IEEE P802.11
Wireless LANs

|  |
| --- |
| Comments to improve D0.3 PHY text alignment |
| Date: 2021-03-08 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Nancy Lee | Signify |  |  | nancy.lee@signify.com |
| Matthias Wendt | Signify |  |  | matthias.wendt@signify.com |

Abstract

This document examines how backwards compatibility of 802.11 PHYs is documented in the current 802.11 standard, and proposes changes to P802.11bb D0.3 to improve alignment with the current 802.11 standard and to clarify the following relationships:

* between Common mode and LC HE mode
* between Common mode and the Clause 17 OFDM PHY
* between LC HE mode and the Clause 27 HE PHY

**Discussion:**

We observe that newer 802.11 PHY specifications typically define new functionality such as new PPDU formats that are based on previous PHYs. In contrast, the LC Common mode and LC HE PHYs are largely copies of existing PHYs with changes to remove functionality not applicable to light communications and to add information on the light interface.

Therefore, the wording “the same as” rather than to say that e.g. the LC CM PHY is “based on” OFDM PHY seems more appropriate to make it clear that everything in Clause 17 applies except when explicitly overridden or marked not applicable.

802.11 PHY clauses, particularly the HT, VHT, and HE PHY clauses, have closely parallel structure, headings, and wording. This document proposes changes to align LC structure, headings, and wording more closely to existing 802.11 text.

***Discussion: Highlighted text preceded by “Discussion” are not to be copied into the TGbb Draft. Such text provides rationale for the proposed changes.***

***TGbb editor: Highlighted text preceded by “TGbb editor” are instructions to the TGbb editor to modify existing material in TGbb draft D0.3. If the changes are adopted, the TGbb editor will execute the instructions rather than copy them to the TGbb Draft.***

**Proposal:**

***Discussion: Align with the first three headings of HT, VHT, and HE PHY clauses.***

***TGbb editor: Change the two headings below as follows:***

32. Light communications (LC) PHY specification

32.1 Introduction

***TGbb editor: Please insert a new subclause header in this location as follows. Note that this will change the numbering of later level 3 subclauses:***

32.1.1 Introduction to the LC PHY

***Discussion: Align wording of the first paragraph with the corresponding subclauses for HT, VHT, and HE PHY, and specify mandatory and optional features here (based on text in 32.3.1) as is done in subclause x.1.1 for the other PHYs.***

***TGbb editor: Change the subclause text as follows:***

Clause 32 (LC PHY specification) specifiesthe PHY entity for a light communications (LC) system. The LC PHY comprises three modes of operation: LC Common mode (CM) PHY, LC High Efficiency (HE) PHY and LC optimized (LCO) PHY.

An LC STA shall support the LC Common mode.

An LC STA should support one of the following:

* LC HE mode
* LC optimized mode

The LC PHY is based on intensity modulation and direct detection (IM/DD) and modulation covers the frequency range of near DC up to a few hundred MHz depending on the mode of operation.32.1.1 LC PHY functions

***Discussion: Wording is based on 17.1.3.1 (General) in 17.1.3 (OFDM PHY functions) and 27.1.3.1 (General) in 27.1.3 (HE PHY functions).***

***17.1.3.1 (General) refers to 17.3 (OFDM PHY) and 17.4 (OFDM PLME); the corresponding LC CM subclauses are 32.3.2.3 (CM PHY) and 32.3.2.4 (CM PLME). The OFDM PHY service interface is described in 17.2 (OFDM PHY specific service parameter list); the corresponding LC CM subclause is 32.3.2.2 (CM mode-specific service parameter list).***

***27.1.3.1 (General) refers to 27.2 (HE PHY service interface******), 27.3 (HE PHY) and 27.4 (HE PLME); the corresponding LC HE mode subclauses are 32.3.3.2 (LC HE PHY service interface), 32.3.3.3 (LC HE PHY) and 32.3.3.4 (LC HE PHY PLME).***

***TGbb editor: Please add two new paragraphs in this location as follows:***

Each mode of the LC PHY contains two functional entities: the PHY function, and the physical layer management function (i.e., the PLME). These functions are described in detail in 32.3.2.3 (CM PHY) and 32.3.2.4 (CM PLME) when operating the LC PHY in the LC Common mode and in 32.3.3.3 (LC HE PHY) and 32.3.3.4 (LC HE PHY PLME) when operating the LC PHY in the LC HE mode.

The LC PHY service is provided to the MAC through the PHY service primitives described in Clause 8 (PHY service specification). The LC PHY service interface is described in 32.3.2.2 (CM mode-specific service parameter list) when operating in the LC Common mode and in 32.3.3.2 (LC HE PHY service interface) when operating in the LC HE mode.

32.1.2 PPDU formats

***Discussion: Wording is based on 27.1.4 (PPDU formats). The OFDM PHY has only one PPDU format so there is no equivalent text for the LC CM PHY.***

***TGbb editor: Please add a new paragraph in this location as follows:***

In the case of LC HE mode, the structure of the PPDU transmitted by an LC STA is determined by the TXVECTOR parameters as defined in Table 27-1 (TXVECTOR and RXVECTOR parameters) and the FORMAT values are specified in subclause 27.1.4 (PPDU formats).

32.2 LC PHY Service interface

***Discussion: This placeholder heading and its shubheading are patterned after 27.2 (HE PHY service interface) and its subclauses, but content corresponding to 27.2 (HE PHY service interface) is already covered under 32.3.2.2 (CM mode-specific service parameter list) for LC CM and 32.3.3.2 (LC HE PHY service interface) for LC HE mode. Therefore 32.2 and its subclauses could be deleted.***

***Alternatively, the second paragraph in 32.1.1 (LC PHY functions) could be moved to here in 32.2 to maintain parallel subclause numbering (32.3 LC PHY, corresponding to 17.3 OFDM PHY and 27.3 HE PHY).***

***TGbb editor: Delete empty subclause headings 32.2.1, 32.2.2, 32.2.3, 32.2.4 as follows:***

32.3 LC PHY

32.3.1 General

***Discussion: Align spelling and remove mandatory/optional text (moved to new subclause 32.1.1 (Introduction to the LC PHY)).***

***TGbb editor: Change the subclause text as follows:***

This subclause provides the procedure by which PSDUs are converted to and from transmissions on the light communication wireless medium.

During transmission, a PSDU (in the SU case) or one or multiple PSDUs (in the MU-MIMO downlink) are processed (i.e., scrambled and coded) and appended to the PHY preamble to create the PPDU. At the receiver, the PHY preamble is processed to aid in the detection, demodulation, and delivery of the PSDU.

The LC PHY can be operated in three principal modes, referred to as LC Common mode, LC HE mode and LC optimized mode.

The **LC Common mode (CM)** is transmitted in the wavelength range between 800 and 1000 nm in single-input single-output (SISO) operation. In the LC Common mode, data subcarriers are modulated using BPSK and forward error correction (FEC) is based on convolutional coding with code rate ½. The LC Common mode provides support for 20 MHz bandwidth only.

The **LC HE mode** is transmitted in the wavelength range between 800 and 1000 nm. In the LC HE mode, data subcarriers are modulated using BPSK, BPSK DCM, QPSK, QPSK DCM, 16-QAM, 16- QAM DCM, 64-QAM and 256-QAM. Forward error correction (FEC) coding (convolutional or LDPC coding) is used with coding rates of 1/2, 2/3, 3/4 and 5/6. The LC HE mode provides support for 20 MHz and 40 MHz, 80 MHz and 160 MHz contiguous channel widths, 80+80 MHz non-contiguous channel width.

The **LC optimized (LCO) mode** is transmitted between 380 nm and 1000 nm. In the LC optimized mode, data subcarriers are modulated using 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 bits per symbol and forward error correction (FEC) coding is used based on LDPC with code rates of 1/2, 2/3, 5/6, 16/18 and 20/21. The LC optimized mode provides support for 50 MHz, 100 MHz and 200 MHz contiguous channel width. The LC optimized mode supports adaptive bitloading and distributed MIMO natively.

***TGbb editor: Change the heading below as follows:***

32.3.2 LC Common mode (CM)

32.3.2.1 Introduction

***Discussion: Wording is changed to reflect that LC CM is largely the same as Clause 17 OFDM PHY and to align with wording in subclause x.1.1 for other PHYs.***

***TGbb editor: Change the text of the subclause as follows:***

Subclause 32.3.2 (LC Common mode (CM)) specifies the PHY entity when operating the LC PHY in the LC Common mode. The LC CM PHY is the same as the Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification) PHY except when the specifications in Subclause 32.3.2 supersede corresponding text in Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification).

An LC STA shall support the mandatory features defined in Clause 17, except:

17.3.8.3 – Regulatory requirements

17.3.8.4 – Operating channel frequencies

17.3.9.3 – Transmit spectrum mask

17.3.9.7.2 – Transmitter center frequency leakage

17.3.10.3 – Adjacent channel rejection

17.3.10.4 – Nonadjacent channel rejection

**[…]**

***TGbb editor: Change the heading and remove the text below as follows:***

32.3.3 LC High Efficiency (HE) mode

32.3.3.1 Introduction

***Discussion: Wording is changed to reflect that LC HE mode is largely the same as Clause 27 HE PHY and to align with wording in subclause x.1.1 for other PHYs.***

***TGbb editor: Change the text of the subclause as follows:***

Subclause 32.3.3 (LC High Efficiency (HE) mode) specifies the PHY entity when operating the LC PHY in the LC HE mode. The LC HE mode PHY is the same as the Clause 27 (High Efficiency (HE) PHY specification) PHY except when the specifications in Subclause 32.3.3 supersede corresponding text in Clause 27 (High Efficiency (HE) PHY specification).

**References:**

P802.11-REVmd D5.0

P802.11ax D8.0

P802.11bb D0.3

<https://mentor.ieee.org/802.11/dcn/20/11-20-0571-08-00bb-proposed-text-for-lc-mandatory-optional-phy.docx>