IEEE P802.11  
Wireless LANs

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| IEEE 802.11 TGax  July 2015 Waikoloa Meeting Minutes | | | | |
| Date: 2015-07-30 | | | | |
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Abstract

Minutes of the TGax full meetings from the IEEE 802.11 Vancouver session, July 12th – 17th, 2015.

Minutes from the TGax ad hoc sessions are contained in the following documents.

* PHY ad hoc:
  + <https://mentor.ieee.org/802.11/dcn/15/11-15-0913-00-00ax-ieee-802-11-tgax-july-2015-hawaii-phy-ad-hoc-meeting-minutes.docx>
* MAC ad hoc:
  + <https://mentor.ieee.org/802.11/dcn/15/11-15-0922-01-00ax-july-2015-hawaii-tgax-mac-ad-hoc-meeting-minutes.docx>
* Multiuser ad hoc:
  + <https://mentor.ieee.org/802.11/dcn/15/11-15-0949-01-00ax-july-2015-hawaii-tgax-mu-ad-hoc-meeting-minutes.docx>
* Spatial Reuse ad hoc:
  + <https://mentor.ieee.org/802.11/dcn/15/11-15-0971-01-00ax-july-meeting-minutes-of-the-spatial-reuse-ad-hoc-group.docx>

**IEEE 802.11 Task Group ax**

**July 2015 Waikoloa Meeting**

**Hilton Waikoloa Village, Waikoloa, HI**

**July 12th – 17th, 2015**

**Monday, July 13th, 2015, AM1 TGax Ad Hoc Session (8:00-10:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of the TGax, @8:01
   1. About 50 people are in the room at the beginning of the meeting. More people came in later.
2. Announcement
   1. This is an ad hoc session of TGax. No decision can be made.
   2. Agenda Doc.11-15/0735r1 on the server. Rev. 2 is the working document.
   3. Meeting Protocol: Please announce your affiliation when you first address the group during a meeting slot.
   4. Attendance reminder.
      1. The attendance server: https://imat.ieee.org/
      2. See 11-09-0517r0 for more information.
3. The chair reviewed the mandatory 5 slides of P&P.
   1. Instructions for the WG Chair.
   2. Participants, Patents, and Duty to Inform.
   3. Patent Related Links.
   4. Call for potentially essential patents.
      1. Chair asked if anyone is aware of potentially essential patents.
      2. **No potentially essential patents reported.**
   5. Other Guidelines for IEEE WG Meetings.
4. Agenda items for the week
   1. Approve TG and Teleconferences minutes since May 2015 meeting.
   2. Continue to advance task group documents.
      1. Simulation Scenarios and Evaluation Methodology
      2. Channel Model
      3. Function Requirements
      4. Specification Framework
   3. Ad Hoc group meetings
   4. Technical Presentations and related straw polls and/or motions
   5. Schedule Teleconference times.
5. General Flow of the meeting
   1. Slides 13 and 14 of the 15/0735r1 contain general flow of the meeting.

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|  | Monday | Tuesday | | Wednesday | | Thursday |
| AM1 | TGax  (ad hoc) |  | |  | | TGax |
| AM2 |  | TGax  (SR) | TGax  (MU) |  | |  |
| PM1 | TGax | TGax  (PHY) | TGax  (Ad Hoc) | TGax  (Ad Hoc) | TGax  (Ad Hoc) | TGax |
| PM2 |  |  | | TGax  (Ad Hoc) | TGax  (Ad Hoc) |  |
| PM3 |  | TGax | |  | |  |

1. Agenda for Monday, July 13th, AM1 (8:00 – 10:00).
   1. Proposed Agenda for Monday AM1 session:
      1. Call meeting to order
      2. Patent policy, etc.
      3. Call for submissions
      4. Set and approve the agenda for this ad hoc meeting
      5. Presentations
      6. Adjourn the TGax ad hoc meeting
   2. Chair asked if there are any other items – No items proposed. Meeting will be conducted based on this order.
2. Call for submissions – slides 15 to 19 of 15/0735r3 contains current submission lists
   1. Submissions (PHY) – 23 submissions
      1. 11-15-0579, “preamble design and autodetection,” Hongyuan Zhang (Marvell)
      2. 11-15-0580, “11ax coding discussion,” Hongyuan Zhang (Marvell)
      3. 11-15-0602, “HE-LTF sequence for UL MU-MIMO,” Qinghua Li (Intel)
      4. 11-15-0805, “SIG-B field for HEW PPDU,” Young Hoon Kwon (Newracom)
      5. 11-15-0810, “HE PHY Padding and Packet Extension,” Hongyuan Zhang (Marvell)
      6. 11-15-0812, “Pilot Design for Data Section,” Sameer Vermani (Qualcomm)
      7. 11-15-0813, “CP Indication for UL MU Transmission,” Zhigang Rong (Huawei)
      8. 11-15-0816, “Interleaver and Tone Mapper for OFDMA,” Yakun Sun (Marvell)
      9. 11-15-0817, “P Matrix for HE-LTF,” Yakun Sun (Marvell)
      10. 11-15-0819, “11ax OFDMA Tone Plan Leftover Tones and Pilot Structure,” Bin Tian (Qualcomm)
      11. 11-15-0821, “HE SIG-B Structure,” Joonsuk Kim (Apple)
      12. 11-15-0822, “SIG-A Structure in 11ax Preamble,” Jianhan Liu (MediaTek)
      13. 11-15-0823, “Preamble Design and Auto-Detection for 11ax,” Sungho Moon (Newracom)
      14. 11-15-0824, “Pilot Design for 11ax Downlink Transmissions,” Yujin Noh (Newracom)
      15. 11-15-0826, “HE-SIG-A transmission for range extension,” Jiayin Zhang (Huawei)
      16. 11-15-0827, “Considerations on HE-SIG-A and B,” Katsuo Yunoki (KDDI Labs)
      17. 11-15-0832, “Performance evaluation of SU/MU MIMO in OFDMA,” Jiayin Zhang (Huawei)
      18. 11-15-0845, “LTF Design for Uplink MU-MIMO,” Daewon Lee (Newracom)
      19. 11-15-0853, “Extensible Preamble Format Design,” Leonardo Lanante (Kyushu Institute of Technology)
      20. 11-15-0865, “Discussion of ACI performance and ACI requirements for IEEE 802.11ax,” Leif Wilhelmsson (Ericsson AB)
      21. 11-15-0868, “Impact of Frequency Selective Scheduling Feedback for OFDMA,” Hakan Persson (Ericsson)
      22. 11-15-0873, “SIG-B Encoding Structure,” Ron Porat (Broadcom)
      23. 11-15-0887, “Efficient padding for last OFDM symbol,” Heejung Yu (Newracom)
   2. Submissions (MAC) – 14 submissions … one presentation 15/880 is not uploaded and regarded as low priority submission.
      1. 11-15-0615, “DL OFDMA Bandwidth,” Liwen Chu (Marvell)
      2. 11-15-0803, “Frame Collision Information Management,” Peng Shao (NEC Communication Systems)
      3. 11-15-0831, “Broadcast and Unicast (Trigger) in DL MU,” Liwen Chu (Marvell)
      4. 11-15-0841, “Cascading Structure,” David Xun Yang (Huawei Technologies)
      5. 11-15-0851, “HE Trigger Frame Format,” John Son (WILUS Institute)
      6. 11-15-0856, “Compressed Uplink Trigger Frame,” Vida Ferdowsi (Newracom)
      7. 11-15-0871, “Efficiency enhancement for 802.11ax,” Guido R. Hiertz (Ericsson)
      8. 11-15-0872, “802.11ai and 802.11ax,” Guido R. Hiertz (Ericsson)
      9. 11-15-0874, “Minimal data rates management frame transmissions in 2.4 GHz,” Guido R. Hiertz (Ericsson)
      10. 11-15-0876, “Duration and MAC Padding for MU PPDU,” Simone Merlin (Qualcomm)
      11. 11-15-0877, “Trigger Frame Format,” Simone Merlin (Qualcomm)
      12. 11-15-0878, “Issues on Trigger Frame Retransmission,” Jinsoo Ahn (Yonsei Univ.)
      13. 11-15-0880, “Scheduled Trigger frames,” Alfred Asterjadhi (Qualcomm)
      14. 11-15-0914, “Enlarged minimal contention window size,” Guido R. Hiertz (Ericsson)
   3. Submissions (MU) – 13 submissions
      1. 11-15-0800, “Multiplexing of Acknowledgements for Multicast Transmission,” Yusuke Tanaka (Sony)
      2. 11-15-0806, “Protection for MU transmission,” Young Hoon Kwon (Newracom)
      3. 11-15-0818, “Further Analysis of Feedback and Frequency Selective Scheduling (FSS) for TGax OFDMA,” Kome Oteri (InterDigital Communication)
      4. 11-15-0829, “Uplink ACK and BA Multiplexing,” Reza Hedayat (Newracom)
      5. 11-15-0843, “UL MU OFDMA analysis,” Yonggang Fang (ZTE)
      6. 11-15-0852, “Transmission Interval of Trigger Frames,” Leonardo Lanante (Kyushu Institute of Technology)
      7. 11-15-0854, “DL OFDMA Signalling,” Tomoko Adachi (Toshiba)
      8. 11-15-0855, “How to collect STAs’ Tx demands for UL MU,” Tomoko Adachi (Toshiba)
      9. 11-15-0858, “MU BFee Interference channel feedback,” Sigurd Schelstraete (Quantenna)
      10. 11-15-0859, “A mechanism for incremental updates to MU precoding,” Sigurd Schelstraete (Quantenna)
      11. 11-15-0867, “MU-RTS/CTS for DL MU,” Po-kai Huang (Intel)
      12. 11-15-0875, “Random Access with Trigger Frames using OFDMA,” Chittabrata Ghosh (Intel)
      13. 11-15-881, “Regarding buffer status of UL-STAs in UL-OFDMA,” Woojin Ahn (Yonsei Univ.)
   4. Submissions (SR) – 8 submissions
      1. 11-15-0797, “NAV Operation for Spatial Reuse,” Yongho Seok (Newracom)
      2. 11-15-0801, “DCCA/DSC Reference Simulation Results,” Masahito Mori (Sony)
      3. 11-15-0804, “Outdoor Enterprise Scenario and DSC,” Graham Smith (SR Technologies)
      4. 11-15-0807, “DSC Summary,” Graham Smith (SR Technologies)
      5. 11-15-0811, “Topics for Consideration for Spatial Reuse,” Xiaofei Wang (InterDigital)
      6. 11-15-0882, “DSC leveraging uplink RTS/CTS control,” M. Shahwaiz Afaqui (Technical University of Catalonia)
      7. 11-15-0883, “Follow Up Discussion on The Receiver Behavior,” Yasuhiko Inoue (NTT)
      8. 11-15-0886, “DSC Calibration Results,” Chinghwa Yu (MediaTek)
   5. Submissions (TG) – 13 submissions
      1. 11-15-0754, “WLAN Packet traffic and efficiency analysis,” Jim Lansford (CSR)
      2. 11-15-0781, “Summary of Power Save Calibration Results,” Eric Wong (Apple)
      3. 11-15-0788, “Box 1 and Box 2 calibration results,” Takeshi Itagaki (Sony)
      4. 11-15-0789, “Proposed Changes to Evaluation Methodologies,” Allan Jones (Activision)
      5. 11-15-0787, “Power Save Calibration Results,” Eric Wong (Apple)
      6. 11-15-0802, “Box5 Calibration Results of SS6,” Jiyong Pang (Huawei)
      7. 11-15-0814, “Simulation Results for Box5 Calibration,” Ke Yao (ZTE)
      8. 11-15-0833, “Calibration results for PSP and UAPSD for 20, 40 and 80MHz bands,” Dmitry Akhmetov (Intel)
      9. 11-15-0680, “Reference Box5 Calibration Assumptions and Parameters,” Jiyong Pang (Huawei)
      10. 11-15-0849, “Simulation Results for Box5 Calibration,” Rongzhen Yang (Intel)
      11. 11-15-0869, “OFDMA and VoIP Capacity,” Hakan Persson (Ericsson)
      12. 11-15-0870, “802.11ax in 2.4 GHz,” Guido R. Hiertz (Ericsson)
      13. 11-15-0885, “Box 5 Calibration Results,” ChingHwa Yu (MediaTek)
3. Presentations
   1. Eric Wong (Apple) presented “Summary of Power Save Calibration,” based on the submission 11-15-0781-00.
      1. Summary
         1. This contribution summarizes the MAC calibration data from different companies, for each power save mechanism (PSM, PS-Poll, U-APSD), defined as baseline in the TGax simulation scenarios.
         2. The results of power save calibrations agree well, this provides a baseline to evaluate power efficiency of 802.11ax proposals.
         3. Spreadsheet of power save calibration results is uploaded on mentor under document IEEE 11-15-0787r0.
      2. Discussions – No discussion.
   2. Jim Lansford (CSR) presented “WLAN Packet traffic and efficiency analysis,” based on the submission 11-15-0754-00.
      1. Summary
         1. Measurement and analytical result of WLAN packets in Colorado – Boulder presented.
         2. Mostly what you would expect:
         3. Lots of 1Mbps traffic including Beacons.
         4. Lots of probe request/probe response traffic
      2. Discussions – No discussion.
   3. Alan Jones (Activision) presented “Proposed changes to Evaluation Methodologies,” based on the submission 11-15-0789-01.
      1. Summary
         1. Suggested changes contained in slide 8 of 15/789r1.
      2. Discussions – no discussions
      3. Next step
         1. Chair suggested Ron to incorporate the proposed changes into evaluation methodology document and get it approved on Thursday.
   4. Dmitry Akhmetov (Intel) presented “Calibration Results for PSP and U-APSD for 20MHz, 40MHz and 80 MHz band,” based on the submission 11-15-0833-02.
      1. Summary
         1. Additional power save calibration test results for 40MHz and 80MHz configuration and compare the results with 20MHz case.
         2. Proposed to include table from slide 3 into SS document.
      2. Discussions
         1. No discussion.
      3. Straw Poll
         1. Do you agree to include table in Slide 3 into the Simulation Scenario document?
            1. Discussion

A member asked for more time to discuss.

Straw poll deferred until PM1.

* 1. Ke Yao (ZTE) presented “Simulation Result
     1. Summary
        1. Box-5 simulation result in the simple scenario for further calibration provided.
     2. Discussions
        1. Are these results go into any other document? 🡪 Yes. Jiyong’s presentation.
  2. Rongzhen Yang (Intel) presented “Simulation Results for Box5 Calibration,” based on the submission 11-15-0849-03.
     1. Summary
        1. Box5 Calibration results (11-15/0802) show good alignment on the condition of Max.32 MPDU aggregation.
        2. However, due to obvious performance gap by MPDU aggregation, Max.64 MPDU aggregation is recommended as default condition for next Box5 calibration.
  3. Chao-Chun Wang (MediaTek) presented “Box 5 Calibration Result,” based on the submission 11-15-0885-00.
     1. Summary
        1. Box 5 simulation results by MediaTek assuming 1 BSS UL test case presented.
     2. Discussions
        1. Chair asked NOT to use names of companies.
  4. Chao-Chun Wang (MediaTek) presented “DSC Calibration Result,” based on the submission 11-15-0886-00.
     1. Summary
        1. Provide MTK’s spatial reuse calibration results based on 15/0652r1.
     2. Discussion
        1. A member asked clarification on the shadowing conditions. 🡪 Need to check.
  5. Guido Hiertz (Ericsson) presented “802.11ax in 2.4GHz,” based on submission 11-15-0870-00.
     1. Summary
        1. Following points are discussed:
           1. 2.4 GHz channel assignment
           2. Probe request frame transmissions
           3. HE STAs and 2.4 GHz channels 🡪 should be limited to 1, 6 and 11 channels.
     2. Discussions
        1. People are very interested in the direction of this discussion.
        2. There are some activities outside of the IEEE to resolve this issue. Need to understand the importance of resolving this issue in the standard. 🡪 There are many devices without interoperability certification and it is very important.
        3. Other members also expressed interest on this topic.
        4. Another member expressed concerns limiting the operating channel only to 1, 6 and 11. It will be more appropriate doing this in the revision TG.
     3. Straw Poll #1: **Do you agree to add the following to the IEEE 802.11 TGax Specification Framework?**
        1. Add to the end of Clause 6 (MAC): “The amendment shall define that HE APs **shall** not operate a primary channel on channels other than 1, 6, and 11 in the 2.4 GHz band. Non-AP HE STAs shall probe on channels 1, 6, and 11 before probing on any other channel in 2.4 GHz.”
        2. Discussion
           1. It is not clear “before probing on any other channel in 2.4 GHz” means.
           2. Another member asked about the channel bandwidth.
           3. Member suggested friendly amendment on the straw poll text.
           4. A member mentioned it is not clear what is required for the action of the devices.
        3. Result: Y/N/A = 77/6/60

1. Plans for this afternoon.
   1. Presentation – OFDMA for VoIP Capacity
   2. PHY presentations.
2. TGax ad hoc meeting adjourned @ 9:58 AM.

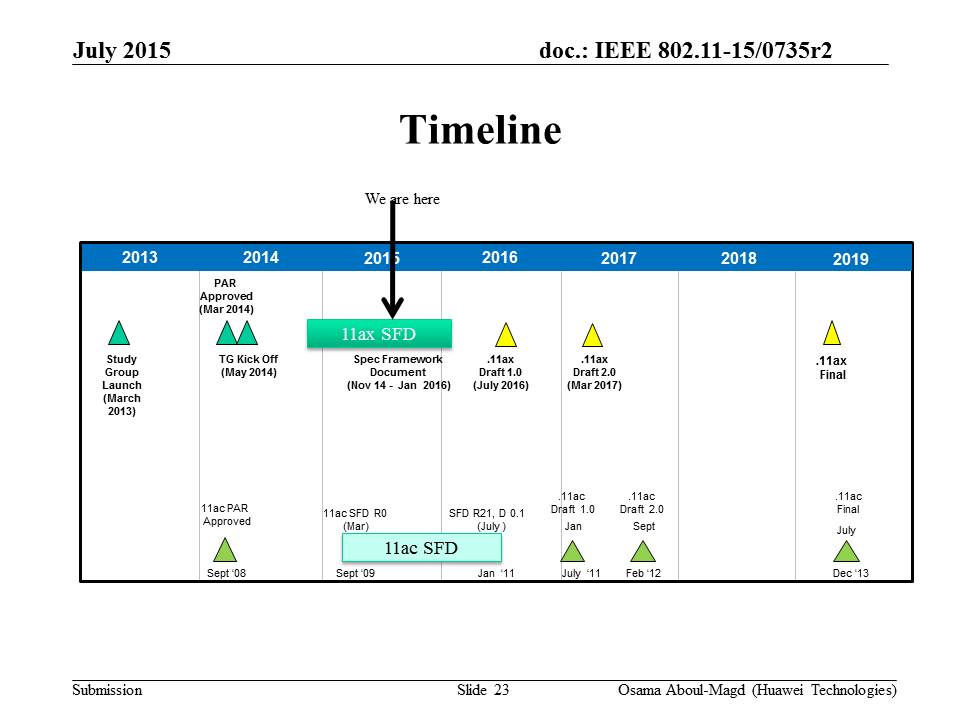
**Monday, July 13th, 2015, PM1 TGax Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of the TGax, @13:30
   1. About 160 people are in the room.
2. Announcement
   1. Agenda Doc.11-15/0735r2 on the server. Rev. 3 is the working document.
   2. Meeting Protocol: Please announce your affiliation when you first address the group during a meeting slot.
   3. Attendance reminder.
      1. The attendance server: https://imat.ieee.org/
3. The chair reviewed the mandatory 5 slides of P&P.
   1. Instructions for the WG Chair.
   2. Participants, Patents, and Duty to Inform.
   3. Patent Related Links.
   4. Call for potentially essential patents.
      1. Chair asked if anyone is aware of potentially essential patents.
      2. **No potentially essential patents reported.**
   5. Other Guidelines for IEEE WG Meetings.
4. Scheduling for the Ad Hoc Group meetings
   1. MAC: 2 sessions.
   2. SR: Tuesday PM1.
   3. PHY needs three ad hoc sessions.

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|  | Monday | Tuesday | | Wednesday | | Thursday |
| AM1 | TGax  (ad hoc) |  | |  |  | TGax |
| AM2 |  | TGax  (PHY) | TGax  (MAC) |  | |  |
| PM1 | TGax | TGax  (SR) | TGax  (MU) | TGax  (PHY) | TGax  (MAC) | TGax |
| PM2 |  |  | | TGax  (PHY) | TGax  (MU) |  |
| PM3 |  | TGax | |  | |  |

* 1. Schedule to be discussed in the evening session on Tuesday.

1. Agenda for Monday, July 13th, PM1 (13:30 – 15:30).
   1. Proposed agenda for this session
      1. Call meeting to order
      2. Patent policy, etc.
      3. Call for submissions – done
      4. Set Ad Hoc Groups schedule and approve agenda
      5. Summary from May 2015 meeting
      6. Timeline
      7. SFD review - Editor
      8. TG motions
         * Approve TG meeting and Telecon minutes since May meeting.
         * Approve the latest SFD revision
      9. Ad Hoc group Rules
      10. Presentations
      11. Recess
   2. Chair asked if there are items to add or modify on the agenda. 🡪
   3. The agenda was approved.
2. Summary from May 2015 Meeting
   1. Passed a number of PHY and MAC motions affecting the TG Specification Framework.
      1. PHY Motions: Tone Plan, STF design, SIG-B.
      2. MAC Motions: Enhancing multi-STA BA and aspects of the trigger frame
   2. Latest revision of the Specification Framework is available at;
      1. <https://mentor.ieee.org/802.11/dcn/15/11-15-0132-05-00ax-spec-framework.docx>
   3. Approved new revisions of the Evaluation Methodology TG documents.
      1. <https://mentor.ieee.org/802.11/dcn/14/11-14-0571-09-00ax-evaluation-methodology.docx>
   4. Other TG documents
      1. [https://mentor.ieee.org/802.11/dcn/14/11-14-0980-12-00ax-simulation-scenarios.docx](https://mentor.ieee.org/802.11/dcn/14/11-14-0882-04-00ax-tgax-channel-model-document.docx)
      2. <https://mentor.ieee.org/802.11/dcn/14/11-14-0882-04-00ax-tgax-channel-model-document.docx>
      3. <https://mentor.ieee.org/802.11/dcn/14/11-14-1009-02-00ax-proposed-802-11ax-functional-requirements.doc>
3. Timeline



1. SFD Review
   1. Robert Stacy, the TGax editor, explained the latest version of Specification Framework Document which is 11-15-0132-06.
      1. Discussion
         * A member asked clarification of revision number. 🡪 It is rev. 6 but the header still shows r5.
2. TG Motions
   1. **Motion: Approve TGax minutes of meetings from May 2015 interim meeting to today:** 
      1. [**https://mentor.ieee.org/802.11/dcn/15/11-15-0622-02-00ax-tgax-may-2015-vancouver-meeting-minutes.docx**](https://mentor.ieee.org/802.11/dcn/15/11-15-0309-01-00ax-tgax-march-2015-berlin-meeting-minutes.docx)
      2. [**https://mentor.ieee.org/802.11/dcn/15/11-15-0399-00-00ax-march-2015-berlin-tgax-mac-ad-hoc-meeting-minutes.docx**](https://mentor.ieee.org/802.11/dcn/15/11-15-0399-00-00ax-march-2015-berlin-tgax-mac-ad-hoc-meeting-minutes.docx)
      3. [**https://mentor.ieee.org/802.11/dcn/15/11-15-0585-00-00ax-tgax-march-2015-berlin-phy-ad-hoc-meeting-minutes.docx**](https://mentor.ieee.org/802.11/dcn/15/11-15-0585-00-00ax-tgax-march-2015-berlin-phy-ad-hoc-meeting-minutes.docx)
      4. [**https://mentor.ieee.org/802.11/dcn/15/11-15-0606-00-00ax-minutes-of-the-march-2015-meeting-of-the-ieee-802-11ax-spatial-reuse-ad-hoc-group.docx**](https://mentor.ieee.org/802.11/dcn/15/11-15-0606-00-00ax-minutes-of-the-march-2015-meeting-of-the-ieee-802-11ax-spatial-reuse-ad-hoc-group.docx)
      5. **Moved by Yasu Inoue, Seconded by Guido R. Hiertz**
      6. **Result: Motion approved with no objection.**
   2. **Motion: Move to accept document 11-15/0132r6 as the current revision of the TG Specification Framework document.**
      1. **Moved by Robert Stacy, seconded by Rakesh Taori**
      2. **Result: Motion accepted with no objection.**
3. Review Ad Hoc Group Rules
   1. A straw poll needs to achieves at least 75% at the ad-hoc level to be converted to a motion at the TG level.
   2. In the case a consensus can not be reached within an Ad Hoc group (a stalemate that prohibits further progress), the subject is moved to the Task group, if an Ad Hoc straw poll vote to move the subject to the Taskgroup achieves > 50% approval.
   3. A straw poll affecting the Spec Framework has to start with,
      1. Do you agree to add to the TG Specification Frame work document?
         * x.y.z. <feature description>
   4. For further details, please see 11-15-0075r0
   5. Minutes of the Ad Hoc group meetings will be available on mentor.
4. Straw Poll by Dimitry
   1. Straw poll about the presentation given during AM1.
   2. Discussion
      1. Inclusion of the table will be fine. The question is people are happy with the numbers on the table.
      2. A member suggested TBD for all the values on the table.
      3. A member suggested this table to be accepted for now and modify the numbers later if necessary.
   3. **Straw Poll: Do you agree to include table in Slide 3 into the Simulation Scenarios Document [1]?**
      1. **Discussions**
         * There was a request to have this straw poll later this week.
      2. **Result: This straw poll will be revisited on Thursday.**
5. Presentations
   1. Hakan Persson (Ericsson) presented “OFDMA and VoIP Capacity,” based on the submission 11-15-0869-00.
      1. Summary
         * The capacity of VoIP by introducing OFDMA for 802.11ax has been investigated. The delay and packet loss for each user is the metrics evaluated.
         * It is shown that the delay and loss are significantly reduced using OFDMA. At around 60 VoIP users/AP, the delay is reduced such that the desired value of maximum of 50 ms of delay is achieved.
         * Using OFDMA yields less channel utilisation (30%) increasing the possibility for other uses of the channel.
      2. Discussions
         * Details of OFDMA transmission of VoIP packets questioned. 🡪 Only data packets are sent in OFDMA. All uplink transmissions are single user transmissions.
         * Another member asked if the frequency selective fading is considered?
         * There was a question whether the AP uses the same access procedure? 🡪 The same procedure.
         * Clarification asked for the VoIP traffic model. 🡪 As in the simulation scenario document.
         * A member asked for clarification of delay.
   2. Hongyuan Zhan (Marvell) presented “802.11ax Preamble Design and Auto-detection,” based on the submission 11-15-0579-02.
      1. Hongyuan explained update from the previous version.
      2. Discussions
         * C (slide 17): A member commented the misdetection probability. 🡪 Need to check the detection algorithm.
         * C (slide 31): Auto-detection should be discussed in the future.
         * C: A member discussed about the false detection probability.
   3. Sungho Moon (Newracom) presented “Preamble Design and Auto-Detection for 11ax ,” based on the submission 11-15-0823-02.
      1. Summary
         * Repeated L-SIG scheme has high false detection probability for 11ac PPDUs and 11a BPSK PPDUs. 1 dB MRC gain of L-SIG is washed away when taking into account false detection issues.
         * Future extension of PPDU formats is important and should be addressed. Signature symbol scheme is preferred.
      2. Discussions
         * C (slide 8): Performance of UMi channel is very bad compared to the results of Hongyuan. --. Need double check if we use the same algorithm.
         * A member asked for clarification on the mis-detection. The impact of repetition threshold alpha is discussed.
         * Another member asked if the same value for threshold alpha was used in the simulations. The answer was yes.
   4. Straw Poll from 11-15-0579-02
      1. **Straw Poll #1: Do you support to add to the SFD as below:**

**11ax preamble shall have a 4us symbol repeating the L-SIG content, right after the legacy section.**

* + - * **This symbol shall be modulated by BPSK and rate ½ BCC.**



* + - * Discussions
      * **Result: Y/N/A = 97/34/24**
    1. **Straw Poll #2: Do you agree to add following into the SFD:**
       - **In an HE PPDU, both the first and second OFDM symbols immediately following the L-SIG shall use BPSK modulation.**

**NOTE–This is to spoof all legacy (11a/n/ac) devices to treat an HE PPDU as a non-HT PPDU.**

* + - * 1. Discussions

A member asked for the intention of this straw poll. 🡪 For the legacy STAs HE signal

* + - * 1. **Result: Y/N/A = 114/1/45**
  1. Straw Poll from 11-15-0823-02
     1. **Straw Poll: Do you agree that auto-detection design (e.g. HE PPDU preamble design) shall take into account mis- and false detection probabilities together with optimization complexity in the implementation?**
        + Discussions
          1. Mis-detection and false detection will be always considered in designing the system.
          2. Assuming this straw poll passes, what will we supposed to do? 🡪 Interested companies get together and discuss what we can do.
        + **Result: Y/N/A = 63/0/59**

1. Recess@15:28. Tuesday AM2 and PM1 will be the ad hoc sessions. TGax full session will be Tuesday PM3 (EVE).

**Tuesday, July 14th, 2015, PM3 TGax Session (19:30-21:30)**

* TGax PHY ad hoc session @ Kona 4 & 5

Agenda for the PHY ad hoc is contained in 11-15-0898

* TGax MAC ad hoc session @ Queen 5

Agenda for the MAC ad hoc is contained in 11-15-0888

**Tuesday, July 14th, 2015, PM3 TGax Session (19:30-21:30)**

* TGax Multiuser ad hoc session @ Kona 4 & 5

Agenda for the MU ad hoc session is contained in 11-15-08

* TGax Spatial Reuse ad hoc session @ Queen 5

Agenda for the SR ad hoc session is contained in 11-15-08

**Tuesday, July 14th, 2015, PM3 TGax Session (19:30-21:30)**

1. Meeting called to order by Osama Aboul-Magd, the chairperson of TGax @ 19:30.
   1. The agenda is contained in 11-15/0735r3
      1. Rev 4 is the working document.
   2. There were more than 150 people in the room.
2. Reminder
   1. Chair reminded the IEEE 802 and IEEE 802.11 Policy and Procedure.
   2. Chair asked people to state name and affiliation when addressing for the first time in the session.
   3. Chair also reminded attendance.
3. Proposed agenda for this session
   1. Proposed Agenda for Monday PM3:
      1. Call meeting to order.
      2. Reminder;
         1. IEEE 802 and 802.11 Patent policy, etc.
         2. Attendance
      3. Summary of Progress
      4. Presentations
         1. Continue with SIG-B presentations and SPs
            1. 11-15/0805r2
            2. 11-15/0821r1
            3. 11-15/0827
            4. 11-15/0873
         2. Pilot
            1. 11-15/0812
            2. 11-15/0819
            3. 11-15/0824
         3. Padding
            1. 11-15/0810
            2. 11-15/0887
      5. Recess
   2. Discussions
      1. There was an agreement to go from left side to right side. So, the order should be pilot first followed by padding.
   3. Chair asked if there is any objection to change the order of pilot and padding presentations and accept this agenda. 🡪 No objection. The agenda was accepted.
4. Summary from progress from AM2 and PM1 ad hoc sessions
   1. PHY ad hoc
      1. 5 submissions heard.
      2. 9 submissions left.
      3. One straw poll passed.
   2. MAC ad hoc
      1. Finished only two and half.
      2. One more session tomorrow.
   3. MU ad hoc
      1. Heard seven submissions. There are six more
   4. SR ad hoc
      1. Heard all submission but one.
   5. Plan for rest of the week
      1. Chair will request two more meeting slots during the WG mid-week plenary.
5. Presentations
   1. Katsuo Yunoki (KDDI Labs.) presented “Considerations on HE-SIG-A/B,” based on the submission 11-15/0827r7.
      1. Summary
         1. Considerations on HE-SIG-A and HE-SIG-B for DL-OFDMA.
         2. #1: MCS per OFDMA Resource Unit
         3. #2: Required OFDM Symbols
         4. #3: Optimization for Decoding Schemes,
      2. Discussions
         1. A member asked for a clarification of MA-Group ID on slide 9.
      3. Straw Polls – to be taken later.
   2. Sriram Venkateswaran (Broadcom) presented “SIG-B Encoding Structure,” based on the submission 11-15/0873r0.
      1. Summary
         1. SIG-B encoding structure in time and frequency domains Proposed.
            1. Simple extensions of SIG-A design structure that do not require fundamentally more complex or different encoding/decoding
            2. Flexible design operating in the bit domain
      2. Discussions
         1. A member asked for the reason of using full bandwidth for SIG-B.
         2. This structure is beneficial in an environment with severe interference.
         3. The member is still concerned about the overhead.
6. Straw Polls on SIG-B
   1. **11-15/0821r2**
      1. **Straw Poll #1: Do you agree to add to 11ax SFD that HE SIG-B does NOT have any OFDM symbol duplicated in each 20 MHz of the PPDU bandwidth?**
         1. **Discussion**
         2. **Result: Y/N/A = 91/0/35**
      2. **Straw Poll #2: Do you agree to add to 11ax SFD that HE SIG-B has the common field followed by the user-specific field, where** 
         * **The common field includes the information for all of designated STAs to receive the PPDU in corresponding bandwidth**
         * **The user-specific field consists of multiple sub-fields that do not belong to the common field, where one or multiple of those sub-fields are for each designated receiving STA**
         * **The boundary between the common & the user-specific field is in the bit-level, not the OFDM symbol boundary**
         1. **Discussion**
         2. **Result: Y/N/A = 90/0/41**
      3. **Straw Poll #3: Do you agree to add to 11ax SFD that the common field in HE SIG-B contains Resource Unit (RU) allocation?**
         1. **Discussion**
         2. **Result: Y/N/A = 96/1/30**
   2. **Straw Polls from 15/0827r2**
      1. **Straw Poll #1: Do you agree to add the following text into 11ax SFD?**

**3.2.3 HE-SIG-B**

**HE-SIG-B includes resource unit assignment and MCS per resource unit for DL-OFDMA PPDU.**

* + - 1. Discussions
         1. Suggested change: resource unit 🡪 STA
      2. **Result: Y/N/A = 52/0/63**
    1. **Straw Poll #2: Do you agree to add the following text into 11ax SFD?**

**3.2 HE preamble**

**3.2.1 General**

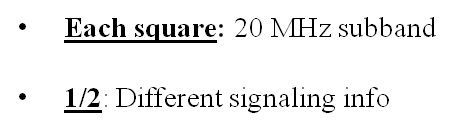
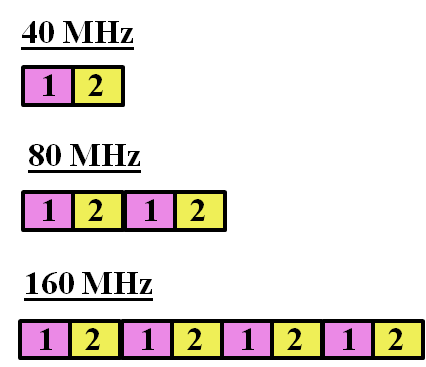
**Sub-band selection measure is provided in HE-SIG-A or HE-SIG-B for DL-OFDMA PPDU reception.**

**Note: It is necessary to study appropriate position of that information.**

* + - 1. Discussions
         1. A member asked for clarification of sub-band. The member is still not clear the intention of this straw poll.
      2. **Result: Y/N/A = 1/33/68**
  1. **Straw Polls from 15/0873r0**

**Straw Poll #1: Do you support the following: SIG-B is encoded on a per-20 MHz basis using BCC, with common and user blocks separated in the bit domain?**

* + - 1. Discussions
      2. **Result: Y/N/A = 82/0/49**
    1. **Straw Poll #2: Do you support the following: for bandwidths ≥ 40 MHz, the number of 20MHz subbands carrying different content is two and with structure as shown**

****

* + - 1. Discussions
      2. **Result: Y/N/A = 75/0/52**

1. Presentations on pilot
   1. Sameer Vermani (Qualcomm) presented “Pilot Design for Data Section,” based on the submission 11-15/0812r1
      1. Summary
         1. It is natural to use 802.11ac single stream pilots for SU and DL/UL OFDMA PPDUs.
         2. The performance benefit of MIMO pilots over SSP is fairly minimal.
         3. Recommend using Single stream pilots (as in 11ac) in data section for all transmission modes of 802.11ax.
      2. Discussions
         1. A member asked a question about the CSD.
         2. Another member would like to see the simulation results.
      3. **Straw Poll #1: Do you agree to add the following text to the TGax spec framework document:**
         * **“All 802.11ax PPDUs shall have single stream pilots in the data section**

* **All streams use the same pilot sequence even in UL MU-MIMO”**
  + - * 1. **Discussions**
        2. **Result: Y/N/A = 81/4/45. 🡪 The straw poll will be converted to a motion.**
  1. Bin Tian (Qualcomm) presented “11ax OFDMA Tone Plan Leftover Tones and Pilot Structure,” based on the submission 11-15/0819r1
     1. Summary
        1. 11ax OFDMA tone plan was decided in IEEE May 2015 meeting except the location of leftover tones.
        2. A balanced leftover tone placement plan for 11ax Pilot design and structure proposed.
        3. Different CFO tracking approaches in 11ax preamble are compared and the solution of using single stream pilots (like in 11ac) in HE-LTF is recommended.
     2. Discussions
        1. A member expressed a concern that the channel interpolation loss could be changed depending on how to choose the RU.
        2. Proposed Pilot Location in slide 24: pilot location of HE80 is not the same as the pilot location of HE40. 🡪 HE40 and HE80 have different designs.
     3. **Straw Poll #1: Do you agree to add the following in 11ax SFD?**
        1. **The left over tones location for 20/40/80 MHz tone plan are shown in the diagrams as in slide 11?** 
           1. **Note: Leftover tones have zero energy**
        2. **Result: Y/N/A = 93/0/28**
     4. **Straw Poll #2: Do you agree to add to the following to 11ax SFD?**
* **Single stream pilot (like 11ac) in HE-LTF shall be used for SU, DL and UL OFDMA as well as in DL MU-MIMO transmissions**
  + - 1. **Discussion:**
      2. **Result: Y/N/A = 92/0/31**
    1. **Straw Poll #3: Do you agree to add the following to 11ax SFD?**
* **All pilot tones in 4x data OFDMA symbol are at even indices**
* **If pilots present in 4x HE-LTF, their tone indices shall be the same as those pilots in 4x data symbol**
* **If pilots present in 2x HE-LTF, their tone indices shall be the same as the indices of those pilots in 4x data symbol divided by 2**
  + - 1. **Discussion:**
      2. **Result: Y/N/A = 94/0/31**
    1. **Straw Poll #4: Do you agree to add the following to the 11ax SFD:**
       - **The pilot location for 20/40/80MHz bandwidth are as shown in the diagrams in slide 24** 
         * **Note: 80MHz pilot positions are enumerated below for reference**

**RU-26 pilots: ±10, ±24, ±38, ±50, ±64, ±78, ±92, ±104, ±118, ±130, ±144, ±158, ±172, ±184, ±198, ±212, ±226, ±238, ±252, ±266, ±280, ±292, ±306, ±320, ± 334, ±346, ±360, ±372, ±386, ±400, ±414, ±426, ±440, ±454, ±468, ±480, ± 494**

**RU-106/242/484 pilots: ±24, ±50, ±92, ±118, ±158, ±184, ±226, ±252, ±266, ±292, ±334, ±360, ±400, ±426, ±468, ±494**

**RU-996 pilots: ±24, ±92, ±158, ±226, ±266, ±334, ±400, ±468**

* + - * **The pilot locations for 160MHz or 80+80 use the same structure as 80MHz for each half of the BW**
      1. **Discussions**
      2. **Result: Y/N/A = 90/0/34**

1. Plans for tomorrow
   1. Ad hoc session during PM1 and PM2.
   2. Chair to request additional meeting slots during the mid-week plenary.
2. Recess @ 21:26 until Wednesday PM1 for ad hoc sessions.

**Wednesday, July 15th, 2015, PM1 TGax Ad Hoc Session (10:30-12:30)**

* PHY ad hoc @ Monarchy meeting room
  + Agenda: 11-15-0898-02
* MAC ad hoc @ Queen 5 meeting room
  + Agenda: 11-15-0888-01

**Wednesday, July 15th, 2015, PM2 TGax Ad Hoc Session (16:00-18:00)**

* PHY ad hoc @ Monarchy meeting room
  + Agenda: 11-15-0898-02
    - Three presentations left.
* Multiuser (MU) ad hoc @ Queen 5 meeting room
  + Agenda: 11-15-0899-01

**Thursday, July 16th, 2015, AM1 TGax Session (8:00-10:00)**

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), chair of TGax, @ 8:03.
   1. The agenda document 11-15/0735r4 is on the server.
      1. Rev 5 is the working document.
         1. Rev4 is exactly the same as r5 shown on the screen.
         2. Rev 4 contains motions and the chair asked to check if they are correct.
      2. There were 190+ people in the room.
2. Administrative Items
   1. Chair reminded the IEEE 802 and IEEE 802.11 Policy and Procedures.
   2. Chair asked people to state name and affiliation when addressing for the first time.
   3. Chair also reminded people to do attendance.
3. Agenda setting
   1. Proposed agenda for this session:
      1. Meeting call to order
      2. Reminder
         1. IEEE 802 and IEEE 802.11 P&P.
         2. Attendance
      3. Presentations
         1. Continue with the remaining presentations from the ad hoc
         2. PHY - 3
         3. MU - 2
         4. SR -1
         5. MAC - 6
      4. Recess
   2. Motions will start not before PM1.
   3. Chair asked if there is any objection to proceed with this agenda. No objection.
      1. The agenda for Thursday AM1 was approved.
4. Presentations
   1. Leonardo Lanante (Kyushu Institute of Technology) presented “Extensible Preamble Format Design,” based on the submission 15/0853r1.
      1. Summary:
         1. Proposed to create a new preamble format that is efficient and straightforward extensible for future PHY amendments.
      2. Discussions
         1. No question.
      3. **Straw Poll #1: Do you support the idea that the preamble format and autodetection of 11ax shall be directly extensible for future 802.11 extensions.**
         1. **Result: Y/N/A = 16/0/many**
      4. **Straw Poll #2: Do you agree to add the following to 11ax SFD:**

**The HE PPDU shall include a TBD number of format indication bits in HE-SIG-A Field.**

* + - 1. **Discussions**
         1. **Need simulation result to understand the benefit of the proposed scheme.**
         2. **A member expressed a concern on the indication of format.**
         3. **Some other members expressed concerns about the number of bits to indicate the format.**
         4. **It is too early for us to commit the number of indication bits.**
      2. **Result: Y/N/A = 9/24/57**
  1. Leif Wilhelmsson (Ericsson) presented “Discussion of ACI performance and ACI requirements for IEEE 802.11ax,” based on the submission 15/0865r0.
     1. Summary:
        1. Discusses the need for inclusion of ACS and a possible way to do so.
        2. ACI performance for 802.11ax is expected to be limited by ACS rather than ACLR for most cases.
        3. Competing technologies are considerably better. It is possible to decrease this gap e.g. by having more stringent radio requirements for APs with high TX power
     2. Discussions
        1. Q (slide 4): A member asked if double size FFT have been considered for the receiver side. Performance will be improved by over sampling.
        2. Q: Another member asked how ACI test is done for LTE. 🡪 Not sure.
     3. **Straw Poll #1: Should ACI performance be included in Evaluation Methodology Document?**
        1. **Discussions – No discussion**
        2. **Result: Y/N/A = 45/0/53**
     4. **Straw Poll #2: Would it be desirable to have different radio requriements (ACLR and ACS) for high TX power APs and non-AP STAs if this results in better performance?**
        1. **Discussions – No discussion**
        2. **Result: Y/N/A = 19/1/64**
  2. Hakan Persson (Ericsson) presented “Impact of Frequency Selective Scheduling Feedback for OFDMA,” based on the submission 15/0868r0.
     1. Summary:
        1. The impact of choice of feedback for frequency selective scheduling (FSS) has been evaluated.
        2. Three feedback options were used for evaluation purpose by simulations and compared to a baseline of no FSS used.
        3. The results show that UL-OFDMA is needed to obtain FSS gain.
     2. Discussions:
        1. Q (slide 7): A member asked which part of the frame is assumed to be measured to create the feedback. 🡪 The same as the beamforming feedback procedure, but need to be confirmed.
        2. Q (slide 6): UL OFDMA is used for the feedback. How the UL OFDMA transmissions are scheduled? 🡪 Conventional scheme is adopted (?)
  3. Tomo Adachi (Toshiba) presented “DL OFDMA Signalling,” based on the submission 15/0854r1.
     1. Summary:
        1. This presentation discusses how to inform RU allocation for DL OFDMA.
        2. The authors want to confirm group’s intention toward some of the points, such as
           1. possibility of non-contiguous RU allocation
           2. how to cope with the large number of RUs
     2. Discussions
        1. C (slide 4): For SP#1, continuous allocation is strongly recommended.
        2. Q: Any views on how to allocate non-contiguous RU? 🡪 Not right now.
        3. C: A member mentioned this is right direction.
     3. **Straw Poll #1: Do you think we should be able to express non-contiguous RU allocation?**
        1. **Discussion:**
        2. **Result: Y/N/A = 46/22/34**
     4. **Straw Poll #2: Do you think we need to re-define SIG-A field for DL-OFDMA from the current format specified for DL-MU-MIMO?**
        1. **Maximum number of RUs cannot be expressed in 3 bits of the current MU[*u*] NSTS field.**
        2. **Discussion:**
           1. **This straw poll is asking GID part of the SIG-A field.**
           2. **Since SIG-A for 802.11ax has not been defined, it is not clear what is really questioned.**
        3. **Result: This straw poll was skipped after discussions.**
     5. **Straw Poll #3: Do you think the Group ID concept in 802.11ac is still applicable for 802.11ax?**
        1. **Discussion: No discussion: No discussion.**
        2. **Result: Y/N/A = 16/1/95**
     6. **Straw Poll #4:** 
        1. **Discussion: There are two questions in this straw poll 🡪 straw poll text was modified by removing the first bullet.**
        2. **Result: Y/N/A = 3/22/85**
     7. **Straw Poll #5:** 
        1. **Discussion:**
           1. **Is it already allowed? 🡪 People have different opinions.**
        2. **Result: Y/N/A = 80/0/38**
  4. Tomo Adachi (Toshiba) presented “How to collect STAs’ Tx demands for UL MU,” based on the submission 15/0855r0.
     1. Summary:
        1. For the trigger frame to specify the PPDU duration of UL-MU, AP may want amount of buffered data at STAs and 1 bit “More Data” field is not enough.
        2. Reviewing QoS Control field, AP PS Buffer State subfield has the best fit, but in the current definition, that can’t be used for non-AP STAs.
        3. Also the current unit size and its upper limit was questioned.
     2. Discussion:
        1. C (slide 4): A member expressed a concern on the way to notify the need for transmission to the AP.
        2. Q:
        3. Q: Will QoS control be the only way to notify the buffer status to the AP? 🡪 This is one of the way, but there might be other ways.
     3. Straw Polls to be conducted after the break.

**Thursday, July 16th, 2015, AM2 TGax Session (10:30-12:30)**

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), chair of TGax, @ 10:30.
   1. The agenda document 11-15/0735r4 is on the server.
      1. Rev 5 is the working document.
      2. There were 190+ people in the room.
2. Administrative Items
   1. Chair reminded the IEEE 802 and IEEE 802.11 Policy and Procedures.
   2. Chair asked people to state name and affiliation when addressing for the first time.
   3. Chair also reminded people to do attendance.
3. Agenda setting
   1. Proposed agenda for this session:
      1. Meeting call to order
      2. Reminder
         1. IEEE 802 and IEEE 802.11 P&P.
         2. Attendance
      3. Presentations
         1. Continue with the remaining straw polls and presentations from the ad hoc
         2. MU – straw polls
         3. SR - 1 presentation
         4. MAC – 6 presentations
      4. Recess
   2. Chair asked if there is any objection to proceed with this agenda. No objection.
      1. The agenda for Thursday AM2 was approved.
4. Straw Polls
   1. 15/855 by Tomo Adachi
      1. **Straw Poll: Which option do you prefer for indicating the buffer load?**

**Option 1: Modifying the current definition of the QoS Control field (bits 8-15)**

**Option 2: HEW-Variant of the HT Control field**

**Option 3: New HEW Control field**

* + - 1. **Discussion:**
      2. **Result: Option 1/Option 2/Option 3/Abstain = 15/1/3/49**
  1. Straw Poll on 15/0829r3 by Reza
     1. **Straw Poll #1: Do you agree to add the following to 11ax SFD:**

**4.x Multi-user (MU) features**

**The HE SIG-B of a DL MU PPDU may carry an indication of the frame length of the response ACK/BA frames, and may carry the information that enables sub-band assignment for the response ACK/BA frames.**

* + - 1. Discussion:
         1. Would like to understand what is the reason to contain this information in SIG-B field. 🡪 For robustness and
         2. Would like to understand the intention of having multiple straw poll. Commenter would like to understand if all of these features should be in the spec.
      2. **Result: Y/N/A = 29/26/50**
    1. **Straw Poll #2: Do you agree to add the following to 11ax SFD:**

**4.x Multi-user (MU) features**

**In each payload within a DL MU PPDU a Trigger frame may be present that carries the information that enables the recipient of the STA to send its ACK/BA response frame after a TBD IFS after the DL MU PPDU**

* + - 1. Discussion:
      2. **Result: Y/N/A = 30/1/70**
    1. **Straw Poll #3: Do you agree to add the following to 11ax SFD:**

**4.x Multi-user (MU) features**

**An HE STA that responds with an UL MU PPDU to a DL MU PPDU or Trigger frame shall set the GI of the UL MU PPDU to the same GI value as the preceding frame, and shall set the HE-LTF symbol duration of the UL MU PPDU to the same HE-LTF symbol duration as the preceding frame.**

* + - 1. Discussion:
      2. **Result: Y/N/A = 21/22/55**

1. Presentation - SR
   1. Yasu Inoue (NTT) presented “Follow up discussion on the receiver behavior,” based on the submission 15/0883r2.
      1. Summary:
         1. The CCA mechanism needs to be enhanced to evaluate if the received signal is from the same BSS or not to improve the spectrum efficiency.
         2. Simulation results show potential benefit of introducing this technique based on BSS identifier.
         3. Transmission criteria also need to be investigated to combine this technique with DSC.
      2. Discussions
         1. Simulation scenario need to be improved to assess the benefit of DSC.
2. Presentation - MAC
   1. Simone Merlin (Qualcomm) presented “Duration and MAC Padding for MU PPDUs,” based on the submission 15/0876r0.
      1. Summary:
         1. The TGax SFD incudes initial specifications for the UL and DL MU OFDMA/MIMO operation.
         2. Proposed that the transmission to/from all the STAs in an MU PPDU end at the same time.
         3. A-MPDU MAC padding to be done according to the 11ac procedure.
      2. Discussion:
         1. C: Clarification asked for the 802.11ac padding procedure if it is PHY padding or MAC padding.
         2. C: This relates to the pre-FEC padding.
         3. C: A member commented about the impact of this proposal on the 2MHz bandwidth transmissions. Potential risk of introducing more hidden node problem.
         4. C: For the UL MU PPDU transmissions, AP may not know length of PPDU and padding may cause big overhead.
      3. **Straw Poll #1: Do you agree that**

* **The transmission for all the STAs in a DL MU (MIMO, OFDMA) PPDU shall end at the same time.**
* **The A-MPDU padding per each STA follows the 11ac procedure**
  + - 1. Discussion:
      2. **Result: Y/N/A = 94/0/30**
    1. **Straw Poll #2: Do you agree that**
* **The transmission for all the STAs in a DL MU (MIMO, OFDMA) PPDU shall end at the same time.**
* **The transmission from all the STAs in an UL MU PPDU shall end at the time indicated in Trigger frame.**
* **The A-MPDU padding per each STA follows the 11ac procedure**
  + - 1. Discussion:
      2. **Result: Y/N/A = 99/0/28**
  1. Guido R. Hiertz (Ericsson) presented “Efficiency enhancement for 802.11ax,” based on the submission 15/0871r2.
     1. Summary:
        1. This material was presented in the MAC ad hoc. Some straw polls are left due to time constraint.
        2. Related parts of remaining straw polls were presented, e.g. BSS Load element, Channel Usage Information and Multiple BSSID element.
     2. Discussions:
     3. Straw Poll
        1. **Straw Poll #5: Do you believe that adding the following to the IEEE 802.11 TGax Specification Framework would be helpful?**
           1. Discussion:

Do you intend to create new information element? 🡪 No.

A commenter disagrees with this proposal.

Current BSS Load parameter contains various information. However it is too early to decide.

* + - * 1. **Result: Y/N/A = 74/2/42**
      1. **Straw Poll #6: Do believe that adding the following to the IEEE 802.11 TGax Specification Framework would be helpful?**

**“HE STAs shall implement Channel Usage procedures.”**

* + - * 1. Discussion:

It is way too early to decide this. 🡪 This is only asking the preference of people.

* + - * 1. **Result: Y/N/A = 14/9/89**
      1. **Straw Poll #7: Do believe that adding the following to the IEEE 802.11 TGax Specification Framework would be helpful?**

**“HE STAs shall implement Channel Usage procedures.”**

* + - * 1. Discussion:
        2. **Result: Y/N/A = 15/11/99**
  1. Guido R. Hiertz (Ericsson) presented “802.11ai & 802.11ax,” based on the submission 15/0872r0.
     1. Summary:
        1. Proposed to adopt 802.11ai with 802.11ax
           1. In dense deployments, management traffic becomes a severe issue
           2. Several submissions revealed a high amount probe frame traffic
           3. 802.11ai provides means to reduce probe frame traffic
     2. Discussion:
        1. C: If no change will be made for 802.11ai amendment, it is not necessary.
        2. Q: A member expressed a concern to adopt whole set of 802.11ai.
     3. **Straw Poll: Do you agree to add the following to the IEEE 802.11 TGax Specification Framework?**

**Add to the end of Clause 6 (MAC): “The amendment shall define a HE STA to be a FILS STA.”**

* + 1. **Result: Y/N/A = 38/34/35**
  1. Guido R. Hiertz (Ericsson) presented “Minimal data rates management frame transmissions in 2.4 GHz,” based on the submission 15/0874r0.
     1. Summary:
        1. Propose to encourage HE STAs to transmit management frames at higher data rates than used today.
     2. **Straw Poll: Do you agree to add the following to the IEEE 802.11 TGax Specification Framework?**

**Add to the end of Clause 6 (MAC): “In 2.4 GHz HE STAs should send beacon and probe (request & response) frames at rates ≥ 5.5 Mb/s.”**

* + - 1. Discussion
         1. This is something required in 11ai.
      2. **Result: Y/N/A = 44/13/58 🡪 to be converted into a motion.**
  1. Jiyong Pang (Huawei) presented “Box 5 Calibration Results,” based on the submission 15/0802r1.
     1. Summary
        1. Calibration results of participants – close to alignment.
        2. See some differences in some results.
        3. 15/680r3 contains the latest simulation parameters.
     2. Discussion:
        1. No discussion.

1. Recess @ 12:26 until PM1 today.

**Thusday, July 16th 2015, PM1 Session (13:30 - 15:30 PM)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of TGax, @13:30.
   1. Agenda 11-15/0735r4 is on the server. Rev 5 still is working document.
   2. There were 180+ people in the room.
2. Administrative Items
   1. Chair reminded the IEEE 802 and IEEE 802.11 P&P.
   2. Chair asked people to state name and affiliation when addressing for the first time in the session.
   3. Attendance!
3. Agenda for today’s session
   1. Thursday PM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance
      3. Presentations (if necessary)
         1. 11-15/0880
         2. 11-15/0914
      4. Start of TG Motions
      5. Recess
   2. Chair asked if there are any modifications to the agenda for PM1.
   3. Agenda for PM1 approved without objections.
4. Presentation
   1. Alfred (Qualcomm) presented “Scheduled Trigger Frames,” based on 15/0880r2
      1. Summary
         1. Trigger frame scheduling with TWT signaling discussed.
         2. Implicit TWT operation for 11ax which enables solicited TWT and broadcast TWT suggested.
         3. The proposed Trigger TWT procedure inherits the power saving properties of the TWT protocol.
      2. Discussions
         1. What will happen if TWT is overlapped with other transmission? 🡪 No big impact.
         2. This proposal comes mostly from 802.11ah spec. Would you like to keep the specification of 802.11ah? 🡪 Basically yes, but it is up to the group.
      3. **Straw Poll #1: Do you support to add the following text in the SFD:**

**The spec shall include a mechanism that allows a target transmission time for a Trigger frame to be indicated. The mechanism is based on implicit TWT operation and additionally enables:**

* **Broadcast triggered TWT by including a TWT element in the Beacon**
* **Solicited triggered TWT by using implicit TWT negotiation procedure**
  + - 1. Discussion:
      2. **Result: Y/N/A = 90/1/56**
    1. **Straw Poll #2: Do you support to add the following text in the SFD:**

**When the broadcast triggered TWT is enabled, STA and AP may exchange TWT request/response to indicate the target Beacon frame to be monitored by the PS STA.**

* + - 1. Discussion: No discussion.
      2. **Result: Y/N/A = 95/1/51 🡪 to be converted into a motion.**
  1. Guido R. Hiertz (Ericsson) presented “Enlarged minimal contention window size,” based on 15/0914r1
     1. Summary
        1. 802.11 OFDM PHYs foresee a minimal Contention Window size of 15.
        2. With many stations contending for access to the wireless medium (WM), this initial Contention Window might be too small.
        3. A simple approach is presented that increases the number of contention slots without impacting any performance relevant aspects.
     2. Discussion
        1. Feasibility of reducing aSlotTime of OFD PHY to 4.5 us, questioned. 🡪 Further study.
        2. Concerned about the impact on energy detect time, unfairness for the legacy devices, etc.
        3. Another member also concerned about having reduced SlotTime value. 🡪 Simulation to evaluate coexistence with legacy devices encouraged. The presenter is happy to provide it in the future meeting.
        4. The relation between the SIFS and SlotTime is just one aspect. Need to think about the relations between other parameters.

1. TG Motions
   1. **PHY Motions**
      1. **PHY Motion #15: Move to add the following into the SFD:**

**In an HE PPDU, both the first and second OFDM symbols immediately following the L-SIG shall use BPSK modulation.**

**NOTE–This is to spoof all legacy (11a/n/ac) devices to treat an HE PPDU as a non-HT PPDU.**

* + - 1. **Moved by: Hongyuan Zhang, Seconded by Simone Merlin.**
      2. **Discussions: No discussions.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #16: Move to add to 11ax SFD that HE-SIG-A is present in all 11ax packets and is two OFDM symbols long when it uses MCS0?**
       1. **Moved by Jianhan Liu, Seconded by Simone Merlin**
       2. **Discussion: No discussion.**
       3. **Result: Motion accepted with no objection.**
    2. **PHY Motion #17: Move to add to 11ax SFD:**
* **the data field in UL Multi-user transmissions shall immediately follow the HE-LTF section**
  + - 1. **Moved by Jianhan Liu, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #18: Move to add to 11ax SFD:**

**HE SIG-B does NOT have any OFDM symbol duplicated in each 20 MHz of the PPDU bandwidth**

* + - 1. **Moved by Joonsuk Kim, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #19: Move to add to 11ax SFD:**

**HE SIG-B has the common field followed by the user-specific field, where**

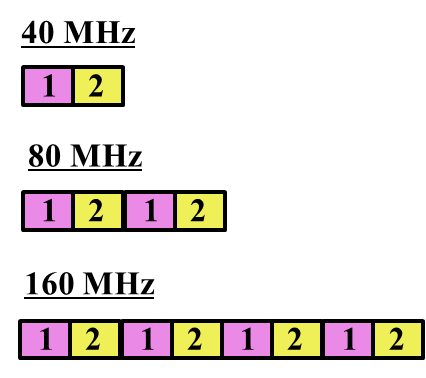
* + **The common field includes the information for all of designated STAs to receive the PPDU in corresponding bandwidth**
  + **The user-specific field consists of multiple sub-fields that do not belong to the common field, where one or multiple of those sub-fields are for each designated receiving STA**
  + **The boundary between the common & the user-specific field is in the bit-level, not the OFDM symbol-level**
    - 1. **Moved by Joonsuk Kim, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #20: Move to add to 11ax SFD:**

**The common field in HE SIG-B contains Resource Unit (RU) allocation.**

* + - 1. **Moved by Joonsuk Kim, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #21: Move to add the following text into 11ax SFD:**

**3.2.3 HE-SIG-B**

* + **HE-SIG-B includes resource unit assignment and MCS per station for DL-OFDMA PPDU.**
    - 1. **Moved by Katsuo Yunoki, Seconded by Simone Merlin**
      2. **Discussion: Friendly amendment on the motion text.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #22: Move to add the TGax SFD:**
  + **HE-SIG-B is encoded on a per-20 MHz basis using BCC, with common and user blocks separated in the bit domain**
    - 1. **Moved by Sriram Venkateswaran, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #23: Move to add the TGax SFD:**
  + **for bandwidths ≥ 40 MHz, the number of 20MHz subbands carrying different content is two and with structure as shown**

****

* **Each square: 20 MHz subband**
* **1/2: Different signaling info**
  + - 1. **Moved by Sriram Venkateswaran, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #24: Move to add the following text to the TGax spec framework document:**

**“All 802.11ax PPDUs shall have single stream pilots in the data section**

* + **All streams use the same pilot sequence even in UL MU-MIMO”**
    - 1. **Moved by Bin Tian, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #25: Move to add the following to the 11ax SFD:**

**The left over tones location for 20/40/80 MHz tone plan are shown in the diagrams as in slide 11 (11-15/0819r1)**

**Note: Leftover tones have zero energy**

* + - 1. **Moved by Bin Tian, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #26: Move to add the following to the 11ax SFD:**

**Single stream pilot (like 11ac) in HE-LTF shall be used for SU, DL and UL OFDMA as well as in DL MU-MIMO transmissions**

* + - 1. **Moved by Bin Tian, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #27: Move to add the following to the 11ax SFD:**

**- All pilot tones in 4x data OFDMA symbol are at even indices**

**- If pilots present in 4x HE-LTF, their tone indices shall be the same as those pilots in 4x data symbol**

**- If pilots present in 2x HE-LTF, their tone indices shall be the same as the indices of those pilots in 4x data symbol divided by 2**

* + - 1. **Moved by Bin Tian, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #28: Move to add the following to the 11ax SFD:**

**- The pilot location for 20/40/80MHz bandwidth are as shown in the diagrams in slide 24**

* + - **Note: 80MHz pilot positions are enumerated below for reference**
      * **RU-26 pilots: ±10, ±24, ±38, ±50, ±64, ±78, ±92, ±104, ±118, ±130, ±144, ±158, ±172, ±184, ±198, ±212, ±226, ±238, ±252, ±266, ±280, ±292, ±306, ±320, ± 334, ±346, ±360, ±372, ±386, ±400, ±414, ±426, ±440, ±454, ±468, ±480, ± 494**
      * **RU-106/242/484 pilots: ±24, ±50, ±92, ±118, ±158, ±184, ±226, ±252, ±266, ±292, ±334, ±360, ±400, ±426, ±468, ±494**
      * **RU-996 pilots: ±24, ±92, ±158, ±226, ±266, ±334, ±400, ±468**
  + **The pilot locations for 160MHz or 80+80 use the same structure as 80MHz for each half of the BW**
    - 1. **Moved by Bin Tian, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #29: Move to add the TGax SFD:**
  + **- in an OFDMA PPDU, using *N* HE-LTF symbols, an RU with *Nsts,total* shall use the first *Nsts,total* rows of the *N × N* P matrix**
    - 1. **Moved by Yakun Sun, Seconded by Simone Merlin**
      2. **Discussion: Friendly amendment.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #30: Move to add the following text into 11ax SFD:**
  + **“LDPC is the only coding scheme in the 11ax Data field for allocation sizes 996 tones and 996\*2 tones.”**
    - 1. **Moved by Hungyuan Zhan, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #31: Move to add the following text into 11ax SFD:**
* **Support of BCC code is limited to less than or equal to four spatial streams (per user in case of MU-MIMO), and is mandatory (for both TX and RX) for RU sizes less than or equal to 242 tones (20MHz).**
* **Support of BCC code is limited to less than or equal to four spatial streams (per user in case of MU-MIMO), and is mandatory (for both TX and RX) for RU sizes less than or equal to 242 tones (20MHz).**
  + - 1. **Moved by Hungyuan Zhan, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #32: Move to add the following text into 11ax SFD:**
* **11ax MCS table shall not have any MCS exclusion, and when LDPC is applied, NDBPS is computed as follows**



* + - 1. **Moved by Hungyuan Zhan, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. PHY Motion #33: **Move to add the TGax SFD:**
* **The BCC interleaver and LDPC tone mapper parameters to be defined in the table**

|  |  |  |  |
| --- | --- | --- | --- |
| **RU (tones)** | **BCC** | | **LDPC** |
| **Ncol** | **Nrot** | **DTM** |
| **26** | **8** | **2** | **1** |
| **52** | **16** | **11** | **3** |
| **106** | **17** | **29** | **6** |
| **242** | **26** | **58** | **9** |
| **484** |  | | **12** |
| **996** |  | | **20** |

* + - 1. **Moved by Yakun Sun, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #34: Move to add the following text into 11ax SFD**

**- 3.y.z CP length of UL OFDMA/MU-MIMO transmission shall be explicitly indicated by AP in the Trigger frame that allocates resources for the UL OFDMA/MU-MIMO transmission. The value of CP length for all users addressed by the Trigger frame shall be the same.**

* + - 1. **Moved by Zhigang Rong, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **PHY Motion #35: Move to add the TGax SFD**

**- the MU-MIMO shall only be supported on allocations sizes>=106 tones**

* + - 1. **Moved by Jiyong Pang, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
  1. **MU Motions**
     1. **MU Motion #6: Move to add to the TG Specification Frame work document**

**x.y.z. *The spec shall define a frame that solicits simultaneous CTS responses from multiple STAs to protect DL MU transmission***

* + - 1. **Moved by Po-kai Huang, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MU Motion #7: Move to add to the TG Specification Frame work document**

**x.y.z. *The scramble seed of simultaneous CTS is same as the scramble seed of the frame which triggers simultaneous CTS. The transmission rate of simultaneous CTS shall use the primary rate based on the rate or MCS of the frame that triggers simultaneous CTS.***

* + - 1. **Moved by Po-kai Huang, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MU Motion #8: Move to add to the spec framework**

***The spec shall define a Trigger frame that allocates resources for random access.***

* + - 1. **Moved by Chittabrata Ghosh, Seconded by Simone Merlin**
      2. **Discussion: No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MU Motion #9: Move to add to the TG Spec Framework**

***4.x.y The amendment shall include a CSI feedback mechanism which allows for a minimum feedback granularity of less than 20 MHz.***

* + - 1. **Moved by Kome Oteri, Seconded by Simone Merlin**
      2. **Discussion:**
         1. **Clarification is required how to return the feedback. 🡪 Using a BW less than 20 MHz.**
      3. **Result: Motion accepted with no objection.**
    1. **MU Motion #10: Move to add to the TG Spec Framework**

**- 11ax shall define a mechanism to feedback information on the channel measured at the receiver for users other than the intended recipient from the BFee to the transmitter**

* + - 1. **Moved by Sigurd, Seconded by Guido Hiertz**
      2. **Discussion:**
         1. **The idea looks fine, but want more time for better understand of this proposal. 🡪 Fair request.**
         2. **Chair asked if there is any objection to table this motion. 🡪 No objection.**
      3. **Result: Motion tabled.**
    1. **MU Motion #11: Move to add the following to 11ax SFD:**

**4.x Multi-user (MU) features**

**In each payload within a DL MU PPDU a Trigger frame may be present that carries the information that enables the recipient of the STA to send its ACK/BA response frame after a TBD IFS after the DL MU PPDU**

* + - 1. **Moved by Reza Hedayat, Seconded by Young Hoon Kwon**
      2. **Discussion:**
      3. **Result: Motion accepted with no objection.**
  1. **MAC Motions**
     1. **MAC Motion #12: Moved to add to the IEEE 802.11 TGax Specification Framework:**
* **The amendment shall define that HE APs shall not operate a primary channel on channels other than 1, 6, and 11 in the 2.4 GHz band.**
  + - 1. **Moved by Guido R. Hiertz, Seconded by Filip Mestanov**
      2. Discussion
         1. Ambiguous.
         2. A member expressed strong concern to reduce the channel adaptability of HE AP considering interference.
         3. This is not appropriate considering the practical deployment. “Shall not” is too strong.
         4. Understand the motivation, but in Korea, government recommends to use 1, 5, 9 and 13 channels as the primary channel. Requests to defer this motion. 🡪 Guido rejected this offer.
         5. Considering the situations in various countries, this idea is not good.
         6. Motion language is not very good.
         7. This is a important decision for the group and would like to see some simulation, measurement results.
      3. **Result: Y/N/A = 25/62/30, motion fails.**
    1. MAC Motion: **Moved to add to the end of Clause 6 (MAC) of the IEEE 802.11 TGax Specification Framework:**

“Non-AP HE STAs should probe on channels 1, 6, and 11 before probing on any other channel in 2.4 GHz.”

* + - 1. This motion was withdrawn
    1. **MAC Motion #13: Do you agree to add the following to the SFD:**
  + **UL OFDMA MPDU/A-MPDU is the acknowledgement of the trigger frame. When the AP receives MPDU correctly from at least one STA indicated by trigger frame, the frame exchange initiated by the trigger frame is successful”**
    - 1. **Moved by Lei Wang, Seconded by Simone Merlin.**
      2. **Discussion – No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MAC Motion #14: Move to add the following to the SFD:**
* **A TXOP can include both DL MU and UL MU transmissions**
  + - 1. **Moved by David Xun Yang, Seconded by Simone.**
      2. **Discussion – No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MAC Motion #15: Move to add the following to the SFD: The spec shall include the definition of a cascading TXOP structure, allowing alternating DL and UL MU PPDUs starting with a DL MU PPDU in the same TXOP**
* **The TXOP sequence has only one DL transmitter**
* **The TXOP sequence may have different UL transmitters within each UL MU PPDU**
* **The TXOP sequence may have a different set of transmitters in an UL MU PPDU as compared to the DL MU PPDU that follows the UL MU PPDU within the same TXOP”** 
  + - 1. **Moved by David Xun Yang, Seconded by Simone.**
      2. **Discussion – No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MAC Motion #16: Move to add the following to the SFD:**
* **DL/UL OFDMA can multiplex different type of unicast frames in frequency domain**
* **Type of frame can be data frame/control frame/management frame**
  + - 1. **Moved by David Xun Yang, Seconded by Simone.**
      2. **Discussion – No discussion.**
      3. **Result: Motion accepted with no objection.**
    1. **MAC Motion #17: Do you support to add the following to the SFD:**
* **DL/UL OFDMA can multiplex different type of unicast frames spatial domain**
  + - * + **Type of frame can be data frame/control frame/management frame**
        + **Different type of frames are to/from different users**
      1. **Moved by David Xun Yang, Seconded by Simone Merlin.**
      2. **Discussion – No discussion.**
      3. **Result: Motion accepted with no objection.**

1. Recess @ 15:27 until PM2 today.

**Thursday, July 16th 2015, PM2 Session (16:00 - 18:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of TGax, @13:30.
   1. Agenda 11-15/0735r4 is on the server. Rev 5 is working document.
   2. There were 150+ people in the room.
2. Administrative Items
   1. Chair reminded the IEEE 802 and IEEE 802.11 P&P.
   2. Chair asked people to state name and affiliation when addressing for the first time in the session.
   3. Attendance!
3. Remaining TG Motions
   1. MAC Motions
      1. **MAC Motion #18: Move to add the following to the IEEE 802.11 TGax Specification Framework:**

* **The amendment shall define a HE STA to be a QMF STA.**
  + - 1. **Moved by Guido R. Hiertz, Seconded by Filip Mestanov**
      2. Discussion
         1. Commenter is not sure now is the right moment to make something mandatory.
         2. Against: Need more time to discuss. It is too early to assume something mandatory at this stage.
         3. Another member also asked for deferral of this motion.
      3. **Result: Y/N/A = 11/21/40, motion fails.**
    1. **MAC Motion #19: Move to add to TGax SFD:**

**The spec shall define a new control frame format that carries sufficient information to identify the STAs transmitting the UL MU PPDUs and allocating resources for the UL MU PPDUs.**

* + - **The format is as in figure**



* + **Presence of A1 is TBD**
    1. **Moved by Simone Merlin, Seconded by Yasu Inoue**
    2. Discussion
       1. Clarification
    3. **Result: Motion accepted with no objection.**
    4. MAC Motion: **Move to add to TGax SFD:**

**- 3.2.z  HE Trigger frame shall be defined as a new MAC control frame**

* + - 1. Motion did not taken.
  1. **MAC Motion #20: Move to add the following to the SFD:**
  + **Unicast trigger frame for a single user may be included within an AMPDU for that user within the DL MU PPDU that precedes the UL MU transmission by TBD IFS**
    1. **Moved by Hongyuan, Seconded by Simone Merlin.**
    2. **Discussion – No discussion**
    3. **Result: Motion accepted with no objection.**
  1. **MAC Motion #21: Move to add the following to the SFD:**
* **Broadcast trigger transmitted in a subchannel of DL OFDMA shall not include the resource allocation information of the STAs which are recipients of frames in the other subchannels of the DL OFDMA:**
  + - * + **the subchannel of the broadcast trigger frame is identified by TBD signaling.**
    1. **Moved by Hongyuan Zhang, Seconded by Simone Merlin**
    2. **Discussion – No discussion**
    3. **Result: Motion accepted with no objection.**
  1. **MAC Motion #22: Move to add the the SFD:**
* **The transmission for all the STAs in a DL MU (MIMO, OFDMA) PPDU shall end at the same time.**
* **The A-MPDU padding per each STA follows the 11ac procedure**
  + 1. **Moved by Simone Merlin, Seconded by Yasu Inoue**
    2. **Discussion – No discussion**
    3. **Result: Motion accepted with no objection.**
  1. **MAC Motion #23: Move to add the the SFD:**
* **The transmission for all the STAs in a DL MU (MIMO, OFDMA) PPDU shall end at the same time.**
* **The A-MPDU padding per each STA follows the 11ac procedure**
  + 1. **Moved by Simone Merlin, Seconded by Yasu Inoue**
    2. **Discussion – No discussion**
    3. **Result: Motion accepted with no objection.**
  1. **MAC Motion #24?: Move to add to the IEEE 802.11 TGax Specification Framework:**
* **“In 2.4 GHz HE STAs should send beacon and probe (request & response) frames at rates ≥ 5.5 Mb/s.”**
  + 1. **Moved by Guido, Seconded by Filip Mestanov**
    2. **Discussion**
       1. **A member asked for a count for this motion.**
    3. **Result: 13/0/66, motion passes.**
  1. **MAC Motion #25: Move to add the following text in the SFD:**
* **The spec shall include a mechanism that allows a target transmission time for a Trigger frame to be indicated. The mechanism is based on implicit TWT operation and additionally enables:**
  + - * + **Broadcast triggered TWT by including a TWT element in the Beacon**
        + **Solicited triggered TWT by using implicit TWT negotiation procedure**
    1. **Moved by Alfred Asterjadhi, Seconded by Simone Merlin**
    2. **Discussion – no discussion**
    3. **Result: Motion accepted with no objection.**
  1. **MAC Motion #26: Move to add the following text in the SFD:**
* **When the broadcast triggered TWT is enabled, STA and AP may exchange TWT request/response to indicate the target Beacon frame to be monitored by the PS STA.**
  + 1. **Moved by Alfred Asterjadhi, Seconded by Simone Merlin**
    2. **Discussion – No discussion**
    3. **Result: Motion accepted with no objection.**

1. TG Documents
   1. Simulation Scenario
      1. Simone explained the latest version (rev 13) of the simulation scenario document highlighting the changes proposed after approval of the previous version.
      2. Discussions
         1. Member suggested minor edits.
   2. Evaluation Methodology
      1. Ron explained the latest version (rev 10) of the evaluation methodology document. There is only one change from the previous version.
      2. Discussion – No discussion.
   3. **Motion (SSD): Move to accept document 11-14/0980r14 as the current revision of the TG Simulation Scenarios document.**
      1. **Moved by Simone Merlin, Seconded by Yasu**
      2. **Discussion – No discussion.**
      3. **Motion accepted with no objection.**
   4. **Motion (EMD): Move to accept document 11-14/0571r10 as the current revision of the TG Evaluation Methodology document**
      1. **Moved by Ron Porat, Seconded by Yasu**
      2. **Discussion – No discussion.**
      3. **Motion accepted with no objection.**
2. Goals for September 2015
   1. Continue to advance the TG documents based on submissions.
      1. With priority to the TG Specification Framework document.
   2. Technical Presentations
3. Teleconference Planning
   * 1. Thursday, August 20th, 10:00 – 12:00 ET.
     2. Chair asked if there is any objection to this plan. 🡪 No objection.
4. AOB

None.

1. Adjourn
   1. TGax adjourned for the week @ 16:47.