IEEE P802.11
Wireless LANs

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| IEEE 802.11ba Task GroupMeeting Minutes for May 2018 Meeting,Warsaw, Poland |
| Date: 05-07-2018 |
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Abstract

Meeting Minutes for the IEEE 802.11ba TG sessions held in Warsaw, Poland, May 6-11, 2018.

**Monday, May 7 2018, 10:30-12:30 am**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-03-00ba-may-2018-tgba-agenda.pptx>

* + Call meeting to order, TGba introduction
	+ Call for submissions
	+ Review agenda and approval
	+ IEEE 802 and 802.11 IPR Policy and procedure
	+ Participation in IEEE 802 Meetings
	+ Summary from March 2018 meeting
	+ Motion: March 2018 meeting (doc: IEEE 802.11-18/607r0) and teleconference minutes (doc: IEEE 802.11-18/653r1)
	+ TGba Spec Framework Document review and approval
	+ TGba D0.2 review and approval
	+ Discussion and approval of closing the TGba SFD
	+ Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 10.30 am. (**About 50 persons in the room.)

Minyoung goes through the Meeting Protocol and reminds about taking attendance.

Minyoung goes through the agenda document 11-18/0647r3.

Minyoung presents the suggested leadership structure for the PHY/MAC ad-hoc meetings and asks if there are any objections. No objections received.

**The Main agenda items for this week are (slide 9):**

* Review and approve TGba SFD and TGba D0.2
* Review spec text documents for TGba D0.3
* Review technical presentations – focus on resolving TBDs
* TGba/ARC joint session – TGba architecture discussion
* Work on TGba task group documents
* Review TG timeline

Minyoung announces that there are 47 submissions for this meeting. These submissions are categorized and prioritized such that the highest priority is given to contributions related to the creation of the specification text.

Minyoung asks if any contribution is missing. Liwen, and Alfred have missing presentations and Junghoon indicates there is an error in the presentation number. After the corrections there are in total 51 presentations

Minyoung presents the agenda (page 15) for the week.

Minyoung asks if there are any questions on the agenda. No questions and the agenda.

**Motion:** Move to approve the agenda

**Move:** Mark Hamilton

**Second:** Younsong Yang

Motion passed by unanimous consent.

Minyoung goes through the slides “Participants have a duty to inform the IEEE” (slide 17) and “Ways to inform IEEE” (slide 18).

Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

Minyoung goes through “Other Guidelines for IEEE WG meetings” (slide 19) and “Patent-related information” (slide 20).

Minyoung reads through “Participation in IEEE 802 Meetings” (slide 21), and encourages people to read through the references on slides 22-24.

**Summary from March 2018 Meeting and Teleconference Calls**

* Approved TGba Spec Framework Document (SFD)
	+ IEEE 802.11-17/575r9
* Approved TGba D0.1 as the initial TGba draft
* Approved PHY/MAC spec text documents to create TGba D0.2
* Reviewed technical presentations
* Reviewed the TG timeline – schedule delayed by 2 months
	+ Now TGba D1.0 is targeted in July 2018
* Set goals for the May 2018 meeting
* Agenda: see doc.: IEEE 802.11-17/313r9

**Motion - Minutes:** Approve TGba minutes of March 2018 meeting [doc: IEEE 802.11-18/607r0] and teleconference calls [doc: IEEE 802.11-18/653r1]

**Move:** Yunsong Yang

**Second:** Po-Kai Huang

Motion passed by unanimous consent.

**Review of TGba Spec Framework Document (Po-Kai Huang).** Po-Kai goes through 11-17/0575r11 and in particular the additions that have been made since the last revision. Mainly these changes are based on the motions that passed in the March f2f.

**Motion:** Move to approve 11-17/0575r11 as the latest revision of SFD.

**Move:** Po-Kai Huang

**Second:** Leif Wilhelmsson

Motion passed by unanimous consent.

Minyoung asks if there are any questions on TGba D0.2. No questions asked.

**Motion:** Move to approve P802.11ba D0.2 as revised draft of TGba.

**Move:** Po-Kai Huang

**Second:** Lei Huang

Motion passed by unanimous consent.

**Discussion on closing the TGba SFD**

* In the last F2F meeting, TGba had discussion on closing the TGba SFD in this meeting (11-17/575r1)
* To meet the TGba timeline, it was suggested to close the SFD during the May 2018 meeting so that the group can focus on producing TGba D1.0

**Question/Comment(Q):** What does it mean to close the SFD

**Answer(A):** The SFD will not be updated and upcoming discussion will need to have text targeting the specification. Bringing in completely new topics that would require very lengthy discussion is probably not a good idea.

**Q:** I think you can still have new ideas, but you just need to bring the corresponding text as well.

**Q:** Is the SFD r11 and the spec text now identical?

**A:** Not completely. We are still working on converting, say, the last 20% of the SFD concepts to specification text to be included in the specification draft.

**Q:** I agree that we don’t need two documents, but I am a bit concerned with differentiating between old and new ideas.

**A:** Don’t worry too much about this concept of new and old ideas. The main thing is really that the SFD will not be updated any longer.

**Straw Poll:**

Do you agree to close the TGba SFD?

**Y/N/A:** 27/1/8

**Motion:**

Move to close the TGba SFD and have the 11-17/0575r11 as the final revision of the TGba SFD

**Move:** Po-Kai Huang

**Second:** Jianhan Liu

Motion passed by unanimous consent.

**Presentations:**

**11-18/0784r0 “FDMA WUR Generation”, Junghoon Suh (Huawei):** The presentation is about how to generate the signal in case several wake-up signals are multiplexed using FDMA.

Q: I think generating the FDMA signal using 80 MHz sampling is not how you would do it. You just need to generate the signal using 20 MHz and perform a frequency shift. I believe such a description would be much simpler

Q: You mention that you generate the signal once and then read it out. How fast do you need to read it out from the memory?

A: I don’t have an answer for this, but I would say that this is the standard approach and this should not cause any issues.

**Straw Poll:**

Would you agree to add the WUR-PPDU waveform generation for FDMA transmission as in spec text proposal 11-18/0785r0 to the Spec text?

SP deferred.

**11-18/0775r2 “Proposed spec text for D0.3 on WUR FDMA Transmissions for PHY”, Jianhan Liu (Mediatek):** Jianhan goes through the text proposed for the draft 0.3 of the specification.

**Q:** I suggest to remove things that you are unsure about rather than saying TBD as we need to resolve all TBDs for draft 1.0.

**Q:** In the figure it looks like the syncwords are of the same length, but I assume one can multiplex wake-up signals of different rates?

**A:** It is not decided, but I agree the syncwords may in that case be of different lengths.

**Q:** If there is no consensus on certain parts in the text, I suggest to remove these parts if possible.

**Straw Poll:**

Do you agree to add the text in the document 18/0775r2 to the 802.11ba d0.3?

The Straw Poll is supported by unanimously.

**11-18/0770r0 “Differential OOK for WUR”, Tolgay Ungan (Endiio):** The presentation proposes to send the wake-up signal on two different frequencies using differential FSK. The idea being to be more robust to interference.

**Recess at 12.30**

**Monday, May 7 2018, 1:30-3:30 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-03-00ba-may-2018-tgba-agenda.pptx>

* + Call meeting to order
	+ IEEE 802 and 802.11 IPR Policy and procedure
	+ Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 10.30 am. (**About 50 persons in the room.)

Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**Presentations:**

**11-18/0770r0 “Differential OOK for WUR”, Tolgay Ungan (Endiio):** This is a continuation of the presentation in the previous session allowing for questions on the presentation.

**Q:** Not clear what happens if the two frequencies experience different fading. It then seems that the performance may be determined by the worst of the two frequencies rather than the best.

**11-18/0751r1, “Spec Text for TSF Update and Wake-up Operation”, Po-Kai Huang (Intel):**

**Straw Poll:**

Which option do you prefer?

Option 1: Separate bit for indicating wake-up frame transmission control

Option 2: Combining with existing Notify bit.

Option1/Option2: 3/7

**Q:** If there are things that are not defined, consider if you can remove the discussion on this completely instead of putting TBDs in a lot of places.

Some discussion on some minor part and Po-Kai agreed update the document taking these discussions into account.

**11-18/0752r0 “Bit location of TSF timer for the Partial TSF field in WUR Beacon”, Po-Kai Huang (Intel)**

**Straw Poll:**

Do you agree with the following:

Replace the value X in 31.3.3 TSF Timer update, proposed in 11-18/0751, with 5.

**Y/N/A:** 10/0/4

**11-18/0836r0 “Proposed spec text for WUR frame format", Alfred Asterjadhi (Qualcomm):** Alfred goes through the added specification text corresponding to the motions that passed in the March f2f meeting.

**Q:** You suggest two methods for calculating the WUR ID? I don’t know why this is needed. Could it not be leaved as implementation specific?

**A:** There are many ways, but there does not seem to be another one that is better.

The Straw Poll is deferred.

**11-18/0751r1, “Spec Text for TSF Update and Wake-up Operation” Po-Kai Huang (Intel):** Po-Kai has updated the documents based on the received comments and is prepared to run the straw poll.

**Straw Poll:**

Do you support the text proposed in 11-18/0751r1?

**Y/N/A:** 9/1/11

**Recess 3.33 pm**

**Monday, May 7 2018, 4:00-6:00 pm**

**PHY ad-hoc (About 25 people in the room)**

Ad-hoc Chair Steve Shellhammer calls meeting to order at 4.08pm

**Presentations:**

**11-18/0854r1 “TX and RX requirements for 802.11ba – Part II”, Leif Wilhelmsson (Ericsson):** Leif goes through most of the remaining requirement with the purpose to agree on as many as possible.

**Straw Poll 1a:**

* Do you support that the PSD across the 4 MHz should be within +- TBD dB over the 4 MHz portion of the signal.
* This the energy is measured using a 64 point FFT sampled at 20 MHz and the 6+6 bins around the DC sub-carrier should fulfill the requirement?

**Y/N/A:** 6/2/9

**Straw Poll 2:**

* Do you support that the transmitted center frequency tolerance shall be ±20 ppm maximum and that the transmit center frequency and the symbol clock frequency shall be derived from the same reference oscillator.

**Y/N/A:** 15/0/1

**Straw Poll 3b:**

* Do you support that the modulation accuracy should measured by a test equipment where

*The sampled signal shall be processed in a manner similar to an actual receiver, and where this actual receiver is as described in the Simulation Scenario and Evaluation Methodology document ?*

**Y/N/A:** 10/0/5

**Straw Poll 3c:**

* Do you support that one requirement related to modulation accuracy is the ratio between the ON and OFF metric as obtained by the receiver according to the Simulation Scenario and Evaluation Methodology document? The ON/OFF metric ratio is TBD

**Y/N/A:** 8/0/5

**Straw Poll 3d:**

* Do you support that the requirement on the previous slide is the only requirement that is needed for modulation accuracy?

**Y/N/A:** 1/2/12

**Straw Poll 4:**

* Do you support that the sensitivity for WUR-HDR is -77 dBm?

**Y/N/A:** 10/0/4

**Straw Poll 5:**

* Do you support that the adjacent channel rejection (ACR) is measured in the same way as for the PCR and the interfering signal is also the same as for the PCR. The adjacent channel rejection (ACR) requirement for WUR-HDR single channel is 11dB?

**Y/N/A:** 8/0/8

**Straw Poll 6:**

* Do you support that the nonadjacent channel rejection (ACR) is measured in the same way as for the PCR and the interfering signal is also the same as for the PCR and that the requirements are:

* + Alternate ACR for WUR-LDR: 32 dB
	+ Alternate ACR for WUR-HDR: 27 dB

**Y/N/A:** 4/0/9

**11-18/0776r0, “PAPR reduction in WUR FDMA mode”, Sudhir Srinivasa (Marvell):** Sudhir presents an approach for reducing the PAPR when several Wake-up signals are multiplexed using FDMA.

**Q:** What if you mix low and high rate

**A:** Only high rate is considered here as this is believed to be the worst.

**Q:** Do you have to specify the input to the IFFT and then the added rotation in the spec?
**A:** You can apply the same rotation irrespective to the input to the IFFT.

The Straw Polls are deferred.

**Recess at 6.04 pm.**

**Tuesday, May 8, 2018, 1:30-3:30 pm**

**PHY ad-hoc (About 25 people in the room)**

Ad-hoc Chair Steve Shellhammer calls meeting to order at 1.35pm.

Steve suggests to group presentations with similar contents together to make better use of the meeting time. No objection to this proposal from the group.

**Presentations:**

11-18/0760r0 “Modification of Spec Text related to sync duration”, Dongguk Lim (LGE): The presentation replaces some of the TBDs with the corresponding numbers that have been agreed.

11-18/0682r2 “OOK Waveform for FDMA”, Rui Yang (Interdigital): The presentation is related to how to construct sequences to be used for FDMA that have low PAPR. The construction is based on Golay sequences. Golay sequences are also used in 802.11ad and 802.11ay.

**Q:** I believe you give up the possibility to build a coherent receiver.
**A:** I don’t agree. I believe it is possible to also allow for a coherent detector.

**Q:** PAPR is not an issue in my opinion.

**A:** I accept that opinion, but the tolerance that we have seen to the TX spectrum mask is not that large.

Q: I believe we need to amend the TX spectrum mask for the specification to also take the FDMA transmission into account.

Q: I agree that it is important to allow for a coherent receiver.

11-18/0802r0 “PAPR Investigation on FDMA Transmission”, Eunsung Park (LGE):

Q: How do you calculate PAPR? I am in particular thinking about if the signal is up-sampled.

A: 4x up-sampling is used.

**Q:** Do you believe the existing phase rotation used in 802.11 is sufficient?

**A:** Yes.

Straw Poll is deferred.

**11-18/0776r0, “PAPR reduction in WUR FDMA mode”, Sudhir Srinivasa (Marvell)**

**Straw Poll 1:**

Do you agree to add the following to SFD?

WUR FDMA transmitter shall apply per-20MHz “tone rotation” to the Legacy portion as in 802.11n/ac/ax for signal bandwidth larger than 20MHz?

**Y/N/A:** 14/0/1

**Straw Poll 2:**

Do you agree to add the following to SFD?

WUR FDMA transmitter can apply per-pattern channel phase rotation (PCPR) to the WUR portion for signal bandwidth larger than 20MHz?

**Y/N/A:** 1/9/6

11-18/0802r1 “PAPR Investigation on FDMA Transmission” Eunsung Park (LGE):

**Straw Poll 2:**

Do you agree to add the following to the 11ba spec?

* + For the WUR FDMA transmission, the existing phase rotation is applied to the WUR portion

**Y/N/A:** 7/1/9

**11-18/0682r2 “OOK Waveform for FDMA”, Rui Yang (Interdigital):**

**Straw Poll:**

Do you agree that the method of OOK waveform generation based on Golay sequences described in the Slide 10 can be included in the 802.11ba spec as an example for implementing the frequency domain multiplexed WUS?

**Y/N/A:** 1/0/16

**11-18/0761r0 “Evaluation of PAPR in WUR FDMA transmission”, Dongguk Lim (LGE):** It is suggested to replace the BPSK Mark symbol with a repeated version of the L-SIG symbol.

**Q:** I do not believe the PAPR of the BPSK Mark symbol is important. It is only 4us and will not cause a problem for the TX spectrum measurements.

**Straw Poll:**

Do you agree that the BPSK Mark symbol which is located after L-SIG is replaced with L-SIG symbol?

**Y/N/A:** 2/6/9

**11-18/0584r3 “MC-OOK ‘On’ Symbol Generation”, Steve Shellhammer (Qualcomm)**

**Straw Poll 1:**

Which of the two version of the text do you prefer?

* + Version #1
	+ Version #2
	+ Abstain

**Version #1/ Version #2/Abstain:** 9/3/4

**Straw Poll 2:**

* Do you support the text on the previous slide?
	+ Yes
	+ No

**Yes/No/Abstain:** 10/2/3

**Recess at 3.30 pm.**

**Wednesday, May 9 2018, 1:30-3:30 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-06-00ba-may-2018-tgba-agenda.pptx>

* Call meeting to order
* IEEE 802 and 802.11 IPR Policy and procedure
* Vice-chair election, Secretary confirmation
* Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 1.30 am. (**About 60 persons in the room.)

Minyoung goes through the agenda document 11-18/0647r6.

The agenda is approved

Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**Motion 1:**

Move to approve Yunsong Yang as TGba 1st Vice-Chair

**Move:** Eunsung Park

**Second:** Rojan Chitrakar

Motion passed by unanimous consent.

**Motion 2:**

Move to approve Eunsung Park as TGba 2nd Vice-Chair

**Move:** Yunsong Yang

**Second:** Alfred Asterjadhi

Motion passed by unanimous consent.

**Motion 3:**

Move to approve Leif Wilhelmsson as TGba Secretary

**Move:** Steve Shellhammer

**Second:** Yunsong Yang

Motion passed by unanimous consent.

Steve Shellhammer gives an update about what happened in the PHY ad-hoc sessions. Steve reports that all presentations related to spec text are done and also those related PAPR. In total there are nien presentations remaining.

**Presentations:**

**11-18/0772r0, “Updated results on WUR performance with multiple TX antennas”, Shahrnaz Azizi (Intel):** The presentation is concerned with how the performance can be improved using CSD. For two antennas, the best results are obtained with CSD values of 3000ns and 400ns for the low and high rate, respectively. For 4 antennas, 750ns provides the best performance. It is also found that the best CSD value is dependent on the actual waveform used for the symbol.

**Q:** Do you plan to define the parameters?

**A:** This is an ongoing discussion in the PHY group. I believe we should define the waveform, but this is not agreed.

**11-18/0773r0, “Multiantenna TX Diversity”, Steve Shellhammer (Qualcomm):** Two different CSD designs are considered for the narrowband part of the signal. One uniform spacing, where the CSD value is increased linearly with the antenna number. In the second a “binary tree spacing” is proposed to obtain larger CSD values for the case of few antennas. For the high data rate, the different CSD designs perform roughly the same for the signal waveform used. For the low data rate, the different CSD designs show some difference in the performance.

**Q:** You only considered the 20 MHz channel?

**A:** Yes. However, I believe this should be the case also for other bandwidths as the receiver will only use one of the 20 MHz channels.

**Q:** Don’t you need to have the same CSD on all channels?

**A:** No.

**Q:** What kind of receiver do you use?

**A:** Envelope detector. Basically what we have agreed on in the simulation document.

**Q:** I believe we should not try to mix CSD and FDMA. Let’s start with the CSD for the 20 MHz case.

**11-18/0881r2 “Omni-directional multi-antenna TX through OFDM symbol diversity”, Miguel Lopez (Ericsson):** An alternative to CSD is presented where different OFDM symbols are transmitted on the different antennas.

**Q:** Could you also do this with a coherent detector

**A:** Yes

**11-18/0824r1 “WUR Power Spectral Density” Steve Shellhammer (Qualcomm):** The presentation points out that since the ON part of the signal is generated in the same way, there will be spectral lines in the PSD. Due to FCC 15.247, which has a requirement on 8dBm/3 kHz, this is something that should be avoided. The spectrum lines may easily be avoided by a randomly shift of the ON signals by 180 degrees.

**Q:** We have also seen the spectrum lines, but we were not aware of the FCC rules.

**Q:** I believe you should get the lines at multiples of 250 kHz for the low rate.

**A:** I agree, but that is also what is seen in the figure.

**Straw Poll #1:**

Do you support

* + “Prior to transmission a pseudo random phase rotation is applied to the ‘On’ symbol, in both the Sync and Data Fields”

**Y/N/A:** 16/2/18

**11-17/1395r2 “Simple multiplexing of Wake-Up Signals” Leif Wilhelmsson (Ericsson):** The presentation describes how wake-up signals that are modulated using OOK and Manchester coding can be multiplexed when the symbol rates are different. Since 11ba only supports two different symbol rates, it would for 11ba mean that the high data rate and the low data rate could be multiplexed in the same packet.

**Straw Poll:**

Do you believe multiplexing of WUSs as described in this presentation is a good alternative or complement to multiplexing using FDM?

**Y/N/A:** 3/8/27

**11-18/0883r1 “Subcarrier Structure for WUR Frames” Jinsoo Ahn (Yonesi Univesity):** The presentation is concerned with potential problems caused by that the bandwidth of the wake-up signal is considerably smaller than 20 MHz.

**Q:** On slide 6, do you consider that the receiver is moving because the PCR must have been used for association?

**A:** Yes.

**Q:** The CCA is done in the time domain so I don’t see how this behavior will be different for different bandwidth provided the power is the same. The reason why a larger bandwidth may be beneficial is of the signal can be transmitted with higher power

**Straw Poll:**

Which option do you prefer for WUR PPDU tone structure?

* Option 1 : Allow Full-band WUR PPDU structure and leave the specific sequence as an implementation issue
* Option 2 : Allow Full-band WUR PPDU structure and specify the specific sequence
* Option 3 : Do not allow using out-band tones (sub-carriers out of 4MHz)
* Option 4 : None of the above
* Abstain

**Option 1/Option 2/Option 3/Option4/Abstain:** 4/1/0/15/6

**Recess at 3.30 pm.**

**Wednesday, May 9, 2018, 4:00-6:00 pm**

**PHY ad-hoc (About 20 people in the room)**

Ad-hoc Chair Steve Shellhammer calls meeting to order at 4.00 pm.

**Presentations:**

**11-18/0413r2 “Discussion on WUR Multi-Antenna Transmission”, Sudhir Srinivasa (Marvell):** This presentation was given already in the last f2f meeting, and essentially only the straw polls were left.

**Straw Poll 1:**

Do you agree to the followings?

* + The WUR transmitters using multi-antennas shall apply per-antenna CSD to the Legacy portion with the pre-VHT CSD values show in table in Table 21.10, IEEE P802.11-REVmc/D8.0.

**Y/N/A:** 13/0/1

**Straw Poll 2:**

Do you agree with the followings?

* + The WUR transmitters using multi-antennas can apply any spatial mapping techniques for the WUR portion?

**Y/N/A:** 9/0/6

**11-18/801r1 “OOK Waveform Generation for FDMA Transmission” Eunsung Park (LGE):** Thepresentation discusses how to generate the waveform. In particular, it is suggested that the total waveform can be generated by concatenating 2us long sequences.

**Straw Poll 1:**

Which option do you prefer for the data rates in the WUR FDMA transmission?

* + Option 1: all sub-bands used for WUR PPDU transmission use the same data rate
	+ Option 2: each sub-band can use a different data rate

**Op1/Op2/A:** 0/7/7

**11-18/0785r1 “Draft Spect Text for FDMA WUR Generation” Junghoon Suh (Huawei)** Junghoon goes through the suggested spec for FDMA. Two different versions are prepared and the purpose is to obtain feedback form the group regarding which one of these is preferred.

**Straw Poll:**

Which option do you prefer?

**Option 1/Option 2/Both/Abstain:** 5/11/3/0

**11-18/0762r0 “Efficient FDMA transmission for WUR”, Dongguk Lim (LGE):** The presentation relates to FDMA transmission and in particular that the different wake-up signals sent in the different 20 MHz channel may have different duration.

The presentation is not finalized during this session, but will continue in a later session.

**Recess at 6.00 pm**

**Thursday, May 10 2018, 8:00-10:00 am**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-08-00ba-may-2018-tgba-agenda.pptx>

* + Call meeting to order
	+ IEEE 802 and 802.11 IPR Policy and procedure
	+ Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 8.00 am. (**About 35 persons in the room.)

Minyoung reminds about taking attendance.

Minyoung goes through the agenda for the remining sessions.

Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**Presentations:**

**11-18/0482r0 “Dynamically Changing WUR ID follow up”, Enrico-Henrik Rantala (Nokia):** The presentation is concerned with battery draining attacks, where the attacker transmits the WUR ID to wake up the WUR. To counteract this, ways to change the WUR ID every time the WUR is activated are discussed. The new WUR ID may be explicitly signalled or it may be implicit (calculated).

**Q:** I would prefer the explicit approach.

**Q:** I also agree that the explicit approach is preferred.

**Q:** I don’t like to put statements like this in the specification.

**Q:** If we use the approach with MIC, that will also protect the whole packet?

**A:** Yes. The difference is that using the MIC you need to process the whole packet.

**Straw Poll:**

* Do you agree that STA WUR ID should be able to change dynamically to fight address spoofing and the solution should be based on the idea of:
	+ 1. Yes for Option 1 (implicit WUR ID)
	+ 2. Yes for Option 2 (explicit WUR ID)
	+ 3. Yes for some other solution
	+ 4. No solution needed, problem is not valid
	+ Abstain

 **1/2/3/4/A:** 3/4/2/4/9

**11-18/0420r1 “Considerations on VL WUR frames”, Alfred Asterjadhi (Qualcomm):**

**Straw Poll 1:**

Do you support the following:

* + A WUR AP that generates a Wake Up frame that contains a Frame Body field with a list of WIDs shall order the WIDs in the Frame Body of the frame in order
		- The AP shall not include the WID of a WUR STA that does not support reception of a Wake Up frame that contains a list of WIDs in the Frame Body field
	+ A WUR STA that supports reception of Wake Up frames that contain Frame Body with a list of WIDs and receives such a frame may discard the frame if either of the following is true:
		- Immediately after locating a WID in the WID list that is greater than the WID assigned to it and no WID equal to the WID assigned to it was located prior to it
		- Immediately after locating the last WID in the WID list and the WID is less than the WID assigned to it

**Y/N/A:** 13/0/6

**11-18/0963r0 “Spec Text for WUR FDMA Channel Access”, Rojan Chitrakar (Panasonic):**

**Q:** I don’t think sending any packet is a good idea since you then may wake up receivers for no reason.

**A:** We have had this discussion and I believe we can find a solution for this. Basically we can send a specific packet which does not wake up the receivers.

**11-18/0808r2 “FDMA Channel signaling”, Suhwook Kim (LGE):** Signaling issues related to FDMA are discussed.

**Q:** On page 7, when you say PCR channel has changed, it does not really apply to the WUR as it seems.

**Straw Poll 1:**

Which option do you prefer?

* + Option 1: Reuse WUR Mode Setup frame and define a new Action Type(Change WUR Parameter)
	+ Option 2: Reuse WUR Mode Setup frame and Enter WUR Mode Response can be transmitted in unsolicited manner
	+ Option 3: Reuse Channel Switch Announcement element
	+ Abstain

**Option 1/Option 2/Option 3/A:** 1/11/1/3

**11-18/0837r2 “Spec Text for FDMA Channel Signaling”, Suhwook Kim (LGE):** This is the spec. text related to presentation 11-1870808r2.

**Q:** The sub-clause number is wrong.

**Q:** The behavior as currently described is not clear enough and probably needs to be updated.

**11-18/0762r1 “Efficient FDMA transmission for WUR”, Dongguk Lim (LGE):** The presentation was started in the PHY ad-hoc session, and this is a continuation including the Q&A part.

**Q:** Having different length for the different channels may cause issue related to e.g. power control and this is why this is not allowed in e.g. 11ax. So if the straw polls allow for longer transmission on the primary I will vote against.

**Q:** Option 2, is it possible to concatenate several wake-up packets?

**A:** Yes.

**Q:** L-SIG must be the same.

**Straw Poll 1:**

Do you agree that transmission on the primary channel is equal to or longer than transmissions on other channels in WUR FDMA?

**Y/N/A:** 14/1/7

**Straw Poll 2:**

Which option do you prefer for alignment of a length of WUR PPDU transmitted on the primary channel with other channels if the length of WUR PPDU on the primary channel is shorter than that of other channels in FDMA transmission?

* + Op1 : applying the low data rate on the primary channel
	+ Op2 : adding the additional WUR frame.
	+ Op3 : adding the Padding symbol.
	+ Abstain

**Op1/Op2/Op3/A:** 0/4/19/3

**11-18/801r3 “OOK Waveform Generation for FDMA Transmission” Eunsung Park (LGE):**

**Straw Poll 3:**

* Do you agree the following?
	+ For the WUR FDMA transmission, the 4us On symbol for WUR LDR can be constructed by two concatenated 2us On symbols used for WUR HDR

**Y/N/A: 8/6/9**

**Recess at 9.58 am.**

**Thursday, May 10 2018, 10:30-12:30 am**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-09-00ba-may-2018-tgba-agenda.pptx>

* + Call meeting to order
	+ IEEE 802 and 802.11 IPR Policy and procedure
	+ Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 10.30 am. (**About 35 persons in the room.)

Minyoung reminds about taking attendance.

Minyoung goes through the agenda. Document 11-18/962 is added to the agenda. Since the number of remaining presentations is small, the agenda is updated so that also TG timeline discussion, Goal for July f2f meeting and Teleconference call schedule is also covered in the AM2 timeslot.

Minyoung asks if there is any objections on the agenda. No objection to the updated agenda.

 Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**11-18/0837r4 “Spec Text for FDMA Channel Signaling” Suhwook Kim (LGE):**

**Straw Poll:**

Do you support to add the above paragraphs to 11ba draft 0.3?

**Y/N/A:** 14/0/1

**11-18/0962r3, “Proposed Spec Text for Indication of Current Value of BSS Parameter Update Counter”, Xiaofei Wang (Interdigital):**

**Straw Poll:**

Do you prefer Option 1 or Option 2 to be included in 802.11ba Draft 0.3?

**Option 1/ Option 2/Abstain:** 11/0/5

**11-18/0790r2, “Proposed Spec Text for WUR FDMA Operation” Yungho Seok (Mediatek):**

**Straw Poll:**

Do you support to incorporate the proposed changes in this document 11-18/0790r2 to the TGba Draft 0.3?

**Y/N/A:** 9/0/7

**11-18/0894r1 “FDMA MAC Support” Liwen Chu (Marvell):**

**Q:** To me slide 6 has nothing to do with FDMA, it is just that you have flexibility regarding where the WUR channel is located.

**Q:** It seems to me you are indicating that FDMA often is not used and therefore you create and a single 20 MHz transmission. But then we are back to what we already had before FDMA was introduced.

**Straw Poll 2:**

Do you support to reuse channel switch rules to wake up single STA wake up in a BSS which FDMA is allowed if an AP has separate WUR radio and main radio which are frequency separated?

**Y/N/A:** 3/1/15

**11-18/0805r0 “Multi-band WUR”, Yungho Seok (Mediatek):** The presentation relates to that the PCR may be operating in 5GHz and the WUR in 2.4 Ghz.

**Q:** I really don’t understand why we need this. I believe we have what we need.

**A:** I don’t propose anything new, I just want to clarify the behavior.

**Q:** I don’t agree that there is a problem with TSF timer. You just start both 2.4 and 5 GHz timers at the very same time and they will be synchronized.

**Recess at 12.35 pm.**

**Thursday, May 10 2018, 1:30-3:30 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-10-00ba-may-2018-tgba-agenda.pptx>

* + Call meeting to order
	+ IEEE 802 and 802.11 IPR Policy and procedure
	+ Motions, Presentations, Recess

**Chair Minyoung Park (Samsung) calls meeting to order at 1.35 pm. (**About 35 persons in the room.)

Minyoung reminds about taking attendance.

Minyoung goes through the agenda. No comments or questions on the agenda.

 Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**Motions:**

**Motion:**

Move to adopt the spec text in the document 11-18/0965r1 “Proposed Text for BSS Parameters Update Notification Follow Up” in the 802.11ba Draft 0.3

**Move:** Ming Gan

**Second:** Xiaofei Wang

Motion passed by unanimous consent.

**Motion:** Move to accept spec text in 18/0748r3 into TGba draft spec. 0.3

**Move:** Guoqing Li

**Second:** Po-Kai Huang

Motion passed by unanimous consent.

**Motion:** Move to accept spec text in 18/0863r4 into TGba draft spec. 0.3

**Move:** Guoqing Li

**Second:** Po-Kai Huang

Y/N/A: 20/0/2, motion passes

**Motion:** Move to add the text in the document 18/0804r3 to the 11ba spec. 0.3

**Move:** Lei Huang

**Second:** Jianhan Liu

Motion passed by unanimous consent.

**Motion:** Move to adopt the spec text changes in doc 11-18/0837r5 into the draft 11ba D0.3

**Move:** Suhwook Kim

**Second:** Po-Kai Huang

Motion passed by unanimous consent.

**Motion:** Move to incorporate the changes shown in doc 11-18/0962r4 into 802.11ba Draft 0.3.

**Move:** Xiaofei Wang

**Second:** Lei Huang

Motion passed by unanimous consent.

**Motion:** Move to add the proposed text in 18/751r1 into 802.11ba Draft 0.3

**Move:** Po-Kai Huang

**Second:** Suhwook Kim

Motion passed by unanimous consent.

**Motion:** Move to add the proposed text in 18/752r0 into 802.11ba Draft 0.3

**Move:** Po-Kai Huang

**Second:** Suhwook Kim

Motion passed by unanimous consent.

**Motion:** Move to add the proposed text in 18/878r2 into 802.11ba Draft 0.3

**Move:** Po-Kai Huang

**Second:** Suhwook Kim

Motion passed by unanimous consent.

**Motion:** Move to add the proposed text in 18/929r1 into 802.11ba Draft 0.3

**Move:** Po-Kai Huang

**Second:** Suhwook Kim

Motion passed by unanimous consent.

**Motion:** Move to adopt the spec text in 11-18/790r2 into TGba D0.3

**Move:** Youngho Seok

**Second:** Ming Gan

Motion passed by unanimous consent.

**Motion:** Move to incorporate the proposed changes provided in document 11-18/0836r1 in the Draft 0.3 of TGba?

**Move:** Alfred Asterjadhi

**Second:** Po-Kai Huang

Motion passed by unanimous consent

**Motion:**

Move to incorporate the proposed changes provided in document 11-18/0835r1 in the Draft 0.3 of TGba?

**Move:** Alfred Asterjadhi

**Second:** Po-Kai Huang

Motion passed by unanimous consent

**11-18/0834r2 “Clarifications on WUR/PCR interactions” Alfred Asterjadhi (Qualcomm):**

**Motion 1:** Move to agree on the following concept:

* The Transmit ID is used as the identifier in the Address field of WUR Wake-up frames to indicate group addressed delivery in the PCR.

**Move:** Alfred Asterjadhi

**Second:** Rojan Chitrakar

Motion passed by unanimous consent

**Motion 2:**

Move to accept the concept provided in the underlined spec text outlined in slides 9,10, and 11 of 11-18/0834r1?

**Move:** Alfred Asterjadhi

**Second:** Po-Kai Huang

Motion passed by unanimous consent

**11-18/0420r3 “Considerations on VL WUR frames” Alfred Asterjadhi (Qualcomm):**

**Motion:** Move to agree with the concept outlined below:

* + A WUR AP that generates a Wake Up frame that contains a Frame Body field with a list of WIDs shall order the WIDs in the Frame Body of the frame in order
		- The AP shall not include the WID of a WUR STA that does not support reception of a Wake Up frame that contains a list of WIDs in the Frame Body field
	+ A WUR STA that supports reception of Wake Up frames that contain Frame Body with a list of WIDs and receives such a frame may discard the frame if either of the following is true:
		- Immediately after locating a WID in the WID list that is greater than the WID assigned to it and no WID equal to the WID assigned to it was located prior to it
		- Immediately after locating the last WID in the WID list and the WID is less than the WID assigned to it

**Move: Alfred Asterjadhi**

**Second: Po-Kai Huang**

Motion passed by unanimous consent

**Motion:**

Move to adopt the spec text changes in doc.: IEEE 802.11-18/00785r5 into the draft P802.11ba D0.3?

**Move:** Junghoon Suh

**Second:** Rui Yang

Y/N/A:18/0/8, motion passes

**Motion:** Move to adopt the text in IEEE 802.11-18/0967r0 into Draft 0.3.

**Move:** Steve Shellhammer

**Second:** Rui Yang

Motion passed by unanimous consent

**Motion:** Move to add the text in document 18/0775r2 to the 802.11ba d0.3

**Move:** Jianhan Liu

**Second:** Ross Yu

Y/N/A: 21/0/1

**Motion:**

Move to adopt the spec. text changes in Doc. IEEE 802.11-18/0760r0 into the draft IEEE 802.11ba D0.3?

**Move:** Dongguk Lim

**Second:** Eunsung Park

Motion passed by unanimous consent

**Motion:** Move to accept the concept in the document 18/0762r4

The transmission on WUR primary 20MHz channel is equal to or longer than transmissions on other channels in WUR FDMA transmission.

If needed, the Padding is used to ensure that transmissions on the WUR primary channel always have the length indicated by L-length field in L-SIG.

**Move:** Dongguk Lim

**Second:** Eunsung Park

Y/N/A: 17/2/5

**Motion:** Move to adopt the spec text in document 11-18/0960r1 into the 802.11ba D0.3.

**Move:** Leif Wilhelmsson

**Second:** Rui Yang

Motion passed by unanimous consent

**Recess at 3.30pm**

**Thursday, May 10, 2018, 4:00-6:00 pm**

**Administration:**

**Co-Chair Minyoung Park (Samsung) – TGba Chair**

**Co-Chair: Mark Hamilton (Ruckus/Arris) – ARC SC Chair**

**Acting Secretary: Yunsong Yang (Huawei)**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/18/11-18-0647-11-00ba-may-2018-tgba-agenda.pptx>

* Call meeting to order
* IEEE 802 and 802.11 IPR Policy and procedure
* Motion assignments for TGba D0.3
* TG timeline discussion
* Goal for July 2018 F2F meeting
* Teleconference call schedule,
* TGba/ARC joint session
* Presentations, Adjourn

**Co-Chair Minyoung Park (Samsung) calls meeting to order at 4.00 pm. (**About 40 persons in the room.)

Minyoung reminds about attendance.

Minyounggoes though the agenda. The agenda is approved by unanimous consent.

Minyoung makes a Call for Potentially Essential Patents. No potentially essential patents reported and no questions asked.

**TG timeline discussion**

It is proposed and agreed to keep the timeline as is. TGba will review the situation again in July.

**Goal for July 2018**

* Review and approve TGba D0.3
* Review technical presentations that resolves TBDs of TGba D0.3
* Review spec text documents for TGba D1.0
* Review TG timeline

**Teleconference Call Schedule**

* Proposed schedule (Mondays, 1 hour each)
	+ May 21, 10:00 ET
	+ June 4, 17:00 ET
	+ Jun 18, 23:00 ET

The proposed teleconference schedule is approved by unanimous consent.

**Motion assignments for D0.3**

* Po-kai (Technical Editor): Since we have closed the SFD and most motions have spec text, we don’t need to assign specific person to drive the text. For those motions that don’t have spec text, the person who made the motion will bring in spec text to TGba.

**TGba/ARC joint session**

**Presentations:**

[11-18-0884-01-0arc-802-11ba-architecture-discussion](https://mentor.ieee.org/802.11/dcn/18/11-18-0884-01-0arc-802-11ba-architecture-discussion.pptx)

* Mark Hamilton (Ruckus/Arris) and Ganesh Venkatesan (Intel) presented the document.
* On Slide 3:
	+ Commented on that WUR is a power save mode overlaid over the PCR PS mode. When the STA wakes up, its PCR returns to the previous state so as not to change the current PS modes.
* On Slide 4:
	+ Commented on that TGba only have the text description, no such diagram. This is just for illustration.
		- Response: Right now, there is no decision in ARC SC to include any diagram in the architecture section. This is just for our understanding.
	+ Discussed if the PCR can be powered down when the WURx is on.
		- One view is that it is an implementation issue. Today, we don’t say the PCR is powered down. We just say it is not available.
		- From ARC’s PoV, need to know what components are available and not available in the WUR mode.
	+ Discussed the question of, when the STA comes out of WUR mode, which stage of the PS mode it goes?
		- Response: take TWT for example, the AP knows when to send a packet to the STA under the TWT schedule. So, if a TWT STA is in WUR mode, the AP sends a wakeup frame and assumes the TWT schedule is still valid. The STA can wake up before the TWT service period. There are WUR Beacons to keep the time synchronization.
		- Commented on that there is no guarantee that when the STA wakes up, its timing is still good.
		- Commented on that when STA wakes up, it starts from where it left. If it wants to synchronize again, it can always read the full Beacon. It is an implementation issue.
	+ Discussed that today an AP cannot transmit at another band. (Note: in this discussion, an AP refers to an AP as defined by the 802.11 specification, which comprises a STA and a DSAF – Not a commercially available product, which is typically dual band, and contains more than one AP.) So, there will be two APs involved when the associated AP is not the AP of the WUR channel.
	+ Discussed if the partial TSF in the WUR Beacon is from the associated AP.
		- TGba member’s view is that it is from the associated AP. When the AP serving the WUR channel and the associated AP are not the same, they should be synchronized.
		- Commented on that, from architecture PoV, in that case, the two separate APs need to share some information about the STA.
	+ The group recognized that WUR is new and many things are being defined for the first time. ARC SC intend to figure out what we have today and what needs to be changed.
	+ On the STA side, the group agreed that the WURx is just a receiver. It doesn’t transmit.
	+ On the AP side, one view is that the WUR transmitter only transmits but doesn’t receive WUR signals. Another view is that the WUR transmitter (the AP) is a standard AP that can transmit the 11ba waveform, which is just another MCS.
	+ Discussed the addressing scheme in the WUR.
		- Commented that the MAC address is too long for the wakeup signal. A separate and shorter ID is used in the wake-up signal.
	+ Discussed that the security issue in WUR is not about data security or privacy, as there is no data in the WUR signal, but is about a STA not being falsely woken up.
	+ Agreed on that the WURx is not a standalone radio, it depends on the PCR. It is a companion radio of the PCR.
* Jumped to Slide 16:
	+ Discussed that when the STA wakes up, its PCR follows the pre-WUR sleep behaviors. On the AP side, the AP needs to wait for a latency (for waking up the STA) to expire. Then, the AP will follow the pre-WUR sleep behaviors.
* Jumped to Slide 18:
	+ Question: since there is no ACK, if a Wake-up frame fails, what happens?
		- Response: The AP can use control frame to check on the STA. The AP can re-transmit the Wake-up frame. But the standard doesn’t say how many time or how often to check on the STA or to re-transmit the wake-up frame.
	+ Question: how long does the STA maintain the association after entering the WUR mode?
		- Response: as defined by the Maximal Idle Time today.
* On Slide 19:
	+ Discussed if the two APs need to be co-located. One view is that they need to be co-located. Another view is that they don’t have to be co-located.
	+ Discussed the question if a dual band AP-product supports 2.4 and 5 GHz PCRs and a 2.4 GHz WUR, is there a one-to-one mapping between the WUR and a PCR? Or can a single WUR transmitter be used to support both 2.4 and 5 PCRs at the same time?
		- Response: if the TSF of 2.4 GHz and 5GHz are synchronized, then one WUR can support both bands.
		- Commented that so if the TSF are not synchronized, then each PCR requires its own WUR.
		- Commented that the current spec doesn’t talk about multiple AP operation.
* Stopped here as we are out of time.
* ARC SC group will consider this discussion and attempt to formulate a state diagram and additional questions to continue the discussion.
* Decided to have a joint session again in July.
* The joint session is over.

**TGba is adjourned without objections at 6.00pm.**