
P802.11bb

Submitter Email:**Type of Project:** Amendment to IEEE Standard 802.11-2020**Project Request Type:** Modify / Amendment**PAR Request Date:****PAR Approval Date:****PAR Expiration Date:****PAR Status:** Draft**Root PAR:** P802.11bb**Root PAR Approved on:** 14 May 2018**Root Project:** 802.11-2020

1.1 Project Number: P802.11bb**1.2 Type of Document:** Standard**1.3 Life Cycle:** Full Use

2.1 Project Title: Standard for Information Technology--Telecommunications and Information Exchange Between Systems Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Light Communications

3.1 Working Group: Wireless LAN Working Group(C/LM/802.11 WG)**3.1.1 Contact Information for Working Group Chair:****Name:** Dorothy Stanley**Email Address:** dstanley1389@gmail.com**3.1.2 Contact Information for Working Group Vice Chair:****Name:** Jon Rosdahl**Email Address:** jrosdahl@ieee.org**3.2 Society and Committee:** IEEE Computer Society/LAN/MAN Standards Committee(C/LM)**3.2.1 Contact Information for Standards Committee Chair:****Name:** Paul Nikolich**Email Address:** p.nikolich@ieee.org**3.2.2 Contact Information for Standards Committee Vice Chair:****Name:** James Gilb**Email Address:** gilb@ieee.org**3.2.3 Contact Information for Standards Representative:****Name:** James Gilb**Email Address:** gilb@ieee.org

4.1 Type of Ballot: Individual**4.2 Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot:** May 2022**Change to Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot:** ~~Nov~~ May ~~2020~~ 2022**4.3 Projected Completion Date for Submittal to RevCom:** Dec 2022**Change to Projected Completion Date for Submittal to RevCom:** ~~Aug~~ Dec ~~2021~~ 2022

5.1 Approximate number of people expected to be actively involved in the development of this project: 50**5.2.a Scope of the complete standard:**The scope of this standard is to define one medium access control (MAC) and several physical layer (PHY) specifications for wireless connectivity for fixed, portable, and moving stations (STAs) within a local area.**5.2.b Scope of the project:** This amendment specifies a new PHY layer and modifications to the IEEE 802.11 MAC that enable operation of wireless light communications (LC).

This amendment specifies a PHY that provides:

- 1) Uplink and downlink operations in 800 nm to 1,000 nm band,
- 2) All modes of operation achieve minimum single-link throughput of 10 Mb/s as measured at the MAC data service access point (SAP),
- 3) Interoperability among solid state light sources with different modulation bandwidths.

This amendment specifies changes to the IEEE 802.11 MAC that are limited to the following:

- 1) Hybrid coordination function (HCF) channel access,
- 2) Overlapping basic service set (OBSS) detection and coexistence,
- 3) Existing power management modes of operation (excluding new modes), and modifications to other clauses necessary to support these changes.

Change to scope of the project: This amendment specifies a new PHY layer and modifications to the IEEE 802.11 MAC that enable operation of wireless light communications (LC). This amendment specifies a PHY that provides: 1) Uplink and downlink operations in ~~380-800~~ 800 nm to ~~5-1,000~~ 1,000 nm band, 2) All modes of operation achieve minimum single-link throughput of 10 Mb/s ~~and at least one mode of operation that achieves single-link throughput of at least 5 Gb/s,~~ as measured at the MAC data service access point (SAP), 3) Interoperability among solid state light sources with different modulation bandwidths. This amendment specifies changes to the IEEE 802.11 MAC that are limited to the following: 1) Hybrid coordination function (HCF) channel access, 2) Overlapping basic service set (OBSS) detection and coexistence, 3) Existing power management modes of operation (excluding new modes), and modifications to other clauses necessary to support these changes.

5.3 Is the completion of this standard contingent upon the completion of another standard? No

5.4 Purpose: The purpose of this standard is to provide wireless connectivity for fixed, portable, and moving stations within a local area. This standard also offers regulatory bodies a means of standardizing access to one or more frequency bands for the purpose of local area communication.

5.5 Need for the Project: A variety of LC vendors currently build various, non-standardized, products for many use-cases that could have significant market growth. The wider context for the economic considerations like decreasing costs for light emitting diodes (LEDs) / laser diodes (LDs) and the availability of higher frequency spectrum for LC is presented in doc. 11-17/0803r1 (<https://mentor.ieee.org/802.11/dcn/17/11-17-0803-01-00lc-economic-considerations-for-lc.ppt>). The availability of chipsets in the relevant semiconductor technologies (process size and light efficacy for LEDs) is seen as key to reduce power consumption, form factor and costs for LC devices. Standardization is seen by many in the industry as a key facilitator of the mass market for LC.

5.6 Stakeholders for the Standard: Stakeholders include chip makers to deliver PHY & MAC sub-systems, system integrators and lighting companies, telecom operators, Internet Service Providers (ISPs), IoT companies, industrial manufacturers, aviation and transportation industries.

6.1 Intellectual Property

6.1.1 Is the Standards Committee aware of any copyright permissions needed for this project?

No

6.1.2 Is the Standards Committee aware of possible registration activity related to this project?

Yes

Explanation: Project may define new management frames (extending the existing IEEE 802.11 frame structure) to support its new features. These frames will include fields that contain 48-bit MAC addresses. It is not expected that any new namespaces for allocation under RAC control will be defined.

7.1 Are there other standards or projects with a similar scope? Yes

Explanation: A key difference between LC and the existing IEEE 802 light based communication standards is the use of the IEEE 802.11 MAC as well as the reuse of associated services. This new approach will allow LC to address a wider range of use cases that are served by local wireless area networks compared to the existing optical camera communications, low data rate photodiode communications (IEEE P802.15.7m), and industrial applications (IEEE P802.15.13). Additionally, new PHY mechanisms will be defined.

A key difference between the ITU-T G.vlc effort compared to the proposed IEEE 802.11 LC amendment is the use of the IEEE 802.11 MAC as well as the targeted deployment of the technology in wider range of use cases including electromagnetic interference (EMI) sensitive environments, in contrast to the focused home networking use case for the G.vlc technology.

Critically, being part of the IEEE 802.11 ecosystem enables LC to leverage the existing brand awareness and processes for product development, testing and market introduction. Tight integration with IEEE Std 802.11, the coexistence and hand-over with other IEEE 802.11 PHY types (through the use of Fast-Session Transfer) will help to increase the LC market by addressing large volume applications together with traditional lighting.

7.1.1 Standards Committee Organization: IEEE Computer Society LAN MAN Standards Committee (C/LM) / ITU-T SG15

Project/Standard Number: IEEE P802.15.7/IEEE P802.15.13 / ITU-T G.vlc

Project/Standard Date: 01 Dec 2014

Project/Standard Title: IEEE Standard for Local and metropolitan area networks--Part 15.7: Short-Range Wireless Optical Communication Using Visible Light /IEEE Draft Standard for Local

and metropolitan area networks--Part 15.13: Multi-Gigabit per Second Optical Wireless Communications (OWC) with Ranges up to 200 meters /ITU-T G.vlc High speed indoor visible light communication transceiver - System architecture, physical layer and data link layer specification

7.2 Is it the intent to develop this document jointly with another organization? No

8.1 Additional Explanatory Notes: PAR modification: The changes made to the PAR scope narrow the spectrum for which operation is defined and remove the specific throughput requirement, to define operation that can be supported by implementations that are expected in the near/medium time frame.

5.2.b A single-link is defined as a link between an access point and a single station in the downlink.

5.2.b LC systems are expected to adhere to regulation and standards such as IEC 62471:2006-"Photobiological safety of lamps and lamp systems" as well as ITU-T G.664 - "Optical Safety Procedures and Requirements for Optical Transmission Systems" and others. In addition, LC systems are expected to not create any additional electromagnetic interference.

5.2.b The project will address the security of the transition between the new LC PHY and the existing IEEE 802.11 PHYs as well as the security implications in supporting Fast Session Transfer.

7.1 IEEE P802.15.13 is expected to be completed in 2021. ITU-T G.vlc was published in March 2019 as Recommendation ITU-T G.9991.

Change to Additional Explanatory Notes: PAR modification: The changes made to the PAR scope narrow the spectrum for which operation is defined and remove the specific throughput requirement, to define operation that can be supported by implementations that are expected in the near/medium time frame. 5.2.b A single-link is defined as a link between an access point and a single station in the downlink.5.2.b LC systems are expected to adhere to regulation and standards such as IEC 62471:2006-"Photobiological safety of lamps and lamp systems" as well as ITU-T G.664 - "Optical Safety Procedures and Requirements for Optical Transmission Systems" and others. In addition, LC systems are expected to not create any additional electromagnetic interference.5.2.b The project will address the security of the transition between the new LC PHY and the existing IEEE 802.11 PHYs as well as the security implications in supporting Fast Session Transfer.7.1 ~~The project/standard date for IEEE P802.15.13 is 2017-03. expected to be~~ The completed project/standard in date 2021. ~~for ITU-T G.vlc is~~ was published in March 2019 as ~~2015 Recommendation ITU -06 T G.9991 .~~