IEEE P802.11  
Wireless LANs

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| TGax Teleconferences Minutes from December 2016 to January 2017 | | | | |
| Date: 2016-12-16 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
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Abstract

This document contains minutes of TGax teleconference from December 2016 to January 2017.

Rev. 0: Minutes from TGax teleconference on December 15th, 2016.

Rev. 1: Bug fix to r0 and minutes from TGax teleconference on January 10th, 2017 included.

Rev. 2: Bug fix to r1 and minutes from TGax teleconference on January 12th, 2017 included.

# Teleconference on Thursday, December 15th, 2016, 21:00 – 23:00 (ET)

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax @ 21:03 (ET).
   1. Introduction of the chairperson and secretary.
2. Agenda Setting
   1. Proposed Agenda
      1. Call the meeting to order
      2. IEEE 802 and 802.11 IPR Policy and Procedure
      3. Attendance (Please send an e.mail to Yasuhiko Inoue (inoue.yasuhiko@lab.ntt.co.jp) and/or Osama Aboul-Magd (osama.aboulmagd@huawei.com))
      4. Annoucement
      5. Presentation
         1. 11-16-1604-00 “PAR Verification Single BSS Simulation,” Frank Hsu (MediaTek)
      6. AOB
      7. Adjourn
   2. Approval of the agenda
      1. Chair asked if there is any item to add to the agenda. 🡪 No item to add to the agenda.
      2. Chair asked if there is any objection to approve the agenda. 🡪 No objection. The agenda was approved.
3. IEEE 802 and 802.11 IPR Policy and Procedure
   1. Chair mentioned that we are operating under the IEEE 802 and 802.11 Policy and Procedure.
   2. Relevant documents
      1. IEEE Patent Policy - <http://standards.ieee.org/board/pat/pat-slideset.ppt>
      2. Patent FAQ - <http://standards.ieee.org/board/pat/faq.pdf>
      3. LoA Form - <http://standards.ieee.org/board/pat/loa.pdf>
      4. Affiliation FAQ - <http://standards.ieee.org/faqs/affiliationFAQ.html>
      5. Anti-Trust FAQ - <http://standards.ieee.org/resources/antitrust-guidelines.pdf>
      6. Ethics - <http://www.ieee.org/portal/cms_docs/about/CoE_poster.pdf>
      7. IEEE 802.11 Working Group Operartions Manual - <https://mentor.ieee.org/802.11/dcn/14/11-14-0629-14-0000-802-11-operations-manual.docx>
   3. Chair asked if there is any potentially essential patent that people are aware of.
      1. No potentially essential patent reported.
4. Attendance
   1. Chair asked the attendees to send an email to Yasu ([inoue.yasuhiko@lab.ntt.co.jp](mailto:inoue.yasuhiko@lab.ntt.co.jp)) and/or Osama ([osama.aboulmagd@huawei.com](mailto:osama.aboulmagd@huawei.com)) to record attendance.
5. Announcement
   1. Chair mentioned that the WG letter ballot on the 802.11ax draft 1.0 is on going and encouraged people to submit comments.
6. Presentations
   1. **(MediaTek) presented “PAR Verification Single BSS Simulation,” based on the submission 11-16-1604-00.**
      1. Summary:
         1. System level simulation results for several UL scenarios using 11ax OFDMA were presented comparing with the results of 802.11ac.
         2. As the number of STAs increases, in UL, 11ax OFDMA has more system throughput gain over 802.11ac.
         3. Will continue to work on multiple BSS scenario definition and simulation, and make contribution to TGax Simulation scenario and EVM documents.
      2. Discussion:
         1. A member asked a question why the throughput pf 11ax is so stable. 🡪 It is because all of the UL transmissions by 11ax STAs are scheduled, there is no collision, hence no performance degradation.
         2. Chair asked follow-up questions for the details of UL sequence such as duration of one UL transmission and frame aggregation. Additionally, chair asked the scheduling of MU transmissions. 🡪 Basically, STAs are randomly chosen.
         3. Another member asked some questions:
            1. Is the overhead of the Trigger frame is considered? 🡪 Yes.
            2. Reason of choosing MCS9 for UL MU. 🡪 It is because of the distance between AP and STAs in the scenario.
            3. The impact of scheduling algorithm for UL MU. 🡪 Priority scheduling could have an impact on the 5th percentile throughput. In the simulation, the authors tried to eliminate the impact of between the different implementations scheduling algorithm and assumed the random scheduling.
         4. There was a question if the authors have any idea to change our simulation scenarios and/or evaluation methodology. 🡪 It is the intension of this simulation works. There was a discussion how to change the documents. The authors think that additional scenario for PAR verification will be good.
      3. Next Step:
         1. We need a proposal to change our simulation scenario and/or evaluation methodology documents. Offline discussions encouraged.
         2. One of the authors mentioned that single BSS scenario is just a start for this work and the plan is to propose a simplified OBSS scenario for PAR verification.
         3. A member emphasized the importance of OBSS scenario.
         4. Additional results to be presented in January 2017 session.
7. AOB
   1. No other business.
8. Adjourn
   1. Meeting adjourned at 21:46 (ET).
9. List of Attendees

|  |  |  |
| --- | --- | --- |
|  | **Name** | **Affiliation** |
| 1 | Osama Aboul-Magd | Huawei Technologies |
| 2 | Tomoko Adachi | Toshiba |
| 3 | Jason Yunchen Guo | Huawei |
| 4 | Frank Hsu | MediaTek |
| 5 | Yasuhiko Inoue | NTT |
| 6 | Junichi Iwatani | NTT |
| 7 | Suhwook Kim | LG Electronics |
| 8 | Geonjung Ko | Wilus Institute |
| 9 | Sung Eun Lee | Cypress |
| 10 | Joseph Levy | InterDigital |
| 11 | Shoko Shinohara | NTT |
| 12 | Xiaofei Wang | InterDigital |
| 13 | James Yee | MediaTek |
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# Teleconference on Tuesday, January 10th, 2017, 11:00 – 13:00 (ET)

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax @ 11:03 (ET).
   1. To join the meeting:
      1. <https://join.me/IEEE802.11>, Conference ID: 808-571-868
   2. Introduction of the chairperson and secretary.
2. Agenda Setting
   1. Proposed Agenda
      1. Call the meeting to order
      2. IEEE 802 and 802.11 IPR Policy and Procedure
      3. Attendance reminder (Please send an e-mail to Yasuhiko Inoue (inoue.yasuhiko@lab.ntt.co.jp) and/or Osama Aboul-Magd (osama.aboulmagd@huawei.com))
      4. Annoucements, if any.
      5. Comment assignments (Robert Stacy)
      6. AOB
      7. Adjourn
   2. Approval of the agenda
      1. Chair asked if there is any item to add to the agenda. 🡪 No item to add to the agenda.
      2. Chair asked if there is any objection to approve the agenda. 🡪 No objection. The agenda was approved.
3. IEEE 802 and 802.11 IPR Policy and Procedure
   1. Chair mentioned that we are operating under the IEEE 802 and 802.11 Policy and Procedure.
   2. Relevant documents
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      2. Patent FAQ - <http://standards.ieee.org/board/pat/faq.pdf>
      3. LoA Form - <http://standards.ieee.org/board/pat/loa.pdf>
      4. Affiliation FAQ - <http://standards.ieee.org/faqs/affiliationFAQ.html>
      5. Anti-Trust FAQ - <http://standards.ieee.org/resources/antitrust-guidelines.pdf>
      6. Ethics - <http://www.ieee.org/portal/cms_docs/about/CoE_poster.pdf>
      7. IEEE 802.11 Working Group Operartions Manual - <https://mentor.ieee.org/802.11/dcn/14/11-14-0629-14-0000-802-11-operations-manual.docx>
   3. Chair asked if there is any potentially essential patent that people are aware of.
      1. No potentially essential patent reported.
4. Attendance
   1. Chair asked the attendees to send an email to Yasu ([inoue.yasuhiko@lab.ntt.co.jp](mailto:inoue.yasuhiko@lab.ntt.co.jp)) and/or Osama ([osama.aboulmagd@huawei.com](mailto:osama.aboulmagd@huawei.com)) to record attendance.
5. Announcements
   1. Chair mentioned that comments from some members may be missing due to the trouble in uploading the comment sheet and asked people to make sure the submitted comments are included in the comment spreadsheet.
      1. The editor suggested a motion to include the missing comments in the January Session.
   2. There are duplicated comments as well.
6. Comment assignment, by Robert Stacy, the technical editor of TGax
   1. Summary - Robert summarized the comments based on the report that he had sent out.
      1. Total number of comments is 7334, for now.
      2. There are 4029 technical comments that we need to resolve.
      3. The plan is to assign the comments section by section to an owner. People who are interested in providing resolutions should contact to the owner of the related clause.
   2. PHY Comments

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| --- | --- | --- |
| **Clause** | **Clause title** | **Owner** |
| 28 | High Efficiency (HE) PHY specification | - |
| 28.1 | Introduction | - |
| 28.1.1 | Introduction to the HE PHY | Lochan Verma (Qualcomm) |
| 28.1.2 | Scope | - |
| 28.1.3 | HE PHY functions | Lochan Verma (Qualcomm) |
| 28.1.3.1 | General |
| 28.1.3.2 | PHY management entity (PLME) |
| 28.1.3.3 | Service specification method |
| 28.1.4 | PPDU format |
| 28.2 | HE PHY service interface | Bo Sun (ZTE) |
| 28.2.1 | Introduction | - |
| 28.2.2 | TXVECTOR and RXVECTOR parameters | Bo Sun (ZTE) |
| 28.3 | HE PHY | - |
| 28.3.1 | Introduction | - |
| 28.3.2 | MU transmission | - |
| 28.3.2.1 | Introduction | Jinsoo Choi (LG Electronics) |
| 28.3.3 | OFDMA and SU tone allocation | Jinsoo Choi (LG Electronics) |
| 28.3.3.1 | General |
| 28.3.3.2 | Resource unit, guard and DC subcarriers |
| 28.3.3.3 | Null subcarriers |
| 28.3.3.4 | Pilot subcarriers |
| 28.3.3.5 | RU restriction rules when operating 20 MHz |
| 28.3.3.6 | 20 MHz only HE STAs |
| 28.3.3.7 | DL MU transmission |
| 28.3.3.8 | DL MU-MIMO |
| 28.3.3.8.1 | Minimum RU size in DL MU-MIMO |
| 28.3.3.8.2 | Maximum number of spatial streams in an HE MU PPDU |
| 28.3.3.8.3 | Resource indication and STA self-identification in an HE MU PPDU |
| 28.3.3.9 | UL MU transmission |
| 28.3.3.9.1 | Introduction |
| 28.3.3.10 | UL MU-MIMO |
| 28.3.3.10.1 | Introduction |
| 28.3.3.10.2 | Minimum RU size in UL MU-MMIMO |
| 28.3.3.10.3 | MU-MIMO LTF Mode |
| 28.3.3.10.4 | Maximum number of spatial streams in an HE trigger-based PPDU |
| 28.3.3.10.5 | Resource allocation for an HE trigger-based PPDU |
| 28.3.4 | HE PPDU formats | Sigurd Shelstraete (Qantenna) |
| 28.3.5 | Transmitter block diagram | Xiaogang Chen (Intel) |
| 28.3.6 | Overview of the PPDU encoding process |
| 28.3.6.1 | General |
| 28.3.6.2 | Construction of L-STF |
| 28.3.6.3 | Construction of L-LTF |
| 28.3.6.4 | Construction of L-SIG |
| 28.3.6.5 | Construction of RL-SIG |
| 28.3.6.6 | Construction of HE-SIG-A |
| 28.3.6.7 | Construction of HE-SIG-B |
| 28.3.6.8 | Construction of HE-STF |
| 28.3.6.9 | Construction of HE-LTF |
| 28.3.6.10 | Construction of the Data field in an HE SU PPDU, HE extended range SU PPDU, and HE trigger-based PPDU |
| 28.3.6.10.1 | Using BCC |
| 28.3.6.10.2 | Using LDPC |
| 28.3.6.11 | Construction of the Data field in an HE MU PPDU |
| 28.3.6.11.1 | General |
| 28.3.6.11.2 | Using BCC |
| 28.3.6.11.3 | Using LDPC |
| 28.3.6.11.4 | Combining to form an HE MU PPDU |
| 28.3.7 | HE modulation and coding schemes (HE-MCSs) | Eunsung Park (LG Electronics) |
| 28.3.8 | Timing-related parameters | Bin Tian (Qualcomm) |
| 28.3.9 | Mathematical description of signals | Hongyuan Zhang (Marvell) |
| 28.3.10 | HE preamble | - |
| 28.3.10.1 | Introduction | <open> |
| 28.3.10.2 | Cyclic shift | <open> |
| 28.3.10.2.1 | Cyclic shift for pre-HE modulated fields | <open> |
| 28.3.10.2.2 | Cyclic shift for HE modulated fields | <open> |
| 28.3.10.3 | L-STF | Hongyuan Zhang (Marvell) |
| 28.3.10.4 | L-LTF |
| 28.3.10.5 | L-SIG |
| 28.3.10.6 | RL-SIG |
| 28.3.10.7 | HE-SIG-A | Ron Porat (Broadcom) |
| 28.3.10.7.1 | General | - |
| 28.3.10.7.2 | Content | Ron Porat (Broadcom) |
| 28.3.10.7.3 | CRC computation |
| 28.3.10.7.4 | Encoding and modulation | Hongyuan Zhang (Marvell) |
| 28.3.10.8 | HE-SIG-B | Sigurd Schelstraete (Quantenna) |
| 28.3.10.8.1 | Encoding and modulation |
| 28.3.10.8.2 | Frequency domain maping |
| 28.3.10.8.3 | Time domain encoding | Hongyuan Zhang (Marvell) |
| 28.3.10.8.4 | HE-SIG-B common content | Sigurd Schelstraete (Quantenna) |
| 28.3.10.8.5 | HE-SIG-B per-user content |
| 28.3.10.9 | HE-STF | Hongyuan Zhang (Marvell) |
| 28.3.10.10 | HE-LTF |
| 28.3.11 | Data field | <open> |
| 28.3.11.1 | General |
| 28.3.11.2 | Pre-FEC padding process |
| 28.3.11.3 | SERVICE field |
| 28.3.11.4 | Scrambler |
| 28.3.11.5 | Coding |
| 28.3.11.5.1 | Binary convolutional coding and puncturing |
| 28.3.11.5.2 | LDPC coding |
| 28.3.11.5.3 | Post-FEC padding |
| 28.3.11.5.4 | Encoding process for an HE MU PPDU |
| 28.3.11.5.5 | Encoding process for an HE trigger-based PPDU |
| 28.3.11.6 | Stream parser |
| 28.3.11.7 | Segment parser |
| 28.3.11.8 | BCC interleaver |
| 28.3.11.9 | Constellation mapping |
| 28.3.11.10 | Space-time block coding |
| 28.3.11.11 | LDPC tone mapper |
| 28.3.11.12 | Segment deparser |
| 28.3.11.13 | Pilot subcarriers |
| 28.3.11.14 | OFDM modulation |
| 28.3.11.15 | Dual carrier modulation |
| 28.3.12 | Packet extension | Sung Eun Lee (Cypress) |
| 28.3.13 | Non-HT duplicate transmission | <open> |
| 28.3.14 | Transmit requirements for an HE trigger-based PPDU | Lochan Verma (Qualcomm) |
| 28.3.14.1 | Introduction |
| 28.3.14.2 | Power pre-correction |
| 28.3.14.3 | Pre-correction accuracy requirements |
| 28.3.15 | SU-MIMO and DL MU-MIMO beamformig |
| 28.3.15.1 | General |
| 28.3.15.2 | Beamforming feedback matrix V |
| 28.3.15.3 | CQI-only feedback |
| 28.3.16 | HE preamble format for sounding PPDUs | Sigurd Schelstraete (Quantenna) |
| 28.3.17 | Receiver specification | Bin Tian (Qualcomm) |
| 28.3.17.1 | General |
| 28.3.17.2 | Receiver minimum input sensitivity |
| 28.3.17.3 | Adjacent channel rejection |
| 28.3.17.4 | Nonadjacent channel rejection |
| 28.3.17.5 | Receiver maximum input level |
| 28.3.17.6 | CCA sensitivity |
| 28.3.17.6.1 | General |
| 28.3.17.6.2 | CCA sensitivity for operating classes requiring CCA-ED |
| 28.3.17.6.3 | CCA sensitivity for signals occupying the primary 20 MHz channel |
| 28.3.17.6.4 | CCA sensitivity for signals not occupying the primary 20 MHz channel |
| 28.3.18 | Transmit specification | Bin Tian (Qualcomm) |
| 28.3.18.1 | Transmit spectral mask |
| 28.3.18.2 | Spectral flatness |
| 28.3.18.3 | Transmit center frequency and symbol clock frequency tolerance |
| 28.3.18.4 | Modulation accuracy |
| 28.3.18.4.1 | Introduction to modulation accuracy testa |
| 28.3.18.4.2 | Transmit center frequency leakage |
| 28.3.18.4.3 | Transmitter constellation error |
| 28.3.18.4.4 | Transmitter modulation accuracy (EVM) test |
| 28.3.18.5 | Time of Departure accuracy |
| 28.3.19 | HE transmit procedure | <open> |
| 28.3.20 | HE receive procedure | <open> |
| 28.4 | HE PLME | <open> |
| 28.4.1 | PLME\_SAP sublayer management primitives | <open> |
| 28.4.2 | TXTIME and PSDU\_LENGTH calculation | <open> |
| 28.4.3 | HE PHY | <open> |
| 28.5 | Parameters for HE-MCSs | Bin Tian (Qualcomm) |
| Annex B | Protocol Implementation Conformance Statement (PICS) proforma | Edward Au (Huawei Technologies) |
| Annex C | ASN.1 encoding of the MAC and PHY MIB |
| Annex G | Frame exchange sequences | Osama Aboul-Magd (Huawei Technologies) |

* 1. MAC Comments

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| --- | --- | --- |
| **Clause** | **Clause title** | **Owner** |
| 4 | General description | - |
| 4.3 | Components of the IEEE Std 802.11 architecture | - |
| 4.3.14a | High efficiency (HE) STA | Guoqing Lee (Apple) |
| 6 | Layer management | - |
| 6.1 | Overview of management model | - |
| 6.2 | Generic management primitives | - |
| 6.3 | MLME SAP interface | - |
| 6.3.3 | Scan | <open> |
| 6.3.3.3 | MLME-SCAN.confirm |
| 6.3.3.3.2 | Semantics of the service primitive |
| 6.3.4 | Synchronization | <open> |
| 6.3.4.2 | MLME-JOIN.request |
| 6.3.4.2.2 | Semantics of the service primitive |
| 6.3.7 | Associate | <open> |
| 6.3.7.4 | MLME-ASSOCIATE.inducation |
| 6.3.7.4.2 | Semantics of the service primitive |
| 6.3.8 | Reassociate | <open> |
| 6.3.8.4 | MLME-REASSOCIATE.indication |
| 6.3.8.4.2 | Semantics of the service primitive |
| 6.3.11 | Start | <open> |
| 6.3.11.2 | MLME-START.request |
| 6.3.11.2.2 | Semantics of the service primitives |
| 6.3.27 | Management of direct links | <open> |
| 6.3.27.4 | MLME-DLS.indication |
| 6.3.27.4.2 | Semantics of the service primitive |
| 8 | PHY service specification | <open> |
| 8.3 | Detailed PHY service specifications | - |
| 8.3.5 | PHY SAP detailed service specification | - |
| 8.3.5.2 | PHY-DATA.request | <open> |
| 8.3.5.3 | PHY-DATA.indication | <open> |
| 8.3.5.10 | PHY-CCARESET.request | <open> |
| 8.3.5.12 | PHY-CCA.indication | <open> |
| 9 | Frame formats | <open> |
| 9.2 | MAC frame formats | - |
| 9.2.4 | Frame fields | <open> |
| 9.2.4.1 | Frame Control field | <open> |
| 9.2.4.5 | QoS Control field | <open> |
| 9.2.4.6 | HT Control field | <open> |
| 9.2.4.7 | Frame Body field | <open> |
| 9.2.5 | Duration/ID fields (QoS STA) | Po-Kai Huang (Intel) |
| 9.2.5.2 | Setting for single and multiple protection under enhanced distributed channel access (EDCA) |
| 9.2.5.7 | Setting for control response frames |
| 9.3 | Format of individual frame types | - |
| 9.3.1 | Control frames | - |
| 9.3.1.2 | RTS frame format | - |
| 9.3.1.3 | CTS frame format | <open> |
| 9.3.1.5 | PS-Poll frame format | - |
| 9.3.1.6 | CF-End frame format | <open> |
| 9.3.1.8 | BlockAckReq frame format | George Cherian (Qualcomm) |
| 9.3.1.8.1 | Overview |
| 9.3.1.8.2 | Basic BlockAckReq variant |
| 9.3.1.9 | BlockAck frame | George Cherian (Qualcomm) |
| 9.3.1.9.1 | Overview |
| 9.3.1.9.3 | Compressed BlockAck variant |
| 9.3.1.9.7 | Multi-STA BlockAck variant |
| 9.3.1.20 | VHT/HE NDP Announcement frame format | <open> |
| 9.3.1.23 | Trigger frame format | Raja Banerjea (Qualcomm) |
| 9.3.1.23.1 | Basic Trriger variant |
| 9.3.1.23.2 | Beamforming Report Poll variant |
| 9.3.1.23.3 | MU-BAR variant |
| 9.3.1.23.4 | MU-RTS variant |
| 9.3.1.23.5 | BSRP variant |
| 9.3.1.23.6 | GCR MU-BAR variant |
| 9.3.1.23.7 | Bandwidth Query Report Poll variant |
| 9.3.2 | Data frames | - |
| 9.3.3 | Management frames | - |
| 9.3.3.1 | Beacon frame format | <open> |
| 9.3.3.5 | Association Request frame format | <open> |
| 9.3.3.6 | Association Response frame format | <open> |
| 9.3.3.7 | Reassociation Request frame format | <open> |
| 9.3.3.8 | Reassociation Response frame format | <open> |
| 9.3.3.10 | Probe Request frame format | - |
| 9.3.3.11 | Probe Response frame format | <open> |
| 9.4 | Management and Extension frame body components | - |
| 9.4.1 | Fields that are not elements | - |
| 9.4.1.11 | Action field | <open> |
| 9.4.1.62 | HE MIMO Control field | <open> |
| 9.4.1.63 | HE Compressed Beamforming Report field | Lochan Verma (Qualcomm) |
| 9.4.1.64 | HE MU Exclusive Beamforming Report field |
| 9.4.1.65 | HE CQI-only Report field |
| 9.4.2 | Elements | <open> |
| 9.4.2.1 | General | <open> |
| 9.4.2.3 | Supported Rates and BSS Membership Selector element | <open> |
| 9.4.2.6 | TIM element | <open> |
| 9.4.2.27 | Extended Capabilities element | <open> |
| 9.4.2.139 | ADDBA Extension element | <open> |
| 9.4.2.200 | TWT element | <open> |
| 9.4.2.218 | HE Capabilities element | <open> |
| 9.4.2.218.1 | General | <open> |
| 9.4.2.218.2 | HE MAC Capabilities Information field | <open> |
| 9.4.2.218.3 | HE PHY Capabilities Information fields | Lochan Verma (Qualcomm) |
| 9.4.2.218.4 | Tx Rx HE MCS Support field |
| 9.4.2.218.5 | PPE Threshold field | <open> |
| 9.4.2.219 | HE Operation element | <open> |
| 9.4.2.220 | OFDMA-based Random Access Parameter Set (RAPS) element | <open> |
| 9.4.2.221 | MU EDCA Parameter Set element | Laurent Cariou (Intel) |
| 9.4.2.222 | BSS Color Change Announcement element | <open> |
| 9.4.2.223 | Quiet Time Period Setup element | <open> |
| 9.4.2.224 | Quiet Time Period Request element | <open> |
| 9.4.2.225 | Quiet Time Period Response element | <open> |
| 9.6 | Action frame format details | - |
| 9.6.4 | DLS Action frame details | - |
| 9.6.5 | Block Ack Action frame details | <open> |
| 9.6.8 | Public Action details | <open> |
| 9.6.13 | TDLS Action field formats | - |
| 9.6.16 | Self-protected Action frame details | <open> |
| 9.6.28 | HE Action frame details | - |
| 9.6.28.1 | HE Action field | - |
| 9.6.28.2 | HE Compressed Beamforming And CQI frame format | Lochan Verma (Qualcomm) |
| 9.6.28.3 | HE BSS Color Change Announcement frame format | <open> |
| 9.6.29 | Quiet Time Period Action frame details | Chao-Chun Wang (MediaTek) |
| 9.7 | Aggregate MPDU (A-MPDU) | Liwen Chu (Marvell) |
| 9.7.1 | A-MPDU format |
| 9.7.3 | A-MPDU contents |
| 10 | MAC sublayer functional description | - |
| 10.2 | MAC architecture | <open> |
| 10.3 | DCF | - |
| 10.3.1 | General | <open> |
| 10.3.2 | Procedures common to the DCF and EDCAF | - |
| 10.3.2.1 | CS mechanism | - |
| 10.3.2.3 | IFS | - |
| 10.3.2.3.7 | EIFS | Jeongki Kim (LG Electronics) |
| 10.3.2.4 | Setting and resetting the NAV | Po-Kai Huang (Intel) |
| 10.3.2.4a | Duration-based RTS/CTS | <open> |
| 10.3.2.8 | Dual CTS protection | Po-Kai Huang |
| 10.3.2.8a | MU-RTS/CTS procedure |
| 10.3.2.10 | MU acknowledgement procedure | <open> |
| 10.3.5 | Individually addressed MPDU transfer procedure | <open> |
| 10.5 | Fragmentation | Ming Gan (Huawei) |
| 10.7 | Multirate support | Liwen Chu (Marvell) |
| 10.9 | HT Control field operation | <open> |
| 10.10 | Control Wrapper operation | <open> |
| 10.12 | A-MSDU operation | <open> |
| 10.13 | A-MPDU operation | Liwen Chu (Marvell) |
| 10.22 | HCF | - |
| 10.22.2 | HCF contention based channel access (EDCA) | Jayh Park (LG Electronics) |
| 10.22.4 | Admission Control at the HC | - |
| 10.24 | Block acknowledgment (block ack) | - |
| 10.24.10 | GCR block ack | - |
| 10.24.10.3 | GCR block ack BlockAckReq and BlockAck frame exchanges | George Cherian (Qualcomm) |
| 10.28 | Reverse diesction protocol | Jarkko Kneckt (Apple) |
| 10.28.3 | Rules for RD initiator |
| 10.28.4 | Rules for RD responder |
| 10.43 | Target wake time (TWT) | <open> |
| 11 | MLME | <open> |
| 11.1 | Synchronization | - |
| 11.1.3 | Maintaining synchronization | - |
| 11.1.3.8 | Multiple BSSID procedure | <open> |
| 11.1.3.10 | Beacon generation in an HE BSS | Yonggang Fang (ZTE) |
| 11.2 | Power management | - |
| 11.2.2 | Power management in a non-DMG infrastructure network | - |
| 11.2.2.6 | AP operation during the CP | Kaiying Lv (ZTE) |
| 11.2.2.8 | Receive operation for STAs in PS mode during the CP | Kaiying Lv (ZTE) |
| 11.2.2.17 | TIM Broadcast | <open> |
| 11.3.5.3 | AP or PCP association receipt procedures (Base STD) | <open> |
| 11.23 | Tunneled direct-link setup | <open> |
| 11.24 | Wireless network management procedures | - |
| 11.49 | HE BSS operation | <open> |
| 27 | High Efficiency (HE) MAC specification | <open> |
| 27.1 | Introduction | <open> |
| 27.2 | Channel Access | - |
| 27.2.1 | Intra-BSS and inter-BSS frame detection | Kaiying Lv (ZTE) |
| 27.2.2 | Updating two NAVs | Po-Kai Huang (Intel) |
| 27.2.3 | Obtaining an EDCA TXOP for UL MU capable STAs | Laurent Cariou (Intel) |
| 27.3 | Fragmentation | Ming Gan (Huawei) |
| 27.4 | Block acknowledgment | George Cherian (Qualcomm) |
| 27.5 | MU operation | - |
| 27.5.1 | HE DL MU operation | Zhou Lan (Broadcom) |
| 27.5.2 | UL MU operation | Abhishek Patil (Qualcomm) |
| 27.5.3 | HE MU cascading operation | David Xun Yang (Huawei) |
| 27.6 | HE sounding protocol | Raja Banerjea (Qualcomm) |
| 27.7 | TWT operation | Alfred Asterjadhi (Qualcomm) |
| 27.8 | Operating mode indication | Jarkko Kneckt (Apple) |
| 27.9 | Spatial reuse operation | Sean Coffey (RealTek) |
| 27.10 | A-MPDU operation | - |
| 27.10.1 | General | - |
| 27.10.2 | A-MPDU padding for an HE SU PPDU, HE extended range SU PPDU and HE MU  PPDU | Liwen Chu (Marvell) |
| 27.10.3 | A-MPDU padding for an HE trigger-based PPDU |
| 27.10.4 | A-MPDU with multiple TIDs | Chittabrata Ghosh (Intel) |
| 27.11 | Setting TXVECTOR parameters for an HE PPDU | - |
| 27.11.1 | STA\_ID\_LIST | Liwen Chu (Marvell) |
| 27.11.2 | UPLINK\_FLAG |
| 27.11.3 | BEAM\_CHANGE |
| 27.11.4 | BSS\_COLOR |
| 27.11.5 | TXOP\_DURATION | Po-Kai Huang (Intel) |
| 27.11.6 | SPATIAL\_REUSE | Liwen Chu (Marvell) |
| 27.12 | HE PPDU post FEC padding and packet extension | <open> |
| 27.13 | Link adaptation using the HE variant HT Control field | <open> |
| 27.14 | Power management | <open> |
| 27.14.1 | Intra-PPDU power save for HE non-AP STAs | Chitabrata Ghosh (Intel) |
| 27.14.2 | Power save with UL OFDMA-based random access |
| 27.14.3 | Opportunistic power save in congested environment | Laurent Cariou (Intel) |
| 27.15 | PPDU format, BW, MCS, NSS and DCM selection rules | Alfred Asterjadhi (Qualcomm) |
| 27.16 | HE BSS operation | Abhishek Patil (Qualcomm) |
| 27.16.1 | Basic HE BSS functionality |
| 27.16.2 | Selecting and advertising new BSS Color |
| 27.16.3 | Quieting HE STAs in a HE BSS | Chao-Chun Wang (MediaTek) |

1. AoB
   1. The next call is scheduled on Thursday, January 12th, 2017, from 20:00 (ET).
   2. Will continue the assignment of the comments. Need volunteers.
2. Adjournment
   1. TGax teleconference adjourned @ 12:59 (ET)
3. List of attendees

|  |  |  |
| --- | --- | --- |
|  | **Name** | **Company** |
| 1 | Osama Aboul-Magd | Huawei Technologies |
| 2 | Jinsoo Ahn | Yonsei Univ. |
| 3 | Woojin Ahn | Wilus Institute |
| 4 | Alfred Asterjadhi | Qualcomm |
| 5 | Edward Kwok Shum Au | Huawei Technologies |
| 6 | Raja Banerjea | Qualcomm |
| 7 | Stephane Baron | Canon Research |
| 8 | Laurent Cariou | Intel |
| 9 | William Carney | Sony |
| 10 | Minho Cheong | Newracom |
| 11 | George Cherian | Qualcomm |
| 12 | Rojan Chitrakar | Panasonic |
| 13 | Jinsoo Choi | LG Electronics |
| 14 | Liwen Chu | Marvell |
| 15 | Sean Coffey | RealTek |
| 16 | Yonggang Fang | ZTE |
| 17 | Ming Gan | Huawei Technologies |
| 18 | Chittabrata Ghosh | Intel |
| 19 | Jason Yuchen Guo | Huawei Technologies |
| 20 | Mark Hamilton | Ruckus/Brocade |
| 21 | Reza Hedayat | Newracom |
| 22 | Guido Hiertz | Ericsson |
| 23 | Lei Huang |  |
| 24 | Po-Kai Huang | Intel |
| 25 | Yasuhiko Inoue | NTT |
| 26 | Jeongki Kim | LG Electronics |
| 27 | Suhwook Kim | LG Electronics |
| 28 | Jarkko Knect | Apple |
| 29 | Geonjung Ko | Wilus Institute |
| 30 | Zhou Lan | Broadcom |
| 31 | Sung Eun Lee | Cypress |
| 32 | Massinissa Lalam | Sagemcom |
| 33 | Jason Lee | ETRI |
| 34 | James Lepp | Blackberry |
| 35 | Joseph Levy | InterDigital |
| 36 | Guoqing Li | Apple |
| 37 | Dong Guk Lim | LG Electronics |
| 38 | Kaiying Lv | ZTE |
| 39 | Jing Ma | NICT |
| 40 | Yuichi Morioka | Sony |
| 41 | Patrice Nezou | Canon Research |
| 42 | Kome Oteri | InterDigital |
| 43 | Eunsung Park | EG Electronics |
| 44 | Abhishek Patil | Qualcomm |
| 45 | Albert Petrick | Jones-Petrick and Associates |
| 46 | Kiseon Ryu | LG Electronics |
| 47 | Sigurd Schelstraete | Quantenna |
| 48 | Jonathan Segev | Intel |
| 49 | Yongho Seok | Newracom |
| 50 | Julien Sevin | Canon Research |
| 51 | John Son | Wilus Institute |
| 52 | Robert Stacy | Intel |
| 53 | Adrian Stephens | Intel |
| 54 | Bo Sun | ZTE |
| 55 | Jung Hoon Suh | Huawei Technologies |
| 56 | Bin Tian | Qualcomm |
| 57 | Lochan Verma | Qualcomm |
| 58 | Pascal Viger | Canon Research |
| 59 | Chao-Chun Wang | MediaTek |
| 60 | David Xun Yang | Huawei Technologies |
| 61 | Sunwoong Yun | LG Electronics |
| 62 | Honghuan Zhang | Marvell |
| 63 |  |  |
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# Teleconference on Tuesday, January 12th, 2017, 20:00 – 22:00 (ET)

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax @ 20:03 (ET).
   1. To join the meeting:
      1. <https://join.me/IEEE802.11>, Conference ID: 808-571-868
   2. Introduction of the chairperson and secretary.
2. Agenda Setting
   1. Proposed Agenda
      1. Call the meeting to order
      2. IEEE 802 and 802.11 IPR Policy and Procedure
      3. Attendance reminder (Please send an e-mail to Yasuhiko Inoue (inoue.yasuhiko@lab.ntt.co.jp) and/or Osama Aboul-Magd (osama.aboulmagd@huawei.com))
      4. Annoucements, if any.
      5. Comment assignments (Robert Stacy and all)
      6. AOB
      7. Adjourn
   2. Approval of the agenda
      1. Chair asked if there is any item to add to the agenda. 🡪 No item to add to the agenda.
      2. Chair asked if there is any objection to approve the agenda. 🡪 No objection. The agenda was approved.
3. IEEE 802 and 802.11 IPR Policy and Procedure
   1. Chair mentioned that we are operating under the IEEE 802 and 802.11 Policy and Procedure.
   2. Relevant documents
      1. IEEE Patent Policy - <http://standards.ieee.org/board/pat/pat-slideset.ppt>
      2. Patent FAQ - <http://standards.ieee.org/board/pat/faq.pdf>
      3. LoA Form - <http://standards.ieee.org/board/pat/loa.pdf>
      4. Affiliation FAQ - <http://standards.ieee.org/faqs/affiliationFAQ.html>
      5. Anti-Trust FAQ - <http://standards.ieee.org/resources/antitrust-guidelines.pdf>
      6. Ethics - <http://www.ieee.org/portal/cms_docs/about/CoE_poster.pdf>
      7. IEEE 802.11 Working Group Operartions Manual - <https://mentor.ieee.org/802.11/dcn/14/11-14-0629-14-0000-802-11-operations-manual.docx>
   3. Chair asked if there is any potentially essential patent that people are aware of.
      1. No potentially essential patent reported.
4. Attendance
   1. Chair asked the attendees to send an email to Yasu ([inoue.yasuhiko@lab.ntt.co.jp](mailto:inoue.yasuhiko@lab.ntt.co.jp)) and/or Osama ([osama.aboulmagd@huawei.com](mailto:osama.aboulmagd@huawei.com)) to record attendance.
5. Announcements
   1. No announcement.
6. Comment assignment, by Robert Stacy, the technical editor of TGax
   1. MAC

|  |  |  |
| --- | --- | --- |
| **Clause** | **Clause title** | **Owner** |
| 4 | General description | - |
| 4.3 | Components of the IEEE Std 802.11 architecture | - |
| 4.3.14a | High efficiency (HE) STA | Guoqing Lee (Apple) |
| 6 | Layer management | - |
| 6.1 | Overview of management model | - |
| 6.2 | Generic management primitives | - |
| 6.3 | MLME SAP interface | - |
| 6.3.3 | Scan | Yasu Inoue (NTT) |
| 6.3.4 | Synchronization |
| 6.3.7 | Associate |
| 6.3.8 | Reassociate |
| 6.3.11 | Start |
| 6.3.27 | Management of direct links |
| 8 | PHY service specification | - |
| 8.3 | Detailed PHY service specifications | - |
| 8.3.5 | PHY SAP detailed service specification | - |
| 8.3.5.2 | PHY-DATA.request | Yongho Seok (Newracom) |
| 8.3.5.3 | PHY-DATA.indication |
| 8.3.5.10 | PHY-CCARESET.request |
| 8.3.5.12 | PHY-CCA.indication |
| 9 | Frame formats | - |
| 9.2 | MAC frame formats | - |
| 9.2.4 | Frame fields | Alfred Asterjadhi (Qualcomm) |
| 9.2.4.1 | Frame Control field |
| 9.2.4.5 | QoS Control field |
| 9.2.4.6 | HT Control field |
| 9.2.4.7 | Frame Body field | <open> |
| 9.2.5 | Duration/ID fields (QoS STA) | Po-Kai Huang (Intel) |
| 9.2.5.2 | Setting for single and multiple protection under enhanced distributed channel access (EDCA) |
| 9.2.5.7 | Setting for control response frames |
| 9.3 | Format of individual frame types | - |
| 9.3.1 | Control frames | - |
| 9.3.1.2 | RTS frame format | - |
| 9.3.1.3 | CTS frame format | Po0Kai Huang (Intel) |
| 9.3.1.5 | PS-Poll frame format | - |
| 9.3.1.6 | CF-End frame format | <open> |
| 9.3.1.8 | BlockAckReq frame format | George Cherian (Qualcomm) |
| 9.3.1.8.1 | Overview |
| 9.3.1.8.2 | Basic BlockAckReq variant |
| 9.3.1.9 | BlockAck frame | George Cherian (Qualcomm) |
| 9.3.1.9.1 | Overview |
| 9.3.1.9.3 | Compressed BlockAck variant |
| 9.3.1.9.7 | Multi-STA BlockAck variant |
| 9.3.1.20 | VHT/HE NDP Announcement frame format | Raja Banerjea (Qualcomm) |
| 9.3.1.23 | Trigger frame format | Raja Banerjea (Qualcomm) |
| 9.3.1.23.1 | Basic Trriger variant |
| 9.3.1.23.2 | Beamforming Report Poll variant |
| 9.3.1.23.3 | MU-BAR variant |
| 9.3.1.23.4 | MU-RTS variant |
| 9.3.1.23.5 | BSRP variant |
| 9.3.1.23.6 | GCR MU-BAR variant |
| 9.3.1.23.7 | Bandwidth Query Report Poll variant |
| 9.3.2 | Data frames | - |
| 9.3.3 | Management frames | - |
| 9.3.3.1 | Beacon frame format | Yasuhiko Inoue (NTT) |
| 9.3.3.5 | Association Request frame format |
| 9.3.3.6 | Association Response frame format |
| 9.3.3.7 | Reassociation Request frame format |
| 9.3.3.8 | Reassociation Response frame format |
| 9.3.3.10 | Probe Request frame format |
| 9.3.3.11 | Probe Response frame format |
| 9.4 | Management and Extension frame body components | - |
| 9.4.1 | Fields that are not elements | - |
| 9.4.1.11 | Action field | <open> |
| 9.4.1.62 | HE MIMO Control field | Matt Fischer (Broadcom) |
| 9.4.1.63 | HE Compressed Beamforming Report field |
| 9.4.1.64 | HE MU Exclusive Beamforming Report field |
| 9.4.1.65 | HE CQI-only Report field |
| 9.4.2 | Elements | <open> |
| 9.4.2.1 | General | Yasuhiko Inoue (NTT) |
| 9.4.2.3 | Supported Rates and BSS Membership Selector element |
| 9.4.2.6 | TIM element | Laurent Cariou (Intel) |
| 9.4.2.27 | Extended Capabilities element | Alfred Asterjadhi (Qualcomm) |
| 9.4.2.139 | ADDBA Extension element | <open> |
| 9.4.2.200 | TWT element | Alfred Asterjadhi (Qualcomm) |
| 9.4.2.218 | HE Capabilities element | <to be assigned> |
| 9.4.2.218.1 | General |
| 9.4.2.218.2 | HE MAC Capabilities Information field |
| 9.4.2.218.3 | HE PHY Capabilities Information fields | Lochan Verma (Qualcomm) |
| 9.4.2.218.4 | Tx Rx HE MCS Support field |
| 9.4.2.218.5 | PPE Threshold field | <to be assigned> |
| 9.4.2.219 | HE Operation element |
| 9.4.2.220 | OFDMA-based Random Access Parameter Set (RAPS) element | Chittabrata Ghosh (Intel) |
| 9.4.2.221 | MU EDCA Parameter Set element | Laurent Cariou (Intel) |
| 9.4.2.222 | BSS Color Change Announcement element | Yasuhiko Inoue (NTT) |
| 9.4.2.223 | Quiet Time Period Setup element | Chao-Chun Wang (MediaTek) |
| 9.4.2.224 | Quiet Time Period Request element |
| 9.4.2.225 | Quiet Time Period Response element |
| 9.6 | Action frame format details | - |
| 9.6.4 | DLS Action frame details | - |
| 9.6.5 | Block Ack Action frame details | George Cherian (Qualcomm) |
| 9.6.8 | Public Action details | - |
| 9.6.8.16 | TDLS Discovery Response frame format | - |
| 9.6.8.34 (Base STD) | QAB Request frame format | Chao-Chun Wang (MediaTek) |
| 9.6.8.36 | FILS Discovery frame format | Laurent Cariou (Intel) |
| 9.6.13 | TDLS Action field formats | - |
| 9.6.16 | Self-protected Action frame details | <open> |
| 9.6.28 | HE Action frame details | - |
| 9.6.28.1 | HE Action field | - |
| 9.6.28.2 | HE Compressed Beamforming And CQI frame format | Lochan Verma (Qualcomm) |
| 9.6.28.3 | HE BSS Color Change Announcement frame format | <open> |
| 9.6.29 | Quiet Time Period Action frame details | Chao-Chun Wang (MediaTek) |
| 9.7 | Aggregate MPDU (A-MPDU) | Liwen Chu (Marvell) |
| 9.7.1 | A-MPDU format |
| 9.7.3 | A-MPDU contents |
| 10 | MAC sublayer functional description | - |
| 10.2 | MAC architecture | <open> |
| 10.2.1  (Base STD) | General | <open> |
| 10.2.4 | Hybrid coordination function (HCF) | - |
| 10.2.4.1 | HCF contention based channel access (EDCA) | Laurent Cariou (Intel) |
| 10.3 | DCF | - |
| 10.3.1 | General | <open> |
| 10.3.2 | Procedures common to the DCF and EDCAF | - |
| 10.3.2.1 | CS mechanism | - |
| 10.3.2.3 | IFS | - |
| 10.3.2.3.7 | EIFS | Jeongki Kim (LG Electronics) |
| 10.3.2.4 | Setting and resetting the NAV | Po-Kai Huang (Intel) |
| 10.3.2.4a | Duration-based RTS/CTS | <open> |
| 10.3.2.8 | Dual CTS protection | Po-Kai Huang |
| 10.3.2.8a | MU-RTS/CTS procedure |
| 10.3.2.10 | MU acknowledgement procedure | <open> |
| 10.3.2.10.1 | Acknowledgement procedure for DL MU PPDU in SU format | Zhou Lan (Broadcom) |
| 10.3.2.10.2 | Acknowledgement procedure for DL MU PPDU in MU format |
| 10.3.2.10.3 | Acknowledgement procedure for an UL MU transmission | George Cherian (Qualcomm) |
| 10.3.5 | Individually addressed MPDU transfer procedure | <open> |
| 10.5 | Fragmentation | Ming Gan (Huawei) |
| 10.7 | Multirate support | Liwen Chu (Marvell) |
| 10.9 | HT Control field operation | <open> |
| 10.10 | Control Wrapper operation | <open> |
| 10.12 | A-MSDU operation | <open> |
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| 10.24.10 | GCR block ack | - |
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| 10.43 | Target wake time (TWT) | <open> |
| 11 | MLME | <open> |
| 11.1 | Synchronization | - |
| 11.1.3 | Maintaining synchronization | - |
| 11.1.3.8 | Multiple BSSID procedure | Chao-Chun Wang (MediaTek) |
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| 11.2 | Power management | - |
| 11.2.2 | Power management in a non-DMG infrastructure network | - |
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| 11.2.2.8 | Receive operation for STAs in PS mode during the CP | Kaiying Lv (ZTE) |
| 11.2.2.17 | TIM Broadcast | Jason Yuchen Guo (Huawei) |
| 11.3.5.3 | AP or PCP association receipt procedures (Base STD) | <open> |
| 11.23 | Tunneled direct-link setup | Chao-Chun Wang (MediaTek) |
| 11.24 | Wireless network management procedures | - |
| 11.49 | HE BSS operation | Chao-Chun Wang (MediaTek) |
| 27 | High Efficiency (HE) MAC specification | <open> |
| 27.1 | Introduction | Osama Aboul-Magd (Huawei) |
| 27.2 | Channel Access | - |
| 27.2.1 | Intra-BSS and inter-BSS frame detection | Kaiying Lv (ZTE) |
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| 27.2.3 | Obtaining an EDCA TXOP for UL MU capable STAs | Laurent Cariou (Intel) |
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| 27.10 | A-MPDU operation | - |
| 27.10.1 | General | - |
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| 27.10.3 | A-MPDU padding for an HE trigger-based PPDU |
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| 27.11 | Setting TXVECTOR parameters for an HE PPDU | - |
| 27.11.1 | STA\_ID\_LIST | Liwen Chu (Marvell) |
| 27.11.2 | UPLINK\_FLAG |
| 27.11.3 | BEAM\_CHANGE |
| 27.11.4 | BSS\_COLOR |
| 27.11.5 | TXOP\_DURATION | Po-Kai Huang (Intel) |
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| 27.16.1 | Basic HE BSS functionality |
| 27.16.2 | Selecting and advertising new BSS Color |
| 27.16.3 | Quieting HE STAs in a HE BSS | Chao-Chun Wang (MediaTek) |

* 1. PHY

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| **Clause** | **Clause title** | **Owner** |
| 28 | High Efficiency (HE) PHY specification | - |
| 28.1 | Introduction | - |
| 28.1.1 | Introduction to the HE PHY | Lochan Verma (Qualcomm) |
| 28.1.2 | Scope | - |
| 28.1.3 | HE PHY functions | Lochan Verma (Qualcomm) |
| 28.1.3.1 | General |
| 28.1.3.2 | PHY management entity (PLME) |
| 28.1.3.3 | Service specification method |
| 28.1.4 | PPDU format |
| 28.2 | HE PHY service interface | Bo Sun (ZTE) |
| 28.2.1 | Introduction | - |
| 28.2.2 | TXVECTOR and RXVECTOR parameters | Bo Sun (ZTE) |
| 28.3 | HE PHY | - |
| 28.3.1 | Introduction | - |
| 28.3.2 | MU transmission | - |
| 28.3.2.1 | Introduction | Jinsoo Choi (LG Electronics) |
| 28.3.3 | OFDMA and SU tone allocation | Jinsoo Choi (LG Electronics) |
| 28.3.3.1 | General |
| 28.3.3.2 | Resource unit, guard and DC subcarriers |
| 28.3.3.3 | Null subcarriers |
| 28.3.3.4 | Pilot subcarriers |
| 28.3.3.5 | RU restriction rules when operating 20 MHz |
| 28.3.3.6 | 20 MHz only HE STAs |
| 28.3.3.7 | DL MU transmission |
| 28.3.3.8 | DL MU-MIMO |
| 28.3.3.8.1 | Minimum RU size in DL MU-MIMO |
| 28.3.3.8.2 | Maximum number of spatial streams in an HE MU PPDU |
| 28.3.3.8.3 | Resource indication and STA self-identification in an HE MU PPDU |
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| 28.3.3.9.1 | Introduction |
| 28.3.3.10 | UL MU-MIMO |
| 28.3.3.10.1 | Introduction |
| 28.3.3.10.2 | Minimum RU size in UL MU-MMIMO |
| 28.3.3.10.3 | MU-MIMO LTF Mode |
| 28.3.3.10.4 | Maximum number of spatial streams in an HE trigger-based PPDU |
| 28.3.3.10.5 | Resource allocation for an HE trigger-based PPDU |
| 28.3.4 | HE PPDU formats | Sigurd Shelstraete (Qantenna) |
| 28.3.5 | Transmitter block diagram | Xiaogang Chen (Intel) |
| 28.3.6 | Overview of the PPDU encoding process |
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| 28.3.7 | HE modulation and coding schemes (HE-MCSs) | Eunsung Park (LG Electronics) |
| 28.3.8 | Timing-related parameters | Bin Tian (Qualcomm) |
| 28.3.9 | Mathematical description of signals | Hongyuan Zhang (Marvell) |
| 28.3.10 | HE preamble | - |
| 28.3.10.1 | Introduction | Dongguk Lim (LG Electronics) |
| 28.3.10.2 | Cyclic shift | Jianhan Liu (MediaTek) |
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| 28.3.10.2.2 | Cyclic shift for HE modulated fields |
| 28.3.10.3 | L-STF | Hongyuan Zhang (Marvell) |
| 28.3.10.4 | L-LTF |
| 28.3.10.5 | L-SIG |
| 28.3.10.6 | RL-SIG |
| 28.3.10.7 | HE-SIG-A | Ron Porat (Broadcom) |
| 28.3.10.7.1 | General | - |
| 28.3.10.7.2 | Content | Ron Porat (Broadcom) |
| 28.3.10.7.3 | CRC computation |
| 28.3.10.7.4 | Encoding and modulation | Hongyuan Zhang (Marvell) |
| 28.3.10.8 | HE-SIG-B | Sigurd Schelstraete (Quantenna) |
| 28.3.10.8.1 | Encoding and modulation |
| 28.3.10.8.2 | Frequency domain maping |
| 28.3.10.8.3 | Time domain encoding | Hongyuan Zhang (Marvell) |
| 28.3.10.8.4 | HE-SIG-B common content | Sigurd Schelstraete (Quantenna) |
| 28.3.10.8.5 | HE-SIG-B per-user content |
| 28.3.10.9 | HE-STF | Hongyuan Zhang (Marvell) |
| 28.3.10.10 | HE-LTF |
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| 28.3.11.1 | General | Tianyu Wu (MediaTek) |
| 28.3.11.2 | Pre-FEC padding process | Hongyuan Zhang (Marvell) |
| 28.3.11.3 | SERVICE field | Ross Jian Yu (Huawei) |
| 28.3.11.4 | Scrambler | Hongyuan Zhang (Marvell) |
| 28.3.11.5 | Coding | Jianhan Liu (MediaTek) |
| 28.3.11.5.1 | Binary convolutional coding and puncturing |
| 28.3.11.5.2 | LDPC coding |
| 28.3.11.5.3 | Post-FEC padding |
| 28.3.11.5.4 | Encoding process for an HE MU PPDU |
| 28.3.11.5.5 | Encoding process for an HE trigger-based PPDU |
| 28.3.11.6 | Stream parser | Tianyu Wu (MediaTek) |
| 28.3.11.7 | Segment parser |
| 28.3.11.8 | BCC interleaver |
| 28.3.11.9 | Constellation mapping | Jianhan Liu (MediaTek) |
| 28.3.11.10 | Space-time block coding | Hongyuan Zhang (Marvell) |
| 28.3.11.11 | LDPC tone mapper | Tianyu Wu (MediaTek) |
| 28.3.11.12 | Segment deparser |
| 28.3.11.13 | Pilot subcarriers | Bin Tian (Qualcomm) |
| 28.3.11.14 | OFDM modulation |
| 28.3.11.15 | Dual carrier modulation | Tianyu Wu (MediaTek) |
| 28.3.12 | Packet extension | Sung Eun Lee (Cypress) |
| 28.3.13 | Non-HT duplicate transmission | Jianhan Liu (MediaTek) |
| 28.3.14 | Transmit requirements for an HE trigger-based PPDU | Lochan Verma (Qualcomm) |
| 28.3.14.1 | Introduction |
| 28.3.14.2 | Power pre-correction |
| 28.3.14.3 | Pre-correction accuracy requirements |
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| 28.3.16 | HE preamble format for sounding PPDUs | Sigurd Schelstraete (Quantenna) |
| 28.3.17 | Receiver specification | Bin Tian (Qualcomm) |
| 28.3.17.1 | General |
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| 28.3.17.3 | Adjacent channel rejection |
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| 28.3.18 | Transmit specification | Bin Tian (Qualcomm) |
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| 28.3.18.2 | Spectral flatness |
| 28.3.18.3 | Transmit center frequency and symbol clock frequency tolerance |
| 28.3.18.4 | Modulation accuracy |
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| 28.3.19 | HE transmit procedure | Xiaogang Chen (Intel) |
| 28.3.20 | HE receive procedure | Xiaogang Chen (Intel) |
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| 28.4.2 | TXTIME and PSDU\_LENGTH calculation | <open> |
| 28.4.3 | HE PHY | Yongho Seok (Newracom) |
| 28.5 | Parameters for HE-MCSs | Bin Tian (Qualcomm) |
| Annex B | Protocol Implementation Conformance Statement (PICS) proforma | Edward Au (Huawei Technologies) |
| Annex C | ASN.1 encoding of the MAC and PHY MIB |
| Annex G | Frame exchange sequences | Osama Aboul-Magd (Huawei Technologies) |

1. AoB
   1. Plans for the next week:
      1. Comment assignment to be continued.
      2. People to start work together reviewing and resolving the comments. Some comments will be re-assigned.
      3. There are some materials to discuss on the server. It is good to discuss about controvertial issues such as spatial reuse.
      4. Timeline can be discussed next week, but update can be done during the March 2017 plenary.
2. Adjournment

TGax conference call adjourned @ 22:00 (ET)

1. List of the attendees

|  |  |  |
| --- | --- | --- |
|  | **Name** | **Company** |
| 1 | Osama Aboul-Magd | Huawei Technologies |
| 2 | Tomoko Adachi | Toshiba |
| 3 | Woojin Ahn | Wilus Institute |
| 4 | Alfred Asterjadhi | Qualcomm |
| 5 | Laurent Cariou | Intel |
| 6 | Minho Cheong | Newracom |
| 7 | George Cherian | Qualcomm |
| 8 | Rojan Chitrakar | Panasonic |
| 9 | Sean Coffey | RealTek |
| 10 | Chittabrata Ghosh | Intel |
| 11 | Jason Yuchen Guo | Huawei Technologies |
| 12 | Po-Kai Huang | Intel |
| 13 | Yasuhiko Inoue | NTT |
| 14 | Junichi Iwatani | NTT |
| 15 | Jeongki Kim | LG Electronics |
| 16 | Suhwook Kim | LG Electronics |
| 17 | Jarkko Knect | Apple |
| 18 | Geonjung Ko | Wilus Institute |
| 19 | Zhou Lan | Broadcom |
| 20 | Sung Eun Lee | Cypress |
| 21 | Yunbo Li | Huawei Technologies |
| 22 | Dong Guk Lim | LG Electronics |
| 23 | Jianahn Liu | MediaTek |
| 24 | Jing Ma | NICT |
| 25 | Narendar Madhavan | Toshiba |
| 26 | Kome Oteri | InterDigital |
| 27 | Eunsung Park | EG Electronics |
| 28 | Yongho Seok | Newracom |
| 29 | Shoko Shinohara | NTT |
| 30 | John Son | Wilus Institute |
| 31 | Robert Stacy | Intel |
| 32 | Jung Hoon Suh | Huawei Technologies |
| 33 | Yusuke Tanaka | Sony |
| 34 | Lochan Verma | Qualcomm |
| 35 | Chao-Chun Wang | MediaTek |
| 36 | James Wang | MediaTek |
| 37 | Xiaofei Wang | InterDigital |
| 38 | James Yee | MediaTek |
| 39 | Ross Jian Yu | Huawei |
| 40 | Sunwoong Yun | LG Electronics |
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