IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Minutes 802.11 bn PHY ad hoc – Warsaw F2F May 2024 | | | | |
| Date: 22 May 2024 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Sigurd Schelstraete | MaxLinear |  |  | sschelstraete@maxlinear.com |

Abstract

This document contains the PHY ad hoc meeting minutes for sessions held during the May 802.11 interim session in Warsaw:

* Tuesday May 14th, 2024, AM2
* Tuesday May 14th, 2024, PM1
* Wednesday May 15th, AM1
* Wednesday May 15th, AM2
* Thursday May 16th, AM1
* Thursday May 16th, AM2

# Tuesday May 14th, 2024, AM2

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 10:30am.
2. The Chair follows the agenda in IEEE 802.11-24/0653r5.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda.
   * [24/0728](https://mentor.ieee.org/802.11/dcn/24/11-24-0728-00-00bn-thoughts-on-dru-pilots.pptx) Thoughts on DRU Pilots Mengshi Hu
   * [24/0736](https://mentor.ieee.org/802.11/dcn/24/11-24-0736-00-00bn-preamble-and-pe-transmission-in-ppdu-using-dru.pptx) Preamble and PE transmission in PPDU using DRU Yapu Li
   * [24/0749](https://mentor.ieee.org/802.11/dcn/24/11-24-0749-00-00bn-thoughts-on-stf-design-for-dru.pptx) Thoughts on STF Design for DRU Bo Gong
   * [24/0752](https://mentor.ieee.org/802.11/dcn/24/11-24-0752-00-00bn-stf-design-consideration-for-dru.pptx) STF design consideration for dRU Lin Yang
   * [24/0766](https://mentor.ieee.org/802.11/dcn/24/11-24-0766-00-00bn-distribution-bandwidth-within-80-mhz-for-dru.pptx) Distribution Bandwidth within 80 MHz for DRU Eunsung Park
   * [24/0767](https://mentor.ieee.org/802.11/dcn/24/11-24-0767-00-00bn-20-mhz-tone-plan-and-pilot-design-for-dru-follow-up.pptx) 20 MHz Tone Plan and Pilot Design for DRU Follow Up Eunsung Park

**Technical contributions**

**24/0728r2 Thoughts on DRU Pilots (Mengshi Hu)**

Various pilot design methods are reviewed.

No SPs

Q&A

Q: what are squeezed pilots?

A: based on description of previous methods. Similar to clustered.

Q: do you have one method that you want to propose? So other people can evaluate.

A: see other submission with specific proposal

**24/0736r0 Preamble and PE transmission in PPDU using DRU (Yapu Li)**

How should PPDU’s Preamble and PE be transmitted to match the performance/power boost of Data?

The SIG field is duplicated over all the 20 MHz channels which overlaps with the DRU assigned to the STA.

Q&A

Q: STF using the same tones as data tones? Does this mean new sequence?

A: we may use EHT-STF sequence

Q: what if tones in LTF and DRU are not the same?

Q: generally agree. For UHR-LTF there are some proposals talking about alternatives.

**24/0749 Thoughts on STF Design for DRU (Bo Gong)**

The part of STF sequence overlapped with DRU is transmitted during UHR-STF. However there are issues with this.

Q&A

Q: how to apply shift value to each RU for 1-8 DRUs?

A: will show further analysis

Q: can we design DRU tone sets such that they all have equal # of STF tones?

A: don’t know – there are many constraints already

SPs will be harmonized offline before running them.

**24/0752 STF design consideration for dRU (Lin Yang)**

Multiple DRUs over same distribution BW transmitting the same STF signal may cause unintentional beamforming. Global CSD is needed.

Q&A

Q: This is an OFDMA DRU case. One user may have multiple streams. Have you considered MU-MIMO in DRU?

A: for further discussion. Each DRU will have distinct index if possible.

Q: worth to see performance analysis of CSD.

Q: reused 8 CSD values if Nuser > 8. Maybe need to define more than 8 CSD values.

**24/0766 Distribution Bandwidth within 80 MHz for DRU (Eunsung Park)**

Distribution bandwidth modes allowed within an 80 MHz channel for DRU are discussed, considering the following cases: Non-puncturing, Preamble puncturing, Hybrid PPDU.

Q&A

Some clarification questions

**Recess**

The meeting is recessed at 12:26 pm.

# Tuesday May 14th, 2024, PM1

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 1:30pm.
2. The Chair follows the agenda in IEEE 802.11-24/0653r5.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda.
   * [24/0767](https://mentor.ieee.org/802.11/dcn/24/11-24-0767-00-00bn-20-mhz-tone-plan-and-pilot-design-for-dru-follow-up.pptx) 20 MHz Tone Plan and Pilot Design for DRU Follow Up Eunsung Park
   * [24/0769](https://mentor.ieee.org/802.11/dcn/24/11-24-0769-00-00bn-on-the-pilot-tone-allocations-in-dru.pptx) On the Pilot Tone Allocations in DRU Mahmoud Kamel
   * [24/0790](https://mentor.ieee.org/802.11/dcn/24/11-24-0790-00-00bn-extra-drus-construction.pptx) Extra dRUs Construction Zhi Mao
   * [24/0799](https://mentor.ieee.org/802.11/dcn/24/11-24-0799-00-00bn-dru-tone-plan-from-the-perspective-of-papr.pptx) DRU Tone Plan from the perspective of PAPR Chenchen Liu
   * [24/0800](https://mentor.ieee.org/802.11/dcn/24/11-24-0800-02-00bn-dsicussions-on-dru-pilot-design-principles.pptx) Discussions on DRU pilot design principles Chenchen Liu
   * [24/0801](https://mentor.ieee.org/802.11/dcn/24/11-24-0801-00-00bn-discussion-on-distribution-bandwidth-of-dru.pptx) Discussion on Distribution Bandwidth of DRU Mengshi Hu
   * [24/0814](https://mentor.ieee.org/802.11/dcn/24/11-24-0814-00-00bn-tone-distribution-in-drus.pptx) Tone distribution in DRUs Yan Xin
   * [24/0882](https://mentor.ieee.org/802.11/dcn/24/11-24-0882-00-00bn-thoughts-on-dru-availability.pptx) Thoughts on DRU Availability Yusuke Asai

**Technical contributions**

**24/0767 20 MHz Tone Plan and Pilot Design for DRU Follow Up (Eunsung Park)**

Proposal for a 20 MHz DRU tone plan and its pilot tones. Compared with other proposals. Proposed tone plan may be more desirable based on the mirror symmetric property.

Q&A

Q: why does one DRU appear to perform worse?

A: not sure

Q: proposed DRU not contained in 20 MHz subblock

Q: we need to decide which DRU data tone mapping we will use before deciding on pilots. Mirror symmetric should be clarified and why is it useful.

Q: similar question. Not clear about value of symmetry between different DRUs.

A: less memory needed to store patterns

**24/0769 On the Pilot Tone Allocations in DRU (Mahmoud Kamel)**

Impact on the performance of phase tracking for different pilot patterns.

Distributed pilot designs perform slightly better than clustered pilot design. A criterion to distinguish the best pilot design is required.

Q&A

Q: we have large freedom to design pilots.

Q: prefer option 1 to option 2, simplifies the signaling

Q: what is the residual CFO?

A: +/- 300 Hz

**24/0790 Extra dRUs Construction (Zhi Mao)**

Some dRU tone plan designs have low utilization efficiency. There can be at most nine 52-tone dRUs in a 40 MHz PPDU. An extra 52-tone dRU can be defined and should be allocated a new dRU index.

Q&A

Q: in some tone plans there are no extra RRUs.26 RRU is not defined in 80 MHz.

A: you can find 52 tones and divide it in 26-tone RUs.

Q: now tone plan will be different from RRU

**24/0799 DRU Tone Plan from the perspective of PAPR (Chenchen Liu)**

With a GCD of 16, the signal repeats every 0.8us. Some receivers may trigger packet detection because of this. Avoid by having a GCD of 8.

Proposed DRU Tone Plan for 80MHz, 160 MHz, … proposal has low PAPR,

Q&A

Some clarification questions

**24/0800 Discussions on DRU pilot design principles (Chenchen Liu)**

Discuss some additional pilot design principles that are intended to enhance performance further. Adheres to all design principles.

Q&A

Q: symmetry should not be defined relative to other DRUs.

A: channel impairments are symmetric around DC.

**24/0801 Discussion on Distribution Bandwidth of DRU (Mengshi Hu)**

Small RUs less important than large RUs. DWB of 160 MHz should be supported.

Proposals for modes in DWB of 80 MHz are included.

SP deferred.

**Recess**

The meeting is recessed at 3:22 pm.

# Wednesday May 15th, 2024, AM1

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 8:00 am.
2. The Chair follows the agenda in IEEE 802.11-24/0653r8.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda.
   * [24/0814](https://mentor.ieee.org/802.11/dcn/24/11-24-0814-00-00bn-tone-distribution-in-drus.pptx) Tone distribution in DRUs Yan Xin
   * [24/0882](https://mentor.ieee.org/802.11/dcn/24/11-24-0882-00-00bn-thoughts-on-dru-availability.pptx) Thoughts on DRU Availability Yusuke Asai
   * [23/1906](https://mentor.ieee.org/802.11/dcn/23/11-23-1906-01-00bn-channel-information-feedback-for-smooth-beamforming-follow-up.pptx) Channel Information Feedback for Smooth Beamforming - Follow Up Jeon Eunsung
   * [24/0224](https://mentor.ieee.org/802.11/dcn/24/11-24-0224-01-00bn-discussion-on-a-ppdu-follow-up.pptx) Discussion on A-PPDU follow-up Ross Jian Yu
   * [24/0431](https://mentor.ieee.org/802.11/dcn/24/11-24-0431-02-00bn-signal-for-preemption-request.pptx) Signal for preemption request Xiangxin Gu

**Technical contributions**

**24/0814 Tone distribution in DRUs (Yan Xin)**

This contribution proposes a systematic and generic design method by using the interleaving technique for uniform or near-uniform tone distribution in DRUs

Q&A

Q: is mapping dependent on DBW?

A: yes

Q: Studied this before. issue is that this tone distribution will cause power loss. Also issues with pilot tones.

**24/0882 Thoughts on DRU Availability (Yusuke Asai)**

To maximize availability of DRU in various regulatory domains, it is beneficial to make the specification of DRU as flexible as possible in advance.

Q&A

Q: how will regulation deal with OFDMA?

A: we need to be flexible

**Straw polls on DRU**

SP1:

Do you agree to include the following text to the 11bn SFD?

DRU tone plan design on distribution BW 20 MHz and 40 MHz is 26-tone RU based DRU method (using 26-tone DRUs as basic building blocks)

* DRU tone plan design on other distribution BW is TBD

Q&A

Q: do we care about the design method? We need the actual tone indices.

A: will come later

Q: 26-tone method is not defined.

A: it’s in the submission

Passed by unanimous consent

SP2:

Do you agree to include the following text to the 11bn SFD?

* The UHR-STF for DRU in a TB PPDU uses 11ax/11be trigger based STF sequences

Passed by unanimous consent

SP3:

Do you agree to include the following text to the 11bn SFD?

* For UHR-STF corresponding to distribution bandwidth for DRU
  + STF sequence depends on PPDU BW
  + Occupied STF tones are the same as that of the largest RRU corresponding to the distribution BW within the PPDU BW

Passed by unanimous consent

SP4:

Do you agree to include the following text to the 11bn SFD?

* Global CSD is used for DRU UHR-STF transmission to solve unintentional beamforming issue
  + Global CSD is applied in each distribution BW

Ref: 24/0749r2 and 24/0752r2

Passed by unanimous consent

SP5:

Do you agree to include the following text to the 11bn SFD?

* DRU transmission reuses the 8 CSD table/values in 11ax/11be for global CSD allocation

Passed by unanimous consent

SP6:

Do you agree to include the following text to the 11bn SFD?

* In a non-punctured 80 MHz PPDU, the following distribution bandwidth modes are allowed for DRU:
  + 80 MHz
  + 20 MHz + 20 MHz + 40 MHz (or 40 MHz + 20 MHz + 20 MHz)

Passed by unanimous consent

**23/1906 Channel Information Feedback for Smooth Beamforming - Follow Up (Jeon Eunsung)**

A modified feedback format may avoid phase jumps in the channel feedback.

Q&A

Q: Don’t see much value on AP doing smoothing for the STA.

**Recess**

The meeting is recessed at 10:00 am

# Wednesday May 15th, 2024, AM2

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 10:00 am.
2. The Chair follows the agenda in IEEE 802.11-24/0653r9.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda
   * [24/0224](https://mentor.ieee.org/802.11/dcn/24/11-24-0224-01-00bn-discussion-on-a-ppdu-follow-up.pptx) Discussion on A-PPDU follow-up Ross Jian Yu
   * [24/0431](https://mentor.ieee.org/802.11/dcn/24/11-24-0431-02-00bn-signal-for-preemption-request.pptx) Signal for preemption request Xiangxin Gu
   * [24/0435](https://mentor.ieee.org/802.11/dcn/24/11-24-0435-00-00bn-ideas-related-to-achieving-ultra-high-reliability.pptx) Ideas related to achieving (Ultra) High Reliability Leif Wilhelmsson
   * [24/0812](https://mentor.ieee.org/802.11/dcn/24/11-24-0812-01-00bn-using-multi-layer-transmission-with-legacy-devices.pptx) Using Multi-Layer Transmission with Legacy Devices Leif Wilhelmsson
   * [24/0774](https://mentor.ieee.org/802.11/dcn/24/11-24-0774-00-00bn-uhr-preamble-design-follow-up.pptx) UHR preamble design follow-up Sigurd Schelstraete
   * [1985r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1985-03-00bn-longer-ldpc-codeword.pptx) Longer LDPC Codeword Rethna Pulikkoonattu
   * [873r0](https://mentor.ieee.org/802.11/dcn/24/11-24-0873-00-00bn-design-targets-and-considerations-for-enhanced-long-range.pptx) Design Targets and Considerations for Enhanced Long Range Jianhan Liu

**Technical contributions**

**24/0224 Discussion on A-PPDU follow-up (Ross Jian Yu)**

TB A-PPDU of HE TB PPDU and EHT TB PPDU is doable with no further efforts. Other modes need further work.

HE 80 + HE 80 and HE 160 + UHR 160 can double the Tput. The case of HE 80 + HE 80 + UHR 160 can result in a four times Tput gain.

Q&A

Q: SST is not defined. Don’t think it should be defined for UHR. Why not consider EHT + UHR? Once we have this mechanism, we could use it.

A: possible. EHT already has 320 MHz.

Q: want to see rapid adoption of new generations. This feature encourages opposite behavior.

A: we are improving the new generations to work better with legacy devices

Q: let the market decide which standard to use. Should provide the tools. Support including

EHT.

SP1

Do you agree to include the following into the 11bn SFD?

* 11bn defines frequency domain aggregation of PPDUs. A frequency domain aggregated PPDU consists of multiple PPDUs.
  + The PPDU format combinations are TBD.
  + The number of PPDUs is TBD.

Y/N/A: 69/20/8

**24/0431 Signal for preemption request (Xiangxin Gu)**

ZC sequences are proposed for preemption request. ZC sequence has been used as msg1 in LTE/NR for contention free random access.

SP deferred

Q&A

Q: first need to consider the feature, before the technical detail.

Q: if there is an OBSS, I need to wait for the other BSS to finish and my BSS to start TXOP.

A: feature as proposed here does not help in the scenario you describe.

**24/0435 Ideas related to achieving (Ultra) High Reliability (Leif Wilhelmsson)**

Bits that require higher reliability can be mapped to the more robust bits of the constellation. Simulation results are presented.

Q&A

Q: do SNR curves depend on receiver type?

A: No, independent

Q: this was proposed earlier for 11be. What is different now?

A: in 11be, the goal was to increase data rate. This helps with reliability.

Q: targeted for SU?

A: doesn’t have to be. Could be for broadcast or two different QoS requirements.

Q: do the bits have different priorities from the MAC

A: this is just simulation. How to line up is not considered.

Q: is there padding?

A: not in this simulation

Q: code rate used do not exist for 256 QAM. Do you expect similar gain with other code rates?

A: yes, gain does not come from coding

Q: different CW assigned to different layers. How is this useful?

A: don’t confuse layer and stream. CWs are not linked to streams. Two sets of data should come from the MAC.

SP deferred

**24/0812 Using Multi-Layer Transmission with Legacy Devices (Leif Wilhelmsson)**

The multi-layer concept can be used also with legacy devices in a way that is transparent for the legacy devices. The idea is to enable legacy RX to receive the N most robust bits of the multi-layer transmission.

Q&A

Q: could this affect algorithms such as equalizer normalization, … that depend on noise measurement?

A: yes

Q: why send higher modulation and only decode some bits?

A: there is additional information for another user.

**24/0774 UHR preamble design follow-up (Sigurd Schelstraete)**

Proposes to use a mix of PHY Version ID to avoid duplication and optimize available bits in preamble for new features.

Q&A

A: Need to consider MU PPDUs as well

**873r0 Design Targets and Considerations for Enhanced Long Range (Jianhan Liu)**

Proposes rate and reach targets for enhanced long range mode.

Q&A

Q: agree with enhance long range. Is this just single stream?

A: open, but single stream makes more sense.

**Recess**

The meeting is recessed at 10:00 am

# Thursday May 16th, 2024, AM1

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 8:00 am.
2. The Chair follows the agenda in IEEE 802.11-24/0653r11.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda
   * [24/0873](https://mentor.ieee.org/802.11/dcn/24/11-24-0873-00-00bn-design-targets-and-considerations-for-enhanced-long-range.pptx) Design Targets and Considerations for Enhanced Long Range Jianhan Liu
   * [24/0508](https://mentor.ieee.org/802.11/dcn/24/11-24-0508-00-00bn-extended-6-ghz-channelization.pptx) Extended 6 GHz channelization Thomas Derham
   * [24/0750](https://mentor.ieee.org/802.11/dcn/24/11-24-0750-00-00bn-tx-evm-setting-for-mimo-detection.pptx) Tx EVM Setting for MIMO Detection Genadiy Tsodik
   * [24/0810](https://mentor.ieee.org/802.11/dcn/24/11-24-0810-03-00bn-dpwifi-mimo-multiplexing-and-beamforming.pptx) DPWiFi MIMO Multiplexing and Beamforming Carlos Rios
   * [24/1985](https://mentor.ieee.org/802.11/dcn/23/11-23-1985-03-00bn-longer-ldpc-codeword.pptx) Longer LDPC Codeword Rethna Pulikkoonattu
   * [24/0869](https://mentor.ieee.org/802.11/dcn/24/11-24-0869-00-00bn-beamforming-feedback-for-ul-beamforming.pptx) Beamforming Feedback for UL Beamforming Leonardo Lanante

**Technical contributions**

**24/0873 Design Targets and Considerations for Enhanced Long Range (Jianhan Liu) - cont**

Q&A

Q: range extension is good topic. We proposed relay. From phy perspective, we need to distinguish ppdu formats. I didn’t see the method to distinguish.

A: legacy preamble is to spoof towards legacy STAs. How to identify could be in ER preamble. Need to see if ER preamble meets the requirements.

Q: relay can not solve every problem. Want to be able to connect directly.

Q: useful also for management frame?

A: could be. Only for low rate and long range.

Q: why extend in DL?

A: could be used instead of 11b

Q: what if legacy preamble is the bottleneck? Do we need parallel detection?

A: could think about it

Q: We could limit min data rate of the BSS to limit the imbalance issue. Multi-AP architecture could help. Group needs to know more details to verify the feasibility. Hard to justify whether we need this or not.

A: multi-AP doesn’t solve the imbalance issue.

Q: very low data rate affects the efficiency of the whole network

A: you can send short packets to ask to be triggered.

SP deferred

**24/1985r3 Longer LDPC Codeword (Rethna Pulikkoonattu)**

This submission proposes Low-Density-Parity-Check (LDPC) codes with a block length of 3888 bits (2x1944) for UHR. Support all the 4 code rates defined in 802.11be.

The performance vs complexity trade off suggests that block-length of 2x1944 bits is a sweet spot.

Simulations for various cases, with several impairments. Code tries to reuse existing structures as much as possible.

Q&A

Q: how many CW were run in the simulations? Decoding algorithm is standard BP?

A: at least 4 CW, 5000 channel realizations. Standard BP is used.

Q: need more time to evaluate.

Q: 4x will bring it close to 5G codes

A: we looked at 4x, gains are not that compelling. Complexity increases. 4x also has some delay constraints.

**24/0508 Extended 6 GHz channelization (Thomas Derham)**

Proposes to slightly extend the channelization in 6 GHz (up to 7.25 GHz). The availability of this range for unlicensed operation would enable one additional 160 MHz channel.

Q&A

Q: even if defined, use of bands wouldn’t be allowed currently?

A: correct, but useful to signal intent.

Q: just used for 11bn?

A: not necessarily.

**24/0750 Tx EVM Setting for MIMO Detection (Genadiy Tsodik)**

Lower (improved) Tx EVM may lead to an improvement of 3-8dB compared with operating at standard Tx EVM. Should be known to Rx to be able to exploit the gain. A possible solution may be a new Tx EVM table and/or a simple mechanism that allows a receiver to indicate the required Tx EVM per transmission.

Q&A

Q: Tx would signal that they are using a better TxEVM? Is this normative requirement on Tx?

A: better for Rx to indicate which TxEVM should be used. Tx could indicate that it is capable or not.

Q: this sounds ill-defined.

A: can discuss further

Q: TxEVM is a vague number. May depend on whether it’s driven by e.g. non-linearity, …

A: believe that main contributor is non-linear components.

Q: make EVM more aggressive or relax it?

A: improve EVM

Q: need more time. Which EVM should I use when sending a packet?

SP deferred.

**Recess**

The meeting is recessed at 10:00 am

# Thursday May 16th, 2024, AM2

**Introduction**

1. The Chair (Dongguk Lim, LGE) calls the meeting to order at 10:30 am.
2. The Chair follows the agenda in IEEE 802.11-24/0653r12.
3. The Chair goes through the IPR policy and asks if anyone is aware of any potentially essential patents. **Nobody speaks up.**
4. The Chair goes through the Copyright policy.
5. The Chair reminds everyone to report their attendance by using IMAT system and by sending an e-mail to the Co-chair, Tianyu Wu (Apple), Sigurd Schelstraete (MaxLinear) or the Chair himself if unable to record attendance via IMAT system.
6. Discussions on the agenda
   * [24/0810](https://mentor.ieee.org/802.11/dcn/24/11-24-0810-03-00bn-dpwifi-mimo-multiplexing-and-beamforming.pptx) DPWiFi MIMO Multiplexing and Beamforming Carlos Rios [cont.]
   * [24/0869](https://mentor.ieee.org/802.11/dcn/24/11-24-0869-00-00bn-beamforming-feedback-for-ul-beamforming.pptx) Beamforming Feedback for UL Beamforming Leonardo Lanante
   * [24/0875](https://mentor.ieee.org/802.11/dcn/24/11-24-0875-00-00bn-uhr-enhanced-long-range-support.pptx) UHR-enhanced-long-range-support Rui Cao
   * [24/0921](https://mentor.ieee.org/802.11/dcn/24/11-24-0921-00-00bn-an-enhanced-long-range-ppdu.pptx) An Enhanced Long Range PPDU Wook Bong Lee
   * [24/0876](https://mentor.ieee.org/802.11/dcn/24/11-24-0876-00-00bn-uhr-ppdu-phy-version.pptx) UHR-PPDU-PHY-Version Rui Cao
   * [24/0001](https://mentor.ieee.org/802.11/dcn/24/11-24-0001-00-00bn-dl-mu-ext-ppdus.pptx) DL MU Ext PPDUs Michail Koundurakis

**Technical contributions**

**24/0810 DPWiFi MIMO Multiplexing and Beamforming (Carlos Rios) - continued**

Summarizes Dynamic Polarization proposal.

Q&A

Q: what are the next steps. Run a SP?

A: Not yet. This is still in evangelization stage.

Q: It would be good to get a sense of what the group thinks, so a SP may be warranted.

A: it takes time for people to understand this. The education process is necessary. It’s revolutionary, paradigm-shattering. Need more time to spread the gospel. Let’s do SP in next session.

Q: did not see any PER, … simulations. I don’t see any noise.

A: I look at BER. BER is zero. I assume high SNR conditions. I have to keep it at the highest level to explain the revolutionary stuff.

SP1:

Would you agree to add the following to the 11bn SFD?

* 11bn shall add a mode to support Dynamic Polarization Spatial Multiplexing.

Y/N/A: 2/72/17

**24/0869 Beamforming Feedback for UL Beamforming (Leonardo Lanante)**

Discusses how to support multiple types of beamforming approaches in the UL.

Q&A

Q: how to do UEQM?

A: may need to add more information, like singular values.

Q: we could send multiple frames for multiple BFR.

A: creates more overhead.

**24/0875 UHR-enhanced-long-range-support (Rui Cao)**

Analyzed the target for UHR enhanced long range design. Proposes the design of a long range PPDU that supports a minimum data rate of 1.5Mbps or slightly higher.

Q&A

Q: 11ax ER solution wasn’t certified by WFA, so that is a disadvantage. This time, we have to make support mandatory.

A: need better design that supports 6 dB target.

Q: is Rx BF considered for UL? Numbers are too specific for now.

A: yes, MRC gain is considered.

Q: will this need more robust design of preamble?

A: we need to do more detailed analysis.

Q: focused on link budget difference. What is design target for DL? Should we improve DL as well?

A: for 2.4 GHz, we see need for both UL and DL. Want to use instead of 11b for data transmission. Same range for BSS with better throughput.

**24/0921 An Enhanced Long Range PPDU (Wook Bong Lee)**

In a typical scenario, a non-AP STA’s transmit power is about 10 dB lower than that of AP STA. Simulation results are presented showing that such design is possible.

Q&A

Q: what are the details of the ELR format?

A: will give details later. Just wanted to show it is possible.

Q: what is packet size and center freq?

A: 200 bytes, 5.8 GHz.

Q: how about UL BF for long range?

A: possible. Need to get feedback from AP. Even for preamble portion?

**24/0876 UHR-PPDU-PHY-Version (Rui Cao)**

Proposes to use PHY Version 1 for all 11bn transmissions.

Q&A

Q: see other presentation.

Let’s leave time for offline discussion.

**24/0001 DL MU Ext PPDUs (Michail Koundurakis)**

This submission proposes a mechanism to support OFDMA with legacy STAs.

Q&A

Q: will this decrease the power for the beacon?

A: that’s an implementation question.

Q: BW is expanded from 20 MHz to 80 MHz during TXOP. Could this be protected?

A: could use non-HT duplicate. This is just an illustration.

Q: what is the difference with A-PPDU? A-PPDU would not need initial frame.

A: different goal. Try to avoid primary channel. AP would choose which one to use.

Q: there are Rx issues, it’s also Tx issue. How would Tx generate this kind of waveform? Not possible with single FFT. This is additional complexity.

**Adjourn**

The meeting is adjourned at 12:30 pm