IEEE P802.11
Wireless LANs

|  |
| --- |
| Minutes of the 2024-11-12 meeting of the IEEE 802.11 Enhanced Light Communication Study Group |
| Date: 2024-11-12 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Mohamed Islim | pureLiFi | Edinburgh, UK |  | Mohamed.Islim@pureLiFi.com  |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This document contains the minutes of the November 2024 meeting of the IEEE 802.11 Enhanced Light Communication (ELC) Study Group.

Abbreviations:

Q: Question

A: Answer

C: Comment

Revision history:

R0: Minutes for first meeting slot

R1: Removed non-presenters names from the minutes.

**ELC Meeting slot# 1 November 12, 2024, AM1**

1. The IEEE 802.11 ELC SG meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi).
2. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
3. No essential patents claimed.
4. All are reminded to record their attendance through the IMAT system and pay the registration fee.
5. The chair introduced the overall agenda in doc. 11-24/1675r1 for the meeting.
6. Nikola Serafimovski: The main agenda is to discuss PAR and CSD.
7. Nikola Serafimovski: We also have two submissions to discuss:
* Low power Enhanced-Range PHY Mode for ELC (doc. 11-24/1926r1)
* Underwater Interoperability and Backwards Compatibility (doc. 11.1928r0)
1. **Motion to accept the agenda in 11-24/1675r1.**

**Approved with unanimous consent.**

1. Nikola Serafimovski: The Scope in the PAR has not changed from the last meeting, and it’s up for discussion.
2. Nikola Serafimovski: The “Need of the project” has been updated. Asked for comments/questions.

C: Matthias Wendt: reasonable changes and updates.

1. Nikola Serafimovski: Updated Section 8.1 Additional Explanatory Notes to include safety of Laser products.
2. Nikola Serafimovski: Proposed a motion to move PAR.

Q: Can we do this at the end after we discuss the other items on the agenda?

A: Yes.

1. Nikola Serafimovski: Presented and read the CSD with updates from previous meeting shown in ‘track changes’ mode.

C: PAR 1599r3: The title 2.1. is incorrect. It must include ELC (and not IMMW).

A: We’ll get back to that in a minute after we discuss CSD.

C: It would be better to quote something more recent than the 85% of indoor data traffic cited from the older Nature paper.

A: Opened a Cisco report shared by Volker to find an updated/ more recent figure: <https://www.cisco.com/c/dam/global/en_ca/solutions/enterprise-networks/xa-09-2023-networking-report.pdf>

A: Unless there is a strong objection, Nikola suggests that we keep it.

1. Nikola Serafimovski: Will move to Motion later after we discuss other items on the agenda.
2. Stefan Videv (Kyocera SLD Laser): Presented Underwater Interoperability and Backwards Compatibility (doc. 11.1928r0)
	1. Discussed the attenuation of optical channels in underwater environments based on Jerlov scale.
	2. Discussed the interoperability of working across different wavelength bands by using single transmit wavelength and broadband detectors with broad filters.
	3. Backward compatibility implies that two emitters would be needed.
	4. Backward compatibility does not offer any advantage in underwater environments, unless they are a must from the backword compatibility of the standard.

C: The challenge is that you can’t specify the use-case / intent within the standard.

C: You could make a distinction between environments. Not sure if this is a problem from the standard point of view. Certification would come at a later stage, and classes can be introduced.

C: Cost is also a factor as backward compatibility requires additional optoelectronics.

A: Added complexity is high, cost of added optoelectronics is not high. Size constraints could be an issue.

Q: One of the main compelling factors of the success of Wi-Fi is backward compatibility. The biggest challenge: There is no mechanism that bounds the operation/performance of the system to the environment.

A: I don’t oppose the backward compatibility. There could be technical questions that we can implement, and your argument is a strong one. Just wanted to discuss this issue in relevance to underwater communications.

1. Volker Jungnickel (Fraunhofer HHI) presented Low power Enhanced-Range PHY Mode for ELC (doc. 11-24/1926r1)
	1. presented On-Off-Keying with Frequency Diman Equalization (FDE) and discussed higher reliability.
	2. OOK allows more drive current to the emitter compared to OFDM due to OFDM’s high PAPR. OOK is promising to reduce power and increase range.
	3. FET transistors consume high power which is not desired in mobile phone applications.
	4. OOK suffers from the high pass of the OFE response. High pass does not allow constant signals. Line coding could help reduce long runs to reduce the effect of high-pass filtration.
	5. FDE can be used to reduce the effects of baseline wander.
	6. Functions need to be defined an implemented in new chipsets, but changes are not major as they only avoid few OFDM related functions, and IFFT needs to be shifted to the receiver side.
	7. Requires some efforts, but it is reasonable efforts.

Q: What is the input data?

A: It’s coded data coming out of the FEC. Need to create bypass around some of the functions.

Q: Do you need to define additional preambles.?

A: We’ll use the same structure of the OFDM.
C: There might be some synergies with MM waves.

A: Only difference is that we have only I, and they have I&Q.

C: Suggest speaking to MM Wave group to check synergies. You could keep the Silicon the same, but you could switch the data through different paths.

C: No doubt about the technical variability. However, this could affect willingness to adopt.

A: We built this 15 years ago for LTE.

Q: Is there a comparison for the energy per bit under the same spectral efficiency and bandwidth?

A: There are already some studies available, but I agree that not everything has been done. The question is how to compare energy per bit (Electrical or optical). The comparison is assuming the same bandwidth.

Q: If this has been implemented in another standards (802.13), what is the motivation to implement it here.

A: The main difference is in the MAC. The discussion here is how can we use this in the same PHY.

C: It’s not the same PHY. It is a new PHY.

A: It’s a flexible PHY. 95% processing is the same.

Q: The waveform is not 95% similar. It’s different.

Q: If we need to compare OFDM with this method under same throughput at higher data rates, we’ll have to compare high order QAM with OOK with wider bandwidth?

A: In this example, I agree. However, the comparison is not fair as we need to compare for the same spectral efficiency.

C: The discussion is too detailed. The proposal is to discuss this topic as a proposal for the TG, and I am supporting that.

C: Suggest inviting contributions on this topic from Volker and Mohamed.

1. Motion to accept the ELC SG PAR in 11-24/1599r3. Approved but had to repeat again with Motion to accept after detecting a typo with IMMW needs to be changed to ELC 1599r4.
2. **Motion to accept the ELC SG PAR in 11-24/1599r4.**

**Mover: Volker Jungnickel**

**Seconded: Stefan Videv**

**Approved**

**Yes: 9**

**No: 0**

**Abstain: 0**

**Approved**

1. **Motion to accept the ELC SG CSD in 11-24/1600r2.**

**Mover: Stefan Videv**

**Seconded: Volker Jungnickel**

**Approved**

**Yes: 9**

**No: 0**

**Abstain: 0**

**Approved**

1. C: It doesn’t help to get the PAR and CSD approved in a plenary session as not a lot can be done in the January meeting. I’ll include the PAR in the NescCom and LMSC agendas. TG could potentially be in May.
2. Nikola Serafimovski: Let’s use the session on Thursday to get feedback from additional people from the wider working group and then decide whether we should plan for WG approval in January 2025.
3. At 09:55, the Chair declares the SG’s meeting adjourned.