IEEE P802.11  
Wireless LANs

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| IEEE 802.11 TGbp Ambient Power Communication  January 2025 Interim Meeting Minutes  Kobe, Japan | | | | |
| Date: 2025-01-13 | | | | |
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Abstract

Rev 0: This document contains the IEEE 802.11 TGbp January 2025 Interim meeting minutes.

TG Chair: Bo Sun (Sanechips)

TG Vice Chairs: Steve Shellhammer (Qualcomm)

Rakesh Taori (Infineon)

TG Secretary: Sebastian Max (Ericsson)

TG Technical Editor: Yinan Qi (OPPO)

Abbrevations:

Q Question

A Answer

C Comment

SP Straw Poll

All times are given in local time of the meeting venue (i.e., JST / UTC+09)

# Monday AM2 (2025-01-13T10:30)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r2).

* Chair calls the meeting to order at 10:30.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-6).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 7-8).
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 9-12).
* Chair reviews the current TGbp session submission list (slides 13 to 16), the meeting agenda for the week (slide 17), and the distribution of submissions to the meeting slots.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r2 (slide 20).

* 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 TG minutes
* FRD/SFD motions
* Contribution discussion
  + 11-24/1846r2, AMP Client STA Types, Rojan Chitrakar (Huawei)
  + 11-24/2132, AMP relay topology and operation, Zhanjing Bao (TCL)
  + 11-25/0052, Active AMP STA Polling Requirements, Sebastian Max (Ericsson)
  + 11-25/0055, Wireless connectivity challenges for backscattering AMP STA, Solomon Trainin (Wiliot)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Motion: Approve TGbp Meeting Minutes

Approve the meeting minutes for TGbp meetings during 802 Nov plenary session and TGbp TCs before Jan 2025 interim session as below:

* https://mentor.ieee.org/802.11/dcn/24/11-24-1965-00-00bp-2024-11-plenary-meeting-minutes.docx
* https://mentor.ieee.org/802.11/dcn/24/11-24-2038-00-00bp-ieee-802-11-tgbp-ambient-power-communication-teleconference-minutes-december.docx
* https://mentor.ieee.org/802.11/dcn/25/11-25-0054-00-00bp-teleconference-minutes-january-2025.docx

Moved: Sebastian Max

Seconded: Yinan Qi

Result: Approved with unanimous consent

## FRD/SFD Motions

### FRD Motion

Approve the updated 11bp FRD as included in:

* [https://mentor.ieee.org/802.11/dcn/24/11-24-1307-03-00bp-proposed-tgbp-functional-requirements.doc](https://mentor.ieee.org/802.11/dcn/23/11-23-2158-00-0amp-802-11-amp-sg-meeting-minutes-for-november-2023-plenary.docx)

Moved: Bin Qian

Seconded: Sebastian Max

Result: Approved with unanimous consent

### SFD Motion

Approve the updated 11bp SFD as included in:

* https://mentor.ieee.org/802.11/dcn/24/11-24-1613-03-00bp-specification-framework-for-tgbp.docx

Moved: Yinan Qi

Seconded: Zhanjing Bao

Result: Approved with unanimous consent

## Contributions

### Presentation of IEEE 802.11-24/1846r2, "AMP Client STA Types", Rojan Chitrakar (Huawei)

C: Ok with the backscatter definition. AMP assisted non-AP STA: maybe better "AMP aware". AMP is not assisting.

A: "Assisted" is used in the technical report. Will check offline.

C: Active Tx. Assume you only consider transmission from an AP by the term "downlink"? Maybe better say "capable of receiving", drop "downlink".

C: Suggest to do discussions for harmonization on the reflector.

C: Slide 6. Active Tx non-AP AMP STA, change to "active uplink AMP transmission".

C: Slide 6. Active STA needs differentiation to AMP Assisted non-AP STA, for example supported clock accuracy.

A: Definition should not be so detailed.

C: Assisted non-AP STA: should have a limitation on what it can support.

C: Active AMP-STA: suggest removing "uplink" and "downlink".

C: Definitions have implications on the architecture. They should be in the architecture section of the SFD, clause 2.

C: Is there a name for the "other side", for the reader?

A: Presentation focuses on the AMP STA side / client side.

### Presentation of IEEE 802.11-24/2132, AMP relay topology and operations, Zhanjing Bao (TCL)

C: We need a definition on what is an "AMP AP" first.

Q: What is the scope, do you cover also backscatter AMP STA?

A: The architecture shall cover both simple AMP STAs and more capable AMP STAs. Simple AMP STAs will not support association.

Q: Backscatter devices will be so simple, they will not be aware who is a relay, etc.

Q: Relay concept was discussed in the SG, not in the TG. Do we really think the relay concept is needed?

A: Relay may improve the range and link quality. Necessity can be clarified.

Q: Current tags can only operate on certain dBm power. Need to check the link budget to see if relays are needed.

A: Yes, may depend on the use-case.

Q: Slide 7. Uplink can be triggered or R-TWT periodic access. Will R-TWT work, given the clock accuracy?

A: R-TWT is a solution for the periodic channel access. Details are not in the focus of this contribution.

### Presentation of IEEE 802.11-25/0052, Active AMP STA Polling Requirements, Sebastian Max (Ericsson)

### Presentation of IEEE 802.11-25/0055, Wireless connectivity challenges for backscattering AMP STA, Solomon Trainin (Wiliot)

Q: Slide 7. Backscatter figure, what if the receiver is located elsewhere from the transmitter?

A: Not included in these figures.

Q: Is this related to the relay proposal?

A: May be.

Q: SP2. Only talk about .11bp frames, "optimized" is not necessary.

A: Agree.

Q: SP1. What about the smartphone which is not associated, there is no DS.

A: It must fit to the IEEE 802.11 architecture, to the baseline. In 802.11, there is no entity "smartphone".

Q: Why "capable", why not simply "AMP STA"?

A: It's the part of the IEEE 802.11 STA that is talking to the AMP-only STA, which is not compatible to the current IEEE 802.11.

## Recess

The chair announced the session recessed at 12:30.

# Monday PM2 (2025-01-13T16:00)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r3).

* Chair calls the meeting to order at 16:00.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r3 (slide 25).

* 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 (PHY) [20 mins for each]
  + 11-24/2114, Channel Correction in Long Range Backscatter, Nelson Costa (Haila Technologies)
  + 11-24/2128, Follow-up on Channel Shifting in Backscatter Operations, Nelson Costa (Haila Technologies)
  + 11-24/2143, Advantages of 802.11b DSS in Long-Range Backscatter, Nelson Costa (Haila Technologies)
  + 11-25/0027, AMP PPDU Design, Yinan Qi (OPPO)
  + 11-25/0028, AMP PPDU Configuration, Yinan Qi (OPPO)
  + 11-25/0033, UL Data Rates for AMP and PPDU, Chuanfeng He (OPPO)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Contributions

### Presentation of IEEE 802.11-24/2114, Channel Correction in Long Range Backscatter, Nelson Costa (Haila Technologies)

Q: Slide 6. Why a new preamble in the excitation field? Can't we just use the legacy preamble, that is also backscattered?

A: No new training field proposed. We integrate an 11bp PPDU into the excitation, but still keep is backwards-compatible.

Q: Why can't we use the "HT/Legacy Preamble", which is also backscattered?

A: This part is not backscattered. Only the excitation filed is.

Q: Slide 5. Receiver needs to estimate h0.

A: Yes, but only in case of cancellation.

Q: Slide 6. Excitation contains Preamble + Header?

A: Yes, and this needs to be backscattered.

Q: Did you analyze doppler, if the STA in the middle moves?

A: We only considered static scenarios. But I'd assume speed must be high for an effect.

Q: Slide 5. Why do we need the channel estimation? There's no requirement.

A: Receiver only hears channel 11. Otherwise, the receiver does not know how to receive the PPDU.

### Presentation of IEEE 802.11-24/2128, Follow-up on Channel Shifting in Backscatter Operations, Nelson Costa (Haila Technologies)

Q: Current STAs do not use DSSS anymore, they are OFDM-based. How is this backwards-compatible?

A: It's compatible to a phy defined in the standard.

Q: On the medium protection. What is the conclusion? Is there an existing mechanism?

A: We have several ideas how to do it. All examined mechanisms will not solve it.

### Presentation of IEEE 802.11-24/2143, Advantages of 802.11b DSS in Long-Range Backscatter, Nelson Costa (Haila Technologies)

Q: Scope is long-range backscatter that can be received by an existing legacy Wi-Fi receiver? Otherwise, we can do OOK, and all optimizations that we want.

A: It's an advantage. Need to talk offline.

Q: Doesn't the gain over OFDM depend on the symbol rate only? How does the decoding work?

A: Example from [3] showed a clear advantage.

Q: Does a current off-the-shelve receiver support reception of this signal?

A: Yes, it would. Any receiver can decode it, it recognized the preamble and the data part backscattered on the other channel.

C: Please point to the slides how the modulation is done.

Q: SP1. Do you want to embed the DSSS PPDU in the excitation field?

A: Yes.

### Presentation of IEEE 802.11-25/0027, AMP PPDU Design, Yinan Qi (OPPO)

Q: Slide 6. Why different construction method from WUR?

A: Just an example, we can use WUR method.

C: SIG in the uplink, they may be usage for that for other STAs listening to the channel.

C: Length on the DL, we have concerns on the power consumption that needs to receive long sequences. Need to limit the size of the DL.

Q: Slide 9. Signal bandwidth, 10MHz. What is the assumption on the tag, is it wide bandwidth or low-pass filtered?

A: Tag is open for the entire bandwidth.

Q: Then why not use full 20MHz?

A: Using 10MHz can be slightly simpler compared to 20MHz.

Q: Tag side or tx side?

A: Tag side.

Q: But this is OOK envelope detector. Benefit of the wider BW is that it can be an existing Wi-Fi PPDU. No new PPDU needed.

### Presentation of IEEE 802.11-25/0028, AMP PPDU Configuration, Yinan Qi (OPPO)

Q: Check how it is done in RFID, they have methods for the uplink.

C: AP needs to protect the medium for the length.

Q: On the excitation. Backscattering tag is purely passive. There, we can define excitation duration in the standard. Also, if the device is powered by battery, and the device is using the energy only for backscatter, it is sufficient.

A: There's also the case that the excitation is to active the device.

C: We need to collect reasonable and useful options.

Q: Slide 5. This is about the excitation at the end?

A: No, at the start.

Q: But then it's difficult to talk about the length.

A: Yes. This needs to be pre-defined, but there can be different values depending on the use-case.

### Presentation of IEEE 802.11-25/0033, UL Data Rates for AMP and PPDU, Chuanfeng He (OPPO)

C: Requirements for active vs backscattering are quite different. Should get different designs.

C: Four data rates might be too complicated, reduce to two.

C: Four rates are not reasonable. RFID has ratio 16 from low:high. Use cases also depend on suitable rate. Maybe make some of them optional?

A: Maybe only first two are mandatory.

Q: How is 250kb/s for active device when considering the link budget?

A: Slide 7 shows -6dB is achieved for channel B. This matches to the requirement. For channel D this does not match.

Q: What kind of receiver is assumed?

A: Correltation detection for the OOK-signal.

C: On the AP side coherent detection can be used, with channel estimation and equalization.

C: Suggest active tags have a higher rate than backscattering. This is only true for the same range. But active tags should have a longer range, which will reduce the data rate. It's confusing to say that they can use higher rates.

A: Integrated case can achieve higher SNR. Also, high rates will save power.

C: We should have rates higher than RFID in the new standard.

## Recess

The chair announced the session recessed at 18:00.

# Tuesday AM1 (2025-01-14T08:00)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r4).

* Chair calls the meeting to order at 08:00.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r4 (slide 27).

* 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
  + 11-25/0034, Sync field for AMP PPDU, Wejie Xu (OPPO)
  + 11-25/0042r0, AMP Downlink Sync Field Study, Steve Shellhammer (Qualcomm)
  + 11-25-0030r0, “AMP UL Bi-Static Leakage and Dynamic-Range Implications”, Dror Regev (Huawei)
  + 11-25-0043r0, “Passive AMP STA RF Power Harvesting Sensitivity Threshold”, Dror Regev (Huawei)
  + 11-25-0047r0, “Follow up on downlink sync field design”, Bin Qian (Huawei)
  + 11-25-0048r0, “Discussion on uplink transmissions for backscatter STAs”, Bin Qian (Huawei)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Contributions

### Presentation of IEEE 802.11-25/0034, Sync field for AMP PPDU, Wejie Xu (OPPO)

Q: Slide 12. SNR is sweeped. Sync Error = 0 is no error, Sync Error = 1 is one chip off?

A: No, one sampling point. E.g., chip duration 2µs, rx 2MHz means 4 sampling points per chip. Recoverable if error is within sampling.

Q: Agree with length 16 and chip duration 2µs. For cross-correlation, one sync error does not mean failure.

A: Yes. One sync error is acceptable.

Q: Slide 5. Is this only for the active receiver?

A: Focus on receiver with correlator. Without correlator it's very simple.

C: For step 2, requirement is not just on performance, but there are other criteria. Step 1 may give tons of feasible sequences. Downselection should be done in step 2.

### Presentation of IEEE 802.11-25/0042r0, AMP Downlink Sync Field Study, Steve Shellhammer (Qualcomm)

Q: Slide 9. 64 is the maximum?

A: Yes, and it is only reached in the optimal case, resulting from the length and the sampling rate.

Q: Details on the sync detection design. 10k PPM – the agreement for active tx was 1k PPM?

A: Receiver clock accuracy might be looser than the transmitter accuracy. 10k PPM is also the accuracy agreed for the MAC.

Q: What is the maximum ADC?

A: No details yet.

C: For this type of receiver, the performance heavily depends on the ADC range.

### Presentation of IEEE 802.11-25-0030r0, “AMP UL Bi-Static Leakage and Dynamic-Range Implications”, Dror Regev (Huawei)

C: Fully agree that bi-static or mono-static should have the same tag.

C: It's a three-body problem, you're using exemplary distances only, it should be coverage.

Q: Slide 6. What is the reader effective DR = 50dB?

A: Assume 12b ADC, which gives practically 50dB.

Q: Is there a cancellation scheme?

A: Yes, in the digital domain.

Q: Slide 6, 50dB, we are using 45dB, 40dB but this is relative to the noise floor, not limited by the ADC.

A: Product guys say 50dB is achievable. 12b ADC is very common.

C: Due to long-range, power at the receiver is much less at the receiver side than we've assumed in the short-range monostatic case.

### Presentation of IEEE 802.11-25-0043r0, “Passive AMP STA RF Power Harvesting Sensitivity Threshold”, Dror Regev (Huawei)

Q: Confirm the numbers. Charging & recharging scheme, slide 7. Why do we need to transmit so many times? Single round should be sufficient for our use-cases.

A: I assumed communication with association.

Q: What happens if the power is less than -26dBm?

A: It needs longer time, but there might also be a minimum sensitivity. In addition, the idle power consumption needs to be low enough, otherwise it will never charge.

Q: Then why do we need a minimum power?

A: To reach a certain minimum distance. It is like the maxmium noise figure. We apply the same approach to the harvesting. Any spec has performance requirements.

C: Slide 7. Very informative, gives an idea on how long the excitation field should be. Initial charging, 240µs, is very long, maybe efficiency of the initial charging can be higher?

A: There's no way to by-pass the simple calculation. There might be small optimizations, but not by an order of magnitude.

### Presentation of IEEE 802.11-25-0047r0, “Follow up on downlink sync field design”, Bin Qian (Huawei)

C: Suggest that the non-backscatter is not only for the full receiver, but also for the low-power receiver without correlator.

A: Yes, we need more insights for the receiver architecture.

Q: Slide 6. Four consecutive zeros, means 8µs without power. There's a risk to lose the channel.

A: Did not notice, will consider this.

Q: Slide 5. Shorter sequences for backscattering will have worse correlation properties. Is this also for longer distances?

A: Consider different scenario, tag is very simple. Similar to RFID case. Hence, even in bi-static case max. distance is 2m. Hence, received SNR is quite high.

Q: What about active STAs? Is this AMP assisted?

A: Not sure if non-Manchester encoded sequence are applicable to active STAs. Here just focus on AMP assisted and backscatter STAs.

### Presentation of IEEE 802.11-25-0048r0, “Discussion on uplink transmissions for backscatter STAs”, Bin Qian (Huawei)

C: In the case of channel shifting the proposed method fails, because the receiver is on a different channel. However, if the tag is not backscattering all the time, the interference can simply be measured.

A: Did not consider channel shifting, as it might be optional.

C: Scaling with the data rate is a good idea, also leaves the complexity to the AP side.

Q: Energizer sends .11-compliant packet, does this contain information?

A: No, just a dummy packet to provide the excitation.

Q: Is the energizer the transmitter of the excitation?

A: Yes, for the bi-static case.

Q: Is there an assumption on the waveform?

A: No. Just .11-compliant PPDU, to re-use an existing device for the energizer.

## Recess

The chair announced the session recessed at 10:00.

# Tuesday PM2 (2025-01-14T16:00)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r4).

* Chair calls the meeting to order at 16:00.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r4 (slide 29).

* 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
  + 11-25/0050r1, “AMP DL Wideband OOK Generation”, Panpan Li (Huawei)
  + 11-25/0051r1, “Signal Design for OOK”, Leif Wilhelmsson (Ericsson)
  + 11-25/0075, Further Thoughts on AMP DL PPDU for Mono-static Backscattering, Rui Cao (NXP)
  + 11-25/0058, AMP-monostatic-backscattering PHY followup, Rui Cao (NXP)
  + 11-25/0061, AMP-monostatic-backscattering-operation, Rui Cao (NXP)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Contributions

### Presentation of IEEE 802. 11-25/0050r1, “AMP DL Wideband OOK Generation”, Panpan Li (Huawei)

Q: Slide 5. Also use a Butterworth filter?

A: Yes, without the sidelobe is not low. Using a filter at the transmitter is acceptable. 2nd / 4th order has low complexity.

Q: Why is a specific spreading sequence needed? The receiver does not care.

A: Correct, the receiver only does OOK detection. The default 11b gives a wide main-lobe. Stronger periodicity narrows the main-lobe.

Q: But both are ok for the mask?

A: Not sure which mask to use, the red line is the 11b mask.

Q: Sequence might not need to be specified. What about using 11b with 22MHz bandwidth?

A: I'm ok with not specifiying the sequence, but we can't use 11b sequence. Should be smaller than 22MHz.

Q: Slide 4. Waveform has constant energy. You can do the same with MC. There's a misconception on MC-OOK. There's not a big difference.

A: Ok, looking forward to your contribution.

Q: Increased BW goes for higher power limits. But the backscatter has to move outside of the spectrum. In this case, on/off switching has to be 10MHz.

Q: Compare goal of >10MHz (slide 4) with signal on slide 5, this is ~10MHz.

A: Yes, this can be changed by adapting the spreading sequence.

### Presentation of IEEE 802.11-25/0051r1, “Signal Design for OOK”, Leif Wilhelmsson (Ericsson)

Q: Slide 7. If we use 8-point FFT, how can we truncate 1/8th of the signal? In 11ba we put the on-signal to every other carrier.

A: For 8-point FFT we don't need to truncate.

Q: In OFDM signal there is a CP part. How can we handle this?

A: In the receiver?

Q: OOK signal in time-domain have the same length. But the on-signal has a CP-part.

A: Think of an 8-point. Then, add CP corresponding to 2 samples. This results in a duration of 0.5µs. An envelope detector does not care.

Q: We tried to divide the OFDM in 4 symbols. But the on-part is 3.2µs. We don't know how to divide the CP part.

A: The CP is scaled. It's 25% of the symbol. We also did this in 11ba, for the 32-point FFT, we also reduced the duration of the CP. There is no difference.

Q: Slide 5. We can have a PAPR=0.6dB by system design. This is really useful for the DL data. But we also have to give power to the device, which needs a high PAPR. This can be adjusted by using MC, we are more flexible.

A: Yes, it's advantageous to be non-linear.

Q: Yes. DL needs low PAPR, energy transmission needs high PAPR. With OFDM we are more flexible.

A: It's really MC, not OFDM.

Q: SP2. There are many bw definitions. Why do you mention the 3dB bandwidth.

A: This is not critical. We cannot say just bandwidth. We need to define what we mean with that.

Q: It should be regarded as the bandwidth of the main-lobe.

A: But what is the bandwidth of the main-lobe?

Q: The main lobe decreases quickly.

A: But we still need to pick one number.

Q: Do you prefer one certain bandwidth?

A: No. People need to check what is feasible. But for the SP we need a number. I used 10dB to distinguish to 11ba (4MHz), it should be wider. I don't have a strict number.

Q: High PAPR requires power backoff, which mean less power to the tag, and charging becomes worse. If average power is the same, but with power backoff you lose too much.

A: Reason for the backoff is the EVM for the large MCS. For OOK we don't have EVM. A bit of backoff is needed for the spectrum mask, but not 10dB, maybe 3dB. Needs to be studied. Maybe start narrower to allow for less power backoff.

Q: Even 3dB is painful. 3dB is critical for range. The whole point of OFDM are the peaks. Constant envelope is the best for charging and harvesting.

### Presentation of IEEE 802.11-25/0075, Further Thoughts on AMP DL PPDU for Mono-static Backscattering, Rui Cao (NXP)

Q: Slide 3. Operating RSSI for active tags is -40dBm, maybe -50dBm; and 50ppm for wakeup tags.

A: Need to check. We consider a different receiver with can do -70dBm.

Q: Slide 4. Close-range 20cm is assumed. Why assume large number of "pupils in the dark"? Inventory is more relevant to the active tags.

A: It's a general challenge.

C: Agree, and it's a bigger challenge for active tags.

C: We need to consider how much we gain by defining new operations.

C: Presentation does not mention long-range backscatter.

Q: SP1, page 15. I also propose this SP text. We also like to consider bit-flipping next to OOK. I'm assuming the SP is for monostatic backscattering, and not for long-range bi-static backscattering.

A: Good question. Open to discuss.

C: We have only agreed on OOK DL for active tags.

### Presentation of IEEE 802.11-25/0058, AMP-monostatic-backscattering PHY followup, Rui Cao (NXP)

Q: Slide 5. Frequency-shift needs further discussion.

A: Yes, but only related to for monostatic backscattering.

Q: What is direct backscattering?

A: Without frequency shift.

Q: So this is only targeting close-range?

A: Yes.

Q: Slide 5. What do I see here? How did you do the measurements? What waveform?

A: Just a 2x2 Wi-Fi device, capture ADC samples. Pulse waveform (very wide, 80MHz).

Q: But we'll not use a pulse. We'll use a wideband signal, continuous transmission. There will be many non-linearities.

A: Not so much impact, tx power 0dBm, not saturated, well within ADC capability.

Q: Still effect of the PA and LNA. I want to understand if it is possible with non-linearities.

A: But what other impacts do we expect?

Q: Expect that a continuous transmission is much harder to remove.

A: Only difference that all pulses will be pushed together. Time-domain impact will not be critical.

### Presentation of IEEE 802.11-25/0061, AMP-monostatic-backscattering-operation, Rui Cao (NXP)

Q: Lots of inspiration of RFID. My concern is mandating for all backscatter types, e.g., slide 6.

A: We can discuss the exact definition. This is only for the tag which re-uses the Gen2 Logical Interface. Otherwise, it does not make sense.

Q: SP1. Very restrictive.

A: Can clarify language, may be only one mode.

C: EPC has significant limitations. No privacy, not well protected. Also, no group access (trigger a subset), it's not defined. Maybe we should not re-use everything.

C: For APs this is limiting in the design, maybe this is fine for phones.

A: Assume AP is more capable.

C: Some commands we can re-use, but other commands should be defined in AMP for better efficiency to have an improvement. For long-range backscattering, with many tags, the access efficiency needs to be improved.

A: We're open to that. Commands need to support the requirements.

Q: SP is refering to monostatic?

A: This is only the processing reply time.

## Recess

The chair announced the session recessed at 18:00.

# Wednesday AM1 (2024-01-15T08:00)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r4).

* Chair calls the meeting to order at 08:00.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r4 (slide 31).

* 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
  + 11-25/0015, Leveraing EBCS and WUR to design MAC for 802.11bp, Kamran Nishat (Haila Technologies)
  + 11-25/0031, Trigger based multiple access for AMP, Chuanfeng He (OPPO)
  + 11-25/0032, Duty-cycle AMP operation, Chuanfeng He (OPPO)
  + 11-25/0035, CDM access for AMP, Weijie Xu (OPPO)
  + 11-24/2112, Secure E2E Operation for AMP, Sanket Kalamkar (Qualcomm)
  + 11-24/2113, UL Access for AMP, Sanket Kalamkar (Qualcomm)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

Slight change of the order of presentations (final order given above), no objection, agenda approved.

## Contributions

### Presentation of IEEE 802.11-25/0015, Leveraing EBCS and WUR to design MAC for 802.11bp, Kamran Nishat (Haila Technologies)

Q: Slide 9. Do you change the size of the addresses?

A: No. Just use that the upper 3 octetts are fixed. Tag and infrastructure will know them, no need to transmit them.

Q: It's very specific, the assumption that the EBCS relay understands the message. It is not agnostic.

A: This can be handled during the provisioning part of the protocol. We will have further presentations on the details.

C: The assumption of EBCS is that the endpoint is providing all higher protocol layers, IP and TCP if needed.

C: Like to understand more about the assumption why WUR is the best frame format. Maybe we need something similar, but not the exact format.

Q: EBCS is designed for broadcast traffic, but not for unicast. What kind of traffic are you envisioning?

A: We are thinking of a protocol designed over that. More details will be presented. The WUR frame is already in the standard, it can be modified for something better. EBCS can be used for many applications, including triggering tags.

C: We could take inspiration, but we're not limited to what is defined.

A: Idea is to start with the specification, and to allow transmissions without association and beacons.

Q: We had a presentation on (re)using the UHF RFID Gen2 protocol and frame structure. Your proposal is diametral to this. I think we need a more general approach.

A: The other presentation is for a different use-case, short-range backscattering.

Q: Do you think we need different MAC frame structures for the different use case?

A: Yes.

### Presentation of IEEE 802.11-25/0031, Trigger based multiple access for AMP, Chuanfeng He (OPPO)

Q: Slide 7. How long are the slots in the phases? Duration of the random access phase may be much shorter than the granted access phase.

A: We try to reduce the payload in the first stage. First stage sends only the access code, it can be very short, 16b.

Q: The payload may be short in both cases, there might not be a lot of information from the tag. But maybe the frame format can be different?

A: For the inventory case the payload is at least 128b. The first phase is just a random id.

### Presentation of IEEE 802.11-25/0032, Duty-cycle AMP operation, Chuanfeng He (OPPO)

Q: Slide 7. One STA listens only to one of the ten triggers? Is a STA associated to one of the triggers?

A: There is one targeted trigger per AMP STA, based on distributed rules. It can be seen as trigger slicing.

Q: If there are 20 STAs then 2 STAs per trigger?

A: Yes.

C: Slide 6. Sleep power is 100x lower and therefore neglegible. That's only valid for short sleep times. For low duty cycles it is the dominating factor. This example thus needs to be generalized more.

C: Slide 10, SP. It's not necessary for AMP STAs to support TSF to support this. No need for TSF, the AMP STA can still search for a trigger.

Q: Can we use a wake-up signal instead of the trigger? Then the AMP STA will wake-up and respond. Why does the AMP STA need to wake-up to look for the trigger.

A: AMP STA needs to wake up to send its uplink data. The trigger provides the resource. The only reason for the AMP STA to wake up is for the uplink transmission.

Q: For me it makes sense that there is a wake-up signal, there is no need to search for triggers. This is mixed up. Why not wake up the STA?

Q: Is the timestamp useful if there is significant clock drift?

A: We target active devices. 1000 PPM. This is sufficient.

### Presentation of IEEE 802.11-25/0035, CDM access for AMP, Weijie Xu (OPPO)

Q: Slide 7. Clock drift is +/- 1000ppm. SFD says 10000ppm.

A: 10k ppm is for the backscatter device. For active it is 1000ppm.

Q: That's for the transmission, but not for the MAC.

A: If the AMP STA supports the TSF, it's 10k ppm. For this procedure here, it depends on the implementation. For the duration between the trigger and the transmission it can use the higher precision oscillator.

C: Ok, that might be possible, but it might take some time to activate the oscillator for higher precision. Good to clarify in the spec.

Q: Slide 6. CDM is not Manchester coded. Is this a new PHY mode?

A: This is an important issue. In the simulation we don't use Manchester encoding. We can have further simulations.

C: Don't know how the payload will look like then. Maybe we don't need a sync. And the data rate is fixed as the chip rate.

Q: Slide 7. Maximum drift 2µs per 2ms. What is the 2ms?

A: This is an example. The trigger starts the random access, 5 slots with 0.5ms. Last slot will start after 2ms.

Q: If it is Manchester encoded the property is not there. You cannot find the peak.

A: I don't think so, we have done simulations. The sync field can be Manchester encoded. Autocorrelation will be ok.

Q: The side-lobe will be very high.

### Presentation of IEEE 802.11-24/2113, UL Access for AMP, Sanket Kalamkar (Qualcomm)

No time for Q&A.

### Presentation of IEEE 802.11-24/2112, Secure E2E Operation for AMP, Sanket Kalamkar (Qualcomm)

No time for Q&A.

## Recess

The chair announced the session recessed at 10:00.

# Wednesday AM2 (2025-01-15T10:30)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r4).

* Chair calls the meeting to order at 10:30.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r4 (slide 33).

* 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
  + 11-25/0021, Channel access and trigger design for active STAs, You-wei Chen (MediaTek)
  + 11-25/0037r0, “Follow-up on AMP Energizer”, Ian Bajaj (Huawei)
  + 11-25/0038r0, “Use Case for AMP STA Reporting”, Ian Bajaj (Huawei)
  + 11-25/0039r0, “AMP Open Service Period”, Ian Bajaj (Huawei)
  + 11-25/0041, Follow up on AMP identification, Zhanjing Bao (TCL)
  + 11-25/0045r0, "Channel Access for Backscatter non-AP AMP STAs", Rojan Chitrakar (Huawei)
* Any other business?
* Recess

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Contributions

### Presentation of IEEE 802.11-25/0021, Channel access and trigger design for active STAs, You-wei Chen (MediaTek)

C: If the PHY is alread different, we don't need to stick to the same format. There are things in WUR that are not needed in AMP. We can make it more efficient, maybe with a similar format. WUR STA might be confused if it receives a different frame type. WUR is for a specific use case, we need to be more flexible.

C: We have two PHYs, UL and DL, we need to decide if we have different frame formats.

C: WUR assumes a prior association. We are not in this situation. There are significant differences.

### Presentation of IEEE 802.11-25/0037r0, “Follow-up on AMP Energizer”, Ian Bajaj (Huawei)

Q: Slide 4. Energizer has 802.11-type of entity on top of the energizing function?

A: Depending on the topology. For the wireless, it needs a second radio to receive the information, if the energizing is on a different frequency. Or, some kind of time-division is needed.

Q: The energizing is also for backscatter?

A: Yes, it's either WPT or excitation.

Q: Slide 4. Energizers 1 or 2 are connected to AMP non-AP STA. Every is connected to every STA. Would it be possible to connect to only a subset?

A: This is just a diagram. Any variation is possible, depending on deployment and coverage.

Q: SP1. The energizer may have more capabilities. Maybe add "at least".

Q: Slide 4. Dotted frame. Energizing function, what is the expected interface to the regular STA?

A: We have some ideas, but this is high-level.

Q: Then this needs a new interface definition in the specification?

A: Yes.

### Presentation of IEEE 802.11-25/0038r0, “Use Case for AMP STA Reporting”, Ian Bajaj (Huawei)

C: Slide 4. Channel sensing power is lower than 10µW.

Q: Slide 6. If the situation is stationary one can determine the best periodicity by getting the information only once.

A: Assume if the energizer progressively increases the power, and check for energized STAs. That's also a protocol; it needs control information sent by the AP.

Q: Energizer is controlled anyways. Details on how it behaves are implementation. But we don't need the reports.

Q: Dynamic feedback is not effective. Assume every STA is fully charged, then why do a feedback?

A: Feedback can be sent on-demand only, if the charge is less than 10%.

Q: Slide 6. At least two reports per STA are needed.

Q: Goes the capability information to the AP or the energizer?

A: To the AP. The energizer is always triggered by the AP.

Q: Slide 6, case 2 and 3. Do you need this much of optimization? Only capability information might be sufficient.

A: There are cases where only capability information is not sufficient. There needs to be a closed loop. Especially for low duty cycles this gives a lot of saving.

Q: Energizer sends backscatter? So, all STAs will charge?

A: Not covering the backscatter case, only for the active case.

C: But this also applies to backscattering, there is charging in-between due to the transmissions. Reporting is useful in this case as well.

C: Depending on the position of the STA the AP cannot know the received energy. So, a reporting is helpful.

Q: How are new STAs discovered?

A: Not considered yet. Size of deployment / number of STAs assumed to be known.

### Presentation of IEEE 802.11-25/0039r0, “AMP Open Service Period”, Ian Bajaj (Huawei)

C: Slide 3. Power consumption of channel sensing. This is too high by an order of magnitude.

C: SP2. There are other SP on duty cycle, they should align.

Q: SP2. How can dozing be done without association?

A: Active STAs, if they don't have power they are off, this is the doze state. We want to prevent them to lose power by channel sensing without receiving a trigger. For this, it needs to receive information when the trigger comes. No need to associate, this is broadcasted.

Q: What if there are two APs?

A: Then it connects to the stronger one.

Q: So, there's some form of association, maybe not the classic 802.11 one?

A: No; we see multiple use cases without association.

Q: For the service period, there are requirements on the clock. Also, what happens if the tag dies and loses all information?

A: A simple way is to assume that the SP info frame (slide 5) is sent frequently. This limits the drift, and it can be used to correct the time.

C: If synchronizity is lost, then the tag needs to stay awake for a long time to re-sync. This might be critical for the limited devices.

Q: This idea provides the SP info in a different frame, other proposal includes it in the trigger frame.

A: Here it can also be included in the trigger frame. Only difference is that we don't have TSF. Only a local clock is needed due to short intervals.

### Presentation of IEEE 802.11-25/0041, Follow up on AMP identification, Zhanjing Bao (TCL)

Q: Do you think that number of streams is relevant for AMP?

A: No, it's just an example of a PHY parameter. I don't want to define the details.

C: It would be good to propose things that make sense to AMP.

Q: Slide 4. Don't see some of the reported parameters, like channel width, clock accuracy. Not sure that we can use / should report these capabilities. They are not needed.

A: This page is just an example that we considered to be reported.

C: My proposal is to first determine at least one parameter that needs to be reported, and then define the mechanism.

C: Support 2nd SP, but not "or capabilities".

Q: SP2. Why is the ID linked to report the existence or the capabilities?

A: We compare with the association procedure and would like to make it simple.

### Presentation of IEEE 802.11-25/0045r0, "Channel Access for Backscatter non-AP AMP STAs", Rojan Chitrakar (Huawei)

Q: This is for backscatter devices?

A: Yes.

Q: UHF RFID is for specific applications, we discussed more. Are the specific things just for identification / discovery?

A: Yes, primary for identification.

Q: Is there anything else?

A: RFID does a lot. E.g., for sensors, there could be a command to read out user space. I would not say that other applications are not supported.

Q: Still, it's specific to a set of applications. We should not go too far down this road and make it mandatory for all backscatter tags.

A: RFID is already as simple as it can get.

Q: I like to get more information on what it means for the complexity, if it is mandatory to support the RFID logical interface.

## Recess

The chair announced the session recessed at 12:30.

# Thursday AM1 (2025-01-16T08:00)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r5).

* Chair calls the meeting to order at 8:00.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r5 (slide 35).

* 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 (WPT & MAC & Security)
  + 11-25/0046r0, Channel Access for Active Tx non-AP AMP STAs, Rojan Chitrakar (Huawei)
  + 11-25/0091, frame format discussion follow up, Liwen Chu (NXP)
  + 11-25/0094, AMP device management, Liwen Chu (NXP)
  + 11-25/0029, WPT Protocol, Wave and PPDU, Yinan Qi (OPPO)
  + 11-25/0012, WPT Waveform Comparison, Amichai Sanderovich (Wiliot)
  + 11-24/1916, Recap of Compact Secure Transaction Methods for AMP, Hui Luo (Infineon)
* Any other business?
* Adjourn

Chair calls for approval of the agenda of the TGbp session.

No discussion, no objection, agenda approved.

## Contributions

### Presentation of IEEE 802. 11-25/0046r0, "Channel Access for Active Tx non-AP AMP STAs", Rojan Chitrakar (Huawei)

Q: Slide 3. Two potential schemes, random access and scheduled access. What about merging them? Given that the TXOP is used, the clients need to stay awake for a long time.

A: Yes, it could be just one phase, or together. In the random phase the STA could also transmit UL data, the reader can indicate what kind of response it expects.

C: Slide 3. In slot 0, there should be a delay before the reply, e.g., SIFS.

A: Yes, agree.

Q: TXOP is very long. What is the TXOP duration, what is the limit?

A: Not discussed here, in the past we said 2.5ms (for AC\_BK). The AP will advertise.

Q: AC\_BK's TXOP is very short, how can we fit multiple STAs?

A: Yes, agree, this is challenging. It depends on the data rate, but of course only few STAs will be allocated. Figure on slide 3 might be misleading, it might be broken into multiple TXOPs.

Q: Slide 3. STA transmit ID after polling. The ID may be from the upper layer, or given during association? If there is association, the AP can assign STAs to different SPs, and then the random access phase is not needed.

A: We don't make assumptions on the ID here, or if the STAs are associated. It can be randomly picked by the STA. If the AP knows who is present, no random access is needed.

### Presentation of IEEE 802.11-25/0091, frame format discussion follow up, Liwen Chu (NXP)

Q: You suggest using RFID frame format, which is an external spec. We cannot use an external document in the IEEE 802.11 spec.

A: This frame type is supposed to be not processed by the receiving MAC. It just checks the FCS, and then sends it to the upper layer, the information is not processed.

Q: So, we do not use the word "RFID".

A: The frame body is transpared to 11bp.

### Presentation of IEEE 802.11-25/0094, AMP device management, Liwen Chu (NXP)

C: You distinguish between RFID and active UL use case. We think the active UL tags will be very similar to RFID, association is not required. We think the difference between backscatter and active is not relevant.

A: Ok, but there might be also other use-cases. So TFS sync is not applied in this use case? If no association is needed, why do we need the TFS? Without association the STA has no ID.

C: We need to see. TFS is needed for the duty cycle. You can have a (random) ID without association.

Q: About the light beacon. What is the periodicity? The AMP STA needs to search for the beacon, which results in power consumption. Can we remove the beacon?

A: Assumed that beacon is needed, as in WUR spec.

Q: Slide 5, backscatter STAs don't need security. I think this is dangerous. Why do you think so?

A: MAC-layer security is not needed, as frame body is RFID. All other information needs no protection, it's only the header and FCS. The body is protected by the RFID security.

Q: You say RFID layer provides security. Is it authentication only, and no encryption?

A: It supports everything that RFID provides.

### Presentation of IEEE 802.11-25/0029, WPT Protocol, Wave and PPDU, Yinan Qi (OPPO)

C: Slide 5. Energizing should depend on the AMP STA. It might not have power.

A: Agree.

C: Energizer should report to the AP when it starts and stops the energizing. Also, an understanding is needed if communication and energizing at the same time is supported.

A: Start and stop can be included in the parameters.

C: Slide 8. It's complicated to associate to both AP and energizer, not feasible for simple devices.

A: I disagree. If there are many energizers and AMP STAs, a single transmission needs activation of all energizers.

C: This is an implementation issue. Association is a very heavy requirement.

A: This is not a traditional association. I just borrowed the word.

Q: Slide 8. The energizer is an AP?

A: No.

Q: But then a non-AP STA transmits to a non-AP STA?

A: Energizer transmits its own ID in the DL, which is feedback to the AP.

C: AP should control the energizer, but the source of the energy should be transparent to the STA.

### Presentation of IEEE 802.11-25/0012, WPT Waveform Comparison, Amichai Sanderovich (Wiliot)

Q: Using high bw pulses is good. The receiver has to have a wide bw to collect the energy, but this is in contrast to receive data.

A: This is only for energy, the circuit is only for harvesting, another circuit is used for communication.

Q: Do we need to specific a hard limit on the maximum time for the energy signal?

A: Location information for the energizer is important to comply to regulatory limits. The standard itself needs to give the location information, but not the regulatory limits.

Q: For short duty cycle and PPM all power is in a short time. Is there a problem for the transmitter's implementation, and for the regulation?

A: It depends a bit on the regulation, I don't think the peak power is limited, usually the average power is limited.

Q: We want to transmit 30dBm, if permitted. If duty cycle is 10%, then the peak power is 40dBm. Is this practical?

A: Thermal issue and power supply issue. Linearity is not a problem. There are such PAs, but we need to look if they are realistic to be used.

Q: Results are based on a certain harvesting model?

A: Based on a specific hardware.

### Presentation of IEEE 802.11-24/1916, Recap of Compact Secure Transaction Methods for AMP, Hui Luo (Infineon)

No time for Q&A.

## Recess

The chair announced the session recessed at 10:00.

# Thursday PM1 (2025-01-16T13:30)

## Opening

The TG Chair, Bo Son (Sanechips), presents the TG bp meeting agenda slides (IEEE 802.11-24/1997r5).

* Chair calls the meeting to order at 13:30.
* Chair instructs members to record attendance in IMAT.
* Chair reviews the meeting rules and patent policy (slides 2-8).
* No response to the call for patents.
* Chair reviews IEEE-SA COPYRIGHT POLICY (slides 9-10)
* Chair reviews other Guidelines, Participation, Suggested Best Practices, and Registration (slides 11-14).
* Chair reviews the agenda for the meeting slot.

## Agenda

Chair presents the agenda of the session: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r5 (slide 37).

* 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
* SPs and Motions (TG motions refer to 11-24/1322)
* Timeline review
* Teleconference plan
* Any other business?
* Adjourn

Chair calls for approval of the agenda of the TGbp session.

Removal of 11-25/0096 from the agenda (contribution is deferred), no objection, agenda approved.

Chair explains the procedure and rules regarding SPs and Motions.

## Straw Polls

See also https://mentor.ieee.org/802.11/dcn/24/11-24-1997r6, slides 38ff

### SP 1.1

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines an “AMP AP STA”
    - AMP non AP STAs may or may not communicate with AMP AP STA without association
    - The AMP AP STA may or may not provide access to the DS for the AMP non AP STA
  + Note: the AMP AP STA may be part of an access point

*[Reference contribution: 11-25/0055r1, 11-24/1537r2]*

Q: Name is TBD. But the next two bullets use the name. This is contradicting.

A: Functionality is defined in the references.

C: Backscatter use-case does not need this AP / access to the DS. Reader can just consume the message. The SP does not reflect this.

A: Disagree.

C: All agree there will be an AMP AP STA. Remove "(name TBD)".

C: Not all cases need that, this is correct. But the SP only says "can". Suggest to change to "may or may not".

Final SP shown above.

Result: No objection.

### SP 1.2

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines communication between AMP non-AP STA and AMP AP STA through 11bp frames

*[Reference contribution: 11-25/0055r1, 11-24/1537r2]*

Q: Why only "non AP STA" specifically?

C: Suggest to delete "non AP".

C: Suggest to change to "communication between AMP non-AP STA and AMP AP STA".

Final SP shown above.

Result: No objection.

### SP 2.1

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines a mechanism to allow an AP to solicit AMP uplink PPDU(s) from one or more 802.11bp clients.

*[Reference contribution: 11-24/2113r0]*

Result: No objection.

### SP 2.2

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines a Time Division Multiple Access (TDMA) mechanism for multiple 802.11bp clients to transmit AMP uplink PPDU(s).

*[Reference contribution: 11-24/2113r0]*

Result: No objection.

### SP 2.3

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines a slotted ALOHA based procedure to enable multiple clients to access the medium to send uplink AMP PPDU(s).

*[Reference contribution: 11-24/2113r0]*

C: Need more time to think about it. In 11ax we have UORA, which is also triggered. Not sure we did enough evaluation on what scheme is the best.

Q: Mechanism is for active AMP STAs only?

A: It's applicable to both.

C: For backscattering we've proposed to used RFID-type of channel access. Need to check if this is in conflict.

SP is deferred.

### SP 2.4

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines a a mechanism to support secure communications for 802.11bp clients.

*[Reference contribution: 11-24/2112r0]*

Result: No objection.

### SP 3.1

* Do you agree to include the following text to the security sub-clause of the 11bp SFD?
  + IEEE 802.11bp will specify secure data communication methods that do not require maintaining security associations.
  + Note:
    - The details are TBD.
    - The security communication methods for backscatter devices is TBD.

*[Reference contribution: 11-24/0178, 11-24/0526, 11-24/0871, 11-24/1242, 11-24/1998, 11-24/1916]*

C: Requested to remove the first two sub-bullets.

C: Have some concerns about the details, request to defer.

C: For the RFID use-case we might just use the RFID security. Hence, we will only have the frame control field and the FCS. No need to have another security protection in the MAC layer.

C: Suggest to add text on backscatter devices.

SP author requests recorded SP.

Final SP shown above.

Result (Y / N / A): 50 / 27 / 30

### SP 3.2

* Do you agree?
  + IEEE 802.11bp will specify ASCON-128 as an optional cipher for 802.11bp STAs.
  + IEEE 802.11bp will specify BIP-ASCON-128 as an optional authentication-only cipher for 802.11bp STAs

*[Reference contribution: 11-24/1584, 11-24/1998, 11-24/1916]*

SP is intended for information collection only.

C: Baseline 802.11 uses AES series for encryption and authentication. Not sure we need to change that.

C: Need to evaluate. For a short-term session this does not add too much value.

A: ASCON is an official standard, adopted in 802.15 as well. We would like to understand if people can accept it, as it consumes 1/3 power and is faster.

C: We should put something in for the AP.

Result (Y / N / A): 17 / 29 / 44

### SP 4.1

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines one mode of backscattering without carrier center frequency shift.

*[Reference contribution: 11-25/0058r1]*

Result: No objection.

### SP 5.1

* Do you agree to include the following text to the 11bp SFD?
  + The preamble of an AMP DL PPDU includes L-STF, L-LTF, L-SIG, RL-SIG, and U-SIGs for AMP enabled non-AP STA and active TX non-AP AMP STA in 2.4GHz

*[Reference contribution: 11-24/1859r0]*

Q: This does not fit sub-1GHz, should be limited to 2.4GHz.

Final SP shown above.

Result: No objection.

### SP 6.1

* Do you agree to include the following text to the 11bp SFD?
  + Backscatter non-AP AMP STA: A non-AP AMP STA that is capable of receiving only AMP Downlink PPDUs and supports uplink backscatter transmission.
  + Active Tx non-AP AMP STA: A non-AP AMP STA that is capable of receiving only AMP Downlink PPDUs and supports active transmission of AMP Uplink PPDUs.
  + AMP Enabled non-AP STA: A non-AP STA (e.g. non-HT, HT or HE STA) that is also capable of receiving AMP Downlink PPDUs

*[Reference contribution: 11-24/1846r2]*

Q: Last sub-bullet. Do we need "Enabled"?

A: It's more specific in this way.

Result: No objection.

### SP 6.2

* Do you agree to include the following text to the 11bp SFD?
  + 11bp supports a mode of operation in which a sub-set of the logical interface of the UHF RFID Standard is used for backscattering communication.
    - Applicable UHF commands are encapsulated in 802.11bp frames.
    - Applicable to both mono-static & bi-static backscattering.
    - The sub-set of the logical interface to be reused is TBD.
    - NOTE – The logical interface of the UHF RFID Standard is defined by the EPC® Radio-Frequency Identity Generation-2 UHF RFID Standard.

*[Reference contribution: 11-25/0045r0]*

C: SPs refers to a published specification, it's illegal to mention it in our document.

A: The standard refers to many other (public available) standards, e.g., 3GPP, ETSI, etc. The chair rules that this is procedurally allowed.

C: First sub-bullet, restrict to "bp" frames.

C: Restricts AMP frame format, request to defer.

A: SP talks about "a mode of operation", does not preclude other modes.

Result (Y / N / A): 45 / 13 / 34.

### SP 6.3

* Do you agree to include the following text to the 11bp SFD?
  + 802.11bp supports a mode of operation that use a time-slot based channel access mechanism for Active Tx non-AP AMP STA.

*[Reference contribution: 11-25/0046r0]*

Q: How is this different from SP 2.2?

Author defers SP.

### SP 7.1

* Do you agree to include the following text to the 11bp SFD?
  + The (3dB) bandwidth of the AMP DL PPDU in 2.4 GHz is at least 10 MHz for backscattering communication. The transmit spectrum mask is TBD.

*[Reference contribution: 11-25/0050r1, 11-25/0051r1]*

C: Current RFID standards use continuous wave. I would like to have more information about the feasibility. It will work for a frequency shifted version.

A: This is for 2.4 GHz.

C: We support it, we might as well add non-backscatterin communication.

A: We agree but received feedback that other companies need more time to evaluate for active STAs.

Result (Y / N / A): 41 / 11 / 40

### SP 8.1

* Do you agree to include the following text to the 11bp SFD?
  + 11bp defines the following data rates for AMP uplink transmissions at 2.4GHz
    - 250kbps and 1Mbps for both backscatter and non-backscatter uplink transmission;
    - 4Mbps for non-backscatter uplink transmission only.
      * Mandatory or optional is TBD

*[Reference contribution: 11-25/0033r0, 11-25/0027r0]*

C: Make 4Mbps optional, or "mandatory/optional TBD".

C: It should be optional for the receiver.

Final SP text shown above.

Result: No objection.

### SP 8.2

* Do you agree to include the following text to the 11bp SFD?
  + If an AMP device is able to support TSF, it can monitor AMP DL Frame in a duty-cycle manner.

*[Reference contribution: 11-25/0032r0, 11-25/0039r0]*

Result: No objection.

### SP 8.3

* Do you agree to include the following text to the 11bp SFD?
  + IEEE 802.11bp defines a TDM multiple access mechanism for AMP.
    - FDM and CDM are TBD.

*[Reference contribution: 11-25/0031r0]*

Author defers the SP.

### SP 9.1

* Do you agree to include the following text to the 11bp SFD?
  + 11bp supports a MAC mechanism to enable an ID to be assigned to an Active Tx No-AP AMP STA.
    - Conditions for ID allocation are TBD.

*[Reference contribution: 11-25/0041r1]*

C: Not sure what ID this is. Is it an association ID? This is too vague.

A: We talked about the ID in the presentation.

C: Better to restrict to active UL transmission.

Result (Y / N / A): 38 / 32 / 24

### SP 10.1

* Do you agree to include the following text to the 11bp SFD?
  + The AMP STA shall meet a minimal harvester sensitivity.

*[Reference contribution: 11-25/?]*

Author defers SP.

### SP 10.2

Do you agree that a passive BS AMP STA shall meet a minimum harvester sensitivity enabling full capacitor re-charge with a threshold of: -20 dBm, -22 dBm, -24 dBm, or -26 dBm?

Author defers SP.

### SP 11.1

* Do you agree to include the following text to the 11bp SFD?
  + IEEE 802.11bp defines at least one AMP-Sync in the AMP Downlink PPDU in 2.4 GHz for backscatter communication, and at least one AMP-Sync in the AMP Downlink PPDU in 2.4 GHz for non-backscatter communication. The AMP-Sync is independent of the integrated and non-integrated deployment.

*[Reference contribution: 11-25/0047r0]*

C: Suggest to remove "field".

C: "AMP-Sync" also includes duration and structure of the symbols etc.

C: If it is not a sequence, what is it?

A: It's more than a sequence.

Final SP text shown above.

Result: No objection.

### SP 12.1

* Do you agree to include the following text to the 11bp SFD?
  + IEEE 802.11bp defines an AMP Energizer that contains an Energizing Function, which is capable of transmitting WPT waveform and/or excitation waveform for backscattering operation. Additionally, the AMP Energizer may contain or be co-located (which one is TBD) with an IEEE 802.11 non-AMP non-AP STA.
  + Note: WPT waveform is transmitted over sub1-GHz. Depending on whether the backscattering operation happens in sub1-GHz or 2.4GHz, accordingly the excitation waveform will be transmitted in the same band.

*[Reference contribution: 11-24/1767r0, 11-25/0037r0]*

Result: No objection.

### SP 12.2

* Do you agree to include the following text to the 11bp SFD?
  + IEEE 802.11bp defines a mechanism that allows control information to be sent by the AMP AP STA to the AMP Energizer. The control information is TBD.

*[Reference contribution: 11-24/1208r1, 11-24/1769r0, 11-25/0037r0]*

C: Clarify who sends the control information. Is it the AP?

A: Intention is that the AP sends it, but AP for bp is not defined yet.

C: Suggest deferring until AP is defined.

A: Solomon's SP define the AMP AP STA. Suggest using this.

Final SP as shown above.

Result: No objection.

### SP 12.3

* Do you agree to include the following text to the 11bp SFD?
  + IEEE 802.11bp defines a mechanism that allows an AMP non-AP STA to report its energy harvesting and power related information to AMP AP STA. The parameters that are included in the report and how to report such information is TBD.

*[Reference contribution: 11-24/1208r1, 11-24/1381r0, 11-24/1524r2, 11-24/1539r0, 11-24/1561r2, 11-24/1769r0, 11-24/1781r2, 11-24/1939r0]*

C: We have not seen yet clear benefits for such mechanism. Prefer to defer.

A: Presentation shows huge savings of the energizer.

C: Need to mention to whom it is reported.

Result (Y / N / A): 59 / 6 / 29

## Motions

See document IEEE 802.11-24/1322r6.

### Motion #22

Moved: Solomon Trainin, Seconded: Weijie Xu

Result: unanimous consent

### Motion #23

Moved: Solomon Trainin, Seconded: Weijie Xu

Result: unanimous consent

### Motion #24

Moved: Sanket Kalamkar, Seconded: Rojan Chitrakar

Result: unanimous consent

### Motion #25

Moved: Sanket Kalamkar, Seconded: Solomon Trainin

Result: Deferred.

### Motion #26

Moved: Sanket Kalamkar, Seconded: Solomon Trainin

Result: passed with unanimous consent

### Motion #27

Moved: Rui Cao, Seconded: Bin Qian

Result: passed with unanimous consent

### Motion #28

Moved: Youwei Chen, Seconded: Sebastian Max

Result: passed with unanimous consent

### Motion #29

Moved: Rojan Chitrakar, Seconded: Sebastian Max

Result: passed with unanimous consent

### Motion #30

Moved: Panpan Li, Seconded: Sebastian Max

Result: passed with unanimous consent

### Motion #31

Moved: Yinan Qi, Seconded: Sebastian Max

Result: passed with unanimous consent

### Motion #32

Moved: Yinan Qi, Seconded: Amichai Sanderovich

Result: passed with unanimous consent

### Motion #33

Moved: Bin Qian, Seconded: Yinan Qi

Result: passed with unanimous consent

### Motion #34

Moved: Ian Bajaj, Seconded: Weijie Xu

Result: passed with unanimous consent

### Motion #35

Moved: Ian Bajaj, Seconded: Yinan Qi

Result: passed with unanimous consent

### Motion #36

Moved: Ian Bajaj, Seconded: Sebastian Max

Result: passed with unanimous consent

## Current Timeline

Chair reviews the current timeline: https://mentor.ieee.org/802.11/dcn/24/11-24-1997r5 (slide 57)

## Teleconference Plan

* Feb 11th (Tuesday), 9:00am, ET, 2 hours; Webex
* Feb 25th (Tuesday), 9:00am, ET, 2 hours; Webex
* Mar 4th (Tuesday), 9:00am, ET, 2 hours; Webex

Teleconference will take place if there is at least one submission to be presented.

## Adjourn

The chair announced the session adjourned at 15:30.

Next session will be the teleconference on February 11th.

Next hybrid (face to face & online) session will be the IEEE 802 plenary meeting in March.