IEEE P802.11  
Wireless LANs

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| IMMW SG November 2023 Meeting Minutes | | | | |
| Date: 2023-09-14 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Volker Jungnickel | Fraunhofer HHI | Einsteinufer 37  10587 Berlin, Germany | +49 162 2552756 | volker.jungnickel@hhi.fraunhofer.de |
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Abstract

This document contains the minutes for the IMMW SG November 2023 Meeting Minutes.

Revision history:

* Rev0: initial version

Abbreviations:

* C: Comment
* A: Answer

# 1st Meeting: Tuesday, November 14, 2023, PM2, (21:00-23:00 ET)

1. The Chair, Laurent Cariou (Intel), calls the meeting to order. The Chair notifies the attendees that the agenda is in [IMMW SG November 2023 meeting agenda](https://mentor.ieee.org/802.11/dcn/23/11-23-1732-02-immw-immw-sg-november-2023-meeting-agenda.pptx)
   * Note that this is a hybrid meeting, with some participants in person and some participating online through a webex session
   * Need to pay the registration fee to attend
2. IEEE-SA Policies and Procedure

The chair reviews the IEEE-SA Patent Policy:

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair. Speak up now and respond to this Call for Potentially Essential Patents. **Nobody speaks/writes up**.

1. The chair goes through other guidelines for IEEE WG meetings, Patent-related information, Participation in IEEE 802 Meetings, and Copyright. The Chair asks that it be minuted that the **Copyright Policy** was presented.
   * Chair provides an attendance reminder:

3.1. Please, record your attendance during the session by using the IMAT system:

* + login to [imat](https://imat.ieee.org/attendance)
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  + select “C/LM/WG802.11 Attendance” entry
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1. Agenda:
   * Chair reviews proposed agenda
   * Discussion:
   * C: None
   * Agenda approved with unanimous consent.
2. Announcements:
   * None
3. Submissions

**1819r1 Integrated mmWave Design Considerations, Claudio da Silva (Meta Platforms, Inc.)**

C: 2.4/5/6 GHz is always required, but already congested, should we define just one of them?

What is the additional effort for Ranging/Sensing?

A: Sub-7 GHz includes all the bands that could offload the control traffic and offer enhanced reliability. For Ranging and sensing, we need to consider that the additional effort is minimal.

C: The suggested mm-wave waveform derives from sub-7GHz. If so, then carrier spacing may be an issue.

A: Answers to this are not yet ready. Discussion should be done in the task group. Btw., 11ac should be added to the sub7-GHz PHYs. This was just forgotten in the slides.

C: What is your view related to coexistence with ad/ay?

A: By reusing sub7-GHz PHY, we break backwards-compatibility. Moreover, mm-wave is highly directional, do not think this would be an issue. Altogether, I see a lot of positive things, lot of gain.

C: The proposal is that technology is based on OFDM, but ad/ay is based on Single-Carrier. What is your view on this?

A: I can see advantages from breaking away from this concept.

**1878r1 High-Level Design Considerations of IMMW, Jianhan Liu (Mediatek Inc.)**

Statements not in slides: One should be careful when starting this project. There was no breakthrough for mm-wave so far, not in 802.11 and cellular. One should limit the range to few meters. In general, reduce ambition. Slides 4/5: Channelization #2 is preferred. Slide 6: In favour of fixed subcarrier spacing, but somewhat larger.

C: Subcarrier spacing of data and preamble are different. Regarding maximum BW=2.5 GHz, it is hard to achieve due to DAC/ADC speed.

A: First question is too much detail for now. I suggest to discuss this later. DAC/ADC for maximum bandwidth do not consume too much power. In all systems designed so far, wider bandwidth gives the simplest solution. The question is what we want to achive. All this can be decided in the task group, not here.

C: Being very focused is fine. There is many echos in the room when keeping the connection. The discussion should not be limited to LOS.

A: 60 GHZ is a one-room solution due to the link budget. If you enable NLOS, needs more link budget. We are open to this comment and can relax the limitation to LOS.

C: Slide 7: Minimum data rate is 100 Mbit/s: How can we realize this?

A: Should be reliable link, I wanted people to think about the minimum data rate. Higher limit will be decided anyway.

C: Do you have any suggestion for minimum MCS/Bandwidth?

A: BPSK/320 MHz.

**1905r0 High Level Thoughts on IMMW, Bin Tian (Qualcomm)**

Statements not in slides: Let’s talk about the scope: How to make mm-wave useful? There are many challenges in the lower bands. The mm-wave spectrum has large bandwidth which is less utilized. Due to limited range of mm-wave, this spectrum can be reused more often. The suggestion is to be very focused in this SG to meet market requirements (complexity, cost). IMMW SG should not do everything, not overload mm-wave technologies with features not needed in the market. mm-wave is not bandwidth-limited. There are different trade-off than for conventional designs. The main goal is to minimize the cost. The unique scope in this SG is to get reasonable data rates with lowest possible cost/complexity. Keep this system simple. Single-stream, single user. Now we have another possibility to make this right!

C: mm-wave needs beam tracking. We need to do something for the beam operations.

A: Very good question: BF is different from sub-7 GHz. The goal is to make this more robust and faster. We are open to work together on this.

C: Dif you consider unidirectional link?

A: I would not go that far, because MLO does not support such mode. Moreover, we do not want that congestion on the reverse link in the sub-7 GHz band has an impact on the 60 GHz transmission.

C: Slide 4: Do you propose 16-QAM as the lowest or highest MCS?

A: Open to discuss. Let us set realistic targets. 16-QAM is assumed as good cut but this is t.b.d..

**1968r0 Discussion on general direction of integrated mmWave, Ming Gan (Huawei)**

Statements not in slides: Our general direction is to upclock the baseband by factor X, where X is tbd..

C: Many things are already aligned with previous speakers. Many STAs support already 160 MHz, why using 80 MHz? MLO does the signaling.

A: I have talked to implementation guys. 320 MHz is not a good starting point for implmenation.

C: Comment for all presenters: WLAN is an AP-centric architecture. Here it looks like, that clients operate in P2P mode only.

A: We do not need to centralize everything. Do we need to focus on spatial reuse? There is so much bandwidth and it costs complexity in the baseband.

C: Sounding. We cannot do this in Sub-7GHz band.

A: Do only minor adjustments for this.

C: Minimum configuration is 80 MHz BW, 2 SS.

A: For high-end we could use larger BW, and more SS. More complex settings can be discussed for high-end.

**1974r0 Flexible sub-7Ghz and mmWave Integration in IMMW, Yanchun Li (Huawei)**

Statements not in slides: Slide 3: mm-wave has controllable delay, while sub-7Ghz has not. Slide 4: Market need is high data rate for low cost. Pevious mm-wave specs have too wide bandwidth. Slide 5: In congested environment, switch to mm-wave. Slide 6: 4x4 at sub-7 GHz is converted into 2 times 2x2 in both bands. This is good for mm-wave because, the LOS channel, channel rank is only 2.

C: None.

* + Recess at 22:55 ET

# 2nd Meeting: Wednesday, November 15, 2023, PM3, (00:30-02:30 ET)

1. The Chair, Laurent Cariou (Intel), calls the meeting to order. The Chair notifies the attendees that the agenda is in [IMMW SG November 2023 meeting agenda](https://mentor.ieee.org/802.11/dcn/23/11-23-1732-02-immw-immw-sg-november-2023-meeting-agenda.pptx)

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1. Agenda:
   * Chair reviews proposed agenda
   * Discussion:
   * C: None.
   * Agenda approved with unanimous consent.
2. Announcements:
   * None
3. Submissions

**1977r1 Requirements Analysis for IMMW Use Cases YueXu (Huawei)**

Statements not in slides: None.

C: Claudio: Thanks for the contribution. We should not overdesign IMMW. Not address the most stringent use case scenarios. In Slide 7, large bandwidth leads to high complexity. I think that some of the features on slide 7 should not be in the focus.

A: High-level consideration. I do not think that everything should be covered.

**1991r0 Discussion on Enabling MIMO in IMMW, Mengshi Hu (Huawei)**

Statements not in slides: SU-MIMO with and without SVD should be used.

C: Claudio: Thanks for the contribution. WE should not pursue high maximum data rates. This gets us to nowhere. When increasing bandwidth, the processor for 1.7 GHz (Slide 3) has very power-hungry ADC. On MIMO, for mm-wave, an antenna is an antenna array, i.e. there is a lot of silicon behind it. More than 2 phased arrays already cost power and space. PolMux/Diversity could be investigated as already supported. More antennas mean more risk. We should not chase high peak data rates.

A: Presented explained the parameters again.

C: If you meet 1 Gbit/s, this is good for most use cases. Wouldn’t it be good if we do not even use the beamforming? Digital BF is more useful.

A: This depends on design. Analog BF is the mainstream, currently.

C: If we go for highest data rates, use 11ad/ay. The group needs more discussion on the BF. Maybe hybrid BF is better.

C: Clarification: The argument was that digital BB is minimal cost. Why the cost for MIMO is small?

A: It is already included in the design. Reuse existing design is low cost, compared to the antenna part.

C: Do you think the antenna cost is dominant?

A: Try to reuse the baseband as much as possible.

**2004r0 Technical scope proposal, Laurent Cariou (Intel)**

Statements not in slides: 8x clock is used as an example on slide 4.

C: Thank you. Agree very much. On the scope: What is the plan for the PAR? What kind of KPI we put in PAR? Range, data rate, what else?

A: Next step of SG discussion in January. Define the range and throughput is a good way. Another point could be the limitation to SU-MIMO. Do not scope everything. Just whant can be agreed in the group.

C: Slide 4: The ac PHY is used. Whould you consider this a good option?

A: Just used as an example. It is an existing numerology in the lower band PHY.

C: Certain features need to be captured. Max. data rate, no MU-MIMO, etc..

A: Lets get together to make it properly.

C: What is your position about SISO, SU vs. MU:

A: Have to discuss this, maybe 2 SS with PolMux. Cold be good option.

C: Thank you. Range and coverage for sub-7 GHz and 60 GHz are different. Can be built based on existing AP deployments? Discovery is the key for 60 GHz.

A: Different range is clear. There chould be an indication in discovery procedure that 60 GHz is available for this AP. At the edge of sub-7-GHz, there is no 60 GHz, obviously. This should be considered.

C: Should be called co-located.

**2016r2 Extend IMMW scope to include optical bands, Volker Jungnickel (Fraunhofer HHI)**

C: How high is the power consumption of light communication?

A: 10W at the moment, typical range is well below 10m, around 3-4m, from ceiling to desktop hight, tyically

C: Slide 8: To understand the similarities better: What is a good bandwidth for LC?

A: Currently, 3-dB bandwidth of 100 MHz can be achieved. With VCSEL arrays, 10-20x bandwidth increase can be achieved. Trials show up to 4 GBaud capabilities with OOK using high-power VCSEL arrays available in the mass market for LIDAR.

Q: Related to the LC Channel model: What channels are relevant?

A: LC is mostly Line-of-sight (LOS) channel with single dominant path. Diffuse reflections are very low reflections, NLOS is 20-30 dB below LOS.

C: What the 10W power consumption refer to?

A: The whole access point is 10W, mobile devices operate at significantly lower power levels. One major motivation of using 802.11 for LC is to reduce baseband power consumption, as this is highly optimized already.

**2052r0 mmWave Operation without mmWave Beacon, Liwen Chu (NXP)**

C: Thank you. Do you consider mm-wave w/o beacon as optional or mandatory? As discussed, this is needed for mm-wave.

A: All this information can be obtained from the non-mm-wave link.

C: Lower band is congested, mm-wave is quite free. Ther is no overhead to support the beacon.

A: Directing the beacon transmission into every sector creates a lot of overhead, what should be avoided.

C: The mm-wave link is not used for association. What is the advantage and disadvantage?

A: The advantage is that the beacon is not used.

C: Would it be more convenient to align with the 11be Standard?

A: Reuse 11be as much as possible.

C: Slide 3: AP can broacast threshold needed to decide if mm-wave is available or not. The STA could decide this, if it knows the required power.

A: The beacon will carry the transmit power. RSI will be used for detection.

C: Beacon already contains the Tx power.

A: Sometimes, this may not be accurate enough.

C: Slide 6: Clarification on coloring.

A: Explained again. Disxussion maybe taken to the task group.

C: I feel there is a misonception of the beacon concept in mm-wave. If there is no Control PHY, the question is coverage. Rx is in omnidirectional mode. How do you know the path loss? Control PHY solves the discovery issue.

A: Received beacon has loss. To be further discussed.

1. Goals for January 2024
   * Contributions how to capture the reduced scope in the PAR and CSD documents.
2. Teleconference/ad-hoc plan
   * No telecon plans for now
   * Will announce them with 10 days notice
3. AoB
   * None
4. Adjourn at 02:16 ET