**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | TG3d Channel Modelling Document (CMD) | |
| Date Submitted | March 2015 | |
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| Re: |  | |
| Abstract | The CMD contains descriptions of the propagation characteristics and channel models of the operational environments relevant for the considered applications (e. g. data required to calculate link budgets) | |
| Purpose | Supporting document for the development of the amendment 3d of IEEE 802.15.3 | |
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Document Overview

The CMD contains descriptions of the propagation characteristics and channel models of the operational environments relevant for the considered applications (e. g. data required to calculate link budgets)

The CMD will support the evaluation of the proposals submitted to P802.15.3d for consideration by the 15.3d task group.

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# Definitions:

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# Scope

This document details the characteristics of the air interface channels for the suite of applications described in the current revision of the 802.15.3d Application Requirements Document, 15-14-304-xx-003d.

# Methodology

Descriptions of the applications and associated channel modeling parameters are listed in paragraphs 4-7.

## General Structure of the Channel Model

Structure of the CIR equation

## Multipath and Polarization Characteristics

Description of the ray-optical propagation paths and the considerartion of polarization characteristics by means of the Jones calculus

## Usage of the Channel Model in System Simulations

## General Channel Parameters

### Operating frequency band(s)

### Path loss model

### Antenna gain/pattern

## Scenario-Specific Channel Parameters

### Angular Dispersion

### Temporal Dispersion

### Other

# Close Proximity P2P Applications

## Environments

Regarding to the application requirement document [x1] and the contribution on application usage [x2], environments in where IEEE802.15.3d devices shall be operated can be defined. Two environments are characterized in this report. Table x1 summarizes the two characterized environments.

The scenario can be uniformed to line-of-sight (LOS) channel with transmission distance of a quite short range. Even for LOS scenario, we have to consider the case which metal chassis or metal cover exists on consumer electronics (CE) in which IEEE802.15.3d devices are implemented inside. That metal must be object for the path between the transmitter (TX) and the receiver (RX).

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Model | Scenario | Environment | Description |
| CMx | LOS | Kiosk  download |  |
|  |  |  |  |
| CMx | LOS  w/o Metal | File  exchange |  |
| CMx | LOS  w Metal | File  exchange |  |

## Channel Characterization

Close Proximity P2P (60 GHz):

Concerning the usage model of close proximity P2P wireless communications, the channel is assumed to be line-of-sight propagation in millimeterwave, 60 GHz band.

Generally, TSV model is introduced in millimeterwave PAN/LAN systems in IEEE802.15.3c and IEEE802.11ad. For proximity communications usage, reflections are observed inside terminals and at surface of terminals, etc. The channel model shall be modified to represent such propagation mechanisms.

The channel model shall apply at least one of the several kinds of propagation depending on the antenna configurations.

### Path Loss

Molecular attenuation can be ignored because transmission distance along application usage is a short range of up to 50 millimeters.

### Power Delay Profile

### Fading Model

### Polarization

## Model Parameterization

### List of Parameters

The complete list of parameters used in this report can be summarize as follows:

1. *K*, K factor of Rice distributions for the first arrival path

2. , the cluster decay rate

3. initial decay between the first arrival path and delayed paths

The parameters are given in Table x.

### Model Parametrization for 57 – 66 GHz

#### Kiosk Downloading

#### File exchange between device to device

## Other

# Intra-Device Communication

## Operating frequency band(s)

## Path loss model

## Antenna gain/pattern

## Scenario Definitions

### Direct Board-to-Board Communication

Transmission between two chips mounted on opposing surfaces

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Directed NLOS Board-toBoard Communication

Transmission between two chips with obstructed or without line of sight

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Chip-toChip Communication

Transmission between two chips mounted on the same surface

#### Angular Dispersion

#### Temporal Dispersion

#### Other

# Backhaul/Fronthaul

## Operating frequency band(s)

## Path loss model

## Antenna gain/pattern

## Scenario Definitions

### Xxx1

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Xxx2

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Xxx3

#### Angular Dispersion

#### Temporal Dispersion

#### Other

# Data Center

## Operating frequency band(s)

## Path loss model

## Antenna gain/pattern

## Scenario Definitions

### Xxx1

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Xxx2

#### Angular Dispersion

#### Temporal Dispersion

#### Other

### Xxx3

#### Angular Dispersion

#### Temporal Dispersion

#### Other

# Reference

[x1] Application requreiment document

[x2] Ken Hiraga, Masasih Shimizu, Toshimitsu Tsubaki, Hideki Toshinaga and Tadao Nakagawa, “Real usage of the kiosk downloading,” IEEE80.15-14-0298-00-003d, Beijing, Mar 2014.

[x3] technical requirement document

[x4] Su-Khiong Yong, “TG3c Channel Modeling Sub-committee Final Report,” IEEE 802.15-07-0584-01-003c, Orland, Mar 2007.

[x5] Ichiro Seto, Kiyoshi Toshimitsu, Kazuaki Kawabata, Koji Akita and Hideo Kasami, “Radio propagation performance on 60 GHz band,” IEEE802.15.14-0416- 01-003d, San Diego, Jul 2014.

[x6] Koji Akita, Yukako Tsutsui, Takayoshi Itoh, Koh Hashimoto, Hideo Kasami and Koji

Ogura, “Design of a 60 GHz Proximity Communication System: Antenna in Package and Desktop Channel Measurements,” 6th GSMM (global symposium on millimeter wave) 2013 in Sendai, Japan, April 22-23 2013