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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
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| Source(s) | GRIDMAN Task Group | Voice:  E-mail: |
| Re: | GRIDMAN Task Group: Narrowband Channel | |
| Abstract | Draft system requirements document | |
| Purpose | For comment prior to session #106 | |
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IEEE 802.16s

Draft System Description Document

Sept 15, 2016

## Introduction

Proposals will be adopted into this document, and should follow the structure of the two sections below. References to the clauses amended in the base standard are desirable.

## Table of System Description Parameters

The following table defines the key parameters defining the PHY

Based on the SRD , Band AMC is assumed, and TDD is assumed.

| **Nominal Channel Bandwidth** |
| --- |
| Sampling frequency (MHz) |
| FFT size |
| Subcarrier spacing (kHz) |
| Subcarrier Allocation Scheme in downlink and in uplink (permutation) |
| Number of Subchannels in downlink and in uplink |
| Actual Bandwidth (centered on nominal channel) for full channel |
| Actual Bandwidth (centered on nominal channel) per subchannel with AMC |
| Preamble Scheme |
| Cyclic Prefix |
| CDMA Codes |
| Frame Size (ms) |
| Slot definition in downlink and in uplink |
| Duplexing Mode (assumed TDD) |
| Forward Error Correction |

## Parameter Ranges

Nominal Channel Bandwidth 1 MHz, 500 KHz, 250 KHz, 125 KHz, 100 KHz

Sampling frequency (MHz) 1.12 MHz, 1.14 MHz, 1.152 MHz (for 1 MHz and 500 KHz  
(sampling ratios of 28/25 to 57/50 to 144/125)

Scales to 50% for 250 and 125 KHz, and 40% for 100 KHz

FFT size 128

Subcarrier spacing (kHz) 8.75 KHz, 4.375 KHz, 3.5 KHz (based on channel width)

Subcarrier Allocation Scheme in downlink and in uplink (permutation) Band AMC 2x3 and 1x6

Number of Subchannels in downlink and in uplink 3, 6, or 12 (based on channel width, in full channel)

Actual Bandwidth (centered on nominal channel) for full channel (derived: sampling clock \* (109/128) \* % subchannels used)

Preamble Scheme Standard 128 FFT, or modified to fit into effective BW

Cyclic Prefix 1/8 or 1/16

CDMA Codes Standard 128 FFT, or modified to fit into effective BW

Frame Size (ms) 5, 10, 12.5, 20, 25, 40mS, 50mS

Slot definition in downlink and in uplink Implied by permutation: 1 sub-channel by 3 or 6 symbols

Duplexing Mode assumed TDD

Forward Error Correction Optional CTC

## System-level design Decisions

The amendment will support exclusive operation using Band AMC operation. The amendment must remove mandatory requirement for PUSC in Zone 1.

## Performance Analysis (with reference to SRD)

## Quantifying the PHY Layer Throughput Benefits[[1]](#footnote-1)

**Summary of throughput enhancements for specific feature modifications**

| **Baseline: 1 MHz channel BW, 128 FFT with PUSC in DL and optional UL PUSC, with 28/25 sampling factor, and 5 ms frame size** | | | | |
| --- | --- | --- | --- | --- |
| **Feature or Attribute** | **Change or Modification** | **Notes** | **Throughput Impact**  **Relative to baseline** |
| Permutation | PUSC to Band AMC | Mobility is a low priority & other PUSC ‘benefits’ less significant with smaller channel BWs | +33.3% | |
| Frame Size | 2x Increase from 5 ms to  10 ms | Tradeoff with 2x increased latency | +24.1% | |
| Further increases to 15 ms, 20 ms, & 25 ms | Subsequent increases will incur considerable additional latency | An additional gain of; +5.5%, +3.3%, +1.4% respectively | |
| Cyclic Prefix | Reduce from 1/8 to 1/16 | Symbol OH is reduced from >11% to <6% | +11.5% | |
| Sampling Factor | 28/25 to 57/50 to 144/125 | Adds 1 data symbol for each step increase from 28/25 | +3.85% and +3.70% respectively | |

<To be developed: table showing channel BW, frame sizes, and resulting overhead>

<To be developed: table showing channel BW, frame sizes, and number of symbols available in UL/DL and possible UL/DL ratios (or consider defining ratio in terms of UL/DL symbols rather than %)>

1. 16-16-0047-01-000s-benefits-of-specific-phy-layer-parameters-to-support-1mhz-channels [↑](#footnote-ref-1)