Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**System parameters for 2-11 GHz Coexistence Simulations, Revision 2**
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Re:	Parameters necessary for preparation of coexistence simulations, revised at session # 16
Abstract	This document provides tables of parameters and parameter values for systems operating in the 2-11 GHz frequency range. These parameters are relevant to interference calculations and simulation work.
Purpose	To provide a basis for preparation of simulation tools and results, following session # 14 .
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System parameters for 2-11 GHz Coexistence Simulations, revision 2

Introduction

This document provides tables of parameters and parameter values revised during session #16, for systems operating in the 2-11 GHz frequency range. These parameters are relevant to interference calculations and simulation work.

Table 1: circa. 2.5 GHz systems with a cellular architecture.

Characteristic (cellular systems)	**Examples**
Layout of system(s) including diagrams	Multi – cell (uniformly distributed), (variable cell sizes including "super cell") Block diagrams needed
Typical sector arrangements and frequencies	Typically 4-sectors per cell, 4 frequencies, V and H polarization both used; . Some systems will use adaptive antennas, pointing at users. TDD Transmitter diversity may be used (base stations only). FDD also used
Propagation	Partly obstructed paths allowed (channel model available 802.16.3c01_29r2) For coexistence purposes, assume free space loss up to a distance of (tba) and beyond that use best fit curve from measured results (JC to produce a typical formula for a best fit curve).[3]. Rain fading assumptions – negligible. Atmospheric multipath fading not considered
Cell size	Up to 45km radius
Availability objective	99.9 – 99.99% of time for 80 – 90% cell area coverage
Number of cells in a system	1 to 25 (typical range)
Number of terminal stations per MHz per T/R per cell	Up to 70
Distribution of terminal stations	Uniform per unit area.
Frequency of operation (for each variant to be studied)	2.15 -2.162, 2.305 – 2.32/ 2.345 – 2.360 and 2.50 to 2.69 GHz. Use 2.6 GHz for coexistence calculations.
Duplex method	TDD, FDD, Half duplex
Receiver parameters	
Channel bandwidth	1.5/3/6/12/25 MHz (N. America) 1.75/3.5/7/14 MHz (Europe). Use 6 MHz for coexistence calculations.

filter response	Root Nyquist with 25% roll off factor assumed
noise floor	4dB noise figure upstream 5dB noise figure downstream
acceptable level for co-channel interference	I/N = –6dB (aggregate of all interferers)
Transmitter parameters	
Channel bandwidth	1.5/3/6/12/25 MHz (N. America) 1.75/3.5/7/14 MHz (Europe) Use 6 MHz for coexistence calculations.
emission mask	See figures 6 and 7 of IEEE 802.16ab-01/01.
Maximum eirp	2000W eirp at base station or subscriber
typical transmitter power	(100W at base station, 1W at subscriber)
use of ATPC, steps and range (typical)	Uplink only, 2dB steps, 50dB range
Tx-Rx parameters	NFD (net filter discrimination; call for contributions to be posted for real measurements or values calculated by numerical integration) (use TM4 values or calculate, in the absence of any other sources of data)
Antenna characteristics (base station, typical)	Use ETSI RPE for 90 degree sector Gain = 16 dBi [RW to investigate whether this is practical]
Antenna characteristics (subscriber station, typical)	Use ETSI RPE Gain = 16dBi; hpbw 25 degrees Some systems may use omni with 2dB gain.
Antenna characteristics (repeater station)	Assume same as BS and SS
Backhaul links	Separate frequency assignments

Table 2: 3.5 GHz systems with a cellular architecture.

Characteristic (cellular systems)	**Examples**
Layout of system(s) including diagrams	Multi – cell (uniformly distributed), (variable cell sizes) Block diagrams needed [1]
Typical sector arrangements and frequencies	Typically 4-sectors per cell, 4 frequencies, V and H polarization both used [1]; Some systems will use adaptive antennas, pointing at individual users. FDD and TDD used

Propagation	Partly obstructed paths allowed (channel model available 802.16.3c01_29r2, subject to formal adoption. For coexistence purposes use line of sight loss up to 15km, then d^4 beyond that point [2] Rain fading assumptions – negligible. Atmospheric multipath ignored on interfering paths.
Cell size	Typically 7km
Availability objective	99.9 – 99.99% of time for 80 – 90% cell area coverage
Number of cells in a system	1 to 25 (typical range)
Number of terminal stations per MHz per T/R per cell	Up to 70
Distribution of terminal stations	Uniform per unit area.
Frequency of operation (for each variant to be studied)	3.4 to 3.8 GHz (use 3.6 GHz for coexistence calculations)
Duplex method	TDD, FDD, Half duplex
Receiver parameters	
Channel bandwidth	1.5/3/6/12/25 MHz (N. America) 1.75/3.5/7/14 MHz (Europe) (use 7 MHz for coexistence calculations)
filter response	Root Nyquist with 25% roll off factor assumed
noise floor	4dB noise figure upstream 5dB noise figure downstream
Acceptable level for co-channel interference	I/N = –6dB (aggregate of all interferers)
Transmitter parameters	
Channel bandwidth	1.5/3/6/12/25 MHz (N. America) 1.75/3.5/7/14 MHz (Europe) (use 7 MHz for coexistence calculations)
emission mask	See figures 4 and 5 of IEEE 802.16ab-01/01
Maximum eirp	Tba
typical transmitter power	(3W at base station, 1W at subscriber)
use of ATPC, steps and range	Uplink only, 2dB steps, 40dB range
Tx-Rx parameters	NFD (net filter discrimination; call for contributions to be posted for real measurements or values calculated by numerical integration) (use TM4 values or calculate, in the absence of any other sources of data)
Antenna characteristics (base station)	Use ETSI RPE for 90 degree sector Gain = 14.5 dBi
Antenna characteristics (subscriber station)	Use ETSI RPE Gain = 18dBi – note 3

Antenna characteristics (repeater station)	Assume same as BS and SS
Backhaul links	Separate frequency assignments

Table 3: 10.5 GHz systems with a cellular architecture.

Characteristic (cellular systems)	**Examples**
Layout of system(s) including diagrams	Multi – cell (uniformly distributed), (variable cell sizes)
Typical sector arrangements and frequencies	Typically 4-sectors per cell, 4 frequencies, V and H polarization.
Propagation	Line of sight paths only [3]. . Rain fading important – ITU equations to be used. Atmospheric multipath fading ignored for coexistence purposes
Cell size	Typically 7km
Availability objective	99.9 – 99.99% of time for approx. 50% cell area coverage
Number of cells in a system	1 to 25 (typical range)
Number of terminal stations per MHz per T/R per cell	70
Distribution of terminal stations	Uniform per unit area.
Frequency of operation (for each variant to be studied)	10.5 to 10.68 GHz
Duplex method	TDD, FDD, Half duplex
Receiver parameters	
Channel bandwidth	3/6/12/25 MHz (N. America) 3.5/7/14 MHz (Europe) Use 7 MHz for coexistence calculations
filter response	Root Nyquist with 25% roll off factor assumed
noise floor	6dB noise figure
Acceptable level for co-channel interference	I/N = –6dB (aggregate of all interferers)
Transmitter parameters	
Channel bandwidth	3/6/12/25 MHz (N. America) 3.5/7/14 MHz (Europe) Use 7 MHz for coexistence calculations
emission mask	Not defined (use ETSI for the purpose of calculating NFD)
Maximum power	TBA
typical power	(1W at base station, ???1W at subscriber)
use of ATPC, steps and range	Uplink only, 2dB steps, 40dB range

Tx-Rx parameters	NFD (net filter discrimination; call for contributions needed) (use TM4 values or calculate, in the absence of any other source of data).
Antenna characteristics (base station)	Use ETSI RPE for 90 degree sector Gain = tba ???16 dBi (RW will research PW to remind RW).
Antenna characteristics (subscriber station)	Use ETSI RPE Gain = 25 dBi (GJG and RW will research)
Antenna characteristics (repeater station)	TBA
Backhaul links	Separate frequency assignments

Note 1: A channel model has now been identified for 2.5 GHz and 10.5 GHz. Further work will be completed on 2.5/3.5 GHz for session #16.

Note 3: The ETSI 3.5 GHz specification requires a much lower minimum gain. This is a typical value for a directional antenna.

Note 4: Some operators of 3.5 GHz and lower frequency systems are considering the use of indoor radio terminal equipment. This has significant propagation modeling consequences. Call for contributions needed.

Note 5: OFDMA may also be used. This may affect the susceptibility of the receiver to interference, if interfering and victim bandwidths are different.

[1] Typical cell re-use pattern is shown in IEEE C802.16-2a/13

[2] This approximates to a hub antenna height of 40m and a subscriber antenna height of 10m (typical system). The formula should be applied both to the wanted and interfering signal paths.

[3] The formula should be applied both to the wanted and interfering signal paths.

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