IEEE P802.11
Wireless LANs

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| IEEE 802.11 Task Group AYMay 2016 Waikoloa Meeting Minutes |
| Date: 2016-5-15 |
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Abstract

Task Group AY meeting minutes from the IEEE 802.11 Waikoloa session, May 15-20, 2016.

**IEEE 802.11 Task Group AY**

**May 2016 Waikoloa Meeting**

**May15-20, 2016**

**Monday, May 16, 2016,AM2 Session (10:30-12:30)**

1. The IEEE 802.11ay task group meeting was called to order at 10:30 by the Chair, Edward Au (Huawei).
2. Chair introduced himself and secretary, Jeorge Hurtarte (Teradyne).
3. Agenda Doc. IEEE 802.11-16/0493r2
4. Chair reviewed the IEEE-SA patent policy, logistics, and reminders on Task Group rules, including meeting guidelines and attendance recording procedures.
	1. Chair asked if anyone has any questions about the IEEE-SA patent policy, logistics or reminders. No questions.
	2. Chair asked if anybody has any disclosures related to the patent policy. None.
	3. Chair asked if there were any questions on any of the above items. None.
	4. Chair reminded all to record their attendance.
	5. Chair reminded all to upload their presentations.
5. Chair introduced the leadership of the AY TG (slide 11)
6. Chair reviewed the meeting time slots, locations and agenda items for the week (see slides 12-15of the agenda document).
7. Chair proceeded to discuss the agenda items for the Monday May 16, 2016 AM2 session.
8. Chair reviewed the progress of the Task Group AY and related documents (slide 18)
9. Motion #51: Motion to approve the March 2016 Macao and April 26, 2016 Conference Call minutes
	1. Move: Edward Au
	2. Second: Kerstin Johnsson
	3. No objections noted. Unanimous consent.
	4. The March 2016 Macao and April 26, 2016 Conference Call minutes were approved.
10. Chair reviewed the timeline of the AY Task Group (slide 20).
11. Chair reviewed the list of presentations submitted (slides 21-27) and schedule for presenting those during the week.
	1. Chair asked if there were any additional presentations submissions
12. Chair reviewed the agenda setting for the week (slide 28)
13. Chair reviewed the selection procedure for contributions (slide 29).
14. Presentations
	1. Presentation by Katsuo Yunoki (KDDI R&D Laboratories), FST Enhancement, Doc. IEEE 11-16/0599r1. Key points reviewed:
		1. Propagation fluctuation will be severe and drastic in public space and/or outdoor environment due to blocking or multipath by pedestrians, reflections, or sometimes cars in 11ay use scenario.
		2. 2.4/5GHz band could compensate some part of degradation in 60GHz performance.
		3. Opened the floor for discussion.
	2. Presentation by Artyom Lomayev (Intel), Performance Comparison of Dual Carrier and Regular Modulations for SU-MIMO in 11ay, Doc. IEEE 11-16/0631r1. Key points reviewed:
		1. This work presents comparison analysis of Dual Carrier Modulations (DCMs) defined for the legacy 11ad OFDM PHY and regular BPSK and QPSK modulations providing the same data rate in application to the open loop 2 x 2 SU-MIMO scheme.
		2. The performance of the SQPSK and QPSK modulations transmitted using two subcarriers in the OFDM signal spectrum is compared to their regular BPSK and QPSK counterparts in frequency selective channel.
		3. Additionally implementation complexity of 2 x 2 SU-MIMO with DCM and regular types of modulations is compared.
		4. Based on the completed analysis a space-frequency diversity scheme is proposed for DCM modulation.
		5. Opened the floor for discussion.
		6. Straw Poll #1.Would you agree to insert the following in section 7 of the SFD: “The 11ay specification shall enable space-frequency diversity scheme for OFDM MIMO transmission using SQPSK DCM modulation with subcarriers mapping shown on slide 13.”
			1. Yes: 28
			2. No: 0
			3. Abstain:16
			4. Straw poll is passed.
	3. Presentation by Artyom Lomayev (Intel), Performance Analysis of Robust Transmission Modes for MIMO in 11ay, Doc. IEEE 11-16/0632r1. Key points reviewed:
		1. This presentation describes the results of performance analysis for MIMO robust transmission modes using MRC 1x2, Alamouti 2x1 and Alamouti 2x2 schemes.
		2. OFDM and SC signal structure is proposed to support Alamouti signal processing.
		3. The performance of OFDM and SC PHY is evaluated in frequency flat and frequency selective Rayleigh channel.
		4. In case of OFDM PHY the performance of dual carrier SQPSK and QPSK modulations and regular BPSK and QPSK modulations providing the same data rate is compared.
		5. Opened the floor for discussion.
		6. Straw Poll #1. Would you agree to insert the following in section 7 of the SFD: “The 11ay specification shall enable transmit diversity schemes including Alamouti scheme for both SC and OFDM modulations for MIMO data transmission.”
			1. Yes: 24
			2. No: 0
			3. Abstain: 10
			4. Straw poll is passed.
	4. Presentation by SangHyun Chang (Samsung), USR wireless docking usage model, Doc. IEEE 11-16/0666r0. Key points reviewed:
		1. Usage Model X: USR Wireless Docking
		2. Opened the floor for discussion.
		3. Motion #52: Do you agree to add USR wireless docking, as outlined in slide 3, to the 11ay usage model document?
			1. Move: SangHyun Chang
			2. Second: Assaf Kasher
			3. Yes: 20
			4. No: 1
			5. Abstain: 10
			6. Motion is passed.
	5. Presentation by Robert Müller (Technische Universität Ilmenau), USR Analysis of Intra-Cluster Effects Using Pencil Beam Antennas, Doc. IEEE 11-16/0668r0. Key points reviewed:
		1. Motivation
		2. Overview of 60 GHz Entrance Hall Measurement
		3. Pencil Beam 60 GHz Intra Cluster Measurements in the Entrance Hall Environment
		4. 60 GHz dual polarimertic Scattering Measurement Results
		5. Discussion of 60 GHz dual polarimertic Scattering Measurements in the Entrance Hall
		6. Conclusions
		7. Opened the floor for discussion.
15. Meeting recessed at 12:25 and will resume on Monday PM1.

**Monday, May 16, 2016, PM1 Session (1:30-3:30)**

1. The meeting was called to order at 01:31by the Chair, Edward Au (Huawei).
2. Agenda Doc.IEEE 802.11-16/0493r3
3. Chair reviewed the IEEE-SA patent policy, logistics, email reflector logistics, and reminders on Task Group rules.
	1. Chair asked if anybody has any disclosures related to the patent policy.
	2. Chair asked if anyone has any questions about the IEEE-SA patent policy, logistics or reminders. No questions.
	3. Chair reminded all to record their attendance.
4. Presentations
	1. Chair reviewed background information on the 3GPP RAN R2-163148’sliaison letter on Enhanced LTE-WRAN aggregation, Doc. IEEE 11-16/0548r0. Then invited the following presenter to discuss the proposed IEEE 802.11 WG response.
	2. Presentation by Laurent Cariou (Intel), 3GPP liaison on enhanced LTE-WRAN aggregation, Doc. IEEE 11-16/0694r1. Key points reviewed:
		1. Reviewed the liaison response paragraph by paragraph and then,
		2. Opened the floor for discussion.
			1. Several comments and feedback given which will be incorporated in the next revision of the liaison response letter.
5. Chair asked if there are any further questions on the liaison letter. None.
6. Meeting recessed at 2:45 and will resume on TuesdayAM1.

**Tuesday, May 17, 2016, AM1 Session (08:00-10:00)**

1. The meeting was called to order at 08:00 by the Chair, Edward Au (Huawei).
2. Agenda Doc. IEEE 802.11-16/0493r4
3. Chair reminded all about the IEEE-SA patent policy, logistics, and reminders on Task Group rules.
	1. Chair asked if anybody has any disclosures related to the patent policy. None.
	2. Chair reminded all to record their attendance.
4. Chair indicated that the latest version of the response letter to the 3GPP on eLWA has been uploaded as Doc. IEEE 11-16/0694r2.
5. Presentations
	1. Presentation by James Wang (Mediatek), Antenna Polarization and Beamforming for 11ay, Doc. IEEE 11-16/0700r0. Key points reviewed:
		* Multiple antenna polarizations is an attractive way for small devices with limited space to realize diversity and MIMO
		* Due to propagation characteristics of mmWave, antenna polarization can affect the performance significantly
		* If polarization is misaligned, it affects end-to-end performance significantly (i.e., signal drops due to polarization misalignment, cross-polarization interference rises)
		* Antenna polarization can support MIMO spatial multiplexing.
		* 11ay should adopt more powerful and efficient method to deal with the effects of polarization for ensuring reliable performance
		* Potential simplification in BF training for antenna polarization by exploiting the high correlation between the ray-tracing path of the multiple polarizations
		* Floor opened for discussion
		* Straw Poll #1. Move to include the antenna polarization capability information in the 11ay capability exchange. (Capability information is TBD)
			1. Yes: 31
			2. No: 0
			3. Abstain: 4
			4. Straw poll is passed.
	2. Presentation by Kaushik Josiam (Samsung), Length 1344 LDPC codes for 11ay, Doc. IEEE 11-16/0676r0. Key points reviewed:
		* Channel bonding and MIMO are core features of 11ay specification.
		* This presentation is proposing enhancements to the 11ad channel coding scheme that can provide “significant” PER performance improvement when large packets are to be transmitted.
		* The use of a longer length LDPC code for 11ay is proposed.
		* Floor opened for discussion
		* Straw Poll #1. Do you agree to use the code matrices listed in slides 3-6 for length 1344 LDPC code in IEEE 802.11ay?
			1. Yes: 27
			2. No: 0
			3. Abstain: 8
			4. Straw poll is passed.
		* Doc. IEEE 11-16/0692r0 contains the Proposed SFD Text on code matrices for length 1344 LDPC codeword.
	3. Presentation by Kaushik Josiam (Samsung), Generic Control Frame for 11ay, Doc. IEEE 11-16/0677r0. Key points reviewed:
		* This contribution proposes a general purpose MAC control frame that:
			1. Simplifies protocol flow with the ability to set-up the MIMO, Multi-user and Channel Bonding features
			2. Enables channel “protection” for these features (different from RTS/CTS)
		* Floor opened for discussion
		* Straw Poll #1. Do you agree to add to the SFD:
			+ 802.11ay shall define a generic MAC control frame that includes, but is not limited to, at least one of the following: SU/MU MIMO Set-up, Channel Aggregation and OFDMA.
				- The generic MAC control frame will be signaled by the control frame extension
			1. Yes: 20
			2. No: 0
			3. Abstain: 13
			4. Straw poll is passed.
	4. Presentation by Katsuo Yunoki (KDDI R&D Laboratories), FST enhancement, Doc. IEEE 11-16/0599r3. Key points reviewed:
		* This is a continuation from Monday AM2 presentation.
		* Straw Poll #1. Do you support to add the following text into the 11ay SFD?

“11ay amendment addresses FST enhancement to enable multi-link operation to split traffic stream into multiple bands/channels. Its flow control is required to be studied.”

* + - Floor opened for discussion on this straw poll.
		- Straw Poll #1 results:
			1. Yes: 7
			2. No: 7
			3. Abstain: 17
			4. Straw poll is failed.
	1. Presentation by Edward Au (Huawei), 11ay Functional Requirements, Doc. IEEE 11-15/1074r0.
		+ Floor opened for discussion or questions regarding this document.
			1. The power efficiency requirement was discussed as possibly needing to be more aggressive than currently stated. Action: Rakesh Taori agreed to provide recommended text.
			2. Some discussion on the video requirements
1. Meeting recessed at 09:55 and will resume on Tuesday AM2.

**Tuesday, May 17, 2016, AM2 Session (10:30-12:30)**

1. The meeting was called to order at 10:32by the Chair, Edward Au (Huawei).
2. Agenda Doc. IEEE 802.11-16/0493r5
3. Chair reminded all about the IEEE-SA patent policy, logistics, and reminders on Task Group rules.
	1. Chair asked if anybody has any additional presentations for the meeting. None.
	2. Chair reminded all to record their attendance.
4. Presentations
	1. Presentation by Rui Yang (InterDigital, Inc.), Open Loop vs Closed Loop SU-MIMO for 11ay, Doc. IEEE 11-16/0642r1.
		* This contribution demonstrates the potential benefit from using closed loop (or channel-dependent pre-coding) SU-MIMO via system level simulations with different antenna configurations and deployment scenarios.
		* Opened floor for discussion
		* Straw Poll #1. Do you agree that closed-loop SU-MIMO based on channel-dependent precoding should be considered in 802.11ay?
			1. Yes: 20
			2. No: 3
			3. Abstain: 19
			4. Straw poll is passed.
	2. Presentation by Yutaka Murakami (Panasonic), Open Loop Spatial Multiplexing with Phase Hopping for 11ay, Doc. IEEE 11-16/0669r0. Key points reviewed:
		* Several MIMO scenarios for 11ay have been proposed, and this contribution focuses on SU-MIMO scenario for open loop spatial multiplexing (OLSM).
		* This presentation details a SU-MIMO scenario using OLSM and covers:
			1. OLSM scenario
			2. Proposal of OLSM + Phase Hopping (PH)
			3. Benefits of PH
			4. Simulation results
		* Floor opened for discussion
		* Straw Poll #1. Do you agree to insert the following in clause 7 of the SFD:

“The 11ay specification shall support SU-MIMO with predetermined and/or no precoding matrices.”

* + - 1. Yes: 9
			2. No: 1
			3. Abstain: 24
			4. Straw poll is passed.
		- Straw Poll #2. Do you agree to insert the following in clause 7 of the SFD:

“The 11ay specification shall define SU-MIMO transmission with and without phase hopping of EDMG-PPDU for EDMG OFDM PHY. An EDMG STA may support transmission and reception of SU-MIMOwith phase hopping.”

 - “with/without precoding” is TBD.

 - Period of phase hopping is TBD.

* + - 1. Yes: 13
			2. No: 0
			3. Abstain: 21
			4. Straw poll is passed
	1. Presentation by Kyungtae Jo (LG Electronics), Multi-Channel Spatial Sharing for 11ay, Doc. IEEE 11-16/0672r2. Key points reviewed:
		+ This contribution intends to investigate how spatial sharing protocol in single channel for 11ad is modified to extend to the spatial reuse for multi-channel.
		+ It suggests that “Enhanced Directional Channel Quality Request/Report frame” be modified by using the reserved bits of existing “Directional Channel Quality Request/Report frame” of 11ad in order to keep backward compatibility with legacy.
		+ Opened floor for discussion.
		+ Straw Poll #1. Do you agree to add the following text into SFD?

“11ay shall modify Directional Channel Quality Request/Report frames to request/report for measurements on multiple channels”

* + - * Yes: 25
			* No: 0
			* Abstain: 10
			* Straw poll is passed.
		- Straw Poll #2. Do you agree to add the following text into SFD?

“11ay shall enable Directional Channel Quality Request/Report frames to provide the measurements averaged over multiple Channels”

* + - * Yes: 25
			* No: 0
			* Abstain: 8
			* Straw poll is passed.
	1. Presentation by Sungjin Park (LG Electronics), Efficient multi-channel operation in 11ay, Doc. IEEE 11-16/0687r1. Key points reviewed:
		+ At the last TGay meeting in March the motion below was passed.
			1. “11ay shall support allocation of SP(s) and scheduled CBAP(s) over more than one channel and/or over a bonded channel.”
		+ Related to the motion above, we propose allowing only secondary channel allocation in order to improve channel utilization in 11ay.
			1. It could be operated by beacon or announce fames.
			2. It does not need to define new frame and procedure.
		+ In this contribution, we investigate the consideration points for allowing only secondary channel allocation.
		+ Opened floor for discussion.
		+ Straw Poll #1. Do you agree to add the following text to the SFD?

“11ay shall support allocation of SP(s) and scheduled CBAP(s) over more than one channel and over a bonded channel. These allocations may not include the primary channel. When allocations over different channels overlap in time, the source and destination of such allocations shall be different. Channels used for such allocations shall be limited to the operating channels of the BSS.”

* + - * + Yes: 28
				+ No: 0
				+ Abstain: 7
				+ Straw poll is passed.
	1. Presentation by Edward Au (Huawei), TGay Evaluation Methodology, Doc. IEEE 11-15/0866r2.
		+ Floor opened for discussion or questions regarding this document.
1. Chair asked if there were any objections to cancel Thursday AM1.
	1. None
2. Meeting recessed at 12:14 and will resume on Thursday AM2.

**Thursday, May 17, 2016, AM2 Session (10:30-12:30)**

1. The meeting was called to order at 10:30by the Chair, Edward Au (Huawei).
2. Chair reminded all about the IEEE-SA patent policy, logistics, and reminders on Task Group rules.
	1. Chair asked if anybody has any additional presentations for the meeting. None.
	2. Chair reminded all to record their attendance.
3. Agenda Doc. IEEE 802.11-16/0493r7
4. Presentations
	1. Presentation (brief update) by Yutaka Murakami (Panasonic), Open Loop Spatial Multiplexing with Phase Hopping for 11ay, Doc. IEEE 11-16/0669r1.
		* Opened floor for discussion
	2. Presentation by ArtyomLomayev(Intel), Channel models for IEEE 802.11ay, Doc. IEEE 11-16/1150r4.
		* Floor opened for discussion.
5. Motion to reaffirm SangHyun Chang (Samsung) as vice chair and Jeorge Hurtarte (Teradyne) as secretary of Task Group AY.
	1. Move: Edward Au (Huawei)
	2. Second: Rakesh Taori (Samsung)
	3. Result:Passed with unanimous consent.
6. Motion #53: 3GPP liaison on eLWA
	1. Move to approve the liaison in 16/0694r4 as a response to 3GPP liaison on eLWA, granting the Working Group Chair editorial license. <https://mentor.ieee.org/802.11/dcn/16/11-16-0694-04-00ay-draft-liaison-response-to-r2-163148.docx>
	2. Move: Laurent Cariou
	3. Second: Kerstin Johnsson
	4. Yes/No/Abstain: 30/0/1
	5. The motion is passed.
7. Motion #54: Functional Requirements Document
	1. Move to adopt document 15/1074r0 as the baseline
	document for the Functional Requirements Document <https://mentor.ieee.org/802.11/dcn/15/11-15-1074-00-00ay-11ay-functional-requirements.docx>
	2. Move: Yan Xin
	3. Second: Yingpei Lin
	4. Yes/No/Abstain: 28/0/0
	5. The motion is passed.
8. Motion #55: Evaluation Methodology Document
	1. Move to adopt document 15/0866r3 as the baseline document for the Evaluation Methodology Document. <https://mentor.ieee.org/802.11/dcn/15/11-15-0866-03-00ay-11ay-evaluation-methodology.doc>
	2. Move: Laurent Cariou
	3. Second: Kerstin Johnsson
	4. Yes/No/Abstain: 27/0/0
	5. The motion is passed.
9. Motion #56: PHY
	1. Do you agree to add the following text in Section 7 of the SFD?The 11ay specification shall enable space-frequency diversity scheme for OFDM MIMO transmission using SQPSK DCM modulation with subcarriers mapping shown on slide 13 of 16/0631r1.
	2. Moved: Artyom Lomayev
	3. Seconded: Kerstin Johnsson
	4. Yes/No/Abstain: 19/0/4
	5. The motion is passed.
10. Motion #57: PHY
	1. Do you agree to add the following text in Section 7 of the SFD?The 11ay specification shall enable transmit diversity schemes including Alamouti scheme for both SC and OFDM modulations for MIMO data transmission.
	2. Moved: Artyom Lomayev
	3. Seconded: Carlos Cordeiro
	4. Yes/No/Abstain: 20/0/4
	5. The motion is passed.
11. Motion #58: PHY
	1. Do you agree to include the antenna polarization capability information in the 11ay capability exchange in the SFD? Capability information is TBD.
	2. Moved: Rakesh Taori
	3. Seconded: Yingpei Lin
	4. Yes/No/Abstain: 25/0/1
	5. The motion is passed.
12. Motion #59: PHY
	1. Do you agree to include the proposed SFD Text in 16/0692r0 on code matrices for length 1344 LDPC codeword?
	2. Moved: Rakesh Taori
	3. Seconded: Carlos Cordeiro
	4. Yes/No/Abstain: 23/0/3
	5. The motion is passed.
13. Motion #60: MAC
	1. Do you agree to add to the SFD:11ay shall define a generic MAC control frame that includes, but is not limited to, at least one of the following: SU/MU MIMO Set-up, Channel Aggregation and OFDMA.
		* The generic MAC control frame will be signaled by the control frame extension
	2. Moved: Rakesh Taori
	3. Seconded: Yingpei Lin
	4. Yes/No/Abstain: 25/0/2
	5. The motion is passed.
14. Motion #61: PHY
	1. Do you agree to insert the following in clause 7 of the SFD:The 11ay specification shall support SU-MIMO with predetermined and/or no precoding matrices.
	2. Moved: Yutaka Murakami
	3. Seconded: Carlos Cordeiro
	4. Yes/No/Abstain: 14/0/9
	5. The motion is passed.
15. Motion #62: PHY
	1. Do you agree to insert the following in clause 7 of the SFD:The 11ay specification shall define SU-MIMO transmission with and without phase hopping of EDMG-PPDU for EDMG OFDM PHY. An EDMG STA may support transmission and reception of SU-MIMO with phase hopping.
		* With/without precoding is TBD.
		* Period of phase hopping is TBD
	2. Moved: Yutaka Murakami
	3. Seconded: Artyom Lomayev
	4. Yes/No/Abstain: 13/1/10
	5. The motion is passed.
16. Motion #63: PHY
	1. Do you agree to add the following text into the SFD:11ay shall modify Directional Channel Quality Request/Report frames to request/report for measurements on multiple channels
	2. Moved: Kyungate Jo
	3. Seconded: SungJin Park
	4. Yes/No/Abstain: 22/0/2
	5. The motion is passed.
17. Motion #64: PHY
	1. Do you agree to add the following text into the SFD:11ay shall enable Directional Channel Quality Request/Report frames to provide the measurements averaged over multiple channels
	2. Moved: Kyungate Jo
	3. Seconded: SungJin Park
	4. Yes/No/Abstain: 21/0/4
	5. The motion is passed.
18. Motion #65: PHY
	1. Do you agree to add the following text into the SFD:11ay shall support allocation of SP(s) and scheduled CBAP(s) over more than one channel and over a bonded channel. These allocations may not include the primary channel. When allocations over different channels overlap in time, the source and destination of such allocations shall be different. Channels used for such allocations shall be limited to the operating channels of the BSS.
	2. Moved: SungJin Park
	3. Seconded: Kyungate Jo
	4. Yes/No/Abstain: 21/0/2
	5. The motion is passed.
19. Presentation by KerstinJohnsson (Intel), 11ay evaluation methodology, Doc. IEEE 11-15/0866r4.
	* + Highlighted any changes to the document
		+ Floor opened for discussion.
20. Chair reviewed the goals for the July 2016 plenary meeting.
21. Chair reviewed the teleconference schedule (10:00am ET – 11:00am ET, June 29, 2016). No objection.
22. The Task Group AY Waikoloa meeting was adjourned on May 19, 2016 at 11:16.