IEEE P802.11  
Wireless LANs

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| IEEE 802.11 TGax  September 2014 Athens Meeting Minutes | | | | |
| Date: 2014-09-30 | | | | |
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Abstract

TGax meeting minutes from the IEEE 802.11 Athens session, September 15th – 19th, 2014.

**IEEE 802.11 Task Group ax**

**September 2014 Athens Meeting**

**Hilton Athens, Athens, Greece**

**September 15th – 19th, 2014**

**Monday, September 15th, 2014, AM2 TGax Session (10:30-12:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of the TGax, @10:30
   1. About 190 people are in the room.
2. Agenda Doc.11-14/1033r0 on the server.
   1. Rev 1 is the working document.
   2. Meeting Protocol: Chair asked to state name and affiliation when speaking for the first time.
   3. Chair reminded attendance.
3. The chair reviewed the mandatory 5 slides of P&P.
   1. Call for potentially essential patents
      1. Chair asked if anyone is aware of potentially essential patents.
      2. No potentially essential patents reported.
4. Agenda items for the week
   1. Approve TG f2f meeting minutes since July meeting.
   2. Vice Chairs election
   3. Continue to advance TG documents; Simulation Scenarios (11-14/0980r1), Evaluation Methodology (11-14/0571r3), and Channel Models (11-14/0882r3).
   4. Approve an initial Functional Requirements documents
   5. Technical Presentations
   6. Schedule Teleconference times.
5. General Flow of the meeting
   1. Slide 12 and 13 of the 14/1033r0 contains general flow of the meetings this week.
   2. There are nine meeting slots for TGax as contained in slide 14 of 14/748r1.

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| --- | --- | --- | --- | --- |
|  | Monday | Tuesday | Wednesday | Thursday |
| AM1 |  |  |  | TGax |
| AM2 | TGax | TGax |  |  |
| PM1 |  | TGax | TGax | TGax |
| PM2 | TGax | TGax |  |  |
| PM3 | TGax |  |  |  |

1. Tentative Agenda for Monday, September 15th, AM2 (10:30 – 10:30).
   1. Proposed Agenda
      1. Call meeting to order
      2. Patent policy, etc.
      3. Call for submissions
      4. Set and approve agenda
      5. Summary from July 2014 meeting
      6. TG motions
         1. Approve TG meeting minutes since July meeting.
      7. Announcement of WNG extra time slot on Wednesday PM2
      8. Vice Chair Election
      9. Presentations
         1. 11-14/1184, “TGax Ad Hoc Structure Discussion”, Vinko Erceg
            1. SP + Motion
         2. 11-14/1009, “Proposed 802.11ax Functional Requirements”, Lei Wang
            1. Motion
         3. FR Submission
      10. Recess.
   2. Chair asked if there are any other items – No items proposed. Meeting will be conducted based on this order.
2. Call for submissions
   1. Functional Requirements
      1. 11-14/1164, “Meaningful 11ax Functional Requirements,” Joe Kwak (InterDigital)
      2. 11-14/1167, “TGax Functional Requirement Discussion,” Yonggang Fang (ZTE)
      3. 11-14/1170, “Functional Requirements Discussions on Coex with Legacy STAs,” Masahito Mori (Sony)
      4. 11-14/1009, “Proposed 802.11ax Functional Requirements,” Lei Wang (Marvell)
      5. 11-14/0920, “Considerations of Functional Requirements Documents,” David Xun Yang (Huawei Technologies)
      6. 11-14/0636, “Discussion on Functional Requirements,” David Xun Yang (Huawei Technologies)
      7. 11-14/1234, “Requirements Discussion,” Joseph Levy (InterDigital)
   2. Simulation Scenarios and Calibration
      1. 11-14/1226, “SLS Box 1&2 Calibration Results,” Russell Huang (MediaTek)
      2. 11-14/1217, “MAC Calibration Results for Test 1 and 2,” Esa Tuomaala (Nokia)
      3. 11-14/1147, “MAC Simulator Calibration Results,” Shoko Shinohara, Akira Kishida (NTT)
      4. 11-14/1175, “MAC Calibration results,” Suhwook Kim (LG Electronics)
      5. 11-14/1177, “Discussion about Box5 Calibration,” Jiyong Pang (Huawei Technologies)
      6. 11-14/0800, “Box 1 and Box 2 Calibration Results,” Nihae Jindal (Broadcom)
      7. 11-14/1187, “The Effect of Preamble Error Model on MAC Simulator,” Po-Kai Huang (Intel)
      8. 11-14/1191, “MAC calibration results,” Zhou Lan (Huawei Technologies)
      9. 11-14/1192, “MAC calibration results comparison,” Zhou Lan (Huawei Technologies)
      10. 11-14/1198, “Additional Test Cases for MAC calibration,” Gwen Barriac (Qualcomm)
      11. 11-14/1223, “Stadium Measurements,” Brian Hart (Cisco Systems)
      12. 11-14/1230, “MAC Calibration Result,” Chinghwa Yu (MediaTek)
   3. Evaluation Methodology
      1. 11-14/1161, “Parameters for Power Save Mechanisms,” Eric Wong (Apple)
      2. 11-14/1162, “Energy Efficiency Evaluation Methodology Follow Up,” Eric Wong (Apple)
      3. 11-14/1174, “PHY Abstraction with Time Varying Interference,” Yakun Sun (Marvell)
      4. 11-14/1176, “PHY abstraction tables for 11ax system level simulation,” Jiayin Zhang (Huawei Technologies)
      5. 11-14/1221, “Traffic Generator for OBSS Calibration Case,” Chao-Chun Wang (MediaTek)
   4. Channel Model
      1. 11-14/1214, “Impact of correlated shadowing in 802.11ax system evaluations,” Leif Wilhelmsson (Ericsson AB)
      2. 11-14/1222, “Doppler Effect Evaluation for 11ax,” Jianhan Liu (MediaTek)
   5. Technology
      1. 11-14/1186, “Comparisons of Simultaneous Downlink Transmissions,” Pengfei Xia (InterDigital)
      2. 11-14/1106, “WLAN Frame Collision Information,” Peng Shao (NEC Communication Systems)
      3. 11-14/1148, “Consideration of asynchronous interference in OBSS environment,” Koichi Ishihara (NTT)
      4. 11-14/1168, “802.11 TGax PHY Frame Structure Discussion for Enabling New Contention Mechanism,” Yonggang Fang (ZTE)
      5. 11-14/1169, “DL-FDMA considerations,” Katsuo Yunoki (KDDI R&D Labs.)
      6. 11-14/1171, “DSC Simulation Results for Scenario 3,” Masahiro Mori (Sony)
      7. 11-14/1172, “Multicast Performance in OBSS,” Yuichi Morioka (Sony)
      8. 11-14/1178, “Inter-BSS interference in WLANs,” Hyunduk Kang (ETRI)
      9. 11-14/1179, “Considerations for Partial Band Interference between WLAN Systems,” Gwangzeen Ko (ETRI)
      10. 11-14/1180, “Discussions on Interference between TD-LTE & WLAN around 2.4GHz Band,” Meng Yang (CATR)
      11. 11-14/1181, “Measurements on A-MPDU performances under various channel conditions,” John Sun (WILUS Institute)
      12. 11-14/1190, “Frame Exchange Control for Uplink Multi-user transmission,” Kaying Lv (ZTE)
      13. 11-14/1199, “Effect of CCA in residential scenario part 2,” Gwen Barriac (Qualcomm)
      14. 11-14/1207, “OBSS reuse mechanism which preserves fairness,” Laurent Cariou (Orange)
      15. 11-14/1208, “MAC considerations on 802.11ax OFDMA,” Jinsoo Ahn (Yonsei Univ.)
      16. 11-14/1209, “Multiple RF operation for 802.11ax OFDMA,” Woojin Ahn (Yonsei Univ.)
      17. 11-14/1210, “HEW PPDU Format for Supporting MIMO-OFDMA,” Yongho Seok (NEWRACOM)
      18. 11-14/1211, “ACK Procedure for OFDMA,” Yongho Seok (NEWRACOM)
      19. 11-14/1216, “Consideration on Coexistence between LTE-U and 802.11 WLAN,” Jae Seung Lee (ETRI)
      20. 11-14/1224, “Link-Aware CCA,” Brian Hart (Cisco Systems)
      21. 11-14/1225, “Considerations on CCA for OBSS Opearation in 802.11ax,” Luo Jun (Huawei Technologies)
      22. 11-14/1227, “OFDMA Performance Analysis,” Tianyu Wu (MediaTek)
      23. 11-14/1128, “Issues on 256-FFT per 20MHz,” Heejung Yu (NEWRACOM)
      24. 11-14/1229, “Dynamic OFDM Symbol Duration,” Alan Jauh (MediaTek)
      25. 11-14/1232, “On MU Aggregation Mechanisms for 11ax,” Reza Hedyat (NEWRACOM)
      26. 11-14/1233, “Adaptive CCA for 11ax,” Reza Hedyat (NEWRACOM)
3. Summary from the July 2014 session
   1. Agreed to elect two vice chairs.
      1. “Call for nomination” e-mail was sent on July 17, 2014.
      2. Agreed to have the VC Chairs election during September f2f meeting.
   2. Agreed to defer the discussion on Ad Hoc groups and related leadership.
   3. Approved new revisions of the TG Simulation Scenarios (11-14/0980r1) and Evaluation Methodology (11-14/0571r3) documents.
   4. Approved the initial revision of the TG Channel Models document (11-14/0882r3)
   5. Preliminary discussion on functional requirements.
   6. Technical presentations
4. TG Motion
   1. **Motion: Approve HEW TG minutes of meetings and teleconferences from July 2014 Plenary meeting to today:**
   2. <https://mentor.ieee.org/802.11/dcn/14/11-14-0864-00-00ax-tgax-july-2014-meeting-minutes.docx>
   3. **Move: Vinko Erceg (Broadcom), Second: Lei Wang (Marvell)**
   4. **Motion accepted with no objection.**
5. Announcement
   1. **David That is planned to provide a presentation on “Bufferbloat”**
      1. Wednesday during the mid-week plenary – 15 minutes
      2. Wednesday PM2 – WNG time slot – 1 hour
   2. Summary
      * 1. ***Bufferbloat is a phenomenon in*** [***packet-switched networks***](http://en.wikipedia.org/wiki/Packet-switched_network)***, in which excess*** [***buffering***](http://en.wikipedia.org/wiki/Buffer_(telecommunication)) ***of*** [***packets***](http://en.wikipedia.org/wiki/Network_packet) ***causes high*** [***latency***](http://en.wikipedia.org/wiki/Latency_(engineering)) ***and*** [***packet delay variation***](http://en.wikipedia.org/wiki/Packet_delay_variation) ***(also known as jitter), as well as reducing the overall network*** [***throughput***](http://en.wikipedia.org/wiki/Throughput)***. When a*** [***router***](http://en.wikipedia.org/wiki/Router_(computing)) ***device is configured to use excessively large buffers, even very high-speed networks can become practically unusable for many interactive applications like voice calls, chat, and even web surfing.***
        2. ***Bufferbloat phenomenon was initially described as far back as in 1985, and gradually became more recognized as an issue. It gained more widespread attention starting in 2009.***
6. Vice Chair election
   1. There are two candidates for the vice chair positions. Chair asked if there are other candidates.
      1. No response. Nomination closed.
   2. Candidate List
      1. Simone Merlin (Qualcomm)
      2. Ron Porat (Broadcom)
   3. Candidate Statement (5 minutes each)
   4. **Chair asked the group to accept the Simone and Ron as the vice chairs of TGax.**
   5. **Simone and Ron accepted for vice chairs of TGax by affirmation.**
7. Discussion on the ad hoc groups
   1. Vinko Erceg (Broadcom) presented “” based on the submission 14/1184r1.
      1. Summary
         1. Four ad hoc groups (PHY, MAC, Multiuser, Spatial Reuse) proposed.
         2. Three co-chairs formation for each group proposed.
      2. Discussion
         1. C: Understand the need for the ad hoc groups. But it is still too early to discuss the structure without having technical discussions. 🡪 We have started discussion in the last meeting and it is good to accelerate the process.
         2. C: Agree except the names of the ad hoc groups.
         3. C: Generally agreed with this idea. But have a concern that multiple people are responsible for the progress of the group.
         4. C: There were COEX ad hoc in TGac. Need similar group here. 🡪 Spatial reuse ad hoc will be the place.
         5. C: Would like to see which ad hoc group addresses which problem.
         6. C: Two ad hoc groups may be enough.
         7. C: There may be some problems in logistics.
      3. **Straw Polls #1: Do you agree to have 4 Ad Hoc Groups?**
         1. **Result: Y/N/A =86/25/19**
      4. **Straw Poll #2: Do you agree to have 3 co-chairs per Ad Hoc Group?**
         1. **Result: Y/N/A = 79/17/36**
      5. **Straw Poll #2: Do you agree to have following Ad Hoc Group?**
         1. **Ad Hoc Groups: PHY/MAC/Multiuser/Spatial Reuse**
         2. **Result: A/N/A = 64/30/41**
8. Discussion on the functional requirements
   1. Lei Wang (Marvell) presented “Proposed 802.11ax Functional Requirements” based on the submission 14/1009r1.
      1. Summary
         1. Requirements: (1) System Performance, (2) Spectrum Efficiency, (3) Bands of Operation, (4) Backward Compatibility and Coexistence, and (5) Compliance to PAR.
      2. Discussion
         1. Some members mentioned that this is nothing more than the PAR of P802.11ax.
         2. Chair commented that the Functional Requirements document is not required to produce as Lei mentioned. Plan is to approve the basic document and have proposals to add features which need 75% approval to be adopted.
      3. **Motion: Move to accept document 11-14/1009r1 as the baseline document for TGax Functional Requirement.**
         1. **Moved by Lei Wang (Marvell), Seconded by Vinko Erceg (Broadcom)**
         2. **Discussions**
            1. **Would like to see more discussions before having a motion to adopt.**
         3. **Result: Y/N/A = 70/8/21, motion passes**
9. Presentations (Functional Requirements)
   1. Yonggang Fang (ZTE) presented “TGax Functional Requirement Discussion” based on the submission 14/1167r0
      1. Summary – Proposed to add following requirements:
         1. Efficiency –MAC efficiency and Spectral efficiency
         2. Packet Delay
         3. Robustness
      2. Discussions
         1. A member mentioned that the spectrum efficiency is already stated in the baseline documents.
         2. Another member pointed out that packet delay is affected by whole system design and need to be careful to set requirements.
      3. Straw Poll – deferred. Chair suggested offline discussions.
   2. Joseph Levy (InterDigital) presented “Requirements Discussion” based on the submission 14/1234r.
      1. Summary
         1. Without agreed well defined requirements there is no criteria to judge the merit of the technical contributions.
         2. We have provided a set of reasonable meaningful functional requirements in 11-14/1164r1.
         3. Without criteria to judge the technical merit of contributions we do not see how the current 802.11ax process will be able to move forward in an open and fair manner.
      2. Discussions
         1. Requirements and simulation scenarios discussed.
10. Recess until PM2 (16:00) today.

**Monday, September 15th, 2014, PM2 TGax Session (16:00-18:00)**

1. Meeting called to order @ 16:00
   1. The agenda is contained in 11-14/1033r1
      1. Rev 2 is the working document.
   2. There were more than 180 people in the room.
2. Administrative Items – Reminder
   1. Chair reminded that we are still operating under 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. Setting and approval of the agenda
   1. Proposed agenda for Monday PM2
      1. Call Meeting to order
      2. IEEE 802 and 802.11 IPR Policy and procedure.
      3. Presentations
         1. 11-14/1164, “Meaningful 11ax Functional Requirements”, Joe Kwak
         2. 11-14/1170, “Functional Requirements Discussions on Coex with Legacy STAs”,
         3. 11-14/0920, “Considerations of Functional Requirements Documents” David YangXun
         4. 11-14/0636, “Discussion on Functional Requirements” David YangXun
      4. SIM and Calibration.
      5. Recess
   2. Chair asked for comments for the agenda. – No response.
   3. Chair asked for approval of the proposed agenda. – Agenda approved.
4. Presentation
   1. Mori (Sony) presented “Functional Requirements Discussions on Coexistence with Legacy STAs” based on the submission 14/1170r2.
      1. Summary
         1. Techniques for BSS densification (e.g. DSC) may cause unfairness among STAs (especially for legacy STAs).
         2. Suggest FRD to include description about maintaining fairness among STAs.
      2. Discussion
         1. A member asked for clarification of the “legacy STAs” 🡪 802.11a/b/g/n/ac devices.
         2. There was discussion on what fairness means.
         3. A member asked what will be regarded as a significant impact.
      3. **Straw Poll:** **Do you agree to add new text described in slide 8?** 
         1. **Result: Y/N/A = 40/1/74**
      4. **Motion: Move to add the following text to the TGax Functional Requirement document:**

**2.x.x Legacy Performance**

* **Legacy performance shall not be significantly degraded by operation in or in proximity of 11ax network.**
  + - 1. **Moved by William Carney (Sony), Seconded by Sean Coffey (RealTek)**
      2. Discussion:
         1. Amendment of motion proposed.
         2. Have a concern to say “significantly degraded”. “Shall not be degraded” will be good.
         3. Need more information on the scenario. 🡪 Legacy network with the same condition.
      3. **Result: Y/N/A = 40/3/44, motion passes.**
  1. Zhou Lan (Huawei Technologies) presented “Consideration on Functional Requirements” based on the submission 14/0636r2
     1. Summary
        1. Improvement of spectrum efficiency should be explicitly stated in FR.
        2. Text for functional requirement proposed.
     2. Discussion
        1. C: TGax R2 includes this requirement.
     3. **Motion: Move to add the following text to the draft FRD document** [**11-14-1009-01-00ax-proposed-802-11ax-functional-requirements**](https://mentor.ieee.org/802.11/dcn/14/11-14-1009-01-00ax-proposed-802-11ax-functional-requirements.doc)**, in subclause 2.2 Spectrum Efficiency, page 4 as:**

**TGax Rn: The 802.11ax amendment shall provide a mechanism to increase spectral efficiency of 20 MHz and larger channels in scenarios with high density of 11ax STAs and in scenarios with presence of legacy devices**

* + - 1. **Moved by Zhou Lan (Huawei), Seconded by Philip Barber (Huawei)**
      2. Discussions
         1. No discussion
      3. **Result: Y/N/A = 39/7/34, motion passes**
  1. Philip Barber (Huawei Technologies) presented “Discussion on 802.11ax Functional Requirements” based on the submission 14/0920r1
     1. Summary
        1. Improvement of spectrum efficiency should be explicitly stated in FR.
        2. Text for functional requirement proposed.
     2. Discussions
        1. Some people asked about clarifications for STA-to-STA communications.
        2. A member mentioned it is considered in the simulation scenario document.
        3. Another member asked what problem will be addressed by this requirement.
     3. **Motion: Move to add the following text to the draft FRD document** [**11-14-1009-01-00ax-proposed-802-11ax-functional-requirements**](https://mentor.ieee.org/802.11/dcn/14/11-14-1009-01-00ax-proposed-802-11ax-functional-requirements.doc)**, in subclause 2.2 Spectrum Efficiency, page 4 as:**

**TGax Rn The 802.11ax amendment may provide a mechanism to improve frequency reuse efficiency and manage interference in the deployment scenarios with high density of 11ax STAs and with the presence of transmission between non-AP STAs**

* + - 1. **Moved by Philip Barber (Huawei), Seconded by Jiayin Zhang (Huawei)**
      2. **Result: Y/N/A = 37/8/41, motion passes.**

1. Presentations – Simulation Scenario and Calibration
   1. Akira Kishida (NTT) presented “MAC Simulator Calibration” based on 14/1147r0.
      1. Summary
         1. Simulations for MAC simulator calibration conducted.
         2. Results are aligned with results from other companies.
      2. Discussions
         1. Clarifications on simulation conditions such as retransmission behavior asked by some people.
         2. Chair asked people to have offline discussions for assumptions and conditions for the simulations.
   2. Brian Hart (Cisco Systems) presented “Stadium Measurements” based on the submission 14/1223r1
      1. Summary
         1. Measurement results of stadium presented.
         2. Results of both 2.4 GHz and 5 GHz channels presented.
         3. Rev 1 is not on the server.
      2. Discussions
         1. Some member asked for clarification on the environment such as the place, the device (802.11n or 802.11ac?).
         2. Another member asked if there are results of counting retry frames. – Do not have it right now, but there may be some.
   3. Chinghwa Yu (MediaTek) presented “MAC Calibration Result” based on the submission 14/1230r1
      1. Summary
         1. Conducted simulation for MAC calibration by using NS-3 based simulator.
         2. Test 2b needs more detailed condition.
      2. Discussions
         1. No discussion.
   4. Chao-Chum Wang (MediaTek) presented “SLS Box 1&2 Calibration Results” based on the submission 14/1226r0
      1. Summary
         1. Provide SLS calibration result for Box 1&2 tests in 4 scenarios. Pretty much aligned with results from other companies.
         2. Help verify the test results of other calibrating companies. Prepare for further calibration tests.
         3. Some assumptions and conditions summarized in slide 13.
      2. Discussions
         1. The results to be included in 14/800.
   5. Nihar Jindal (Broadcom) presented “Box 1 and Box 2 Calibration Result” based on the submission 14/0800r18
      1. Summary
         1. Results from more companies included since the last meeting.
         2. Results are pretty much aligned and calibration seems to be successful.
      2. Discussions
         1. A member commented on conditions such as number of spatial streams and CCA.
         2. Nihal encouraged other companies to submit the results.

7 submissions are planned for the evening session.

Chair asked if there is objection to recess until evening session. 🡪 No objection.

1. Recess @ 18:00 until PM3 (19:30) today.

**Monday, September 15th, 2014, PM3 TGax Session (19:30-21:30)**

1. Meeting called to order @ 19:30
   1. The agenda is contained in 11-14/1033r2 which is on the server.
      1. Rev 3 is the working document.
   2. There were more than xxx people in the room.
2. Administrative Items
   * + 1. Chair reminded that we are still operating under the IEEE 802 and IEEE 802.11 Policy and Procedure.
       2. Chair asked to address himself/herself when speaking for the first time.
3. Set and approve agenda
   1. Proposed agenda for Monday PM3
      1. Call Meeting to order
      2. IEEE 802 and 802.11 IPR Policy and procedure.
      3. Presentations
         1. 11-14/1217, “MAC Calibration Results for Test 1 & 2,” Esa Tuomaala
         2. 11-14/1175, “MAC Calibration Results,” Suhwook Kim
         3. 11-14/1177, “Box 5 Calibration Discussion,” Jiyong Pang
         4. 11-14/1187, “The effect of preamble errors on MAC Simulation,” Po-Kai Huang
         5. 11-14/1191, “MAC calibration results,” Zhou Lan
         6. 11-14/1192, “MAC calibration results comparison,” Zhou Lan
         7. 11-14/1198, “Additional Test cases for MAC Calibration,” Gwen Barriac
      4. Recess
   2. Chair asked for comments for the agenda. – No response.
   3. Chair asked for approval of the proposed agenda. – Agenda approved.
4. Presentation
   1. Zhou Lan (Huawei Technologies) presented “MAC calibration results” based on the submission 14/1191r0 and “MAC calibration results comparison” based on the submission 14/1192r0.
      1. Summary
         1. 14/1191r0 contains updated simulation results for MAC calibration.
         2. 14/1192r0 contains simulation results for MAC calibration of test 1 to 3 from multiple companies.
      2. Discussions
         1. Q: Are those results aligned? 🡪 A: Most of the results are aligned with a few exceptions.
      3. **Straw Poll #1: Do you support adopting the parameter settings listed in slide 9 into the simulation scenario document?** 
         1. **Result: Y/N/A = 59/0/6**
      4. **Straw Poll #2: Do you support adopting the comparison result slides (slides 4 to 8) into the simulation scenario document as a initial report of MAC calibration results?** 
         1. Discussions
            1. A member mentioned it may be too early to adopt the results since new parameters have just been accepted.
         2. **Result: Y/N/A = 19/34/35**
      5. **Motion: Move to adopt the parameter settings listed in slide 9 of doc 11-14/1192r1 into the simulation scenario document** 
         1. **Moved by Zhou Lan (Huawei Technologies), Seconded by Wookbong Lee (LG)**
         2. **Result: Motion accepted with no objection.**
   2. Suhwook Kim (LG Electronics) presented “MAC Calibration results” based on the submission 14/1175r1.
      1. Summary
         1. MAC calibration results presented.
         2. MU-MIMO test case suggested as Test 5 and Test 6 as in slide 15 and 16.
      2. Discussions
         1. Need consider other basic features before MU Transmissions.
         2. Need to specify the initiation procedure for the MU transmissions? 🡪 This is DL only and it is not necessary.
   3. Esa Tuomaala (Nokia) presented “MAC Calibration results for Test 1 and 2” based on the submission 14/1217r1.
      1. Summary
         1. Results of MAC calibration presented.
      2. Discussions
         1. No discussion.
   4. Po-Kai Huang (Intel) presented “The Effect of Preamble Error Model on MAC Simulator” based on the submission 14/1187r1.
      1. Summary
         1. Different preamble error models can lead to different throughput performance.
         2. Propose to model the preamble error based on the 802.11 spec to evaluate the performance gain of OBSS techniques.
      2. Discussions
         1. Clarification asked for the behavior of having interference.
         2. Clarification asked for the use of the color bits.
   5. Jiyong Pang (Huawei Technologies) presented “Discussion about Box5 Calibration” based on the submission 14/1177r1.
      1. Summary
         1. The calibration progress from Box-1, Box-2 and Box-0 towards Box-5 reviewed.
         2. Detailed Box-5 calibration parameters of both PHY layer and MAC layer proposed and initial results presented.
         3. Use of 802.11ac scenario 6, OBSS Enterprise scenario, suggested as an easy-to-start scenario to calibrate Box-5.
      2. Discussions
         1. Discussed how the MU-MIMO feature can be considered here.
   6. Jianhan Liu (MediaTek) presented “Doppler Effect Evaluation for 11ax” based on the submission 14/1222r1.
      1. Summary
         1. While the IEEE 802.11ax outdoor operation focus on pedestrian mobility, reflections from fast moving objects can cause higher Doppler.
         2. Following two Doppler modes should be supported in the TGax Channel Model document.
            1. Speed up to 3kmph for all clusters for UMi and UMa models; (STA velocity = 3 kmph)
            2. 2. The TBD cluster of UMi and UMa models assigned a speed of 60kmph and the rest of the clusters assigned 0 kmph
      2. Discussions
         1. Compare with the 802.11ah channel model suggested.
      3. Straw Poll – deferred after discussion with some people.
5. Recess @ 21:30 until Tuesday AM2 (10:30 AM)

**Tuesday, September 16th, 2014, AM2 TGax Session (10:30-12:30)**

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), chair of TGax, @ 10:30 AM.
   1. The agenda document 11-14/1033r2 is on the server.
      1. Rev 3 is the working document.
      2. There were 170 people in the room.
2. Reminder
   1. Chair asked people to state name and affiliation when addressing for the first time.
   2. Chair reminded that we are still operating under the IEEE 802 and IEEE 802.11 Policy and Procedures.
   3. Chair also reminded people to do attendance.
3. Agenda setting
   1. Proposed agenda
      1. Call Meeting to order
      2. Presentation
         1. 14/1198 “Additional Test Cases for MAC Calibration,” Gwen Barriac
         2. 14/1214, “Impact of correlated shadowing in 802.11ax system evaluations” Leif Wilhelmsson
         3. 14/1222, “Doppler Effect Evaluation for 11ax” Jianhan Liu – follow up.
         4. 14/1221, “Traffic Generator for OBSS Caliberation Case “, Chao Chun Wang
         5. 14/1176, “PHY Abstraction Tables for 11ax System Level Simulations”, Jiayin zhang
         6. 14/1174, “PHY Abstraction Tables for 11ax System Level Simulations”, Yukun Sun
         7. 14/1161, “Parameters for Power Save Mechanisms”, Eric Wong
         8. 14/1162, “Energy Efficient Evaluation Methodology Follow up “, Eric Wong
      3. Recess
   2. Chair asked if there is any objection to proceed with this agenda. No objection.
      1. The agenda for Tuesday AM2 was approved.
4. Presentations:
   1. Simone Merlin (Qualcomm) presented “Additional Test Cases for MAC calibration” based on the submission 14/1198r1
      1. Summary
         1. Ultimate goal is to be able to calibrate MAC functionality in the full simulation scenarios in 11-14/980.
         2. Suggest some additional calibration tests that test MAC interactions when there are multiple STAs per AP.
      2. Discussions
         1. A member asked about the intention of having new calibration scenarios.
         2. Another member asked what’s new in the proposed scenarios 🡪 multiple STAs per AP, different distances, etc.
         3. There was a question asking whether the asynchronous interference is considered in the proposed scenario. 🡪 No.
      3. **Straw Poll: Do you support to add the calibration tests in document 1220r0 to the Simulation Scenario document 980r2?**
         1. Discussion
            1. This is integrated system calibration rather than MAC calibration.
            2. Traffic condition 🡪 only uplink
            3. Consistency with the current simulation scenario document discussed.
         2. **Result: Y/N/A = 21/25/44**
   2. Leif Willhelm (Ericsson) presented “Impact of correlated shadowing in 802.11ax system evaluations” based on the submission 14/1214r1
      1. Summary
         1. Proposed to use correlated shadowing in the systems evaluations to better reflect real world conditions.
         2. Without considering the correlated shadowing effect, SINR for the 5th-percentile STA will be under estimated by 5 dB.
         3. Different scenarios will need different values.
      2. Discussions
         1. Clarification asked which scenarios to consider this effect. 🡪 Outdoor scenarios.
         2. A member asked a question if this is a proposal to do calibration again for each scenario. 🡪 Just for reference point will be enough.
   3. Straw Poll & Motion by Jianhan Liu (MediaTek) on 14/1222r1
      1. **Motion: Move to add the following Doppler effect to IEEE 802.11ax channel model document.**

* **The 2nd and the 3rd clusters of UMi and UMa models assigned a speed of 60 kmph and the rest of the clusters assigned 3 kmph.**
  + - 1. **Moved by Jianhan Liu (MediaTek), Seconded by Wookbong Lee (LG Electronics)**
      2. **Result: Motion accepted by unanimous consent.**
  1. Chao-Chun Wang (MediaTek) presented “Traffic Generator for OBSS Calibration Case” based on the submission 14/1221r1
     1. Summary
        1. Use Poisson distribution model instead of Weibull distribution model.
        2. Introduced how to generate data traffic and how long the simulation time will be.
     2. Discussions
        1. No discussion.
     3. **Straw Poll: Do you agree to revise the traffic generator to use Poisson traffic generator?**
        1. **Result: No objection.**
        2. **Chair asked Chao-Chun to come up with the exact changes to the document.**
  2. Jiayin Zhang (Huawei) presented “PHY abstraction tables for 11ax system level simulation” based on the submission 14/1176r0
     1. Summary
        1. Results from two more companies are included since the last meeting.
        2. The results are very much aligned.
     2. Discussions
        1. C: Confused to see the results. Would like to know which one should be based on.
  3. Yakun Sun (Marvell) presented “PHY Abstraction with Time Varying Interference” based on the submission 14/1174r0
     1. Summary
        1. Propose to update the basic PHY abstraction to block-wise PHY abstraction.
     2. Discussions
        1. The unit to calculate this effect? 🡪 Per-MPDU basis.
        2. Impact on the MCS selection discussed.
        3. Issue of timing relation between OFDM symbol and interference discussed.
        4. What will be the next step for this? 🡪 Just proposed a solution for this time. Will talk with some people to see if this is acceptable for the group.
  4. Eric Wong (Apple) presented “Parameters for Power Save Mechanisms” based on the submission 14/1161r3
     1. Summary
        1. Discussed parameters associated to each baseline power save mechanism proposed.
        2. MAC simulator calibration scenario for each power save mechanism presented.
     2. Discussions
        1. Consideration for PSMP questioned.
        2. Impact of multiple level of power consumption level discussed.
     3. Straw Polls – deferred until PM1 session.
  5. Eric Wong (Apple) presented “Energy Efficiency Evaluation Methodology Follow Up” based on the submission 14/1162r1
     1. Summary
        1. Follow up contribution to energy efficiency evaluation methodology 11-14/827r3 providing:
           1. An update on the Energy Efficiency Rating
           2. Discussed feedback received from 11-14/827r3
     2. Discussions
        1. Chair suggested straw polls be taken after lunch

1. Recess at 12:26 until Tuesday PM1 (13:30) today.

**Tuesday, September 16th 2014, PM1 Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of TGax, @13:30
   1. Agenda 11-14/1033r3 is on the server. Rev 4 is working document.
   2. There were 160 people in the room.
2. Reminder
   1. Chair asked people to state name and affiliation when addressing for the first time in the session.
   2. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   3. Attendance!
3. Agenda Setting
   1. Proposed agenda for this session - Tuesday PM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance.
      3. Presentations
         1. Straw Polls (11-14-1161 and 11-14-1162)
         2. Technical submissions (CCA)
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
4. Presentations
   1. Straw Polls on 11-14-1161 and 11-14-1162 by Eric Wong (Apple)
      1. **Straw Poll #1.1: Do you agree, in principle, to add metrics corresponding to energy efficiency to the evaluation methodology document (11-14/571r3)?**
         1. Discussion: No discussion.
         2. **Result: Approved with no objection.**
      2. **Straw Poll #1.2: Do you support adding the following definition for Energy Efficiency Ratio (EER) to the evaluation methodology document (11-14/571r3)?**

* **Energy efficiency ratio is defined as the ratio of average energy consumed for one bit of data successfully exchanged between STAs using any new proposed power save mechanism over the baseline power save mechanism**



* + - 1. Discussion: No discussion.
      2. **Result: Approved with no objection.**
    1. **Straw Poll #1.3: Do you support adding these metrics to evaluation methodology document (11-14/571r3)?**

|  |  |  |
| --- | --- | --- |
| **Metric** | **Units** | **Definition** |
| **Per-STA energy per TX bit** | **Joules/bit** | **Total energy consumed by a STA divided by the total number of successful data bits transmitted by the STA** |
| **Per-STA energy per RX bit** | **Joules/bit** | **Total energy consumed by a STA divided by the total number of successful data bits received by the STA** |

* + - 1. Discussions
         1. Energy is implementation dependent and it may be difficult to align the number.
      2. **Result: Approved with no objection.**
    1. **Straw Poll #2.1: Do you support adding standardized power tables for the purpose of computing energy consumption to the simulation scenario document (11-14/980r2)?**
       1. Discussions
          1. How to align the result – use the common table.
          2. Discussed if the items in straw poll 2.2 is enough.
       2. **Result: Approved with no objection.**
    2. **Straw Poll #2.2: Do you support adding the following power table (whose entries are TBD) to the simulation scenario document (11-14/980r2)?**

|  |  |
| --- | --- |
| **Power State** | **Average Power Consumption (mW)**  **Bandwidth = { 20 MHz }, Band = { 2.4 GHz, 5 GHz }, NSS = { 1 },**  **Number of TX/RX antennas = { 1 }, TX power per antenna = { 15 dBm }** |
| **Transmit** |  |
| **Receive** |  |
| **Listen** |  |
| **Sleep** |  |

* + - 1. Discussions – No discussion.
      2. **Result: Accepted with no objection.**
    1. **Straw Poll #2.3: Do you support adding the following power transition table (whose entries are TBD) to the simulation scenario document (11-14/980r2)?**

|  |  |  |
| --- | --- | --- |
| State Transition | Transition Time (ms) | Average Power Consumption (mW) |
| Transmit 🡸🡺 Listen | 0 | 0 |
| Receive 🡸🡺 Listen | 0 | 0 |
| Receive 🡺 Transmit | TRT (e.g. SIFS of 16 us) | PRT |
| Transmit 🡺 Sleep | TTS | PTS |
| Receive 🡺 Sleep | TRS | PRS |
| Listen 🡺 Sleep | TLS | PLS |

* + - 1. **Result: No objection.**
    1. **Straw Poll #3.1: Do you support adding a baseline power save mechanism to each scenario and associated traffic modes, in reference traffic profile in Annex 1 to the simulation scenario document (11-14/980r2)?**
       1. Discussions
          1. Prefer to keep simplicity.
          2. Discussed how to define metric for the energy 🡪 energy/bit.
       2. **Result: Y/N/A = 10/2/many**
    2. **Straw Poll #3.2: The baseline power save mechanism may include one of the following 3 power save mechanisms defined in [4]?**

**a) Power save mode (PSM)**

**b) Power save polling (PSP)**

**c) Unscheduled automatic power save delivery (U-APSD)**

**d) Not applicable**

* + - 1. Discussions
         1. C: PSP covered by PSM. Requested to run the straw poll separately. 🡪 PSP and PSM are different mechanisms.
         2. C: Relationship with the access category questioned.
         3. C: Relationship with the power save mechanism defined in recent standards is asked for.
      2. **Result: Y/N/A = 12/0/many**
      3. **Chair suggested two motions, one for SS document and one for EM.**
    1. **Straw Poll #1: Do you agree to define parameters associated with each power save mechanism to the simulation scenario document (11-14/980r2)?**
       1. Discussions: No discussion.
       2. **Result: Y/N/A = 11/0/many**
    2. **Straw Poll #2: Do you agree to add a test for power save mechanisms to the simulation scenario document (11-14/980r2) in the “Scenarios for calibration of MAC simulator” section?**
       1. Discussions:
          1. Q: Clarification asked what exactly will be added.
       2. **Result: Y/N/A = 11/2/many**

1. Presentations – CCA
   1. Masahiro Mori (Sony) presented “DSC Simulation Results for Scenario 3” based on the submission 14/1171r1.
      1. Summary
         1. System gain by DSC and the impact for legacy devices are confirmed in the Simulation Scenario 3.
         2. Some additional techniques to avoid loss of Rx opportunity should be used together to effectively obtain the DSC gain.
      2. Discussions
         1. C(slide 7): 802.11ac provides a mechanism for this purpose.
         2. C(slide 7): STA goes back to the receive mode when missed the VHT-SIG.
   2. Brian Hart (Cisco) presented “Link-Aware CCA” based on the submission 14/1224r0.
      1. Summary
         1. Many proposals for optimizing CCA thresholds and/or receiver sensitivities, including “Dynamic Sensitivity Control”
         2. The Margin parameter in Dynamic Sensitivity Control must be carefully set to avoid unfairness.
         3. Solution: Option #1 - 14/872 (per-PPDU CCA thresholds using PER), Option #2 - CCA Do-Over – design CCA rules that really address the real problem
      2. Discussions
         1. Discussed the effect of antenna pattern.
   3. Koichi Ishihara (NTT) presented “Consideration of asynchronous interference in OBSS environment” based on the submission 14/1148r0.
      1. Summary
         1. Issue of asynchronous interference in the OBSS environment discussed.
         2. Need solution(s) to resolve the asynchronous interference issue such sensitivity control and BSS color.
      2. Discussions
         1. No discussion.
      3. **Straw Poll: Do you think asynchronous interference issues should be addressed in TGax?**
         1. Discussions: No discussion.
         2. **Result: Y/N/A = 63/1/8**
   4. Laurent Cariou (Orange) presented “OBSS reuse mechanism which preserves fairness” based on the submission 14/1207r1.
      1. Summary
         1. Fairness analysis with different CCA adaptation (DSC, fixed CCA), with TPC presented.
         2. Proposed a mode that optimizes both area throughput and fairness.
      2. Discussions
         1. Clarification for the fairness questioned 🡪 per-user throughput within a BSS.
   5. Luo Jin (Huawei) presented “Considerations on CCA for OBSS Operation in 802.11ax” based on the submission 14/1225r1.
      1. Summary
         1. Simulation results from integrated SLS using CCA adjustment presented.
         2. CCA for multiple channel (OFDMA) discussed.
      2. Discussions
         1. No questions.

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

1. Recessed at 15:22 until PM2 (16:00) today.

**Tuesday, September 16th 2014, PM2 Session (16:00-:18:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @16:01
   1. Agenda 11-14/1033r3 is on the server. Rev 4 still is working document.
   2. There were 150 people in the room.
2. Reminder and announcements
   1. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   2. Chair asked for people to state name and affiliation when addressing for the first time in the session.
   3. Chair also reminded people to do attendance.
3. Announcement
   1. Chair encouraged referring to the document number or the name of the person of the contribution rather than using the name of the company. It is the policy of IEEE 802 and 802.11.
4. Agenda Setting
   1. Proposed agenda for this session (Tuesday PM2)
      1. Call Meeting to order
      2. IEEE 802 and 802.11 IPR Policy and procedure.
      3. Presentations
         1. TECH Submissions.
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
5. Presentations
   1. Simone Merlin (Qualcomm) presented “Effect of CCA in residential scenario part2” based on the submission 14/1199r1.
      1. Summary
         1. Simulation results for various CCA settings in residential scenario presented.
            1. For residential scenario of reuse 1: Increasing CCA can be harmful for the 5% throughput.
            2. For residential scenario of reuse 3: gain from CCA depends on the conditions.
            3. For residential scenario of reuse 6: No gains by increasing CCA (except 1 special case).
      2. Discussions
         1. Generally agree with the results.
         2. Q(slide 6): Would like to know why the throughput goes up and down for this case. 🡪 Not sure.
   2. Reza Hedayat (NEWRACOM) presented “Adaptive CCA for 11ax” based on the submission 14/1233r2.
      1. Summary
         1. Compared adaptive CCA and static CCA.
         2. Risk of adaptive CCA identified such as increased hidden terminal, fluctuation of interference level which causes transmission errors, additional overhead and unfairness.
      2. Discussions
         1. Relation between the adaptive CCA and MCS selection questioned.
   3. Hyunduk Kang (ETRI) presented “Inter-BSS interference in WLANs” based on the submission 14/1178r2.
      1. Summary
         1. Inter-BSS interference is one of important problems 11ax should solve to achieve High Efficiency WLAN.
         2. Three topics related to Inter-BSS Interference Mitigation are considered – (i) Identification of OBSSs, (ii) Exchanging necessary information among OBSSs to help IBIM, and (iii) Managing operating channels among OBSSs to avoid co-channel interference.
      2. Discussions
         1. Need for a new AP-to-AP communication protocol discussed.
   4. Peng-Fei Xia (InterDigital) presented “Comparison of Simultaneous Downlink Transmissions” based on the submission 14/1186r1.
      1. Summary
         1. Comparison of transmission overhead for downlink MU-MIMO, OFDMA, and single user transmissions presented.
         2. DL OFDMA will be useful for short packets and improved over single user transmissions observed.
         3. DL MU-MIMO will be useful for high SNR scenarios and long packet conditions.
      2. Discussions
         1. Clarification on simulation conditions questioned such as channel allocation and channel model. 🡪 SU transmission is in 80 MHz channel and MU is four 20MHz transmissions. Channel model B is used.
         2. Q(slide 8): Why the throughput for 8 antenna case goes up in a low SNR condition? 🡪 MCS selection.
         3. ACK procedure for MU transmissions discussed.
   5. Peng Shao (NEC Communications) presented “WLAN Frame Collision Information” based on the submission 14/1106r0.
      1. Summary
         1. Use of frame collision information suggested.
      2. Discussions
         1. Additional overhead by introducing Frame Collision Information discussed.
      3. **Straw Poll: Do you agree that TGax should support frame collision information?**
         1. Discussions:
            1. Not sure how much gain, it really works, etc.
            2. Where is this information put?
         2. **Result: Y/N/A = 0/16/many**
   6. Gwangzeen Ko (ETRI) presented “Considerations for Partial Band Interference” based on the submission 14/1179r0.
      1. Summary
         1. The impact of partial band interference and possible solution discussed.
         2. For the 2.4 GHz, upper layer management will be good.
         3. For the 5 GHz band, OFDMA will be the solution.
      2. Discussions
         1. Actual solution for 2.4 GHz band discussed. But will be a future work.
         2. Definition of partial band interference questioned.

We still have 15 submissions. We may have time to cover only 12 puresentations.

Chair asked if there is objection to recess. 🡪 No objection.

1. Recessed at 17:55 until Wednesday PM1 (13:30).

**Wednesday, September 17th 2014, PM1 Session (13:30-15:50)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @13:30
   1. Agenda 11-14/1033r4 is on the server. Rev 5 is working document.
   2. There were about 170 people in the room.
2. Reminder and Announcements
   1. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   2. Chair asked people to address himself/herself when speaking for the first time.
3. Agenda for this session
   1. Wednesday AM2
      1. Call Meeting to order
      2. Reminder and Announcements
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance.
      3. Presentations
         1. Tech submissions
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
4. Presentations – Chair asked to limit the time for each presentation to 20 min.
   1. Katsuo Yunoki (KDDI Labs) presented “DL-FDMA consideration” based on the submission 14/1169r0.
      1. Summary
         * 1. Suggested Down Link FDMA (DL-FDMA) as a candidate technique for 802.11ax to improve the spectrum efficiency.
      2. Discussions
         1. Many questions such as exact definition of legacy, aggregation use of channel.
         2. Some people commented that the proposal here is Frequency Division Multiplexing.
      3. **Straw Poll: Do you support to study DL-FDMA as a possible technique for efficiency improvement for 11ax?**
         1. **Discussion**
         2. **Result: Y/N/A = 4/3/many**
   2. Yonggang Fang (ZTE) presented “802.11 TGax PHT Frame Structure Discussion for Enabling New Contention Mechanism” based on the submission 14/1168r0.
      1. Summary
         * 1. In high density deployment cases, the spectrum efficiency of CSMA/CA would be very low.
           2. Code based contention mechanism would help to reduce the collision and improve the spectrum usage efficiency.
      2. Discussions
         1. Asked if the auto detection of the frame is possible.
   3. Jinsoo Ahn (Yonseei Univ.) presented “MAC consideration on 802.11ax OFDMA” based on the submission 14/1208r1.
      1. Summary
         1. Full scanning method makes OFDMA channel access protocol simple, however, it requires high operational overhead.
         2. Modified RTS does not cause hidden terminal problem.
         3. Since using OFDMA with RTS/CTS provides good performance in dense STAs and OBSS scenario, it is recommended to study more in 802.11ax.
      2. Discussions
         1. No discussion.
   4. Kaying Lv (ZTE) presented “Frame Exchange Control for Uplink Multi-user transmission” based on the submission 14/1190r3.
      1. Summary
         1. UL MU TXOP needs a new scheme to allow flexible UL MU transmission.
         2. Discussed a new control scheme with a multi-user BA+Poll frame.
      2. Discussions
         1. Clarification on the error recovery procedure asked for.
         2. Asked if the proposed scheme can be applied to both MU-MIMO and OFDMA. The answer is yes.
   5. Meng Yang (CATR) presented “Discussion on Interference between TD-LTE & WLAN around 2.4GHz Band” based on the submission 14/1180r1.
      1. Summary
         1. There is interference issue between TD-LTE system and WLAN system around 2.4GHz.
      2. Discussions
         1. No discussion.
   6. Woojin Ahn (Yonsei Univ.) presented “Multiple RF operation for 802.11ax OFDMA” based on the submission 14/1209r1.
      1. Summary
         1. Contention overhead is one of the biggest reasons that reduces the MAC efficiency of 802.11 networks.
         2. Multiuser wider band operation (OFDMA) might play a key role to reduce the contention overhead and enhance the overall MAC efficiency.
         3. More investigations on multiple RF chains operation is necessary in 802.11ax.
      2. Discussions
         1. No discussion.
   7. Alan Jauh (MediaTek) presented “Dynamic OFDM Symbol Duration” based on the submission 14/1229r1.
      1. Summary
         1. 4x OFDM symbol duration may enhance efficiency for longer payloads and may have benefit of less CP overhead and finer frequency granularity.
         2. Support for dynamic OFDM symbol duration may result in greater overall efficiency.
         3. Two methods to enable dynamic 1x/4x OFDM symbol duration are proposed.
      2. Discussions
         1. Clarification on CTS-to-self indication requested.
   8. Yuichi Morioka (Sony) presented “Multicast performance in OBSS” based on the submission 14/1172r2.
      1. Summary
         1. Multicast could be the most efficient technique to achieve this use case and legacy multicast performance in current simulation scenario is shown in this submission.
         2. Legacy multicast mechanisms under perform in dense environments.
         3. More efficient transmission technique needs to be considered for 11ax.
      2. Discussions
         1. No discussion.

We still have 6 presentations to hear. 🡪 To be presented during Thursday AM1.

Task Group businesses including motions will be considered in Thursday PM1.

Chair asked if we have any item to discuss in the next 10 minutes.

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

1. Recessed at 15:21 until AM1 (8:00) Thursday.

**Thursday, September 18th, 2014, AM1 Session (8:00-10:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @8:00 AM
   1. About 150 people are in the room.
   2. Agenda 14/1033r4 is on the server. Rev. 5 is the working document.
2. Reminder and Announcements
   1. Chair asked people to state name and affiliation when addressing for the first time in the session.
   2. Chair reminded IEEE 802 and 802.11 IPR P&P.
   3. Chair reminded people to do attendance.
3. Agenda for this session
   1. Thursday AM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance
      3. Presentations
         1. Tech Submissions
         2. Motion – if time allows
      4. Recess
   2. Chair asked if there are any modifications to the agenda.
   3. Agenda approved without objections.
4. Presentations
   1. Yongho Seook (NEWRACOM) presented “HEW PPDU Format for Supporting MIMO-OFDMA”, based on the submission 14/1210r1r0.
      1. Summary
         1. Advanced MIMO technology of IEEE 802.11n/ac should be a base of IEEE 802.11ax new technology.
         2. In order to efficiently support heterogeneous users (having different link quality and different device capability), at least the TXVECTOR parameters of MCS, NUM\_STS, FEC\_CODING should be considered as user-specific values.
         3. STBC should be allowed as user-specific value or a common value.
      2. Discussions
         1. Question about the detailed design of preamble asked. 🡪 The presenter is not proposing detailed design at this time.
         2. Discussed the use of different GI length for different part.
   2. Yongho Seok (NEWRACOM) presented “Ack Procedure for OFDMA”, based on the submission 14/1211r0.
      1. Summary
         1. Discussions in IEEE 802.11ax are favoring on the OFDMA technology.
         2. The protocol overhead of the OFDMA has to be considered.
         3. The robustness and fairness of the ACK procedure have to be carefully evaluated before deciding the support of the OFDMA in IEEE 802.11ax
      2. Discussions
         1. No discussion.
   3. Tianyu Wu (MediaTek) presented “OFDMA Performance Analysis”, based on the submission 14/1227r2.
      1. Summary
         1. With more active STAs participating in the OFDMA transmission, larger throughput gain can be achieved.
         2. RB size shall be selected as a balance of OFDMA throughput gain and overhead.
      2. Discussions
         1. Clarification asked for the graphs in slide 8.
         2. Conditions for analysis discussed.
         3. Question asked the graph in slide 7 – where from the gain comes from? A: Multi-user diversity gain and frequency diversity gain.
   4. Reza Hedyat (NEWRACOM) presented “On Multi-STA Aggregation Mechanisms for 11ax”, based on the submission 14/1232r1.
      1. Summary
         1. While short packets are highly likely in many applications, current aggregation mechanism in WiFi is mostly suited for large packets.
         2. To enhance WiFi MAC efficiency, it is important to offer multi-STA aggregation mechanisms in 11ax and to have efficient aggregation for ACK/BA.
         3. CDMA-based signaling would also offer good tradeoffs for ACK aggregation in UL direction, as well as for bandwidth/airtime request which would be necessary for UL OFDMA and UL MU mechanisms
      2. Discussions
         1. Clarification for CDMA based BAR/BA aggregation is asked.
         2. (Slide 13) Reason of DL YouTube packet to have size of more than 20000 Byte questioned. 🡪 Characteristics of video traffic.
   5. John Son (WILLUS) presented “Measurements on A-MPDU Performance Under Various Channel Conditions”, based on the submission 14/1181r1.
      1. Summary
         1. Measurements of A-MPDU performances under various channel conditions, bandwidths, and population densities presented.
         2. The more MPDUs are aggregated, the more frequent link adaption is triggered, due to higher error rates in the latter MPDUs.
         3. For 802.11ax, “64 MPDU aggregation” and “5.46ms duration” could play as the limiting factor in wide band and narrow sub-band respectively
      2. Discussions
         1. Clarification on the measurement condition requested.
      3. **Straw Poll: Do you agree that 11ax should enhance the frame aggregation feature?**
         1. **Discussions**
            1. **Clarification on the intention of this straw poll questioned.**
         2. **Result: Y/N/A = 42/1/many**
   6. Jae Sung Lee (ETRI) presented “Consideration on Coexistence between LTE-U and 802.11 WLAN”, based on the submission 14/1216r0.
      1. Summary
         1. Reviewed considerations for Coex between LTE-U and 802.11
         2. The Coex mechanism should require only minimal changes to the existing spec.
      2. Discussions
         1. Confused to hear the presentation. While assuming that it is LTE system to have some coexisting mechanism, the presenter proposes a solution.
         2. Would like to know how much the duty cycle approach scales. What if more than one LTE systems and Wi-Fi system are operating in proximity.
5. TG Motions
   1. Motion on Functional Requirements (14/1167r2)
      1. **Motion #1: Move to add the following text to the TGax Functional Requirement document** [**11-14-1009-01-00ax-proposed-802-11ax-functional-requirements**](https://mentor.ieee.org/802.11/dcn/14/11-14-1009-01-00ax-proposed-802-11ax-functional-requirements.doc)**:**

**2.x Latency Requirements**

**TGax Rx: The 802.11ax amendment shall bring latency to a desirable level to meet QoS requirement in**

* + - 1. **Moved by Yonggang Fang (ZTE),**
      2. Discussions
         1. Requirement for the latency is not quantified. Suggested removal of the latecy.
         2. QoS requirement.
      3. **Result: Y/N/A = 30/7/30, motion passes.**
    1. **Motion #2: Move to add the following text to the TGax Functional Requirement document** [**11-14-1009-01-00ax-proposed-802-11ax-functional-requirements**](https://mentor.ieee.org/802.11/dcn/14/11-14-1009-01-00ax-proposed-802-11ax-functional-requirements.doc)**:**

**2.x Robustness Requirements**

**TGax Rx: The 802.11ax amendment shall bring PER to a desirable level to make the link robust in high dense deployment scenario.**

* + - 1. **Moved by Yonggang Fang (ZTE), Seconded by Sun Bo (ZTE)**
      2. Discussions
         1. This is not something that should be in the functional requirement. It could be a part of link adaptation.
         2. It is not clear how it will be addressed.
    1. **Result: Y/N/A = 7/48/21, motion fails.**

1. Recess @ 10:00 AM until PM1 (13:30) today.

**Thursday, September 18th, 2014, PM1 Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @ 13:30.
   1. About 160 people are in the room at the beginning of the session.
   2. Agenda Doc.11-14/1033r4 is on the server. Rev 5 is the working document
2. Reminder and Announcements
   1. Chairperson reminded IEEE 802 and 802.11 IPR P&P.
   2. Chair asked people to announce name and affiliation when addressing for the first time in the session.
   3. Chairperson reminded attendance.
3. Agenda for this session
   1. Thursday PM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance
      3. TG Motions
         1. Chao-Chun Wang
         2. Zhou Lan
         3. Eric Wong
         4. Motions to approve the latest revisions of TG documents
      4. Goals for November
      5. Teleconference Schedule
      6. Adjourn
   2. Chair asked if there are any objections to proceed with this agenda – no objections. The agenda was approved.
4. TG Motions
   1. Motion by Chao-Chun Wang on Traffic Generator
      1. Chao-Chun explained the updated document (14/1272r0).
      2. Discussions
         1. Suggested keeping the changes only to the traffic models. 🡪 Chao-Chun accepted the suggestion and to update the document to rev 1.
         2. Asked if there will be any changes to the evaluation methodology.
         3. Had discussion on the simulation time.
      3. **Motion: Move to include the revised text for use case number 4 in document 11-14/1272r1 in the simulation scenarios document (11-14/0980r2)**
         1. **Moved by Chao-Chun Wang (MediaTek), Seconded by Zhou Lan (Huawei Technologies)**
         2. Discussion
            1. No discussion.
         3. **Result: Y/N/A = 35/1/30, Motion passes.**
   2. Motion by Zhou Lan on MAC Calibration Results
      1. Zhou Lan (Huawei Technologies) explained the updated document.(14/1192r3).
         1. Discussions:
      2. **Motion: Move to add a link of this 11-14-1192r3 into the simulation scenario document as an initial report of box 3 MAC calibration.**
         1. **Moved by Zhou Lan (Huawei Technologies), Seconded by Sean Coffey (RealTek).**
         2. Discussions
            1. No discussion on this motion.
         3. **Result: Y/N/A = 57/0/10, motion passes.**
   3. Motions by Eric Wong
      1. Motion #1
         1. Eric Wong (Apple) explained the changes to the evaluation methodology document (11-14-0571-03) based on 14-1285-00.
            1. The TGax Evaluation Methodology document was updated based on 11-14/1285-00.
         2. Ron Porat (Broadcom) explained the changes to 11-14-0571-05.
         3. **Motion:**

**Move to accept document 11-14-0571r5 as the new revision of the TGax Evaluation Methodology document.**

* + - * 1. **Move by Ron Porat (Broadcom), Seconded by Eric Wong (Apple).**
        2. Discussions

A member commented the procedure of updating the TG document – the point is that the members should have enough time to review the document.

Another member mentioned that we should proceed with this motion since the changes are really editorial.

* + - * 1. **Result: Y/N/A = 53/0/17, motion passes.**
  1. Approval of the latest revisions of the TG documents
     1. Motion by Jianhan Liu (MediaTek) on Channel Model
        1. Jianhan explained the changes made to the channel model document.
        2. **Motion**

**Move to accept document 11-14/0882r4 as the new version of the TG Channel Model document.**

* + - * 1. Discussion – No discussion
        2. **Chair asked if there is objection to accept this motion. No objection.**
        3. **Result: Motion accepted with no objection.**
    1. Motion by Lei Wang on TGax Functional Requirements document.
       1. Lei Wang (Marvell) explained the changes made to the functional requirement document.
          1. Discussions
          2. **Motion**

**Move to accept the document 11-14-1009r2 as the new version of TG Functional Requirement document.**

**Moved by Lei Wang (Marvell), Seconded by Rakesh Taori (Samsung).**

Discussion – No discussion.

**Chair asked if there is objection to accept this motion. No objection.**

**Result: Motion accepted with no objection.**

* + 1. Motion by Simone Merlin on the TGax Simulation Scenario document.
       1. Simone Merlin (Qualcomm) explained the changes made to the current version of the TG Simulation Scenario document (14/0980r2).
          1. Discussions
       2. **Motion**

**Move to accept the document 11-14-0980r4 as the new version of TG Simulation Scenarios document.**

* + - * 1. **Moved by Simone Merlin (Qualcomm), Eric Wong (Apple)**
        2. Discussion – No discussion.
        3. **Chair asked if there is objection to accept this motion. No objection.**
        4. **Result: Motion accepted with no objection.**

1. Goals for November 2014 meeting
   1. Chair suggested two items
      1. Continue to advance TG documents
      2. Presentations
2. Teleconference Planning
   1. Chair three teleconferences between now and November meeting.
      1. Thursday , October 9th, 10:00 – 12:00 ET proposed by Chair.
   2. Discussions
      1. One more conference call requested, but could not find date.
3. AOB
   1. No other businesses.
   2. Chairperson asked if there is any objection to adjourn at this time. No objections.
4. TGax has adjourned@14:36.