IEEE P802.11
Wireless LANs

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| P802.11bb Coexistence Assessment Document (CAD) |
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Abstract

This document describes the coexistence properties of IEEE Std. 802.11bb, a standard defining operation in optical spectrum. While the standard describes the MAC and PHY layers, the focus of this document is on coexistence.

# Introduction

This document is supplemental to the IEEE 802.11bb standard under development and describes the coexistence properties of IEEE 802.11bb, which specifies operation in optical spectrum. While the standard describes the MAC and PHY layers, the focus of this document is on coexistence.

# Background

**Excerpts from the IEEE 802.11bb Project Authorization Request (PAR)**

**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

**5.2 Scope:** 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.

**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.

# Coexistence of IEEE 802.11bb with other standards

Light does not interfere with other parts of the electromagnetic spectrum and communication below 3 THz but operates in an orthogonal part of the electromagnetic spectrum.

The propagation of light is confined within the illuminated area, typically spanning a few meters diameter of illuminated area. In addition, the directivity of light helps minimizing interference with neighboring networks.

Prior to starting a new network, the installers are recommended to ensure that there are no overlapping LC networks in operation.

IEEE P802.11bb uses the same CCA mechanisms currently used by HT, VHT and HE.

The current standards defining operation in light spectrum are listed below:

* Remote controls
	+ Remote controls are narrowband and their modulation spectrum is not relevant for the IEEE 802.11bb which operates at higher modulation frequencies on all its PHYs.
	+ A typical Consumer IR (CIR) remote control has an IR Emitter Diode (IRED) that emits electromagnetic energy with a frequency of 319,928,146,808,510Hz and a wavelength of about 940nm.
* IrDA in various variants up to GigaIR
	+ IrDA found mass market adoption in the 1990s, operating in infrared spectrum. Modern devices replaced IrDA with Bluetooth and 802.11. Given the rapid replacement of mobile devices in the market, it can be concluded that IrDA is no longer relevant in the market, i.e. there is no need to consider coexistence with 802.11bb.
	+ IrDA operates between 850 nm and 900 nm [1].
* IEEE Std 802.15.7-2018
	+ IEEE Std 802.15.7-2018 defines wireless communication in optical spectrum. PHY I, PHY II and PHY III modes in the IEEE Std 802.15.7-2018 can operate with photodiode receivers; PHY IV, PHY V and PHY VI can operate using optical cameras. PHY I, PHY IV, PHY V and PHY VI use frequencies below the LC IF spectrum. PHY II and PHY III have never been adopted by the market. Hence, there is no need to consider coexistence with the IEEE 802.11bb.
	+ IEEE Std 802.15.7, IEEE 802.15.7a and IEEE P802.15.13 use light wavelengths from 10,000 nm to 190 nm in optically transparent media.
* ITU-T G.9991
	+ Coexistence between the two systems can be ensured by spatial separation or by using different optical wavelengths. Implementers are encouraged to avoid direct overlap of the IEEE 802.11bb and ITU-T G.9991 systems to avoid interference.
	+ ITU-T G.9991 defines two wavelength bands, which are visible light (380 nm-780 nm) and infrared (800 nm – 1675 nm).
* IEEE P802.15.13
	+ Coexistence between the two systems can be ensured by spatial separation or by using different optical wavelengths. Implementers are encouraged to avoid direct overlap of IEEE 802.11bb and IEEE 802.15.13 systems to avoid interference.
* IEEE 802.15.7a
	+ Coexistence between the two systems can be ensured by spatial separation or by using different optical wavelengths.

# Conclusion

Based on the analysis above, the IEEE 802.11 WG believes that devices compliant with the IEEE P802.11bb will be able to coexist only when the implementers assure that there is suitable wavelength or spatial separation between IEEE P802.11bb devices and those devices using other standards available in the market in the field of optical wireless communications. IEEE P802.11bb devices that are collocated and share the same IF frequencies with other standards operating in the same optical spectrum will cause co-channel interference and may not operate.

# References

[1] <https://www.rfwireless-world.com/Terminology/IrDA-vs-WLAN-vs-Bluetooth.html>.