
**IEEE P802.11
Wireless LANs**

IEEE 802.11 TGax**March 2015 Berlin Meeting Minutes****Date:** 2015-03-31**Author(s):**

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Abstract

TGax meeting minutes from the IEEE 802.11 Berlin session, March 8th – 13th, 2015.

**IEEE 802.11 Task Group ax
March 2015 Berlin Meeting
Estrel Hotel, Berlin, Germany
March 8th – 13th, 2015**

Monday, March 9th, 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, @8:03
 - 1.1. About 90 people are in the room. More people came in later.
2. Announcement
 - 2.1. This is an ad hoc session of TGax. No decision can be made.
 - 2.2. Agenda Doc.11-15/0235r1 on the server. Rev. 2 is the working document.
 - 2.3. Meeting Protocol: Please announce your affiliation when you first address the group during a meeting slot.
 - 2.4. Attendance reminder.
 - 2.4.1. The attendance server: <https://imat.ieee.org/>
 - 2.4.2. See 11-09-0517r0 for more information.
3. The chair reviewed the mandatory 5 slides of P&P.
 - 3.1. Instructions for the WG Chair.
 - 3.2. Participants, Patents, and Duty to Inform.
 - 3.3. Patent Related Links.
 - 3.4. Call for potentially essential patents.
 - 3.4.1. Chair asked if anyone is aware of potentially essential patents.
 - 3.4.2. **No potentially essential patents reported.**
 - 3.5. Other Guidelines for IEEE WG Meetings.
4. Agenda items for the week
 - 4.1. Approve TG and Teleconferences minutes since January meeting.
 - 4.2. Continue to advance task group documents.
 - 4.2.1. Simulation Scenarios, Evaluation Methodology
 - 4.2.2. Channel Model, Function Requirements
 - 4.2.3. Specification Framework
 - 4.3. Hold Ad Hoc group meetings – for the first time.
 - 4.4. Technical Presentations and related straw polls and/or motions.
 - 4.4.1. Chair identified 55 submissions so far.
 - 4.5. Schedule Teleconference times.
5. General Flow of the meeting
 - 5.1. Slides 13 and 14 of the 15/0235r2 contain general flow of the meeting.
 - 5.2. There are eight meeting slots planed for TGax.

	Monday	Tuesday	Wednesday	Thursday
AM1	TGax		TGax (Ad Hoc)	TGax (Ad Hoc)
AM2		TGax (Ad Hoc)	TGax (Ad Hoc)	
PM1	TGax	TGax	TGax	TGax
PM2				
PM3		TGax		

6. Agenda for Monday, March 9th, AM1 (8:00 – 10:00).
 - 6.1. Proposed Agenda for Monday AM1 ad hoc session:
 - 6.1.1. Call the ad hoc meeting to order
 - 6.1.1.1. Before the official opening of the IEEE 802.11 WG meeting. Motions are not allowed.
 - 6.1.2. Patent policy, etc.
 - 6.1.3. Call for submissions
 - 6.1.4. Set and approve agenda
 - 6.1.5. Summary from January 2015 meeting
 - 6.1.6. Presentations
 - 6.1.7. Recess
 - 6.2. Chair asked if there are any other items – No items proposed. Meeting will be conducted based on this order.
7. Call for submissions
 - 7.1. MAC - 6 submissions
 - 7.1.1. 11-15/0320, “GCR-BA with Measurement Report Performance in OBSS,” Yuichi Morioka (SONY)
 - 7.1.2. 11-15/0336, “MAC Overhead Analysis of MU Transmissions,” Xiaofei WANG (InterDigital)
 - 7.1.3. 11-15/0362, “Beacon Transmission Issues,” Yonggang Fang (ZTE)
 - 7.1.4. 11-15/0365, “UL MU Procedure,” Kiseon Ryu (LG Electronics)
 - 7.1.5. 11-15/0366, “Multi-STA BA,” Simone Merlin (Qualcomm)
 - 7.1.6. 11-15/0376, “UL-MU MAC Throughput Under Non-Full Buffer Traffic,” Tatsumi Uwai (Radrix Co. Ltd)
 - 7.2. Spatial Reuse – 7 submissions
 - 7.2.1. 11-15/0300, “Potential of Modified Signal Detection Thresholds,” Gustav Wikstrom (Ericsson AB)
 - 7.2.2. 11-15/0318, “CCA Regime Evaluation Revisited,” Amin Jafarian (Newracom Inc.)
 - 7.2.3. 11-15/0319, “Impact of TPC coupled to DSC for legacy unfairness issue,” Masahito Mori (Sony)
 - 7.2.4. 11-15/0338, “Discussions on the Definition of CCA Threshold,” Akira Kishida (NTT)
 - 7.2.5. 11-15/0367, “OBSS preamble detection,” Gwen Barriac (Qualcomm)
 - 7.2.6. 11-15/0371, “Proposal and simulatin based evaluation of DSC-AP Algorithm,” Eduard Garcia-Villegas (UPC)
 - 7.2.7. 11-15/0374, “Further Considerations on Legacy Fairness with Enhanced CCA,” John Son (WILUS Institute)
 - 7.3. PHY – 12 submissions
 - 7.3.1. 11-15/0305, “Effective Subcarrier Assignment for DL-OFDMA,” Katsuo Yunoki (KDDI R&D Laboratories)
 - 7.3.2. 11-15/0330, “OFDMA Numerology and Structure,” Shahrnaz Azizi (Intel Corporation)
 - 7.3.3. 11-15/0344, “SIG field design principle for 11ax,” Young Hoon Kwon (Newracom)
 - 7.3.4. 11-15/0349, “HE-LTF Proposal,” Hongyuan Zhang (Marvell)
 - 7.3.5. 11-15/0358, “Numerology for 11ax,” Daewon Lee (Newracom)
 - 7.3.6. 11-15/0360, “Preamble Auto-Detection for 802.11ax,” Sungho Moon (NEWRACOM)
 - 7.3.7. 11-15/0364, “11ax Preamble design: training sequence,” Sigurd Schelstraete (Quantenna)
 - 7.3.8. 11-15/0375, “Minimum Resource Granularity in OFDMA,” John Son (WILUS Institute)
 - 7.3.9. 11-15/0378, “Channel Sensing in UL OFDMA,” Reza Hedayat (Newracom)
 - 7.3.10. 11-15/0380, “Discussion on OFDMA scheduling for 802.11ax,” Le Liu (Huawei Technologies)
 - 7.3.11. 11-15/0381, “HE-STF Proposal,” Yakun Sun (Marvell)
 - 7.3.12. 11-15/0383, “Impact of number of sub-channels in OFDMA,” Leif Wilhelmsson (Ericsson)
 - 7.4. MU – 9 submissions
 - 7.4.1. 11-15/0331, “Uplink Multi-User MIMO Protocol Design,” Yongho Seok (NEWRACOM)

- 7.4.2. 11-15/0333, "Throughput Comparison of Some Multi-user Schemes in 802.11ax," Kome Oteri (InterDigital)
- 7.4.3. 11-15/0336, "MAC Overhead Analysis of MU Transmissions," Xiaofei WANG (InterDigital)
- 7.4.4. 11-15/0353, "OFDMA Non-contiguous Channel Utilization," Jinsoo Ahn (Yonsei univ.)
- 7.4.5. 11-15/0354, "Bandwidth granularity on UL-OFDMA data allocation," Woojin Ahn (Yonsei Univ.)
- 7.4.6. 11-15/0363, "UL MU Synchronization Requirements," Yonggang Fang (ZTE)
- 7.4.7. 11-15/0377, "Considerations on UL MU Resource Scheduling," Leonardo Lanante (Kyutech)
- 7.4.8. 11-15/0379, "DL OFDMA Performance and ACK Aggregation," Reza Hedayat (Newracom)
- 7.4.9. 11-15/0384, "Discussion on DL-OFDMA Sub-channel Indication Method," Yu Cai (Lenovo)

7.5. Simulation and Calibration – 23 submissions

- 7.5.1. 11-14/1392, "Simulation results for Box-5 calibration," Suhwook Kim (LG Electronics)
- 7.5.2. 11-14/1434, "SLS Box4 Calibration Results," Russell Huang (MediaTek Inc.)
- 7.5.3. 11-15/0053, "Box5 Results of 11ac SS6," Jiyong Pang (Huawei)
- 7.5.4. 11-15/0072, "U-APSD power saving calibration results," Yanchun Li (Huawei)
- 7.5.5. 11-15/0125, "Box 1 and Box 2 Calibration Results," Ron Porat (Broadcom)
- 7.5.6. 11-15/0304, "Evaluating Power Save Performance," Joonsuk Kim (Apple)
- 7.5.7. 11-15/0306, "Power Save Mode Calibration Results," Eric Wong (Apple)
- 7.5.8. 11-15/0307, "MAC calibration results for Test 4," Ke Yao (ZTE Corp.)
- 7.5.9. 11-15/0308, "Simulation results for box 5," Ke Yao (ZTE Corp.)
- 7.5.10. 11-15/0314, "Sleep States in IEEE 802.11ax Simulation Scenarios," Chittabrata Ghosh (Intel)
- 7.5.11. 11-15/0316, "Power Save Calibration," Hyeyoung Choi (LG)
- 7.5.12. 11-15/0326, "U-APSD Enhancements for HE," Jarkko Kneckt (Nokia)
- 7.5.13. 11-15/0327, "Microsleep for HE STA," Jarkko Kneckt (Nokia)
- 7.5.14. 11-15/0343, "In Situ Frame Size Measurements," Chuck Lukaszewski (Aruba Networks)
- 7.5.15. 11-15/0351, "Empirical Measurements of Channel Degradation Under Load," Chuck Lukaszewski (Aruba Networks)
- 7.5.16. 11-15/0357, "Scenario 1 CCA Simulation," Knut Odman (Broadcom Corporation)
- 7.5.17. 11-15/0359, "Clarification of MIMO Box2 calibration," Jaehyun Ahn (Newracom)
- 7.5.18. 11-15/0368, "Box 5 results for Single BSS Calibration Case," Esa Tuomaala (Nokia)
- 7.5.19. 11-15/0369, "MAC calibration test 4 simulation results," Enrico-Henrik Rantala (Nokia)
- 7.5.20. 11-15/0370, "MAC Calibration Results," Guoqing Li (Apple)
- 7.5.21. 11-15/0372, "Corrections on Reference Traffic Profile for Scenario 2 in Simulation Scenarios Document," Yingpei Lin (Huawei)
- 7.5.22. 11-15/0373, "Mixed traffic configurations on simulation scenarios," Yingpei Lin (Huawei)
- 7.5.23. 11-15/0382, "MAC calibration test 4 simulation results," Yanchun Li (Huawei)
- 7.5.24. 11-15/0441, "Proposed text to TGax Simulation Scenarios MAC test 4," Enrico-Henrik Rantala (Nokia)

8. Presentations - Simulation and Calibration category

- 8.1. Ke Yao (ZTE) presented "MAC calibration results for Test 4," based on the submission 11-15/0307r0
 - 8.1.1. Summary
 - 8.1.1.1. ZTE's simulation results for Box 3 Test 4.
 - 8.1.2. Discussions:
 - 8.1.2.1. No discussions.
 - 8.1.2.2. Chair suggested the next presentation from the same author.
- 8.2. Ke Yao (ZTE) presented "Simulation results for Box 5," based on the submission 11-15/0308r0
 - 8.2.1. Summary

- 8.2.1.1. Provide ZTE's Box 5 simulation results and compare with some other companies.
- 8.2.1.2. 1-BSS case results are already aligned.
- 8.2.1.3. For 3-OBSS cases, results from different companies have not converged to a stable state, our results are within them.
- 8.2.2. Discussions:
 - 8.2.2.1. There will be an update for the performance compared, which will be presented in the later session.
- 8.3. Yanchun Li (Huawei Technologies) presented "MAC Calibration Test 4," based on the submission 11-15/0382r1.
 - 8.3.1. Summary
 - 8.3.1.1. In the scenario of test 4, AP1 in RTS-disable case achieves slightly higher throughput than in RTS-enable case.
 - 8.3.1.2. Further assumptions on RTS/CTS transmission and the required outputs shall be provided in SSD to help every participant get the calibration results aligned.
 - 8.3.1.3. Next step, to check the performance of multi-channel in system simulation scenarios.
 - 8.3.2. Discussions:
 - 8.3.2.1. The header field of r1 document still says r0. → Chair suggested r2 to be placed on the server.
 - 8.3.2.2. What are the conclusions for this presentation?
 - 8.3.2.2.1. Need more simulation results.
 - 8.3.2.2.2. Need clarifications on simulation scenario.
- 8.4. Yanchun Li (Huawei Technologies) presented "Discussion on MAC Calibration Power Saving Test," based on the submission 11-15/0072r1.
 - 8.4.1. Summary
 - 8.4.1.1. Huawei's MAC calibration test 5 U-APSD's simulation results match with the theoretical analysis.
 - 8.4.1.2. The energy efficiency ratio of U-APSD for delivering 120byte MSDU per 40ms in both UL and DL in ideal case is 0.0635.
 - 8.4.2. Discussions:
 - 8.4.2.1. No discussions.
- 8.5. Enrico-Henrik Rantala (Nokia) presented "MAC calibration test 4 simulation results," based on the submission 11-15/0369r0.
 - 8.5.1. Summary
 - 8.5.1.1. Simulation results for test 4 calibration case.
 - 8.5.1.2. The results are aligned with the results from other documents.
 - 8.5.2. Discussions:
 - 8.5.2.1. No discussions.
- 8.6. Enrico-Henrik Rantala (Nokia) presented "Box 5 results for Single BSS Calibration Case," based on the submission 11-15/0368r0.
 - 8.6.1. Summary
 - 8.6.1.1. Simulation results for single BSS calibration case.
 - 8.6.1.2. The results are aligned with the results from other documents.
 - 8.6.2. Discussions:
 - 8.6.2.1. No discussions.
- 8.7. Guoqing Li (Apple) presented "MAC Calibration Results," based on the submission 11-15/0370r0.
 - 8.7.1. Summary

- 8.7.1.1. Simulation results for MAC calibration presented.
- 8.7.1.2. The results are aligned with the results from other documents.
- 8.7.2. Discussions:
 - 8.7.2.1. No discussions.

8.8. Chuck Lukaszewski (Aruba Networks) presented “Empirical Measurements of Channel Degradation Under Load,” based on the submission 11-15/0351r1.

8.8.1. Summary

- 8.8.1.1. This contribution presents throughput measurement results for 100x1SS, 100x2SS and 100x3SS STAs in VHT20 and HT40 channels.
- 8.8.1.2. Significant throughput degradation observed beyond 25 simultaneously contending STAs.
- 8.8.1.3. With current MAC, spectral efficiency is inversely proportional to active STAs in BSS. Simulators need to be updated.

8.8.2. Discussions:

- 8.8.2.1. Clarification on “frame” was asked if it means upper layer data block such as TCP and TCP ACK.
- 8.8.2.2. Key findings seem to be short TXOP and MAC overheads. The question is it really MAC problem. → need more measurements and analysis.
- 8.8.2.3. Any idea why the performance significantly degrades beyond 25 STA? → Need more analysis.
- 8.8.2.4. Clarification on measurement environment discussed.
- 8.8.2.5. STA’s behavior of using NDP packet such as beamforming and power saving questioned. → No evidence but it is possible STAs’ behavior.
- 8.8.2.6. Clarification on slide 18 (measurement conditions) asked.
- 8.8.2.7. Discussed the reason of not increasing retries.
- 8.8.2.8.

9. Planning for ad hoc sessions

9.1. Plan

- 9.1.1. Tuesday AM2: PHY & MAC
- 9.1.2. Thursday AM1: Spatial Reuse & MU

9.2. A member suggested revisit of the ad hoc operating rules.

10. TGax meeting recessed @ 9:54 AM until PM1 (13:30) today.

Monday, March 9th, 2015, PM1 TGax Session (13:30-15:30)

11. Meeting called to order by Osama Aboul-Magd, the chairperson of TGax @ 13:30.

- 11.1. The agenda is contained in 11-15/0235r2
 - 11.1.1. Rev 2 is the working document.
- 11.2. There were more than 190+ people in the room.

12. Reminder

- 12.1. Chair reminded the IEEE 802 and IEEE 802.11 Policy and Procedure.
- 12.2. Chair asked people to state name and affiliation when addressing for the first time in the session.
- 12.3. Chair also reminded attendance.

13. The chair reviewed the mandatory 5 slides of P&P.

- 13.1. Instructions for the WG Chair.
- 13.2. Participants, Patents, and Duty to Inform.
- 13.3. Patent Related Links.
- 13.4. Call for potentially essential patents.
 - 13.4.1. Chair asked if anyone is aware of potentially essential patents.
 - 13.4.2. No potentially essential patents reported.**
- 13.5. Other Guidelines for IEEE WG Meetings.

14. Proposed agenda for this session

- 14.1. Proposed Agenda for Monday PM1:
 - 14.1.1. Call meeting to order.
 - 14.1.2. Reminder;
 - 14.1.2.1. IEEE 802 and 802.11 Patent policy, etc.
 - 14.1.2.2. Attendance
 - 14.1.3. Announcement
 - 14.1.3.1. On Wednesday, meeting room will be changed. Jon Rosdahl, the 1st vice-chair of the 802.11WG, is working on this.
 - 14.1.3.2. Submission 15/330: initial submission is actually empty. The submission is regarded as a late submission and is put at the last of queue.
 - 14.1.3.2.1. A member objected to put the 15/330 last of the queue.

14.1.3.2.2. Straw Poll: Would you prefer to remove the red color from the presentation list?

14.1.3.2.2.1. Y/N = 41/41

- 14.1.4. Call for submissions – done.
- 14.1.5. Set and approve the agenda.
- 14.1.6. Summary from January 2015 meeting.
- 14.1.7. Spec Framework Update (Robert Stacey- Editor)
- 14.1.8. Motion to approve the Spec Framework document
- 14.1.9. Presentations
 - 14.1.9.1. Approve TG meeting and Telecon minutes since September meeting.
- 14.1.10. Presentations
 - 14.1.10.1. 15/0304, “Evaluating Power Save Performance” by Joonsuk Kim (Apple)
 - 14.1.10.2. 15/0306, “Power Save Mode Calibration Results” by Eric Wong (Apple)
 - 14.1.10.3. 15/0314, “Sleep States in IEEE 802.11ax Simulation Scenarios” by Chittabrata Ghosh (Intel)
 - 14.1.10.4. 15/0316, “Power Save Calibration” (LG Electronics)
 - 14.1.10.5. 15/0326, “U-APSD Enhancements for HE” by Jarkko Knecht (Nokia)
 - 14.1.10.6. 15/0327, “Microsleep for HE STA” by Jarkko Knecht (Nokia)
- 14.1.11. Recess
- 14.2. Chair asked if there is any objection to accept this agenda → Agenda accepted.
- 14.3. Adjustment of the presentation and ad hoc sessions
 - 14.3.1. Changed will be contained in 11-15/0235r3.

15. Summary from the January 2015 session

15.1. Completed the selection of the ad hoc group chairs.

MAC	PHY	MU	Spatial Reuse
Eric Wong (Apple)	Bo Sun (ZTE)	Sigurd Schelstraete (Quantenna)	Laurent Cariou (Orange)
Reza Hedayat (Newracom)	Jianhan Liu (MediaTek)	Kiseon Ryu (LG Electronics)	Guido Hiertz (Ericsson)
Brian Hart (Cisco)	Yakun Sun (Marvell)	Kausik Josiam (Samsung)	Jae Seung Lee (ETRI)

15.2. Passed 4 PHY motions related to OFDMA numerology, L-Preamble, HE-SIG-A, and guard intervals.

15.3. Passed a single MU motion related to MU BA

15.4. Updated TG documents:

15.4.1. <https://mentor.ieee.org/802.11/dcn/15/11-15-0132-02-00ax-spec-framework.docx>15.4.2. <https://mentor.ieee.org/802.11/dcn/14/11-14-0571-07-00ax-evaluation-methodology.docx>15.4.3. <https://mentor.ieee.org/802.11/dcn/14/11-14-0980-06-00ax-simulation-scenarios.docx>

16. TG Motion

Approve TGax minutes of meetings and teleconferences from January 2015 interim meeting to today:

· <https://mentor.ieee.org/802.11/dcn/15/11-15-0090-01-00ax-tgax-january-2015-atlanta-meeting-minutes.docx>

Moved by Allan Jones, Seconded by Lei Wang

Motion approved with no objection.

17. Spec Framework Update (Robert Stacy)

17.1. Robert Stacy, the TGax technical editor, explained the latest spec framework document.

18. Motion to approve the Spec Framework document

Move to accept document 11-15/0132r2 as the current revision of the TG Specification Framework document.

Moved by Robert Stacy, Seconded by Sean Coffey

Result: Motion accepted with no objection.

19. Presentation

19.1. Joonsuk Kim (Apple) presented “Evaluating Power Save Performance” based on the submission 15/0403r1.

19.1.1. Summary:

19.1.1.1. This presentation discusses two concepts to evaluate the performance of a power save mechanism:

- 19.1.1.1.1. Power States refinement
- 19.1.1.1.2. Network Energy Efficiency Ratio (N-EER)
- 19.1.1.2. Any PS proposal is encouraged to use the numbers in the power consumption table for EER evaluation
- 19.1.2. Discussions:
 - 19.1.2.1. Need reasonable definitions on shallow sleep and deep sleep. → Definition can be discussed when we consider the table in slide 8. Current assumption is somewhere in deep sleep and active mode.
- 19.2. Chittabrata Chosh (Intel) presented “Sleep States in IEEE 802.11ax Simulation Scenarios” based on the submission 15/0314r1.
 - 19.2.1. Summary:
 - 19.2.1.1. Need for refinement of current sleep state for Wi-Fi devices in IEEE 802.11ax presented.
 - 19.2.1.2. Three sleep states based on the duration of sleep:
 - 19.2.1.2.1. Micro sleep
 - 19.2.1.2.2. Shallow sleep
 - 19.2.1.2.3. Deep sleep
 - 19.2.1.3. Proposed to modify the Simulation Scenarios by including a table specifying the 3 sleep states for better power and latency modeling
 - 19.2.2. Discussions:
 - 19.2.2.1. No discussion.

- 19.3. Straw Polls for this topic:
 - 19.3.1. From 15/304r1
 - 19.3.1.1. Discussions
 - 19.3.1.1.1. This proposal is just for evaluation purpose. → Correct.
 - 19.3.1.1.2. Is this power saving relate to PHY or MAC? → both.
 - 19.3.1.2. Straw Poll #1: Do you support to have multiple sleeping states, depending on power consumption level and transition delay, for evaluation and simulation purpose?
 - 19.3.1.2.1. Y/N/A = 47/0/57
 - 19.3.1.3. Straw Polls #2 and #3 not conducted.
 - 19.3.1.4. Straw Poll #4: Do you support to define an EER definition in [6] under title of “Network EER” in page 25 of [6], by referring to the power model parameter table in [7], by defining B as MSDU bits?
 - 19.3.1.4.1. Discussion:
 - 19.3.1.4.1.1. Clarification asked.
 - 19.3.1.4.2. Result: Y/N/A = 22/1/53

- 19.3.2. Straw Polls from 15/314r1
 - 19.3.2.1. Discussions on the straw poll
 - 19.3.2.1.1. This proposal is only for the evaluation purpose.
 - 19.3.2.1.2. Change timing of PLL discussed.
 - 19.3.2.2. Straw Poll #1: Which option do you prefer to add to the Simulation Scenarios document?
 - 19.3.2.2.1. Option 1: 2 sleep states (shallow and deep sleep)
 - 19.3.2.2.2. Option 2: 3 sleep states (micro, shallow, and deep)
 - 19.3.2.2.3. Result: Option 1/Option 2 = 39/14

19.3.2.3. Straw Poll #2: Do you agree to include the table under Common Power Model Parameters for all simulation scenarios in the Simulation Scenarios document?

Sleep State Power and Latency Values		
Sleep State	Current Consumption	Latency from sleep mode to active state
Shallow Sleep	0.9mA	500us
Deep Sleep	0.003mA [2]	3ms

19.3.2.3.1. Discussion

19.3.2.3.1.1. What is the unit mA or watt? → Table modified

19.3.2.3.2. Result: 33/0/41

20. Chair asked if there are any comments on the submission lists.

21. Ad hoc planning – the first ad hoc session planned for Tuesday AM2.

- 21.1. PHY will be this room (Estrel Hall A)
- 21.2. MAC will meet in Estrel Hall B room.

22. Recess @ 15:30 until AM2 (10:30) tomorrow.

Tuesday, March 10th, 2015, AM2 TGax Session (10:30-1230)

1. TGax ad hoc sessions.
 - 1.1. Minutes are contained in separate documents.

Tuesday, March 10th, 2015, PM1 TGax Session (13:30-15:30)

2. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), chair of TGax, @ 13:30.
 - 2.1. The agenda document 11-15/0235r3 is on the server.
 - 2.1.1. Rev 4 is the working document.
 - 2.1.2. There were 190+ people in the room.
3. Administrative Items
 - 3.1. Chair reminded the IEEE 802 and IEEE 802.11 Policy and Procedures.
 - 3.2. Chair asked people to state name and affiliation when addressing for the first time.
 - 3.3. Chair also reminded people to do attendance.
4. Agenda setting
 - 4.1. Proposed agenda for this session:
 - 4.1.1. Left over straw polls from PHY and MAC ad hocs.
 - 4.1.2. 11-15/0306, "Power Save Mode Calibration Results," Eric Wong (Apple)
 - 4.1.3. 11-15/0316, "Power Save Calibration," Hyeyoung Choi (LG Electronics)
 - 4.1.4. 11-15/0327, "Microsleep for HE-STA," Jarkko Knecht (Nokia)
 - 4.1.5. 11-15/0326, "U-APSD Enhancement for HE," Jarkko Knecht (Nokia)
 - 4.1.6. Recess
 - 4.2. Chair asked if there is any objection to proceed with this agenda. No objection.
 - 4.2.1. The agenda for Tuesday AM2 was approved.
5. Left over straw polls from PHY and MAC ad hoc sessions

5.1. 15/0358r1, "Numerology for 11ax" - Straw Poll #1:

5.1.1. Do you agree to add to the TG specification framework document?

5.1.2.x.y.z. The 40 MHz HE PPDU numerology (i.e. number of data and pilot tones, DC tone, and guard tones) is defined by aggregating two 20MHz HE PPDU numerology in frequency.

5.1.3. Results: Y/N = 33/55

5.2. 15/0358r1, "Numerology for 11ax" - Straw Poll #2:

5.2.1. Do you agree to add to the TG specification framework document?

5.2.2.x.y.z. The 80 MHz HE PPDU numerology (i.e. number of data and pilot tones, DC tone, and guard tones) is defined by aggregating four 20MHz HE PPDU numerology in frequency.

5.2.2.1. Y/N = 25/56

5.3. 15/0358r1, "Numerology for 11ax" - Straw Poll #3:

5.3.1. Do you agree to add to the TG specification framework document?

x.y.z The 20MHz HE PPDU numerology (i.e. number of data and pilot tones, DC tone, and guard tones) [230, 228, or 224] usable (i.e. data or pilot) tones with [1, 3, or 5] DC tones.

Note that TGax will down select later among the numbers in brackets.

5.3.2. Results: Y/N = 28/60

5.4. 15/0358r1, "Numerology for 11ax" - Straw Poll #4:

5.4.1. Do you agree to add to the TG specification framework document?

x.y.z. The 160 MHz HE PPDU numerology (i.e. number of data and pilot tones, DC tone, and guard tones) is defined by aggregating two 80MHz HE PPDU numerology in frequency.

5.4.2. Result: Y/N = 31/35

5.5. 15/365r0, “UL MU Procedure” - Straw Poll**5.5.1. Do you agree to add to the spec framework?****5.5.2. The spec shall define the following mode of operation:**

An UL MU PPDU (MU-MIMO or OFDMA) is sent as an immediate response (IFS TBD) to a Trigger frame (format TBD) sent by the AP.

5.5.3. Result: Y/N = 112/2, straw poll will be converted to the motion.

5.6. 15/0376r2, “UL-MU MAC Throughput under Non-Full Buffer Traffic” - Straw Poll**5.6.1. Do you agree to add to the TGax Specification Framework:**

x.y.z. The amendment shall define a mechanism for both AP and non-AP STA to initiate a UL MU transmission.

5.6.2. Discussions

5.6.2.1. Clarification asked for the STA initiated UL transmission.

5.6.3. Result: Y/N = 7/36

5.7. 15/0344r1, “SIG Field Design Principle for 11ax” - Straw Poll #1**5.7.1. Do you agree to add to the TGax Specification Framework:**

- 3.y.z. Downlink HE MU PPDU shall include HE-SIG-B field, and the number of OFDM symbols of HE-SIG-B field is variable.
- * Note: HE-SIG-B field includes information required to interpret HE PPDU, and detail is TBD.

5.7.2. Result: Y/N = 78/3, straw poll to be converted to the motion.

5.8. 15/0344r1, “SIG Field Design Principle for 11ax” Straw Poll #2**5.8.1. Do you agree to add to the TGax Specification Framework:**

- 3.y.z. HE-PPDU shall include HE-SIG-B field which is composed of more than one decoding blocks, and target receiver of the HE-PPDU may need to decode more than one HE-SIG-B decoding blocks.

5.8.2. Result: Y/N = 28/46

6. Presentations

6.1. Eric Wong (Apple) presented “Power Save Mode Calibration Results” based on the submission 15/0306r2.

6.1.1. Summary

6.1.1.1. To model Beacon reception, we introduce two new parameters to each power save mechanism.

6.1.1.2. Two additional parameters to model Beacon reception associated to each power save mechanism; pre-TBTT and Beacon timeout.

6.1.2. Discussions

6.1.2.1. Slide 7: A member asked for clarification on the scenario.

6.1.3. Straw Poll

6.1.3.1. Do you agree to define pre-TBTT and Beacon timeout parameters associated with each power save mechanism to the simulation scenario document (11-14/980r6)?

6.1.3.1.1. No objection to the straw poll. Eric to come back with redlined text.

6.2. Jarkko Knecht (Nokia) presented “U-APSD Enhancement for HE” based on the submission 15/0326r0.

6.2.1. Summary

6.2.1.1. Enhancements for U-APSD service period trigger and termination are proposed.

6.2.2. Discussions

6.2.2.1. Clarification of the scenario in which STA transmits uplink data but keeps power save mode.

6.2.2.2. Where do you set the termination signal in an ACK frame. → A new ACK frame will be considered.

6.2.2.3. Need to be careful for the legacy STAs not be confused.

6.2.3. Straw Poll #1: Do you agree to add following requirement to the section 6.1 Power Save of the SFD [2]:

A HE STA shall be capable to indicate in a trigger frame whether the frame initiates an U-APSD service period.

6.2.3.1. Result: Y/N = 8/13

6.2.4. Straw Poll #2: Do you agree to add following requirement to the section 6.1 Power Save of the SFD [2]:

A U-APSD service period shall be terminated when a HE AP transmits a frame (data, ACK, BA or management) with an indication to terminate the U-APSD service period.

6.2.4.1. Discussion: a member suggested more study.

6.2.4.2. Result: Y/N = 7/8

6.3. Jarkko Knecht (Nokia) presented “Microsleep for HE STA” based on the submission 15/0327r0.

6.3.1. Summary

6.3.1.1. Presented a microsleep mechanism that enables a non-AP STA to operate in Doze state while the channel is not available due to transmissions to other STAs.

6.3.1.2. HE STA can microsleep when it knows that it is not able to receive from HE AP.

6.3.1.3. HE AP can microsleep when it knows that it cannot receive from any STA.

6.3.2. Discussions

6.3.2.1. Clarification asked for the proposal itself.

6.3.2.2. More study suggested by many members.

6.3.2.3. Need to make sure if it works well in an OBSS scenario.

6.4. Hynyoung Choi (LG Electronics) presented “Power Save Calibration” based on the submission 15/0316r4.

6.4.1. Summary

6.4.1.1. Results for power save calibration simulations presented.

6.4.1.2. All test cases and parameters are defined in 11-14-0980r6 Simulation Scenarios.

- 6.4.1.3. Some texts in the simulation scenario need to be changed (proposal contained in slide 15 of this document).
- 6.4.2. Discussions
 - 6.4.2.1. A member asked for the reason of specifying the Beacon length which is already specified in the simulation scenarios. And the size of the Beacon discussed as well.
 - 6.4.2.2. Clarification on PSM timeout discussed. → Will have offline discussions.
- 6.5. Sigurd Schelstraete (Quantenna) presented “11ax preamble design: training sequence” based on the submission 15/0364r0.
 - 6.5.1. Summary
 - 6.5.1.1. Increased training lengths are a very efficient and low-complexity way to gain 1.5-2 dB in EVM.
 - 6.5.1.2. In practice, there are several ways to implement increased training lengths
 - 6.5.2. Discussions
 - 6.5.2.1. No discussion.

- 6.5.3. Straw Polls: Do you support investigating the use of longer training signal lengths during HE-LTF to allow averaging when estimating the channel?**
 - 6.5.3.1. Discussion**
 - 6.5.3.1.1. Clarification asked: longer than what? → current symbol.**
 - 6.5.3.2. Result: Y/N/A = 27/23/many**

- 7. Recess at 15:30 until PM3 (19:30) this evening.

Tuesday, March 10th 2015, PM3 Session (19:30-21:30)

- 8. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of TGax, @19:30
 - 8.1. Agenda 11-15/0235r3 is on the server. Rev 4 is working document.
 - 8.2. There were 200+ people in the room.
- 9. Administrative Items
 - 9.1. Chair reminded the IEEE 802 and IEEE 802.11 P&P.
 - 9.2. Chair asked people to state name and affiliation when addressing for the first time in the session.
 - 9.3. Attendance!
- 10. Agenda Setting
 - 10.1. Proposed agenda for this session - Tuesday PM2
 - 10.1.1. Call Meeting to order
 - 10.1.2. IEEE 802 and 802.11 IPR Policy and procedure.
 - 10.1.3. Agenda Setting
 - 10.1.4. Presentations
 - 10.1.4.1. 11-15/0349, “HE-LTF Design,” by Hongyuan Zhang (Marvell)
 - 10.1.4.2. 11-15/0360, “Preamble Auto-Detection in 802.11ax,” Sungho Moon (Newracom)
 - 10.1.4.3. 11-15/0381, “HE-STF Proposal,” by Yakun Sun (Marvell)
 - 10.1.5. Recess
 - 10.2. Chair asked if there are any objections to proceed with this agenda – no objections.

10.2.1. The agenda approved.

11. Presentations – PHY Presentations

11.1. Hongyuan Zhnag (Marvell) presented “HE-LTF Proposal” based on the submission 15/0349r1.

11.1.1. Summary

11.1.1.1. Analyzed that the overhead issues with HE-LTFs when 4x OFDM numerology is introduced in 11ax.

11.1.1.2. Proposed a straight forward method of compressing HE-LTFs, while still use conventional P matrix across LTFs, so that receiver design from 11ac may be carried over.

11.1.1.3. Proposed 11ax to use both 4x and 2x HE-LTFs as two HE-LTF modes..

11.1.2. Discussions

11.1.2.1. Discussed about the pilot tone and 1x OFDM symbol length.

11.1.2.2. All of the Impairments considered in the simulation?

11.1.2.3. A member commented that he would like to see a number for throughput evaluation.

11.1.2.4. A member asked about the effect of beamforming.

11.1.3. Straw Poll #1: Do you agree that the HE-LTF shall adopt a structure of using P matrix in the data tones as in 11ac.

11.1.3.1. In the data tones, every space-time stream is spread over all HE-LTF symbols by one row of the P matrix as defined in 11ac. Different space-time streams use different rows in P matrix.

11.1.3.2. Discussion

11.1.3.3. Result: Y/N = 110/0, straw poll to be converted to a motion later this week.

11.1.4. Straw Poll #2: Do you agree that the HE PPDU shall support the following two LTF modes:

11.1.4.1. HE-LTF symbol duration of 6.4us excluding GI

11.1.4.1.1. Equivalent to modulating every other tone in an OFDM symbol of 12.8 μ s excluding GI, and then removing the second half of the OFDM symbol in time domain

11.1.4.2. HE-LTF symbol duration of 12.8 μ s excluding GI

11.1.5. Discussions – A member talked about 3.2 μ s

11.1.6. Result: Y/N = 104/2, straw poll to be converted to a motion later this week.

11.1.7. Straw Poll #3: Do you agree that in HE PPDU, the HE-LTF section shall start at the same point of time and end at the same point of time across all users?

11.1.7.1. Discussion

11.1.7.2. Result: Y/N = 104/0, straw poll to be converted to a motion later this week.

11.2. Sungho Moon (Newracom) presented “Preamble Auto-Detection in 802.11ax” based on the submission 15/0360r1.

11.2.1. Summary

11.2.1.1. If three or more symbols for SIG-A is considered, (BPSK, BPSK, QBPSK) can be a reasonable option.

11.2.1.2. The modulation starting from (QBPSK, BPSK, ~) can cause undefined operations in 11n devices due to a falsely detected SIG-A in 11n devices in approximately 0.4 % of the time.

- 11.2.1.3. If two symbols for SIG-A is considered, further investigation on impact to system performance when false detection of 11ax as 11n is approximately 0.4% will be required.
- 11.2.2. Discussions
 - 11.2.2.1. No discussion.

11.2.3. Straw Poll #1: Do you agree that HE-SIG-A shall consist of three 4 us OFDM symbols.

- 11.2.3.1. Discussion – no discussion.**
- 11.2.3.2. Result: Y/N/A = 8/12/many**

- 11.3. Yakun Sun (Marvell) presented “HE-STF Proposal” based on the submission 15/0381r0.
 - 11.3.1. Summary
 - 11.3.1.1. By extensive simulations we compared three (long, median, and short) HE-STF designs in different channels and signal types.
 - 11.3.1.2. By extensive simulations we compared three (long, median, and short) HE-STF designs in different channels and signal types.
 - 11.3.1.3. .
 - 11.3.2. Discussions
 - 11.3.2.1. A member asked for a question of on the DC offset estimation around -25 dB.
 - 11.3.2.2. HE-STF of 1.6 μ s: What will be the use case?
 - 11.3.2.3. STF design should be based on the numerology. TG should investigate more considering the result of straw poll this morning.

11.3.3. Straw Poll #1: Do you support the HE-STF of a non-trigger-based PPDU has a periodicity of 0.8 μ s with 5 periods?

- 11.3.3.1. A non-trigger-based PPDU is not sent in response to a trigger frame**
- 11.3.3.2. Discussions:**
 - 11.3.3.2.1. Is the timing of having this straw poll okay? → Yes.**
 - 11.3.3.2.2. If the straw poll is just to have a general sense of the group, it is okay. But the intention of the straw poll is to have motion, we need more discussion.**
- 11.3.3.3. Result: Y/N = 92/0, straw poll to be converted to a motion.**

11.3.4. Straw Poll #2: Do you support the HE-STF of a trigger-based PPDU has a periodicity of 1.6 μ s with 5 periods?

- 11.3.4.1. A trigger-based PPDU is an UL PPDU sent in response to a trigger frame**
- 11.3.4.2. Discussions:**
 - 11.3.4.2.1. A member asked for a clarification on trigger-based PPDU.**
 - 11.3.4.2.2. No definition about the trigger frame.**
- 11.3.4.3. Result: Y/N = 64/34, did not achieve 75%.**

11.3.5. Straw Poll #3: Do you support the HE-STF tone positions are defined in Equation 1 where N_{STF_sample} is TBD?

$$i_{STF} \bmod N_{STF_sample} = 0, \quad \lfloor N_{DC} / 2 \rfloor < |i_{STF}| \leq N_{SR} \quad (1)$$

i_{STF} : HE-STF tone index

N_{DC} : number of DC tones

N_{SR} : highest data subcarrier index

11.3.5.1. Discussions: STF design is an important topic and deferral of this discussion suggested until May meeting

11.3.5.2. Another member proposed to amend the straw poll text.

11.3.5.3. Modification proposed:

11.3.5.3.1. Do you support the HE-STF tone positions are defined in Equation 1 where $N_{STF_sample} = 16$ for a non-trigger-based PPDU and $N_{STF_sample} = 8$ for a trigger-based PPDU?

11.3.5.4. Result: Y/N = 66/32, did not achieve 75%.

12. Presentations

12.1. John Son (WILUS Institute) presented “Minimum Resource Granularity in OFDMA” based on the submission 15/0375r1.

12.1.1. Summary

12.1.1.1. While the minimum resource granularity with < 5MHz will provide higher scheduling gains in certain environments, less than 5MHz sub-band can not meet the current ETSI regulations on 5GHz unlicensed spectrums.

12.1.1.2. Discussed possible options to utilize < 5MHz sub-band, and those options or any other approaches require further discussions in 11ax.

12.1.2. Discussions

12.1.2.1. A member commented the author is talking about the TP.

12.1.2.2. It is too early to talk about this topic.

13. Plan for tomorrow

13.1. Ad hoc session in AM1

13.1.1. MU ad hoc – ECC1 meeting room.

13.1.2. Spatial Reuse – Estrel Hall B

13.2. Chair will ask for one additional session in Wednesday PM2, but need to be confirmed during the mid-week plenary.

13.3. Still have 11 minutes.

Chair asked if there is any objection to recess. → No objection.

14. Recessed at 21:20 until AM1 (8:00) Wednesday.

Wednesday, March 11th 2015, AM1 TGax ad hoc session (8:00-10:00)

1. The second ad hoc meeting slot.
 - 1.1. MU.
 - 1.2. Spatial Reuse.
2. Minutes are contained in separate documents.

Wednesday, March 11th 2015, PM1 Session (13:30-15:30)

3. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @13:30
 - 3.1. Agenda 11-15/0235r4 is on the server. Rev 5 is working document.
 - 3.2. There were about 200+ people in the room.
4. Administrative Items
 - 4.1. Chair reminded the IEEE 802 and IEEE 802.11 P&P.
 - 4.2. Chair asked people to address himself/herself when speaking for the first time.
 - 4.3. Attendance
 - 4.4. Announcements
 - 4.4.1. TGax got one more slot Wednesday PM2.
 - 4.4.2. Report from ad hoc
 - 4.4.2.1. Spatial Reuse: Five submissions presented. Two submissions pending.
 - 4.4.2.1.1. No motion affecting spec framework.
 - 4.4.2.2. MU: Five submissions presented.
 - 4.4.2.2.1. Two motions affecting spec framework can be conducted.
5. Agenda for this session – plans for the rest of the week.
 - 5.1. Wednesday PM1
 - 5.1.1. Call Meeting to order
 - 5.1.2. IEEE 802 and 802.11 IPR Policy and procedure
 - 5.1.3. Agenda Setting
 - 5.1.4. Presentations for WED PM1
 - 5.1.4.1. 11-15/0338, “Discussions on the Definition of CCA Threshold,” Akira Kishida (NTT)
 - 5.1.4.2. 11-15/0343, “In Situ Frame Size Measurement,” Chuck (Aruba)
 - 5.1.4.3. 11-15/0378, “Channel Sensing in UL-OFDMA,” Reza Hedayat (Newracom)
 - 5.1.4.4. 11-15/0379, “DL OFDMA Performance and ACK Aggregation,” Reza Hedayat (Newracom)
 - 5.1.4.5. 11-15/0383, “Impact of number of sub-channels in OFDMA,” Leif Wilhelmsson (Ericsson AB)
 - 5.1.5. Recess
 - 5.2. Wednesday PM2
 - 5.2.1. Call Meeting to order
 - 5.2.2. IEEE 802 and 802.11 IPR Policy and procedure
 - 5.2.3. Agenda Setting
 - 5.2.4. Presentations for WED PM2 – Simulation related presentations
 - 5.2.4.1. 11-14/1391
 - 5.2.4.2. 11-14/1434, “SLS Box 4 Calibration Results,” Russel Huang (Marvell)
 - 5.2.4.3. 11-15/0125, “Box 1 and Box 2 Calibration Results,” Ron Porat (Broadcom)
 - 5.2.4.4. 11-15/0357, “Scenario 1 CCA Simulation,” Knut Odman (Broadcom)
 - 5.2.4.5. 11-15/0359, “Clarification of MIMOBox 2 calibration,” Jaehyun Ahn (Newracom)
 - 5.2.4.6. 11-15/0053, “Box 5 Results of 11ac SS6,” Jiyong Pang (Huawei)

- 5.2.4.7. 11-15/0372, “Corrections on Reference Traffic Profile for Scenario 2 in Simulation Scenario,” Yingpei Lin (Huawei)
 - 5.2.4.8. 11-15/0373, “Mixed Traffic Configurations on Simulation Scenario,” Yingpei Lin (Huawei)
 - 5.2.5. Recess
 - 5.3. Thursday AM1
 - 5.3.1. Call Meeting to order
 - 5.3.2. IEEE 802 and 802.11 IPR Policy and procedure
 - 5.3.3. Agenda Setting
 - 5.3.4. Presentations for THU AM1 – Power Save related presentation and straw polls
 - 5.3.5. Recess
 - 5.4. Thursday PM1
 - 5.4.1. Call Meeting to order
 - 5.4.2. IEEE 802 and 802.11 IPR Policy and procedure.
 - 5.4.3. Goals for May 2015
 - 5.4.4. Presentations
 - 5.4.4.1. 11-15/330
 - 5.4.4.2. TG Motions
 - 5.4.5. TG Motions
 - 5.4.6. Telecon Schedule
 - 5.4.7. Adjourn
 - 5.5. Chair asked if there are any objections to proceed with this agenda for the rest of the week – no objections.
 - 5.5.1. The agenda approved.
6. Presentations
- 6.1. Akira Kishida (NTT) presented “Discussions on the Definition of CCA Threshold” based on the submission 15/0338r1.
 - 6.1.1. Summary
 - 6.1.1.1. The term of “CCA-ED” has already defined and used for other purpose.
 - 6.1.1.2. Proposed to use another name for the threshold what we called CCA-ED.
 - 6.1.2. Discussions
 - 6.1.2.1. Is this TGmc issue?
-
- 6.1.3. Straw Polls: Do you agree with defining new terminology of the threshold that indicates the level of 20 dB above the minimum modulation and coding rate sensitivity?**
- 6.1.3.1. Discussion**
 - 6.1.3.2. Result: Y/N/A = 8/8/many**
-
- 6.2. Reza Hedayat (Newracom) presented “DL OFDMA Performance and ACK Aggregation” based on the submission 15/0379r0.
 - 6.2.1. Summary
 - 6.2.1.1. The advantage of OFDMA vs OFDM is mostly in avoiding IFS/PLCP/backoff overheads.
 - 6.2.1.1.1. OFDMA gain depends on payload size, number of payloads aggregated in one OFDMA PPDU, and ACK procedure for OFDMA
 - 6.2.1.2. Results show that large gains of OFDMA are washed out if 11ac polled-ACK mechanism is used.

6.2.1.3. To keep OFDMA gain, there is a need for some ACK aggregation method so that multiple ACK/BA from clients are aggregated efficiently.

6.2.2. Discussions

6.2.2.1. A member commented he agrees with the results and mentioned that he would like to see further evaluation results.

6.2.3. Straw Polls: Do you agree to add the following to 11ax SFD:

6.2.3.1. "802.11ax amendment shall include a mechanism to multiplex BA/ACK responses to a DL MU PPDU."

6.2.3.2. Discussion:

6.2.3.2.1. Discussed that how to multiplex is TBD.

6.2.3.2.2. A member asked if there are any reason to exclude MU-MIMO. → Not excluding the MU-MIMO.

6.2.3.3. Result: Y/N/A = 113/0/-, to be converted to a motion.

6.3. Reza Hedayat (Newracom) presented "Channel Sensing in UL-OFDMA" based on the submission 15/0378r1.

6.3.1. Summary

6.3.1.1. CSMA/CA is an important aspect of 802.11 operation that needs to be observed in presence of UL OFDMA frames.

6.3.1.2. UL MU transmissions require additional considerations so that unintended nodes sense presence of UL MU PPDU across the whole bandwidth of the frame and throughout the frame duration.

6.3.2. Discussions

6.3.2.1. Clarification on hidden node and unintended STA discussed. Do not find any difference between the single user cases.

6.3.2.2. A member asked if the adjacent channel leakage was considered. → No. This is just an analysis. Need to consider it in a full system simulation.

6.3.2.3. A member asked if the intention is to protect the receptions at the AP. → Not limited to the receptions at the AP. Use of NAV mechanism should also be considered. Not always necessary to sense the actual channel.

6.3.2.4. Discussion continued for some time.

6.3.3. Straw Polls: Do you agree to add the following to 11ax SFD:

6.3.3.1. "4.x.x TGax shall provide mechanisms that enable physical channel sensing (ED and CS) across the bandwidth and throughout the duration of an UL OFDMA frame."

6.3.3.2. Discussions

6.3.3.3. Result: Y/N/A = 31/51/47

6.4. Leif Wilhelmsson (Ericsson AB) presented "Impact of number of sub-channels in OFDMA" based on the submission 15/0383r2.

6.4.1. Summary

6.4.1.1. The impact the number of sub-channel of OFDMA was studied. If support for small packets is one of the key targets, 8 sub-channels in 20 MHz seem to be reasonable.

- 6.4.1.2. The gain from Frequency Selective Scheduling depends on SNR. Gains of 15-40 % seems reasonable at SNR = 15 dB.
 - 6.4.1.3. Number of sub-channels should be determined by the support for small packets, not FSS, as the gain is more easily achieved.
 - 6.4.2. Discussions
 - 6.4.2.1. No discussion.
7. Recessed at 15:30 until PM2 (16:00) today.

Wednesday, March 11th 2015, PM2 Session (16:00-18:00)

8. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @18:00
- 8.1. Agenda 11-15/0235r4 is on the server. Rev 5 is working document.
 - 8.2. There were about 200+ people in the room.
9. Reminder and Announcements
- 9.1. Chair reminded people the IEEE 802 and IEEE 802.11 P&P.
 - 9.2. Chair asked people to address himself/herself when speaking for the first time.
 - 9.3. Attendance
10. Agenda for this session
- 10.1. Wednesday PM2
 - 10.1.1. Meeting call to order
 - 10.1.2. Reminder
 - 10.1.2.1. IEEE 802 and IEEE 802.11 Policy and Procedure
 - 10.1.2.2. Attendance (an issue on the server is now fixed)
 - 10.1.3. Presentations
 - 10.1.3.1. 11-15/357
 - 10.1.3.2. 11-15/343
 - 10.1.3.3. As ready basis.
 - 10.1.4. Recess
 - 10.2. Chair asked if there are any objections to proceed with this agenda – no objections.
 - 10.2.1. The agenda approved.
11. Presentations
- 11.1. Knut Odman (Broadcom) presented “802.11ax scenario 1 CCA” based on the submission 15/0357r4.
 - 11.1.1. Summary
 - 11.1.1.1. Simulation of Scenario 1 where ED/CCA was swept over a range of -87:5:-52 showed that different BSS react very differently to a global CCA setting.
 - 11.1.1.2. The smooth curves seen on simulations of total or average throughput get much more complicated when you look at individual BSSs.
 - 11.1.1.3. Preliminary results based on blind adjustment of CCA levels shows early promise in identifying an optimal value for ED threshold that provides some throughput gains for an 802.11 system
 - 11.1.1.4. Additional work is needed to develop protocol enhancements to provide further gains.
 - 11.1.2. Discussions
 - 11.1.2.1. No discussion.

11.2. Chuck Lukaszewski (Aruba Networks) presented “In Situ Frame Size Measurements,” based on the submission 11-15/0343r1.

11.2.1. Summary

11.2.1.1. This contribution adds in situ measurements of an enterprise office, 70K seat stadium, and IEEE Jan Interim meeting in Atlanta.

11.2.1.2. In 802.11 MAC design, the minimum payload size necessary to exceed 50% or more of airtime in a TXOP is dangerously unrealistic.

11.2.1.3.

11.2.2. Discussion

11.2.2.1. Channel bonding

11.2.2.2. ACK in slide 4 → TCP ACK.

11.2.2.3. Supporting data for the last bullet in slide 2.

11.3. Yingpei Lin (Huawei Technologies) presented “Corrections on Reference Traffic Profile for Scenario 2 in Simulation Scenarios Document,” based on the submission 11-15/0372r0.

11.3.1. Summary

11.3.1.1. Proposed correction to Reference Traffic Profile for Scenario 2 in Simulation Scenarios Document doc.:IEEE 802.11-14/0980r6.

11.3.2. Discussion

11.3.2.1. No discussion.

11.3.2.2. This should be included in the Simulation Scenario document. To be included in the Simulation Scenario document and approved as a whole document.

11.4. Yingpei Lin (Huawei Technologies) presented “Mixed traffic configurations on simulation scenarios,” based on the submission 11-15/0373r2.

11.4.1. Summary

11.4.1.1. A mixed traffic model for each simulation scenario in Simulation Scenarios Document IEEE 802.11-14/0980r6 provided.

11.4.1.2.

11.4.2. Discussion

11.4.2.1. No discussion.

11.4.3. Straw Poll: Do you agree to add above traffic mix onfigurations for scenario 1~4 into the simulation scenario document IEEE 802.11-14/0980?

11.4.3.1. Result: No objection.

11.5. Jaehyun Ahn (Newracom) presented “Clarification of MIMO Box2 calibration,” based on the submission 11-15/0359r2.

11.5.1. Summary

11.5.1.1. Receiver filter assumption is not clear in MIMO Box 2 calibration.

11.5.1.2. Precoding matrix selection rule is not clear in MIMO Box 2 calibration.

11.5.1.3. Need clarification for LSP correlation.

11.5.2. Discussion

11.5.2.1. A member commented for the first and second items and agreed LSP correlation is not clear.

11.5.2.2. Many results have already provided.

11.5.2.3. Authors asked just show hands for the straw polls – not counted.

11.5.2.4. Following Straw Polls conducted.

11.5.3. Straw Polls: following straw polls are conducted just to get the feeling of the group, i.e. the votes were not counted.

11.5.3.1. Straw Poll #1: What should be the receiver assumption for MIMO Box 2 “calibration” purposes?

- 11.5.3.1.1. (1) MMSE receiver with ideal interference rejection (Option 1 in slide 5)**
- 11.5.3.1.2. (2) MMSE receiver with only co-spatial-stream interference rejection (Option 3 in slide)**
- 11.5.3.1.3. (3) Need further discussion**

11.5.3.2. Straw Poll #2: What should be the precoding matrix assumption for MIMO Box 2 “calibration” purposes?

- 11.5.3.2.1. (1) No precoding (i.e. full rank transmission with identity matrix as precoding matrix)**
- 11.5.3.2.2. (2) Genie precoding (i.e. full rank transmission with right sided SVD matrix based on channel matrix of the intended signal link)**
- 11.5.3.2.3. (3) Something else (e.g. some fixed precoding rank 1 vector)**
- 11.5.3.2.4. (4) Need further discussions**

11.5.3.3. Straw Poll #3: What is the current understanding of the LSP correlation conditions between ‘AP to STA’ for MIMO Box 2?

- 11.5.3.3.1. (1) Distance based correlation (based on ITU M.2135 correlation between ‘Base Station and User Terminal’)**
- 11.5.3.3.2. (2) Uncorrelated**
- 11.5.3.3.3. (3) Undefined in the EMD and therefore interpretation left up to each individual contributor**

11.5.3.4. Straw Poll #4: What should be the LSP correlation conditions for MIMO Box 2? For options with correlation, the assumption is that correlation shall be based on the distance-based-correlation defined for ‘BS and UT’ in ITU M.2135

- 11.5.3.4.1. (1) ‘AP to AP’ uncorrelated & ‘STA to STA’ uncorrelated**
- 11.5.3.4.2. (2) ‘AP to AP’ correlated & ‘STA to STA’ correlated**
- 11.5.3.4.3. (3) ‘AP to AP’ uncorrelated & ‘STA to STA’ correlated**
- 11.5.3.4.4. (4) ‘AP to AP’ correlated & ‘STA to STA’ uncorrelated**
- 11.5.3.4.5. (5) Need further discussions**

11.6. Suhwook Kim (LG Electronics) presented “Simulation results for Box 5 calibration,” based on the submission 11-14/1392r6.

11.6.1. Summary

- 11.6.1.1. Updated simulation results for Box-5 calibration presented.
- 11.6.1.2. This presentation clarifies CCA threshold parameter and suggests additional performance metrics.

11.6.2. Discussion

- 11.6.2.1. A member commented to check the result of 3 BSS case.

11.7. Jiyong Pang (Huawei Technologies) presented “Box5 Results of 11ac SS6,” based on the submission 11-15/0053r2.

11.7.1. Summary

- 11.7.1.1. Updated simulation results for Box-5 calibration based on the latest EMD presented.
- 11.7.1.2. CCA thresholds are modified from -82dBm/-62dBm to -76dBm/-56dBm on 80MHz.
- 11.7.1.3. Similar results are found for 1-BSS case.
- 11.7.1.4. Companies have not got aligned 3-BSS results.

11.7.2. Discussion

- 11.7.2.1. A member commented to check the result of 3 BSS case.

11.8. Enrico-Henrik Rantala (Nokia) presented “Proposed text to TGax Simulation Scenarios MAC test 4,” based on the submission 11-15/0441r0.

11.8.1. Summary

11.8.1.1. Suggested for the MAC simulator section “Test 4: Deferral Test for 20 and 40MHz BSSs” of the simulation scenario document:

11.8.1.1.1. Remove sentence that suggest that RTS/CTS is disabled for AP1

11.8.1.1.2. Fix typos in the text

11.8.1.1.3. Provide a more clear definition of the required output. Add an example how percentage of occupation on 20MHz/40MHz is calculated.

11.8.2. Discussion

11.8.2.1. Chair suggested discussion with the simulation scenario editor.

12. Planning for tomorrow

12.1. Power Save SP and motion.

12.2. 11-15/0441 for changes to SSD and related SP motion

12.3. SSD related motions

12.4. EMD motions

13. Motions

13.1. Motion #1: Move to add traffic mix configurations for scenarios 1 to 4 as in document 11-15/373r2 into the TG simulation scenario document 11-14/980.

13.1.1. Moved by Yingpei Lin

13.1.2. Discussion

13.1.2.1. A member asked to have a time to check the content

13.1.2.2. Another member asked for the reason of traffic profile.

13.1.2.3. Motion not conducted during this time slot. To be voted tomorrow morning.

14. AoB?

14.1. A member asked if 15/330 is on the agenda. The answer was it was not.

14.2. Chair asked if there is any objection to recess until tomorrow morning. No objection.

15. Recessed at 17:28 until AM1 (8:00), Thursday.

Thursday, March 12th, 2015, AM1 Session (8:00-10:00)

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @8:02 AM
 - 1.1. About 200+ people are in the room.
 - 1.2. Agenda 15/0235r6 is on the server. Rev. 7 is the working document.
2. Reminder and Announcements
 - 2.1. Chair reminded IEEE 802 and 802.11 IPR P&P.
 - 2.2. Chair asked people to state name and affiliation when addressing for the first time in the session.
 - 2.3. Chair reminded people to do attendance.
3. Agenda for this session
 - 3.1. Thursday AM1
 - 3.1.1. Call Meeting to order
 - 3.1.2. Reminder
 - 3.1.2.1. IEEE 802 and 802.11 IPR Policy and procedure.
 - 3.1.2.2. Attendance
 - 3.1.3. Presentations
 - 3.1.3.1. Power save SP and motions
 - 3.1.3.2. 11-15/0372 and 11-15/373 related motions
 - 3.1.3.3. 11-15/0441 for changes to SSD and related SP/motion
 - 3.1.3.4. SSD related motions
 - 3.1.3.5. EMD motions
 - 3.1.4. Group input on how many time slots to request for next meeting
 - 3.1.5. Recess
 - 3.2. Thursday PM1
 - 3.2.1. Call Meeting to order
 - 3.2.2. IEEE 802 and 802.11 IPR Policy and procedure.
 - 3.2.3. Presentations
 - 3.2.3.1. 11-15/300
 - 3.2.4. TG Motions
 - 3.2.4.1. 11-15/0441 for changes to SSD and related SP/motion
 - 3.2.5. SSD related motions
 - 3.2.6. EMD motions
 - 3.3. Recess
 - 3.4.
 - 3.5. Chair asked if there are any modifications to the agenda.
 - 3.6. Agenda approved without objections.
4. Power Save Straw Polls and Motions

4.1. Straw Polls on 11-15/316r5

4.1.1. Straw Poll #1: Do you agree to add the following text into Test 5 (Power Save Mechanism and PS Polling Tests) of the latest Simulation Scenarios document

4.1.1.1. Beacon is 80 octets long Beacon frame (as defined in the Traffic model)

4.1.2. Discussion

4.1.2.1. A member suggested another value between 100 and 200 for the Beacon frame size.

4.1.3. Result: No objection.

4.2. Straw Poll #2: Do you agree to add the following text into Test 5 (Power Save Mechanism and PS Polling Tests) of the latest Simulation Scenarios document

4.2.1.1. When a STA in PS mode wakes for DTIM Beacon and detects that the TIM bit corresponding to its AID is set to 0, STA returns to Shallow Sleep state. STA remains in Shallow Sleep state until the next DTIM Beacon.

4.2.2. Discussion – No discussion.

4.2.3. Result: No objection.

4.3. Ron Porat (Broadcom) presented “Evaluation Methodology,” based on 14/571r8

4.3.1. Summary

4.3.1.1. Allan explained the motion on slide 18.

4.3.2. Discussions – No discussion.

4.3.3. Motion

4.3.3.1. Move to accept 11-14/0571r8 as the current revision of the Evaluation Methodology document.

4.3.3.1.1. Moved by Ron Porat, Seconded by Eric Wong.

4.3.3.1.2. Result: Motion accepted with no objection.

5. Presentation and discussion on 11-15/372r0 and 11-15/373r2 related SP/motion

5.1. Yingpei (Huawei Technologies) presented “,” based on the submission 11-15/0372r0 and 11-15/373r2.

5.1.1. Summary

5.1.1.1. Yingpei explained the documents highlighting the changes.

5.1.2. Discussions

5.1.2.1. For 15/372r0:

5.1.2.1.1. What introduced the changes? → Game traffic presentation in the last meeting.

5.1.2.2. For 15/373r2:

5.1.2.2.1. A member pointed out that the impact of multicast traffic will be under estimated.
→ This is unicast traffic.

5.1.2.2.2. A member mentioned the sum of the percentage of STAs becomes 105%. → It is because some STAs are running more than one applications.

5.1.2.2.3. Another member commented on the traffic model of streaming audio and video.

5.1.2.2.4. There was a question how to apply the population to the simulation.

5.1.2.3. Next step

5.1.2.3.1. Do not run the motion right now. Work on the table in 15/373r2.

6. Presentation and discussion on 11-15/0441 for changes to SSD and related SP/motion

6.1. Enrico-Henrik Rantala (Nokia) presented “Proposed text to TGax Simulation Scenarios MAC test 4,” based on the submission 11-15/0441r2.

6.1.1. Summary

6.1.1.1. Suggestions for the MAC simulator section “Test 4: Deferral Test for 20 and 40MHz BSSs” of the simulation scenario document.

6.1.1.1.1. Remove sentence that suggest that RTS/CTS is disabled for AP1

6.1.1.1.2. Fix typos in the text

6.1.1.1.3. Provide a more clear definition of the required output. Add an example how percentage of occupation on 20MHz/40MHz is calculated.

6.1.2. Discussions

6.1.2.1. No discussion.

6.1.3. Straw Poll

6.1.4. Straw poll: Do you agree to adopt the changes below to 11-14-980r6?
6.1.4.1. Result: No objection.

6.1.5. Next step

- 6.1.5.1. Simone to incorporate the contents of the document and have a motion to approve the entire simulation scenario document.

- 7. Group input on ad hoc sessions during the May 2015 Vancouver session.
 - 7.1. Chair asked for guidance how many time slots we need for TGax full and TGax ad hoc meetings.
 - 7.1.1. Chair will request 8 TGax sessions:
 - 7.1.1.1. 4 TGax full sessions.
 - 7.1.1.2. 4 ad hoc sessions.
- 8. Plans for the PM1 session:
 - 8.1. Call Meeting to order
 - 8.2. IEEE 802 and 802.11 IPR Policy and procedure.
 - 8.3. Presentations
 - 8.3.1. 11-15/300
 - 8.4. TG Motions
 - 8.4.1. 11-15/0441 for changes to SSD and related SP/motion
 - 8.4.2. Simulation Scenario document
 - 8.5. SSD related motions
 - 8.6. EMD motions
 - 8.7. Recess

The agenda will be approved at the beginning of the next session.

- 9. Recess @ 9:05 until PM1 this afternoon.

Thursday, March 12th, 2015, PM1 Session (13:30-15:30)

- 8. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @13:30 AM
 - 8.1. About 200+ people are in the room.
 - 8.2. Agenda 15/0235r6 is on the server. Rev. 7 is the working document.
- 9. Reminder and Announcements
 - 9.1. Chair reminded IEEE 802 and 802.11 IPR P&P.
 - 9.2. Chair asked people to state name and affiliation when addressing for the first time in the session.
 - 9.3. Chair reminded people to do attendance.
- 10. Agenda for this session
 - 10.1. Thursday PM1
 - 10.1.1. Call Meeting to order
 - 10.1.2. IEEE 802 and 802.11 IPR Policy and procedure.
 - 10.1.3. Presentations
 - 10.1.3.1. 11-15/300
 - 10.1.4. TG Motions
 - 10.1.4.1. TG motions (11 motions from the ad hocs)

- 10.1.4.2. Simulation Scenario document motion
- 10.1.5. Goals for May 2015
- 10.1.6. Teleconference scheduling
- 10.1.7. Adjourn
- 10.2. Chair asked if there is any objection to proceed with this agenda. No objection heard.
- 10.3. The agenda approved.

11. Presentation

- 11.1. Filip Mestanov (Ericsson AB) presented "Potential of Modified Signal Detection Threshold," based on the submission 11-15/300r0.
 - 11.1.1. Summary
 - 11.1.1.1. Several studies have investigated the impact of increased signal detection thresholds. Importance of correct modeling of preamble detection shown in 11-15/0050r0.
 - 11.1.1.2. The effects of changing signal and energy detection thresholds and estimates the potential gains of such changes.
 - 11.1.1.3. By modifying the CCAT and EDT the number of back-offs is reduced substantially, from 70% in legacy system to 25% in most aggressive case (CCAT = EDT = -52dBm).
 - 11.1.1.4. The potential of reducing sensing thresholds from legacy levels is about 28%. At -52dBm CCAT and EDT there is only 3.5% potential left.
 - 11.1.2. Discussion
 - 11.1.2.1. A member asked what exactly the potential gain in slide 14 → Expressed in time.

12. TG Motions

12.1. PHY Motion #5

- 12.1.1. Move to add to the TG Specification Framework document:
- 12.1.2. The HE-LTF shall adopt a structure of using P matrix in the data tones as in 11ac.
 - 12.1.2.1. In the data tones, every space-time stream is spread over all HE-LTF symbols by one row of the P matrix as defined in 11ac. Different space-time streams use different rows in P matrix.
 - 12.1.2.2. Moved by Hongyuan Zhan, Seconded by Kaushik Josiam
 - 12.1.2.3. Result: Motion accepted with no objection.

12.2. PHY Motion #6

- 12.2.1. Move to add to the TG Specification Framework document:
 - 12.2.1.1. The HE PPDU shall support the following LTF modes:
 - 12.2.1.1.1. HE-LTF symbol duration of 6.4us excluding GI
 - 12.2.1.1.1.1. Equivalent to modulating every other tone in an OFDM symbol of 12.8 μs excluding GI, and then removing the second half of the OFDM symbol in time domain
 - 12.2.1.2. HE-LTF symbol duration of 12.8 μs excluding GI
 - 12.2.2. Moved by Hongyuan Zhan, Seconded by Kaushik Josiam
 - 12.2.3. Discussion
 - 12.2.3.1. Some members expressed objection to this motion. It is not clear how much gain we can expect. The commenters asked for additional discussion based on the simulation results.
 - 12.2.3.2. Another member commented that there may be if we specify the 2x LTE and 4x LTF.
 - 12.2.4. Result: Y/N/A = 86/26/15, motion passes.

12.3. PHY Motion #7**12.3.1. Move to add to the TG Specification Framework document:**

12.3.1.1. In HE PPDU, the HE-LTF section shall start at the same point of time and end at the same point of time across all users

12.3.2. Moved by Hongyuan Zhan, Seconded by Robert Stacy

12.3.3. Discussion – no discussion.

12.3.4. Result: Motion accepted with no objection.

12.4. PHY Motion**12.4.1. Move to add to the TG Specification Framework document:**

12.4.1.1. The HE-STF of a non-trigger-based PPDU has a periodicity of 0.8 μ s with 5 periods?

12.4.1.1.1. A non-trigger-based PPDU is not sent in response to a trigger frame

12.4.2. Motion deferred until the next meeting.

12.5. PHY Motion #9**12.5.1. Move to add to the TG Specification Framework document:**

12.5.1.1. 3.y.z Downlink HE MU PPDU shall include HE-SIG-B field, and the number of OFDM symbols of HE-SIG-B field is variable.

12.5.1.1.1. Note: HE-SIG-B field includes information required to interpret HE MU PPDU, detail is TBD.

12.5.1.2. Moved by Young Hoon Kwon, Seconded by Minho Cheong

12.5.1.3. Discussion

12.5.1.3.1. A member suggested a friendly amendment.

12.5.1.3.2. A member asked for clarification on “variable”

12.5.1.4. Result: Motion accepted with no objection.

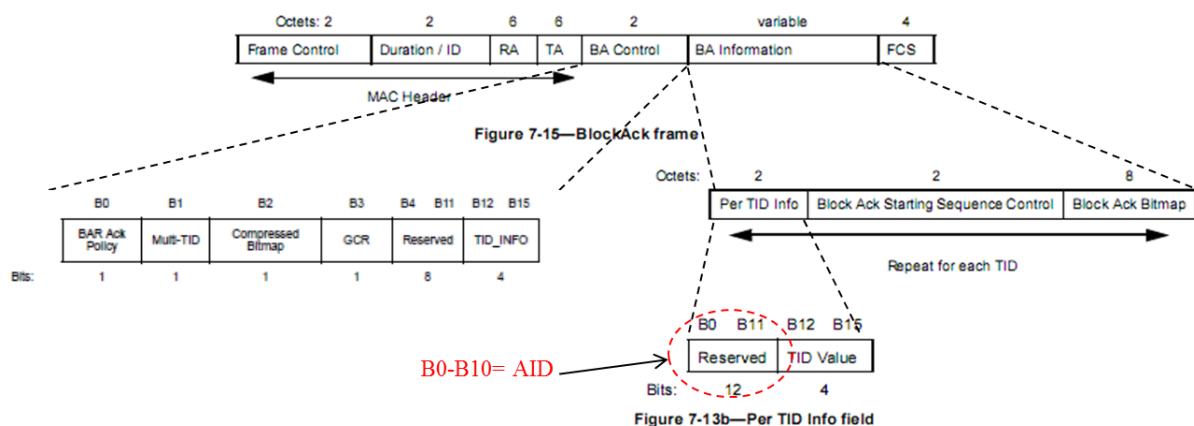
12.6. MAC Motion #2**12.6.1. Move to add the following to the SFD:**

12.6.1.1. X.y.z The spec shall define a multi-STA BA frame by using the Multi-TID BlockAck frame format with the following changes:

12.6.1.1.1. Add an indication that the frame is a multi-STA BA (TBD)

12.6.1.1.2. Each BA Information field can be addressed to different STAs

12.6.1.1.2.1. B0-B10 of the Per TID Info field carry a (Partial) AID identifying the intended receiver of the BA Information field



12.6.2. Moved by Simone Merlin, Seconded by Rakesh Taori

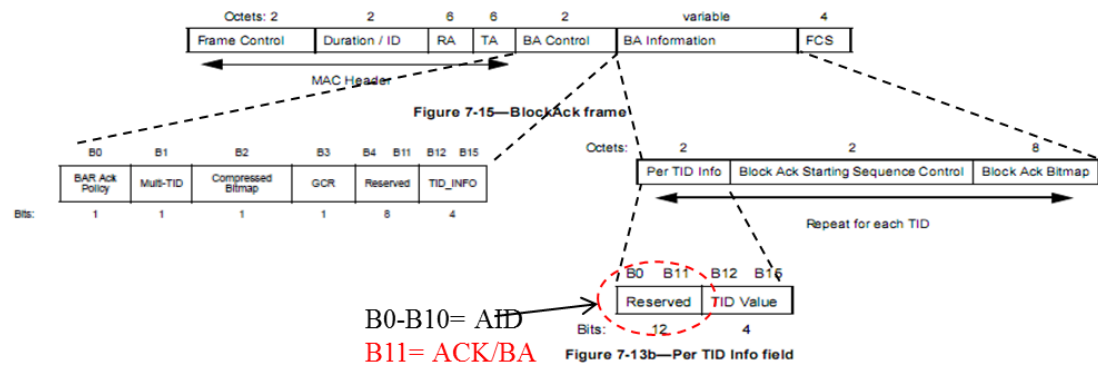
12.6.3. Result: Motion accepted with no objection.

12.7. MAC Motion #3**12.7.1. Move to add the following to the SFD:**

12.7.1.1. x.y.z The spec shall define a signaling in the Multi-STA BA frame that can indicate an ACK, as follows:

12.7.1.1.1. If B11 in the per-TID info field is set, then the BlockAck bitmap and the SC subfields in the BA Info field are not present and this BA Info field indicates an ACK for the STA with AID indicated in the per-TID info field

12.7.1.2. Instruction to the Editor: replace the Multi-STA BA figure from motion 1 with the following



12.7.2. Moved by Simone, Seconded by Philip Barber

12.7.3. Result: Motion accepted with no objection.

12.8. MAC Motion #4**12.8.1. Move to add to the spec framework document:**

12.8.1.1. x.y.z The spec shall define the following mode of operation:

12.8.1.2. An UL MU PPDU (MU-MIMO or OFDMA) is sent as an immediate response (IFS TBD) to a Trigger frame (format TBD) sent by the AP.

12.8.1.3. Moved by Simone Merlin, Seconded by Yasuhiko Inoue

12.8.1.4. Result: Motion accepted with no objection.

12.9. MU Motion #2**12.9.1. Move to add to the TG Specification Framework document:**

12.9.1.1. 3.y.z The amendment shall define a mechanism to support non-contiguous channel transmission.

12.9.2. Moved by Jinsoo Ahn, Seconded by Ronny Kim

12.9.3. Discussion

12.9.3.1. Against) The motion contains unclear terms.

12.9.3.2. Against) We already have this kind of function in the standard.

12.9.3.3. In favor) We need more flexible use of the channel.

12.9.3.4. Against) If this motion means 80+80, it is specified in 802.11ac. If the motion intends beyond 80+80 mode, we need more study for it.

12.9.4. Result: Y/N/A = 5/35/85, motion fails.

12.10. MU Motion #3**12.10.1. Move to add to the TG Specification Framework document:**

- 12.10.1.1. x.y.z. HE-PPDU for UL-OFDMA shall support UL data transmission below 20MHz for an HE STA
- 12.10.1.2. Moved by Woojin Ahn, Seconded by Ronny Kim
- 12.10.1.3. Discussion
 - 12.10.1.3.1. A member commented that it is difficult to understand the meaning of this motion.
- 12.10.1.4. Result: Y/N/A = 5/0/107, motion passes.

12.11. MU Motion #4

- 12.11.1. Move to add the following 11ax SFD:
 - 12.11.1.1. "802.11ax amendment shall include a mechanism to multiplex BA/ACK responses to DL MU transmission"
- 12.11.2. Moved by Minho Cheong, Seconded by Young Hoon Kwon
- 12.11.3. Discussion
 - 12.11.3.1. The intention is not clear enough.
- 12.11.4. Result: Motion accepted without objection.

12.12. Simulation Scenario document motion

- 12.12.1. Simone explained Simulation Scenario document revision 8.
 - 12.12.1.1. Modification from submissions incorporated:
 - 12.12.1.1.1. 15/441
 - 12.12.1.1.2. 15/360
 - 12.12.1.2. Further modification will be made to the document.
 - 12.12.1.3. Discussion
 - 12.12.1.3.1. A member asked to reflect the suggested changes by 15/373r2.

13. Goals for May 2015

- 13.1. Continue to advance the TG documents based on submissions.
 - 13.1.1. Expectation is more submissions affecting the TG specification framework document will be considered.
- 13.2. Technical Presentations

14. Teleconference scheduling

- 14.1. Thursday April 9 10:00 – 12:00 ET
- 14.2. Thursday April 30 20:00 – 22:00 ET

15. Motion (SSD)

- 15.1. Move to accept document 11-14/0980r9 as the current revision of the TG Simulation Scenario document.
- 15.2. Moved by Simone Merlin, Seconded by Phillip Barber.
- 15.3. Discussion – No discussion.
- 15.4. Result: Motion accepted with no objection.

16. AOB

16.1. A member pointed out that there had been some overlapping topics and he missed some presentations.

16.1.1. Chair mentioned that we will spend more time to classify the submission.

16.1.2. A member suggested name of the ad hoc to be included in the title of the simulation.

17. Adjourn

17.1. TGax adjourned @ 14:48.