IEEE P802.11
Wireless LANs

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| TGbd Coexistence Assurance Document |
| Date: 2020-10-03 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Rui Cao | NXP |  |  | rui.cao\_2@nxp.com |
| Bo Sun | ZTE |  |  | sun.bo1@zte.com.cn |

Abstract

This serves as the coexistence assurance document for TGbd in meeting the requirement of the CSD.

Revision History:

r0: Draft CAD for accompanying WG LB for 11bd D1.0

r1: Incorporate comments from the group. Separate description for ITS band and non-ITS band operation.

r2: update doc. header.

# Introduction

This document addresses coexistence of IEEE 802.11bd [1] per the PAR [2] and CSD [3]. The relevant sections of the P802.11bd PAR and CSD are outlined below:

* PAR scope:
	+ This amendment defines operations in frequency bands for 5.9 GHz and 60 GHz. The new amendment shall enable backward compatibility and coexistence with deployed OCB devices operating in the same band.
* CSD:
	+ Response to 1.1.2: “Will the WG create a CA document as part of the WG balloting process as described in Clause 13? YES”

# Bands of Operation

802.11bd is an amendment to the IEEE 802.11 standard, defining enhancements to OFDM in the 5.9 GHz frequency band and DMG in the 60 GHz frequency band [4]. The channelization for the 5.9 GHz frequency band and 60 GHz frequency band remain unchanged.

# Coexistence in ITS bands

When working on the 5.9 GHz intelligent transportation systems (ITS) band, all 802.11bd devices operate as licensed devices, hence coexistence is assured through both regulation and 802.11 technologies.

When working on the 60 GHz ITS band, all 802.11 devices operate as licensed devices, hence coexistence is assured through both regulation and 802.11 technologies.

## Coexistence with Non-802.11 systems

The mechanism for 802.11 devices to co-exist with non-802.11 devices uses clear channel assessment (CCA). For 802.11bd operation on 5.9 GHz frequency band, 802.11bd devices continue to use the same CCA rule for 10 MHz channel as defined in 17.3.10.6 [4] (which corresponds to 802.11p).

For 802.11bd operation on 60 GHz frequency band, 802.11bd devices continue to use the same CCA rules as defined in 20.5.4.2.2 [4] (which corresponds to 802.11ad).

## Coexistence with 802.11 systems

802.11bd devices working on 5.9 GHz frequency band use a common preamble, the non-HT short training field, non-HT long training field, and non-HT signal field as the initial fields in each 10 MHz channel as implemented in 802.11p 10 MHz PPDU [5]. Therefore, 802.11bd guarantees PHY-level coexistence with 802.11p 10 MHz devices working on 5.9 GHz frequency band [5].

802.11bd devices working on 60 GHz frequency band reuse the 802.11ad PPDU format without change to guarantee coexistence with other 802.11 devices working on 60 GHz frequency band.

## New 802.11bd features which may affect coexistence

The following features introduced in 802.11bd for 5.9 GHz frequency band may affect OCB coverage area and transmitted RF energy in the operating environment:

* Preamble power boost
* New OFDM waveform design and 20 MHz transmit spectrum mask
* NON\_NGV\_10 repetition transmission

Each of these features and their potential impact on coexistence is described below.

### Preamble power boost

In 802.11bd 10 MHz PPDU modulated with binary phase shift keying (BPSK), short and long training fields are boosted by 3dB. The legacy signal field is repeated twice for all 11bd PPDU. Dual Carrier Modulation is also defined for the data field to collect diversity gain.

This modification can extend 802.11bd 10 MHz PPDU communication range, which may affect coexistence with neighboring legacy devices.

### New OFDM waveform design and 20 MHz transmit spectrum mask

In 802.11p, the 10 MHz channelization uses a 64pt FFT with edge tones at +/-26. In 802.11bd, the 10 MHz channelization uses a 64pt FFT with edge tones at +/-28. More spectrum is occupied within the channel bandwidth with the new 802.11bd OFDM waveform design. The spectral rolloff for 802.11bd 10 MHz PPDU will be sharper and may result in less out-of-band emissions beyond +/-5.5 MHz.

In 802.11p, the 20 MHz channelization uses a 64pt FFT with edge tones at +/-26. In 802.11bd, the 20 MHz channelization uses a 128pt FFT with edge tones at +/-58. More spectrum is occupied within the channel bandwidth with the new 802.11bd OFDM waveform design, and tone spacing is half of 802.11p 20 MHz.

In additional, 802.11bd defines a new 20 MHz transmit mask (C2), which requires the same transmit spectrum roll-off as 10 MHz transmit mask C [1]. The spectral rolloff for 802.11bd 20 MHz PPDU will be sharper and result is less out-of-band emissions beyond +/-10 MHz. This new mask can mitigate adjacent channel interference of 20 MHz operation, thus assure better coexistence with operations on adjacent 10 MHz channels.

### NON\_NGV\_10 repetition transmission

802.11bd defines repetitive transmission of NON\_NGV 10 MHz PPDU. This mode allows transmitter to repeat NON\_NGV 10 MHz PPDU transmission up to three times, where the gap between each two repetitions is SIFS time. This feature guarantees interoperability with legacy devices and can enable 802.11bd devices to collect time diversity from repetitive reception.

This modification may extend communication range of legacy NON\_NGV 10 MHz PPDU to 802.11bd devices, which may affect coexistence with neighboring legacy devices.

# Coexistence outside of the ITS band

While 802.11bd devices are intended to operate in the ITS band under ITS regulations, it is also possible for 802.11bd to operate outside of the ITS band.

## Coexistence with Non-802.11 systems

For 802.11bd operation in the 60 GHz frequency band, 802.11bd devices use the same CCA rules as defined in 20.5.4.2.2 [4] (which corresponds to 802.11ad).

##  Coexistence with 802.11 systems

802.11bd devices working on 60 GHz frequency band reuse the 802.11ad PPDU format without change to guarantee coexistence with other 802.11 devices working on 60 GHz frequency band.

# References

[1] P802.11bd D1.0

[2] 11-18-0861-09-0ngv-ieee-802-11-ngv-sg-proposed-par

[3] 11-18-0862-03-0ngv-ieee-802-11-ngv-sg-proposed-csd

[4] IEEE Std 802.11-2016

[5] IEEE 802.11P-2010