IEEE P802.11
Wireless LANs

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| 802.11 AMP SG meeting minutes for November 2023 Plenary  |
| Date: 2023-11-26 |
| Author(s): |
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| Hao Wang | Tencent |  |  | Harryhwang@tencent.com |

Abstract

This document includes minutes of AMP SG Sessions of IEEE November 2023 Plenary.

Version Tracking:

R0: Creating the minutes.

# Monday 13 November 2023 @ 2:00-4:00 pm ET

## Opening (IEEE 802.11-23/ 1723 r0)

* 1. Call to order 2:00 am ET.
	2. Chair, Bo Sun (Sanechips), instructed members to record attendance in IMAT.
	3. Chair introduced the patent policy and meeting rules (slides 2-8).
	4. No response to the call for patents.
	5. Chair introduced IEEE-SA COPYRIGHT POLICY (slides 9-10)
	6. Chair reviewed other Guidelines, Participation and Guideline for Straw Polls (slides 11-13).
	7. Chair reviewed Suggested Best Practices, Registration, Meeting plan, current AMP SG Session submission list (slides 14-19).
	8. Hao Wang (Tencent) is the secretary.
	9. Chair call for approval of the agenda of the AMP session.

## Agenda (IEEE 802.11-23/1723 r0)

* 1. Chair presented the agenda: https://mentor.ieee.org/802.11/dcn/23/11-23-1723-01-0amp-amp-sg-meeting-agenda-for-nov-plenary-2023.pptx. (slide 22)
		+ Call meeting to order and remind the group to record attendance on imat.ieee.org
		+ IEEE-SA IPR policies and meeting rules
		+ Approve meeting agenda
		+ Approve past meeting minutes
		+ AMP SG timeline and progress review
		+ ITU-T SG20 Liaison (11-23/1707) discussion
		+ Contribution discussion
			- 11-23/1994, Simulation on coexistence of AMP traffic and existing traffic, Weijie Xu (OPPO)
			- 11-23/2013, Discussions on AMP Link Budgets, Wei Lin (Huawei)
		+ Any other business?
		+ Recess
	2. No objection, Agenda approved.

## Approve AMP SG meeting minutes

* 1. Motion to approve the AMP SG meeting minutes since September Interim

Approve the meeting minutes for AMP SG meetings during 802 Sep interim session and for AMP SG teleconferences after Sep interim session as below:

* + - https://mentor.ieee.org/802.11/dcn/23/11-23-1666-00-0amp-802-11-amp-sg-meeting-minutes-for-september-2023-interim.docx
		- https://mentor.ieee.org/802.11/dcn/23/11-23-1740-00-0amp-amp-sg-telecon-minutes-on-october-10th.docx

Moved: Harry Hao Wang

Seconded: Sebastian Max

Result: Approved with unanimous consensus

## AMP SG Timeline Plan (IEEE 802.11-23/ 1723 r0)

* 1. Chair reviewed the AMP SG time plan.

## ITU-T SG20 Liaison (11-23/1707) discussion

* 1. Review of IEEE 802.11-23/1707-r0, AMP STA, Weijie Xu (OPPO)

Comment: ITU SG 20 will do a study on the use case and requirement on Ambient IoT. We should use this work to raise awareness and provide input in response.

Comment: Two points for the liaison response: 1) the progress of the AMP SG report and the ongoing study in 802.11; 2) open to collaboration with ITU SG20.

Weijie is volunteered to draft the liaison response.

## Contribution discussion

* 1. Presentation of IEEE 802.11-23/1994, Simulation on coexistence of AMP traffic and existing traffic, Weijie Xu (OPPO)

Q(uestion): The ms-level latency impact to VI/VO category will be more severe than BE category. Suggest to include VI/VO in future simulations. 1ms TXOP is used in the simulations, I don’t think it is an extreme case. Do you want to limit the TXOP size in the PAR? The query interval of 10s is also slow.

A: Query interval means all AMP devices will be queried within this interval.

Q: It can be translated to a duty cycle, it should be clarify the requirement in the simulation. 100% duty cycle is not acceptable.

A: It is assumed to use AC-BK for the AMP traffic. It is lower traffic class than the legacy. When there is a legacy traffic, the impact will be on the AMP not the legacy.

C: The plot shows small latency impact.

Q: In the simulation, we need to look at the tail of CDF moving to the left and assess if it has real impact.

C: This is up to 100ms impact which is unacceptable for VO/VI traffic. If 5ms TXOP is used for AMP the impact will be 100% sure.

A: We can submit more results on the VI/VO traffic and larger TXOP length.

C: Slide 10, simulation results show that it has small impact to higher channel access class traffic. I agree to allow AP to trigger the transmission in TXOP in most cases, but there are cases that require STA to initiate the transmission. Both modes should be supported.

Q: The simulation results of FTP download is not convincing. 2.4Ghz band is heavily used. Are you assuming only triggered based access is used in the simulation? Should put more restrictions in the PAR.

A: Can provide more simulation on other TXOP length.

C: Need to put restriction on polling time.

Q: In the simulation, 11b is used for UL and 11ba WUR for DL? 11b signal is old and less efficient. Suggest to design new waveform for AMP.

A: 11b is one option for its low complexity and power consumption. AMP traffic load is low and can be carried by 11b. The query interval of AMP will not impact on other traffic since its traffic is set to the lowest access category. It’s not necessary to include query interval restrictions in the PAR.

Q: Question on slide 11, do you consider the query delay in the simulation? What if the delay is larger than 10s?

A: In the simulation, 3000 AMP traffic will consume 3s. If the AMP traffic is delayed and overlapped with the follow-up traffic, the latency will be extended. But the impact will be on the AMP traffic not on the legacy.

C: This is not the conventional case that is using 1Mbps for full STA. AP can turn it off by exclude it from the basic service set and the system continues to work. There will be no beacon on 1Mbps and no DL to receive.

Q: You assume 800 microseconds, what if you can further reduce it to 200 microseconds? I think it will be a realistic value.

A: If shorter PDU length is used, the latency will be reduced.

C: If the initiator is the AMP, the situation will be better. AMP STA has shorter time to do transmission. The STAs will transmit at different time, and the impact will be reduced.

* 1. Presentation of IEEE 802.11-23/2013, Discussions on AMP Link Budgets, Wei Lin (Huawei)

C: TGN model is for the mean power to be received, the distribution is high. DCN 57 covers realistic model including ray tracing showing propagation situation. Slow and fast fading needs to be considered.

Q: Slide 9, network layout includes the energizer providing the power and integrate with communication system, like the AP. It is also possible for the energizer scattering around and provide energy. It is separate from the AP.

A: Direct link is assumed between STA and AP. We assume the energy provided by the AP.

C: On 2.4Ghz band, TX power is 27dBm. But in EU, the max TX power is 20dBm and range is reduced. It is impossible to power the device on 2.4Ghz band. Sub-1Ghz band is more suitable. Backscatter device is full duplex and complex. We should use Sub-1Ghz for DL, and 2.4Ghz for UL.

C: Slide 7, case 4, -45dBm sensitivity limits the range and causes gap for DL and UL. It is reasonable for case 3. The value is high for case 4.

C: The value is aligned with the TIG report. -45dBm sensitivity is for balance DL and UL. At least for case 4, the sensitivity depends on implementation. 11ba sensitivity could be as low as -62dBm. For UL, -10dBm or 0dBm TX power can be achieved.

C: If 0dBm is used for active transmission, it will add 33dB for 3000 devices. It will impact communication.

Q: Relay may be used for both DL and UL. But in this contribution, only DL relay is shown. Do you assume to use existing protocol or new ones for the relay?

A: Based on the link budget calculation, DL relay is required. But it is open for discussion.

Q: In case 1, IoT device doesn’t have the power storage, so it will be in full duplex operation. AP rx sensitivity is -95dBm and tx power is 27dBm. It will introduce huge dynamic range, and UL range should not be that long.

A: The calculation is done based on reference 1. I agree with this issue.

C: -95dBm rx sensitivity for AP is too optimistic for full duplex. The realistic rx sensitivity should be much lower.

C: In case 1, if AP provides power, it will cause an issue of too much dynamic range. But if the transmitter and receiver can be separated, similar results can be achieved.

## Recess

* 1. The chair announced the session recessed at 3:45 pm ET.
	2. Next session will be on Nov 14th.

# Tuesday 14 November 2023 @ 4:30-6:30 pm ET

## Opening (IEEE 802.11-23/ 1723 r2)

* 1. Call to order 10:30 pm ET.
	2. Chair, Bo Sun (Sanechips), instructed members to record attendance in IMAT.
	3. Chair introduced the patent policy and meeting rules (slides 2-8).
	4. No response to the call for patents.
	5. Chair introduced IEEE-SA COPYRIGHT POLICY (slides 9-10)
	6. Chair reviewed other Guidelines, Participation and Guideline for Straw Polls (slides 11-13).
	7. Chair reviewed Suggested Best Practices, Registration, Meeting plan, current AMP TIG Session submission list (slides 14-19).
	8. Hao Wang (Tencent) is the secretary.
	9. Chair call for approval of the agenda of the AMP session.

## Agenda (IEEE 802.11-23/ 1723 r2)

* 1. Chair presented the agenda:
		+ Call meeting to order and remind the group to record attendance on imat.ieee.org
		+ IEEE-SA IPR policies and meeting rules
		+ Approval of agenda
		+ Approve AMP SG meeting minutes
		+ Contribution discussion
			- 11-23/2038, Close-rang AMP Backscattering in 2.4 GHz, Rui Cao (NXP)
			- 11-23/2042, Further Discussion on AMP PAR, Yinan Qi (OPPO)
		+ Any other business?
		+ Recess
	2. No objection, Agenda approved.

## Contribution discussion

* 1. Presentation of IEEE 11-23/2038, Close-rang AMP Backscattering in 2.4 GHz, Rui Cao (NXP)

Q: When you calculate the link budget, P\_tx is the tx power from the AP, P\_rx is the rx power from backscatter at the AP side. It has 50dB power imbalance. Is it ok for 2 antennas to mitigate the imbalance?

A: TX power is 0dBm, and from Tx antenna to Rx antenna is 20-25dB. The direct coupling is 20dBm. The dynamic range is 30dB requirement for the Rx.

Q: Do you think the shadow effect should be considered?

A: The backscatter range is on centimeter level, Friis model is enough.

Q: The received signal is -30dB lower than the reception of the transmitted signal. It has -30dB signal to interference ratio, the on-off key can be decoded?

A: Thermal noise will not be an issue, noise figure is the major factor. SNR will be at high 40dB or even 50dB. WUR definition for OOK is 20dB. Our feasibility test shows 10% PER can be easily achieved.

Q: Whether this AMP STA needs to associate with AP?

A: No need, it’s a P2P configuration.

Q: Besides OOK, need to consider other waveforms for backscatter, like DSSS.

A: It is possible, DSSS is like PSK modulation.

Q: In summary slide, first bullet, you can combine AMP and RFID in the same device? Can you explain more? Because they are in different bands, they will be using the same tag or two tags?

A: Prefer to use one tag. It is possible to tune the antenna for both 2.4Ghz and Sub-1Ghz. The change should be incremental, current RFID should be easily upgrade to the AMP.

Q: You suggest to keep the PAR open to backscatter, is there limitation for the technical spec?

A: Based on our analysis, no need to define more restrictions. Current PAR is good.

Q: The function is similar to NFC. I wonder how your thought on current NFC market, because it has been integrated in many smart phones?

A: NFC and RFID address different market segment. NFC is for secure payment and access. RFID is for supply chain and logistics use cases. This proposal is to extend the application to consumer side.

C: Looking at the API for using NFC in Android, the NFC has text field and support text information or URL. When it is scanned, it will take you to an URL and show arbitrary information. NFC tag can be used for the similar use case.

Q: 2.4Ghz band is used to readout from the tag. You have to energize the tag and wait for the backscatter, how long will it take?

A: It will be similar to RFID, at multi millisecond level, within one TXOP.

Q: Slide 8, in the system model, the reader transmit carrier and receive the signal. AP operates in full duplex mode. Do you think it is necessary to separate tx and rx?

A: In broad scope, it is full duplex. One antenna Tx and one R x, the same information. Full duplex is for different data on Tx and Rx. But here you can send on one carrier and backscatter on the same carrier, the receiver just get the combined signal.

Q: How about the self-interference in full duplex mode?

A: It is challenging to support the large dynamic range. There is split architecture to separate energizer and backscatter receiver, and backscatter modulation to different frequency. But it requires hardware change. We think the dynamic range for self-interference and backscatter is within 30-50dB range. The current ADC could support that. No need more hardware support.

Q: Could you clarify the simplification on the MAC header?

A: This is the general direction. In 11ba, there is condensed MAC header. No specific information.

Q: Are planning to define new waveform for backscatter?

A: Yes, we will be working on new design to meet the requirement.

Q: Additional comment on slide 8, you assume direct coupling on Tx and Rx antenna so that the self-interference can be eliminated. I don’t know if it is possible for other signals like OFDM. There are other non-linear factors like amplifier to consider.

A: Will do more evaluation.

Q: I like the idea of reuse existing tech. We had a lot discussion on co-existence. Your proposal requires only the low Tx power. Do you consider more co-existence requirements?

A: On slide 11, with smaller Tx power, the impact is localized. Regarding the access category, AC-BE should be good enough. But the longer PPDU duration is required, the read duration of several millisecond won’t work.

Q: Slide 12, the energizer waveform is DSSS or OFDM, 20Mhz signal is for tag reading? Are energizer waveform and tag reading using the same waveform?

A: Those are different. Energizer is used for backscatter. The third one is the control signaling.

Q: Slide 8, I want to challenge the claim of ‘no major RF and digital change’. Because full duplex operation is supported in 802.11 and also new waveform will be designed, it will introduce more change.

A: We are referring to the existing hardware, it will be able to support. What you mentioned is for the control side, one Tx and one Rx RF control. The RF chain and digital chain will not change.

* 1. Presentation of IEEE 802.11-23/2042, Further Discussion on AMP PAR, Yinan Qi (OPPO)

Q: For 2.4Ghz, setting AC-BK is not enough. Suggest to do more simulation on latency sensitive traffic.

A: For legacy background traffic, AMP traffic may cause 30-40ms additional latency. But for gaming kind traffic, it will be set to higher priority so less impact can be expected.

Q (to commentor): You mentioned duty cycle restriction, how do you justify the requirement?

A: Suggest to wait certain period after one poll.

A: In RTA report, the average latency between AP and client is 7ms. Will submit more simulation results on VO/VI traffic.

Q: When the AP polling AMP traffic, how the worst case latency will be? In the simulation, you only assume trigger based access. Suggest to add trigger based access in the PAR.

A: We should consider both AMP triggered and AP triggered.

A: In the simulation, 3000 AMP devices are extreme cases. But the number of AMP device contend for channel access will be much lower.

Q: Do you think the method for power transfer should be included in the PAR? Should beacon structure need to be considered?

A: Tow modes of power transfer will be considered, namely the passive and active mode.

## Recess

* 1. The chair announced the session recessed at 6:16 pm ET.
	2. Next session will be on November 16th.

# Thursday 16 November 2023 @ 2:00-4:00 pm ET

## Opening (IEEE 802.11-23/ 1723 r3)

* 1. Call to order 2:00 pm ET.
	2. Chair, Bo Sun (Sanechips), instructed members to record attendance in IMAT.
	3. Chair introduced the patent policy and meeting rules (slides 2-8).
	4. No response to the call for patents.
	5. Chair introduced IEEE-SA COPYRIGHT POLICY (slides 9-10)
	6. Chair reviewed other Guidelines, Participation and Guideline for Straw Polls (slides 11-13).
	7. Chair reviewed Suggested Best Practices, Registration, Meeting plan, current AMP TIG Session submission list (slides 14-19).
	8. Hao Wang (Tencent) is the secretary.
	9. Chair call for approval of the agenda of the AMP session.

## Agenda (IEEE 802.11-23/ 1723 r3)

* 1. Chair presented the agenda:
		+ Call meeting to order and remind the group to record attendance on imat.ieee.org
		+ IEEE-SA IPR policies and meeting rules
		+ Approval of agenda
		+ Contribution discussion
			- 11-23/2107, Simulation on coexistence of AMP traffic and existing traffic Part 2, Weijie Xu (OPPO)
			- 11-23/2042, Further Discussion on AMP PAR, Yinan Qi (OPPO)
		+ PAR and CSD SG motion (potential)
		+ Any other business?
		+ Recess
	2. No objection, Agenda approved.

## Technical Contribution

* 1. Update of IEEE 802.11-23/2107, Simulation on coexistence of AMP traffic and existing traffic Part 2, Weijie Xu (OPPO)

Q: Slide 4, in the simulation, there is only one AP and one STA? 2.4Ghz band is busy.

A: No other interference.

Q: Suggest to refer to DCN 11-14-0980 for simulation setup and add AMP traffic to evaluate. In this simulation, there is no collision and all traffic is for DL. In real scenario, there is a chance that AMP traffic collide with other traffic or interference, the impact is not captured here. But it will further increase the AMP activity in the network. Video traffic has bursty pattern, the worst case latency happened at the burst in the session. Need to consider the traffic pattern in the simulation.

A: In this case, we don’t consider other traffic and interference. But the results are still useful. The purpose is to evaluate the additional delay caused by AMP traffic. I think the change in delay will hold in real scenario.

Q: Slide 9, what is the traffic pattern generated by AMP device?

A: For AMP initiate transmission, the number of AMP STA will be around 100. The traffic will arrive every 10s. For example, each of 10 AMP STA will generate 1 traffic at random time during 10s.

Q: The load is small, the packet can easily pass through, making it difficult to evaluate the impact. The results show delay increased from 3ms to 8ms for TXOP 4.

A: It’s the extreme case and will never happen in real scenario.

Q: The legacy evaluation is not realistic. In addition, 3000 AMP devices will take 100% channel occupancy, I can’t understand your claim of no impact to legacy traffic. It will affect the legacy BK traffic.

A: AMP traffic has the lowest traffic class, so no impact is shown and no increase on the max latency.

* 1. Update of IEEE 802.11-23/2042, Further Discussion on AMP PAR, Yinan Qi (OPPO)

C: We don’t think the simulation covers all cases, propose to defer the motion. I also propose some comments in the chat window.

On Webex Chat, the following comments are provided:

‘For the 2nd bulletin, I propose to change to: at least one mode of data communication in 2.4 GHz band with all below restrictions

the AMP access category (AC) being set to AC\_BK (background);

AP trigger-based AMP access only

Maximum TXOP time per AMP access <= 1ms

Minimum AMP poll interval >= TXOP time \* 100 (1% duty cycle)

The tail latency (95th percentile) for legacy devices (ex: HE or EHT) shall not increase by more than 1% for scenarios defined and simulated by previous amendments (see link: 11/14-0980r16)’

Q: What does it mean for ‘at least one mode of data communication on 2.4Ghz band with access category set to AC\_BK’? Other access category is allowed?

A: It’s common language in 802.11. The intention is to set AC\_BK for 2.4Ghz data communication.

Q: Backscatter is considered as one mode for 2.4Ghz communication. AMP tag will not actively access to the channel. The text will cause confusion for future development.

A: Right. It is OK to remove the phrase.

C: The current PAR text is a result of comprise, suggest to move on and address the issues in TG. Backscatter signal can be treated as response and no LBT is required.

C: Support this motion. PAR defines the minimum to deliver. I prefer to discuss tech here in this group to address coexistence issue.

C: Not see many changes in the PAR. Debate is needed to justify. I support the amendment in the chat. I see target numbered defined in previous PARs. There should be no increase at 2.4Ghz up to some percentage. I think it’s a reasonable target.

Q: Suggest to add ‘AMP communication AC’ for backscatter.

## PAR/CSD SPs

* 1. Motion #1:

Approve the following modification to the AMP PAR document (11-23/1006r3):

This amendment defines:

at least one mode of data communication in sub-1 GHz band

at least one mode of data communication in 2.4 GHz band with the AMP communication access category (AC) being set to AC\_BK (background)

at least one mode of wireless power transfer ~~RF energy harvesting~~ in sub-1 GHz band, to support RF energy harvesting.

Moved: Yinan Qi

Seconded: Vytas Kezys

Result: 87Y/23N/9A Passed

Voting status:



* 1. Motion on PAR and CSD

On AMP PAR:

Believing that the PAR contained in the document referenced below meets IEEE-SA guidelines,

Request that the PAR contained in 11-23/1006r4 <https://mentor.ieee.org/802.11/dcn/23/11-23-1006-04-0amp-ieee-802-11-amp-sg-proposed-par.docx> be posted to the IEEE 802 Executive Committee (EC) agenda for WG 802 preview and EC approval to submit to NesCom.

Moved by Bo Sun on behalf of AMP SG

AMP SG Vote:

Moved: Rakesh Taori

Seconded: Bin Tian

Result: 82Y/20N/5A Passed

Voting status:



On AMP CSD:

Believing that the CSD contained in the document referenced below meets IEEE 802 guidelines,

Request that the CSD contained in 11-23/1212r2 <https://mentor.ieee.org/802.11/dcn/23/11-23-1212-02-0amp-ieee-802-11-amp-sg-proposed-csd.docx> be posted to the IEEE 802 Executive Committee (EC) agenda for WG 802 preview and EC approval.

Moved by Bo Sun on behalf of AMP SG

AMP SG Vote:

Moved: Bin Tian

Seconded: Rakesh Taori

Result: 82Y/9N/11A Passed

Voting status:



## Teleconference Plan

The following teleconference plan is approved:

* + - Dec 5th, 10:00am, ET; 2 hours, webex
		- Dec 19th, 10:00am, ET; 2 hours, webex

## Adjourn

* 1. The group finished all the work so the last session is cancelled.
	2. The chair announced the session adjourned at 3:59 pm ET.