**IEEE P802.15**

**Wireless Personal Area Networks**

|  |  |  |
| --- | --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | Coexistence Document for IEEE 802.15.4z | |
| Date Submitted | November 2018 | |
| Source | Benjamin Rolfe  Blind Creek Associates  Los Gatos, CA | Voice: +1 408 395 7207  Fax: Deprecated E-mail: [ben.rolfe @ ieee.org] |
| Re: | Analyze the coexistence of 802.15.4z and other 802 wireless systems | |
| Abstract | IEEE 802.15.4 Coexistence Document | |
| Purpose | Document coexistence analysis | |
| Notice | This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. | |
| Release | The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15. | |

Contributors of the CA document are sorted by alphabetical order of the last name:

TBD

**Contents**

1 Introduction 5

1.1 Bibliography 5

1.2 Acronyms 5

2 Overview 6

2.1 Overview of 802.15.4 UWB 6

2.1.1 LRP 6

2.1.2 HRP 6

2.2 Bands and Services considered 6

2.3 Overview of Coexistence Mechanisms in 802.15.4 6

2.4 Coexistence Analysis Methodology 6

3 Dissimilar Systems Sharing the Same Frequency Bands 7

3.1 Coexisting Systems in 4940 - 4990 MHz Band 7

3.2 Coexisting Systems in 5250 - 5850 MHz Band 7

3.3 Coexisting Systems in xxx – xxx MHz Band 7

4 Coexistence Scenario and Analysis 9

4.1 Methodology 9

4.2 PHY Modes in the 802.15.4 UWB and 802.15.4z System 9

4.3 Dissimilar systems 9

4.3.1 802.11 as victim 9

4.3.2 802.15 as victim 9

4.4 Other 802.15.4 systems 9

4.5 xxx – xxxx MHz Band Coexistence Performance 9

5 Summary conclusions 9

6 Interference Avoidance and Mitigation Techniques 10

7 Conclusions 11

**Table of Figures**

**Table of Tables**

[Table 1: Frequency Bands for Coexistence Considerations 6](#_Toc535311314)

[Table 6: Dissimilar Systems coexisting with 802.15.4z within 5250 - 5350 MHz band 7](#_Toc535311315)

[Table 6: Dissimilar Systems coexisting with 802.15.4z within 5250 - 5350 MHz band 7](#_Toc535311316)

[Table 9: Dissimilar Systems coexisting with 802.15.4z within 5725 - 5850 MHz band 8](#_Toc535311317)

# Introduction

## Bibliography

(B1) IEEE Std. 802.15.2-2003, IEEE Recommended Practice for Information Technology – Telecommunications and Information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.2: Coexistence of Wireless Personal Area Networks with Other Wireless Devices Operating in Unlicensed Frequency Bands.

(B2) IEEE Std. 802.15.4-2015, IEEE Standard for Information Technology – Telecommunications and Information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs).

(B3) P802.15.4z/Dxx IEEE Draft Standard for Information Technology –

(B4) IEEE Std. 802.11-2016 IEEE 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.

(B5) P802.11ax/Dxx

## Acronyms

The acronyms used are taken from [B1], [B2], and [B3]. Definitions of the terms can be found in the same documents.

# Overview

Description of 802.15.4 UWB and Amendment 4z. Summary of regions with UWB regulations and typical applications.

## Overview of 802.15.4 UWB

### LRP

Reference to standard. Might be good to show band graphic?

### HRP

Reference to standard

## Bands and Services considered

Summary of regional UWB regulations.

shows which 802 Wireless PHYs operate in the bands subject to this coexistence analysis.

Table 1: Frequency Bands for Coexistence Considerations

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Band (MHz) | IEEE 802.15.4p PHYs | | |
| 802.15.4 HRP | 802.15.4 LRP | 802..11 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Overview of Coexistence Mechanisms in 802.15.4

Ref to another CAD

## Coexistence Analysis Methodology

Ref to another CAD

# Dissimilar Systems Sharing the Same Frequency Bands

This clause presents an overview on other 802 systems which are specified to operate in some of the same frequency bands.

## Coexisting Systems in 4940 - 4990 MHz Band

At this time, there are approved standards which specify operation in this band: IEEE 802.15.11-2016 and 802.15.4-2016. Specifically the following PHYs may be operating in the band:

In the 4940 – 4990 MHz band, IEEE 802.11-2011 is the only other 802 system sharing this band with the proposed 802.15.4 UWB PHYs.

Table 6: Dissimilar Systems coexisting with 802.15.4z within 5250 - 5350 MHz band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Standard | Standard PHY | Involved 802.15.4z PHY | | |
| HRP | LRP |  |
| 802.11a | OFDM |  |  |  |
| 802.11n | OFDM |  |  |  |
| 802.15.4 | LMR DSSS |  |  |  |
|  |  |  |  |  |

## Coexisting Systems in 5250 - 5850 MHz Band

In the 5250 - 5350 MHz band, IEEE 802.11-2011 is the only other 802 system sharing this band with the proposed 802.15.4 UWB PHYs.

Table 6: Dissimilar Systems coexisting with 802.15.4z within 5250 - 5350 MHz band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Standard | Standard PHY | Involved 802.15.4z PHY | | |
| HRP | LRP |  |
| 802.11a | OFDM |  |  |  |
| 802.11n | OFDM |  |  |  |
| 802.15.4 | LMR DSSS |  |  |  |
|  |  |  |  |  |

## Coexisting Systems in xxx – xxx MHz Band

shows other 802 systems that share

Table 9: Dissimilar Systems coexisting with 802.15.4z within 5725 - 5850 MHz band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Standard | Standard PHY | Involved 802.15.4p PHY | | |
|  |  |  |
| 802.11a | OFDM |  |  |  |
| 802.11n | OFDM |  |  |  |

# Coexistence Scenario and Analysis

## Methodology

Describe the methodology {e.g. based on prior CADs with deltas}

## PHY Modes in the 802.15.4 UWB and 802.15.4z System

What is added by the amendment not covered in prior CAD work.

## Dissimilar systems

### 802.11 as victim

### 802.15 as victim

## Other 802.15.4 systems

## xxx – xxxx MHz Band Coexistence Performance

This sub-clause presents the coexistence performance of the systems coexisting in the [whatever] MHz frequency band. Parameters for Coexistence Quantification

Present conclusions w/references.

# Summary conclusions

# Interference Avoidance and Mitigation Techniques

# Conclusions

As a victim, 802.15.4p FSK has comparable BER performance with the other 802 FSK systems; 802.15.4p DSSS has much better BER performance than the other 802 DSSS systems due to option of the high spreading factor values.

As an interferer, either 802.15.4p FSK or 802.15.4p DSSS has similar performance impact to the other 802 systems at the same transmitting power level. However the performance degradation to the other systems can become significant as the transmitting power is increased up to the possible maximum 30dBm. This requires more physical distance from other 802 systems if an 802.15.4p system is designed to operate at a high transmitting power level.