IEEE P802.11
Wireless LANs

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| Minutes of the IEEE 802.11ax Spatial Reuse ad hoc group meeting – Bangkok, September 2015 |
| Date: 2015-09-18 |
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Abstract

This document contains the minutes of the September 2015 meeting of the IEEE 802.11ax Spatial Reuse ad hoc group held in Bangkok.

**PM1 - Tuesday 13:30 September 15, 2015 – Interim Meeting**

PM1 Session was chaired by Laurent Cariou (Intel).

Chair called the meeting to order at 13:30.

Chair went through the agenda.

Chair reviewed agenda, asked for objection. None noted.

There were 72 attendees including 3 co-chairmen during PM1 SR ad hoc session (checked at 14:36)

**15/1139r1, Co-chairmen notes on current status of 802.11ax Spatial Reuse ad hoc group**

Presenter: Guido Hiertz (Ericsson)

Guido reviewed document 15/1139r1.

Guido encouraged attendees to propose additions to the SFD.

**15/1069r1, Adaptive CCA and TPC**

Presenter: James Wang (Mediatek)

James reviewed document 15/1069r1

Question: In the diagram on slide 13, the middle BSS is A, the bottom BSS is C, and the top BSS is B. That’s not the scenario. I cannot accept the numbers. Graham mentioned simulation result in doc. 1135.

Answer: The simulation is not calibrated, but middle one is showing about 100 Mbps in baseline Gput. All 3 BSSs reach higher throughput.

Question: In the baseline, probably it should be better than this. In other simulations, the middle BSS gets totally slammed.

Answer: The condition is in appendix. Fixed MCS is used.

Question: Full buffered?

Answer: Yes.

Question: Is it only applied for UL? It might not work for DL.

Answer: See the note in the slide. OBSS\_PD for AP can be set to values based on the farthest STA.

Straw Poll 1 – amended after long discussion

* When an 11ax STA detects a valid OBSS PPDU it may terminate reception of the PPDU and reevaluate the medium condition if the RXPWR of the received PPDU is below the OBSS\_PD threshold and TBD conditions are met, noting that the OBSS\_PD threshold is accompanied by a TXPWR value and a change in the TXPWR shall be accompanied by an inverse TBD change in the OBSS\_PD threshold value.
	1. Yes: 28
	2. No: 11
	3. Abstain 25

-🡪 fails

After the straw poll, there was a request to bring this back after changing the wording offline because the text change did not satisfy all the people.

**15/1109r1, NAV and PD Threshold Rule for Spatial Reuse**

Presenter: Rossi Jun Luo (Huawei)

Rossi reviewed document 15/1109r1

Question: Question on the second bullet, ‘except that the medium condition shall indicate BUSY during the period of time that is taken by the receiving STA to validate that the PPDU’. Only for that time the channel is considered to be busy?

Answer: Before you check the BSS color of the received frame, the channel is BUSY. But after you decode SIG-A, you know the frame is an inter-BSS frame or not.

 Straw Poll 2

* **Do you agree to add the TGax Specification Framework:**
	1. 5.1 Features for operation in dense environments [802.11ax SFD]

 A STA should regard an Inter-BSS PPDU with a valid PHY header and that has a receive power/RSSI below the OBSS PD level used by the receiving STA and that meets additional TBD conditions, as not having been received at all (e.g., should not update its NAV), except that the medium condition shall indicate BUSY during the period of time that is taken by the receiving STA to validate that the PPDU is from an Inter-BSS, but not longer than the time indicated as the length of the PPDU payload

* The OBSS PD level is greater than the minimum receive sensitivity level
	+ Y: 39
	+ N: 0
	+ A: 12

 -🡪 passes

Question: What is the intended behaviour when the channel goes from busy to idle?

Answer: If the channel goes busy to idle, whether the time is used for backoff or not depends on our decision.

There was more discussion on the intended behaviour.

**15/1110r0, BSS-TXOP**

Presenter: Amin Jafarin (Newracom)

Amin reviewed document 15/1110r0.

Question: Why do we have to have this TXOP for my BSS if other BSSs decide to ignore it? Something is misssed here.

Answer: What is missed is the case in which you do not want to allow some BSSs to transmit. If you want to ignore the NAV, you can ignore it under some conditions. But, I want to keep the conventional TXOP. If the conventional TXOP is set, you should not ignore it.

Comment on selfish STA.

Answer: That’s the discussion on the TXOP limit. The conventional TXOP limit is shorter.

Question: The STA only initiates conventional TXOP if the STA experiences a lot of problems?

Answer: I am not talking about when to do that in the straw poll. It’s up to discussion.

Question: How to signal it?

Answer: TBD.

Straw Poll 3 (amended)

**Do you agree with the definition of BSS-TXOP that can be used to set the NAV for the BSS STAs only.**

* + Y
	+ N
	+ A:

 🡪 amended as follows:

**Do you agree to add to the TG Spec Framework document:**

 The concept that the TXOP initiator has the choice to set the NAV for BSS only or all the recipient STAs

-Y: 12

-N: 12

-A: 29

-🡪 fails

SR ad hoc meeting was recessed until EVE.

**EVE - Tuesday 19:30 September 15, 2015 – Interim Meeting**

EVE Session was chaired by Laurent Cariou (Intel).

Chair called the meeting to order at 19:33.

Chair went through the agenda.

There were 68 attendees including 3 co-chairmen during EVE SR ad hoc session (checked at 21:09)

**15/1118r0, Discussions on Spatial Reuse Enhancement**

Presenter: Geonjung Ko (WILUS)

Geonjung reviewed document 15/1118r0.

Question: The straw poll language is similar to a straw poll in MAC ad hoc session proposed by Mediatek.

Answer: I am focusing on the legacy protection. CCA threshold is increased only when HE PPDU from OBSS is observed.

Comment: In most situations, you cannot identify OBSS PPDU.

Question: Only for HE PPDU?

Answer: Only when HE PPDU from OBSS is observed.

Question: Why not legacy PPDU?

Answer: In a specific environment, legacy STA cannot get opportunity becauses of the HE STAs.

Answer: We have simulation result on legacy starvation when there are two BSSs (ax and legacy)

Straw Poll 4

* **Do you agree to add the following text into 11ax SFD?**

- 5.y.z HE STA shall apply increased CCA threshold for spatial reuse only when HE PPDU from OBSS is observed.

- Y : 7

- N : 12

- A: 23

-🡪 fails

**15/1138r0, To DSC or not to DSC**

Presenter: Filip Mestanov (Ericsson AB)

Filip reviewed document 15/1138r0.

Straw Poll 5 (amended after long discussion)

**Do you agree to add to Section 5.1 of the SFD:**

 **“The amendment shall include one or more mechanisms to improve spatial reuse by allowing adjustments to one or more of the CCA-ED , CCA Signal Detect , OBSS\_PD or TXPWR threshold values. The constraints on selecting threshold values are TBD.”**

Y 24

N 0

A 18

* + - passes:

Comment: CCA-SD, what does it mean? How about changing it to “OBSS PPDU”?

Comment: I like current text (CCA-SD).

Question: Please clarify what is ‘CCA-SD’.

Answer: This is the level at which you determine to backoff or set the NAV

**15/1104r2, TXOP Considerations for Spatial Reuse**

Presenter: Reza Hedayat (Newracom)

Reza reviewed document 15/1104r2.

Question: Question on slide 11. For AC\_BE, TXOP limit is 0, which means only one frame is transmitted. That frame may be quite long. Then you do not have anything to measure.

Answer: For single frame transmission, maybe we have proposals from others.

Question: Data frame is more frequently used frames. I am more concerned on MU case.

Answer: We haven’t addressed multi user case

Question on slide 13: You have to find optimum TBD threshold.

Straw Poll 6 (amended)

* **Do you agree the following to be added to 11ax SFD:**

The specification to consider a procedure that may revise the NAV depending on TBD conditions at the recipient of the ongoing OBSS frame.

* Y: 16
* N: 0
* Abs: 26
	+ - Passes

Ron suggested amended straw poll text.

**15/1045r0, Dynamic CCA control and TPC Simulation Results with SS1~SS3**

Presenter: Takeshi Itagaki (Sony)

Takeshi reviewed document 15/1045r0

There was no question, no discussion on the presentation.

**15/1081r4, Further consideration on receive behavior based on the cascading structure and the BSS color scheme**

Presenter: Jing Ma (NICT)

Jing reviewed document 15/1081r4

Question: In the example, how do you know which is up and which is down in each communication?

Question: How do you determine is it safe to go?

Let’s take it offline.

Question: Ack from AP1 to STA12 will collide with frames from AP2 to STA22.

Answer: I am sorry. I did not consider the ack.

Question: You considered 2 APs. If there are more APs, it is more difficult to find opportunity to transmit simultaneously. In dense environment, there are 10 ~ 20 APs in the range of each other

Answer: This presentation introduces the simplest case. High density is our future work.

**15/1136r6, Discussion on Concurrent STA-to-STA Transmissions in 11ax**

Presenter: Der-Jiunn Deng (National Changhua University of Education)

Deng reviewed document 15/1136r6.

Presentation will be continued on Wednesday PM1 SR ad hoc session.

SR ad hoc meeting was recessed until Wednesday PM1.

**PM1 - Wednesday 13:30 September 16, 2015 – Interim Meeting**

PM1 Session was chaired by Laurent Cariou (Intel).

Chair called the meeting to order at 13:30.

Chair went through the agenda. The chairman announces that five submissions are remaining for presentation during this week’s meeting.

The revised submission 11-15/1069r3 once presented during the 1st SR ad hoc session was uploaded to the server and the chairman explained that he added this submission to the schedule as the authors asked to present the straw poll contained within.

The Chairman asked the group if there is any objection against this modified agenda. As no objection was brought forward the agenda 11-15/ 1143r2 was accepted by unanimous consent.

There were 69 attendees including 2 co-chairmen during PM1 SR ad hoc session (checked at 14:50).

**15/1136r6, Discussion on Concurrent STA-to-STA Transmissions in 11ax (continued)**

Presenter: Der-Jiunn Deng (National Changhua University of Education)

Deng reviewed remaining part of document 15/1136r6.

Comment: Interesting topic, thanks for the presentation. APs have more antennas than stations, since stations want to save power. They have less transmit-receive chains. Thus, with 802.11ax it might be more efficient to send the through the AP.

Straw Poll 7

**▪ Do you agree that 802.11ax should support concurrent STA-to-STA transmissions?**

* Yes: 9
* No: 2
* Abstain: 33

**15/1069r3, Adaptive CCA and TPC (Revisit for straw poll)**

Presenter: James Wang (Mediatek)

James Wang presented the straw poll in the revised document.

Straw Poll 8

 **Do you agree to add the following text into 11ax SFD:**

An 11ax STA regards a valid OBSS PPDU *as not having been received at all (e.g., should not update its NAV), except that the medium condition shall indicate BUSY during the period of time that is taken by the receiving STA to validate that the PPDU is from an Inter-BSS, but not longer than the time indicated as the length of the PPDU payload*  if the RXPWR of the received PPDU is below the OBSS\_PD threshold and TBD conditions are met, noting that the OBSS\_PD threshold is accompanied by a TXPWR value and a reduction in the TXPWR may be accompanied by an TBD increase in the OBSS\_PD threshold value.

Yes: 38

 No: 1

 Abstain: 18

🡪 passes

Question: What about beacons and other management frames? Should the also be discarded because of low power?

Answer: Yes, if power is below power and from OBSS.

Comment: I have an issue with the last sentence. We have an action item to improve this sentence in the future. It’s the right direction but needs to become better.

**15/1082r1, Analysis of BSS and ESS Structure during Concurrent SR Transmissions**

Presenter: Chuck Lukaszewski (Aruba Networks)

Chuck reviewed document 15/1082r1.

Question: Do you believe that roaming decisions need to be further assisted by the network?

Answer: Yes, absolutely. With spatial reuse mechanisms applied non-AP STAs and APs need to collaborate more on roaming. More help from the network will be needed. Possibly there are standardized features needed.

Question: Can you talk more about the MCS 7 design criteria?

Answer: Customers usually look at the rate displayed in their devices. Customers complaint if they see something lower in their devices. They believe that they didn’t get what they pay for if they don’t see the full data rate.

Comment: System performance maximization may not be able to satisfy everyone. Targeting super high MCS is probably not the best to improve spectral efficiency.

Question: What is the SR gain in your model? If you compare with a system that does not have any SR, do you have any results?

Answer: I am just offering some considerations. I am not adding results. Please look at other presentation from Monday. This presentation provides background information and compares the different MCSs that can be used.

Question: I believe you are using too high power.

Answer: It doesn’t really matter what power we set. The SINR is relative if all nodes are set to the same power.

Question: So all your APs and all your devices use the same power.

Answer: It doesn’t matter what power. The curves are the same. Higher power will cover wider ranges but the gap between the BSSs on same channel is the same.

Comment: We need guard cells for separation.

Answer: Yes, this is needed for good spatial reuse.

Question: Curves show -50 dBm at 45 m, mine show around -60 dBm.

Answer: N is equal 3.5 after 10 m distance. See the channel model applied.

**15/1083r3, Cost/Benefit Analysis of SR Techniques**

Presenter: Chuck Lukaszewski (Aruba Networks)

Chuck reviewed document 15/1083r3.

Comment: I believe that DSC is not well understood. There is a wrong understanding of DSC. What one wants is high signal strength, high SINR that provides high MCS.

Comment: We have seen similar behavior in Formula 1 deployments where APs cannot send out beacon frames because they observe the medium to be constantly busy.

Comment: The chairmen’s note contains information about the history of the selection of the -82 dBm PD criteria. Was based on simulations leading to -87 dBm and a 10 dB noise figure and 5 dB margin.

Comment: We have seen vendors ignoring association requests from STAs with probe frames below a certain RSSI. However, the devices become desperate and continue to probe because they see perfect beacon signal strength. This presentation provides a lot of helpful and nice answers to this current kludge.

**15/1101r0, DSC/DCCA Calibration with TGax Agreed Scenarios**

Presenter: Masahito Mori (Sony)

Masahito reviewed document 15/1101r0.

Comment: What we are not doing is taking scenarios that are used with spatial reuse. We move on from there that scenarios are designed for spatial reuse. I am amazed that you used that you had any gains. This is great work. I am supporting this a lot. These are simulations for calibration. Now we should move on with scenarios in which spatial reuse can be used. This is what this group should be doing.

Response: If the group agrees on the scenarios I am happy to use them.

Comment: I disagree with new scenarios. These are the scenarios that were agreed to be evaluated.

Comment: No, we should set the frequency channel assignment right. This is not what we have done so far.

The chairman adjourns the meeting at 15:30.