:4:252, 260:4:500] | B1=[-252:2:-12, 12:2:252, 260:2:500] | B1=[-253:-12, 12:253, 259:500] |
| 2nd 20MHz punctured | RU242+484, [-500:-259, 12:253, 259:500] | B2=[-500:4:-260, 12:4:252, 260:4:500] | B2=[-500:2:-260, 12:2:252, 260:2:500] | B2=[-500:-259, 12:253, 259:500] |
| 3rd 20MHz punctured | RU242+484, [-500:-259, -253:-12, 259:500] | B3=[-500:4:-260, -252:4:-12, 260:4:500] | B3=[-500:2:-260, -252:2:-12, 260:2:500] | B3=[-500:-259, -253:-12, 259:500] |
| 4th 20MHz punctured | RU242+484, [-500:-259, -253:-12, 12:253] | B4=[-500:4:-260, -252:4:-12, 12:4:252] | B4=[-500:2:-260, -252:2:-12, 12:2:252] | B4=[-500:-259, -253:-12, 12:253] |
| 1st 40MHz punctured | RU484, [12:253, 259:500] | C1=[12:4:252, 260:4:500] | C1=[12:2:252, 260:2:500] | C1=[12:253, 259:500] |
| 2nd 40MHz punctured | RU484, [-500:-259, -253:-12] | C2=[-500:4:-260, -252:4:-12] | C2=[-500:2:-260, -252:2:-12] | C2=[-500:-259, -253:-12] |

Y/N/A: 38/0/8

**Straw poll #201 *[#SP201]***

**20/1290r1 (PDT-PHY-Parameters-for-EHT-MCSs, Yujin Noh, Newracom)**

SP#1

Do you agree that:

* MCS numbering for BSPK – 1024QAM is the same as 11ax
* 4096 QAM is defined with R=3/4 and R=5/6
* MCS numbering for 4096 QAM is 12 and 13.

Y/N/A: 42/1/3

**Straw poll #209 *[#SP209]***

Editor’s note: This straw poll is related to the contents of the PDT text and it is not related to the contents of the SFD.

Reference: 11-20-1093-09-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## August 31 (MAC): 3 SPs

**20/0741r3 (Indication of Multi-link Information: Follow-up, Insun Jang, LGE)**

SP#2

Do you support to add to the 11be SFD in R1 that during multi-link setup a non-AP MLD includes, in a multi-link element included in Association Request frame, the complete information of affiliated non-AP STAs corresponding to the links requested for setup?

Y/N/A: 44/6/23

**Straw poll #202 *[#SP202]***

**20/0669r4 (MLD transition, Po-Kai Huang, Intel)**

SP#4

Do you support the following in R1?

* For a non-AP MLD and an AP MLD in a FT initial mobility domain operation, use non-AP MLD address as S1KH-ID and S0KH-ID and AP MLD address as R1KH-ID. Use AP MLD address and non-AP MLD address to compute PMKID, PTK, and PTKName
* For a non-AP MLD and a target AP MLD in an over-the-air FT operation, use non-AP MLD address as S1KH-ID and AP MLD address as R1KH-ID. Use AP MLD address and non-AP MLD address to compute PMKID, PTK, and PTKName

Y/N/A: 35/7/35

**Straw poll #203 *[#SP203]***

**20/0834r9 (Tentative Re(Association) for Non-AP MLD, Guogang Huang, Huawei)**

SP

Do you support the inclusion of the following in the SFD for R2?

* Tentative reassociation. The concept in which is that the multi-radio non-AP MLD can do the tentative reassociation through one link with the target AP meanwhile it can still deliver data with the current AP through another link. After completing the tentative reassociation with the target APMLD, the multi-radio non-AP MLD will send a frame to trigger the target AP MLD sending DS-STA-NOTIFY.request primitive to DS. As a result, the data delivery will be immediately switched from the current AP MLD to the target AP MLD .

Y/N/A: 27/31/24

Reference:

11-20-1079-16-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## September 1 (MAC): 5 SPs

**20/0993r6 (Sync ML operations of non-STR device, Dmitry Akhmetov, Intel)**

SP#1

A non-STR MLD that intends to align the start time of the PPDUs sent on more than one link shall ensure that EDCA count down procedure is completed on all the links

* Note: An MLD is the sole originator of an intended sync transmission
* Note: Whether to extend this mechanism to STR MLD is TBD Note: R1 feature

Y/N/A: 58/21/38

**20/0669r4 (MLD transition, Po-Kai Huang, Intel)**

SP#5

Do you support the following in R1?

* For a non-AP MLD and an AP MLD in a FT initial mobility domain operation, deliver different GTK/IGTK/BIGTK of different setup links in one FT 4-way handshake
* For a non-AP MLD and a target AP MLD in an over-the-air FT operation, deliver different GTK/IGTK/BIGTK of different setup links in FTE of reassociation response of the over-the-air FT protocol

Approved with unanimous consent

**Straw poll #204 *[#SP204]***

**20/0741r3 (Indication of Multi-link Information: Follow-up, Insun Jang, LGE)**

SP#3

Do you support to add to the 11be SFD in R1 that during multi-link setup, when an AP MLD accepts the association request of a non-AP MLD, the AP MLD provides, in a multi-link element included in Association Response frame, the complete information of affiliated APs corresponding to the links that are accepted by the AP MLD and requested by the non-AP MLD?

Approved with unanimous consent

**Straw poll #205 *[#SP205]***

**20/0661r4 (Group addressed frames delivery for MLO, Ming Gan, Huawei)**

SP#1

Do you agree that each AP in an AP MLD shall independently transmit all bufferable group addressed Management frames after every DTIM beacon in R1?

Y/N/A: 61/3/44

**Straw poll #206 *[#SP206]***

**20/0948r3 (Priority Service Capability Information, Subir Das, Perspecta Labs)**

SP#1

Do you support the addition of following text to TGbe SFD (R1)?

The Priority Service Information shall be defined in EHT MAC Capability Information Element to exchange the NS/EP Priority Service capability information between AP STA and non-AP STA.

Y/N/A: 44/13/41

**Straw poll #207 *[#SP207]***

Reference:

11-20-1079-16-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## September 3 (Joint): 1 SP

**20/0933r1 (Hidden Node Protection in Coordinated AP Transmissions, Dennis Sundman, Ericsson)**

SP#1

Do you believe the hidden node problem in multi-AP environments (e.g. coordinated AP transmission) should be addressed by TGbe?

Y/N/A: 87/4/24

**Straw poll #208 *[#SP208]***

Reference: 11-20-1109-05-00be-july-september-tgbe-teleconference-minutes

## September 9 (MAC): 1 SP

**20/1270r4 (PDT-MAC-MLO-Power-save-Proceduress, Abhishek Patil, Qualcomm)**

SP#1

Which scheme do you support for signaling MLD Max Idle Period?

* Option 1: ML IE carries signaling for MLD Max Idle Period (as presented in 11-20/1270r3)
* Option 2: BSS Max Idle Period element signals for MLD Max Idle Period (as presented in 11-20/1270r3)
* No preference

Option 1/Option 2/No preference: 5/59/26

Reference:

11-20-1079-17-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## September 10 (PHY): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1093-10-00be-minutes-for-tgbe-phy-ad-hoc-cc-july-to-sept-2020

## September 10 (MAC): 0 SP

No straw polls related to technical contributions were conducted.

Reference:

11-20-1079-18-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## September 14 (PHY): 0 SP

No straw polls related to technical contributions were conducted.

Reference:

11-20-1499-00-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## September 14 (MAC): 0 SP

No straw polls related to technical contributions were conducted.

Reference:

11-20-1079-19-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-in-july-and-september-2020

## September 15 (Joint): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1496-01-00be-sep-nov-tgbe-teleconference-minutes

## September 16 (MAC): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1518-00-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## September 17 (Joint): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1496-02-00be-sep-nov-tgbe-teleconference-minutes

## September 21 (PHY): 0 SP

No straw polls related to technical contributions were conducted.

Reference:

11-20-1499-01-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## September 21 (MAC): 2 SPs

**20/1395r10 (Proposed Spec Text: Multi-link Channel Access: General-Non-STR, Matthew Fischer, Broadcom)**

SP#1

Do you wish to keep 2nd from last paragraph in 11-20/1395r10?

“A STA that is affiliated with a non-AP MLD may transmit a frame on a link of one of its NSTR link pairs at the same time that another STA affiliated with the same non-AP MLD is not receiving a frame addressed to that receiving STA on the other link of the NSTR link pair, provided that the transmission meets other restrictions indicated in this subclause.”

Y/N/A: 29/21/25

Editor’s note: This straw poll is related to the contents of the PDT text and it is not related to the contents of the SFD.

SP#2

Do you wish to keep the last paragraph in 11-20/1395r10?

“A STA that is affiliated with a non-AP MLD and that transmits a frame on a link of one of its NSTR link pairs at the same time that another STA affiliated with the same non-AP MLD is receiving a frame on the other link of the NSTR link pair should ensure that the transmitted PPDU ends at the same time or earlier than the PPDU that is being recevied”

Y/N/A: 12/41/27

Editor’s note: This straw poll is related to the contents of the PDT text and it is not related to the contents of the SFD.

Reference: 11-20-1518-00-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## September 23 (MAC): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1518-01-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## September 24 (PHY): 1 SP

**20/1135r5 (PAPR issues for EHT ER SU PPDU, Eunsung Park)**

SP#2a

Do you agree to add the following text to the TGbe SFD?

* 11be supports the following duplication and phase rotation methods which are applied to the data field of the PPDU transmitted to a single user and limited to {MCS0+DCM, Nss=1}
  + For 80MHz PPDU, 484-tone RU is duplicated and the tones corresponding to the second highest 20MHz subchannel is multiplied by -1
  + For 160MHz PPDU, 996-tone RU is duplicated and the tones corresponding to the second highest 40MHz subchannel is multiplied by -1
  + For 320MHz PPDU, 2x996-tone RU is duplicated and the tones corresponding to the second highest 80MHz subchannel is multiplied by -1
  + Phase rotation is not applied to pilot tones
  + This is for rel. 1

Y/N/A: 23/9/8

Reference:

11-20-1499-02-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## September 24 (MAC): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1518-02-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## September 28 (PHY): 1 SP

**20/1191r1 (DUP Mode PAPR Reduction, Ron Porat, Broadcom)**

SP#1

Do you support that the PAPR reduction scheme for the DUP mode consists of flipping the sign of data tones only, as shown in red?

* BW80 and BW160 PPDU data-tone processing:
  + Pre-DCM freq-domain signal: 𝒙
  + DCM-encoded freq-domain signal: 𝒚 = [𝒙 𝒙𝐷𝐶𝑀 ]
  + DUP freq-domain signal: [𝒚 −𝒙 𝒙𝐷𝐶𝑀 ]
* BW320 PPDU data-tone processing:
  + Pre-DCM freq-domain signal split into two halves:
    - 𝒙𝐿 over lower 𝑁𝑆𝐷/2 sub-carriers, 𝒙𝑈 over upper 𝑁𝑆𝐷/2 sub-carriers.
  + DCM-encoded freq-domain signal: 𝒚 = [𝒙𝐿 𝒙𝐿,𝐷𝐶𝑀 𝒙𝑈 𝒙𝑈,𝐷𝐶𝑀]
  + DUP freq-domain signal: [𝒚 −𝒙𝐿 −𝒙𝐿,𝐷𝐶𝑀 𝒙𝑈 𝒙𝑈,𝐷𝐶𝑀 ]

Y/N/A: 51/13/5

**Straw poll #210 *[#SP210]***

Reference:

11-20-1499-03-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## September 28 (MAC): 1 SP

**20/1332r5 (PDT MAC MLO BSS parameter update, Ming Gan, Huawei)**

SP

Do you support the following text?

If an AP within an AP MLD is transmitted BSSID in a Multiple BSSID set, the AP shall include in the the Beacon and Probe Response frames it transmits a Change Sequence field for each of other APs in the same AP MLD as a nontransmitted BSSID in the same multiple BSSID set as the AP.

Y/N/A: 27/30/24

Editor’s note: This straw poll is related to the contents of the PDT text and it is not related to the contents of the SFD.

Reference: 11-20-1518-03-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## September 30 (Joint): 0 SP

No straw polls related to technical contributions were conducted.

Reference: 11-20-1496-03-00be-sep-nov-tgbe-teleconference-minutes

## October 8 (PHY): 10 SPs

**20/1238r4 (Open Issues on Preamble Design, Sameer Vermani, Qualcomm)**

SP#1

Do you support punctured channel information field in U-SIG to be ‘5 bits + 1 reserved bit adjacent to it’ in the version dependent section?

* Non-OFDMA:  use a 5 bit BW dependent table to signal the puncturing pattern of the entire PPDU BW
* OFDMA: a bitmap field of 4 bits to indicate which 20MHz is punctured in the current 80MHz
  + 1 bit out of the 5 bits is not used
* 1 reserved bit for possible future expansion (e.g, more puncturing patterns in R2) of non-OFDMA puncturing modes
* Interpretation of the field shall be dependent on the transmission being OFDMA vs non-OFDMA

Y/N/A: 29/14/12

SP#2

Do you agree with the EHT-SIG User Field Design shown below?

* The ordering of the fields will be as shown below.
* User field for a non-MU-MIMO allocation:

|  |  |
| --- | --- |
| Subfield | Number of bits |
| STA-ID | 11 |
| MCS | 4 |
| Reserved | 1 |
| NSTS | 4 |
| Beamformed | 1 |
| Coding | 1 |

* User field for an MU-MIMO allocation:

|  |  |
| --- | --- |
| Subfield | Number of bits |
| STA-ID | 11 |
| MCS | 4 |
| Coding | 1 |
| Spatial Configuration | 6 |

Y/N/A: 41/2/8

**Straw poll #211 *[#SP211]***

SP#3

Do you agree that the EHT-SIG common field will include the following?

* U-SIG overflow
  + Repeated in each content channel to be friendly to 20MHz operating devices
* Total number of non-OFDMA users (3 bits for 1-8 users)
  + Only present in the non-OFDMA compressed mode
  + Repeated in each content channel (just like 11ax where the number of MU-MIMO users in the compressed mode was carried in HE-SIG-A)
* RU allocation subfields (RUA)
  + Only present in the uncompressed mode
  + Contents are sent parallelized into two content channels

Y/N/A: 47/1/4

**Straw poll #212 *[#SP212]***

SP#6

Do you agree to encode the EHT-SIG common field together with the first user field for the non-OFDMA compressed modes?

* Applicable only if EHT-SIG field exists.

Y/N/A: 41/0/11

**Straw poll #213 *[#SP213]***

SP#8

Do you agree for the EHT-SIG common field in the uncompressed mode, we will have the following coding structure for various BWs

* In case of 20/40/80 MHz, just 1 code block is present
* In case of 160/320MHz, 2 code blocks are present
  + 1st code block has fixed size (U-SIG overflow + 2 RUA fields)
  + 2nd code block includes all remaining RU allocation subfields (2 RUA fields in 160MHz, 6 RUA fields in 320MHz)

Y/N/A: 33/1/17

**Straw poll #214 *[#SP214]***

SP#12

Do you agree that EHT-SIG will support the following MCSs?

* MCS0, MCS1, MCS3 and ‘MCS0+DCM’

Y/N/A: 36/10/9

**Straw poll #215 *[#SP215]***

SP#13

Do you agree that for the EHT MU PPDU, only the following GI/LTF combinations will be supported?

* 2x LTF + 0.8us GI
* 2x LTF + 1.6us GI
* 4x LTF + 3.2us GI
* 4x LTF + 0.8us GI

Y/N/A: 44/1/14

**Straw poll #216 *[#SP216]***

SP#14

Do you agree that 11be will not have Doppler bit in EHT-SIG for R1?

* No midamble support in R1

Y/N/A: 39/1/18

**Straw poll #217 *[#SP217]***

SP#15

Do you agree that 11be shall not support STBC?

Y/N/A: 37/2/15

**Straw poll #218 *[#SP218]***

**20/1310r0 (Coding bit in MU-MIMO, Ron Porat, Broadcom)**

SP#1

Do you support defining the meaning of the coding bit in MU-MIMO per-user field for RU>242 as reserved?

Y/N/A: 38/0/10

**Straw poll #219 *[#SP219]***

Reference:

11-20-1499-04-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## October 8 (MAC): 8 SPs

**20/0105r7 (Link Latency Statistics of Multi-band Operations in EHT, Frank Hu, MediaTek)**

SP#2

Do you support that “Link latency measurement and report in MLO” is in R1?

Y/N/A: 43/40/30

**20/1046r5 (Prioritized EDCA channel access - slot management, Chunyu Hu, Facebook)**

SP#1:

Do you agree to add to the TGbe SFD (in R1), a mode where an AP may announce restricted TWT session(s) such that:

* Any EHT STA associated to the AP shall end its TXOP before the start of the restricted SP(s)
* Note-1: the “restricted TWT” name is TBD.
* Note-2: such restricted TWT SPs are intended to provide more predictable latency performance for latency sensitive traffic.

Y/N/A: 45/59/15

SP#1a:

Do you agree to add to the TGbe SFD (in R1), a mode where an AP may announce restricted TWT session(s) such that:

* Any EHT STA that supports following restricted TWT schedule(s), and associated to the AP, shall end its TXOP before the start of the restricted SP(s)
* Note-1: The support for the restricted TWT feature is optional for the EHT Non-AP STA
* Note-2:  the “restricted TWT” name is TBD
* Note-3:  such restricted TWT SPs are intended to provide more predictable latency performance for latency sensitive traffic

Y/N/A: 45/46/22

**20/0712r5 (BQR for 320MHz, Yunbo Li, Huawei)**

SP#3

Do you support below indications of BQR Control subfields in A-Control subfield in R2?

* When there are two BQR control subfields in A-Control subfield, the 1st BQR Control is used to indicate the primary 160MHz, the 2nd BQR Control is used to indicate the secondary 160MHz
* When there is one BQR control subfield in A-Control subfield, the BQR Control is used to indicate the primary 160MHz

Approved with unanimous consent

**Straw poll #220 *[#SP220]***

**20/0993r7 (Sync ML operations of non-STR device, Dmitry Akhmetov, Intel)**

SP#1

A non-STR MLD that intends to align the start time of the PPDUs sent on more than one link shall ensure that EDCA count down procedure is completed on all the links

* Note: The above restriction only applies to the case when the non-STR MLD is the TXOP initiator
* Note: Whether to extend this mechanism to STR MLD is TBD
* Note: R1 feature

Y/N/A: 52/22/18

**20/0669r5 (MLD transition, Po-Kai Huang, Intel)**

SP#6

Do you support the following in R1?

* For a ML transition from a legacy AP to an AP MLD, the MAC address of the non-AP STA that is associated with the legacy AP shall be used as the MLD MAC address of the non-AP MLD that is reassociated with the AP MLD
* For a ML transition from an AP MLD to a legacy AP, the non-AP MLD MAC address of the non-AP MLD that is associated with the AP MLD shall be used as the MAC address of the non-AP STA that is reassociated with the legacy AP
* Note: Tear down of previous association and have a new association is not an ML transition

Approved with unanimous consent

**Straw poll #221 *[#SP221]***

**20/0921r3 (Discussion about STR capabilities indication, Yunbo Li, Huawei)**

SP#2

Do you support that a MLD indicates NSTR constraint of each link pair as below?

* Mandatory to use 1 bit to indicate the link pair is STR or non-STR
* If non-STR, optional to indicate other TBD parameters that describe the non-STR constraints.

Y/N/A: 44/20/18

**20/1009r4 (Multi-link hidden terminal-followup, Dibakar Das, Intel)**

SP

Do you agree to add the following to 11be SFD R1: if during a transmission of a STA (STA-1) of a non-STR non-AP MLD, another STA (STA-2) of the same MLD cannot detect its medium state when required (due to STA-1’s UL transmission interference), STA-2 shall start a MediumSyncDelay timer at the end of STA-1’s transmission, unless the STA-2 ended a transmission at the same time:

* the MediumSyncDelay timer expires after a duration value that is either assigned by AP or specified in spec or if at least either of the following events happens:
  + any received PPDU with a valid MPDU
  + a received PPDU with a valid TxOP\_duration

whichever happens first

* while the MediumSyncDelay timer is running the STA is only allowed to attempt to initiate up to number of TxOPs assigned by the AP (at least 1) and shall attempt to initiate that TxOP with the transmission of an RTS frame using regular EDCA backoff using baseline CCA but a TBD ED threshold value
  + The TBD ED threshold value has a default value specified in the spec (e.g., -62dBm) but can also be assigned by the AP MLD within a limited range such as between -82dBm and -62dBm
* If the channel was busy immediately after the blind period, additional TBD rules to use RTS may apply.

Note:

* If either the intra-BSS NAV or the inter-BSS NAV is non-zero in STA-2 at the end of transmission of STA-1, STA-2 does not transmit any PPDU using EDCA until the NAV expires.
* If either the intra-BSS NAV or the inter-BSS NAV is non-zero in STA-2 at the end of transmission of STA-1, there could be further TBD conditions and requirements to expire the MediumSyncDelay timer.

Y/N/A: 30/26/15

Reference: 11-20-1518-04-00be-minutes-for-tgbe-mac-ad-hoc-teleconferences-sept-nov-2020

## October 12 (PHY): 0 SP

No straw polls related to technical contributions were conducted.

Reference:

11-20-1499-05-00be-minutes-802-11-be-phy-ad-hoc-telephone-conferences-september-november-2020

## October 12 (MAC): 4 SPs

**20/1009r4 (Multi-link hidden terminal-followup, Dibakar Das, Intel)**

SP

Do you agree to add the following to 11be SFD R1: if during a transmission of a STA (STA-1) of a non-STR non-AP MLD, another STA (STA-2) of the same MLD cannot detect its medium state when required (due to STA-1’s UL transmission interference), STA-2 shall start a MediumSyncDelay timer at the end of STA-1’s transmission, unless the STA-2 ended a transmission at the same time:

* the MediumSyncDelay timer expires after a duration value that is either assigned by AP or specified in spec or if at least either of the following events happens:
  + any received PPDU with a valid MPDU
  + a received PPDU with a valid TxOP\_duration

whichever happens first

* while the MediumSyncDelay timer is running the STA is only allowed to attempt to initiate up to number of TxOPs assigned by the AP (at least 1) and shall attempt to initiate that TxOP with the transmission of an RTS frame using regular EDCA backoff using baseline CCA but a TBD ED threshold value
  + The TBD ED threshold value has a default value specified in the spec (e.g., -62dBm) but can also be assigned by the AP MLD within a limited range such as between -82dBm and -62dBm
* If the channel was busy immediately after the blind period, additional TBD rules to use RTS may apply.

Note:

* If either the intra-BSS NAV or the inter-BSS NAV is non-zero in STA-2 at the end of transmission of STA-1, STA-2 does not transmit any PPDU using EDCA until the NAV expires.
* If either the intra-BSS NAV or the inter-BSS NAV is non-zero in STA-2 at the end of transmission of STA-1, there could be further TBD conditions and requirements to expire the MediumSyncDelay timer.

Y/N/A: 35/38/18

**20/1046r7 (Prioritized EDCA channel access - slot management, Chunyu Hu, Facebook)**

SP#1

Do you agree to add to the TGbe SFD (in R1), a mode where an EHT AP may announce restricted service periods (SPs) such that:

* Any EHT non-AP STA that supports following the announced restricted SPs, and associated to the AP, shall end its TXOP before the start of the restricted SP(s)
* The support for the restricted SPs is optional for the EHT non-AP STA
* If the support for this mode for the EHT AP is mandatory or optional is TBD
* Note:  such restricted SPs are intended to provide more predictable latency performance for latency sensitive traffic

Y/N/A: 45/45/18

**20/0586r9 (MLO: Signaling of critical updates, Abhishek Patil, Qualcomm)**

SP#7

Do you support the following:

* if an AP corresponding to a nontransmitted BSSID in a multiple BSSID set is affiliated with an AP MLD, then the AP corresponding to the transmitted BSSID in the same Multiple BSSID set shall include in the Beacon and Probe Response frames it transmits the Change Sequence fields that indicate changes of system information for that AP corresponding to a nontransmitted BSSID and other APs within the AP MLD to which that AP corresponding to the nontransmitted BSSID is affiliated with, where the change sequence field value for each AP is initialized to 0, and is incremented when there is a critical update to the operational parameters for that AP

Y/N/A: 41/26/22

**20/0992r3 (MLO optional mandatory, Laurent Cariou, Intel)**

SP#1

Do you agree to add the following to the SFD:

* An EHT STA that is capable of operating in at least 2 links (in 2 bands or 2 channels within one band) shall be part of an MLD

Y/N/A: 26/40/19

Reference: Draft meeting minutes to be posted.