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Title	**System parameters for 2-11 GHz Coexistence Simulations**
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Re:	Parameters necessary for preparation of coexistence simulations (output document from coexistence study group at session #14)
Abstract	This document provides tables of parameters and parameter values agreed during session#14, 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

Introduction

This document provides tables of parameters and parameter values agreed during session#14, 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")
Typical sector arrangements and frequencies	Typically 4-sectors per cell, 4 frequencies, V polarization normal. Some systems will use adaptive antennas, pointing at users. TDD Transmitter diversity may be used (base stations only).
Propagation	Partly obstructed paths allowed (channel model available 802.16.3c01_29r2). Rain fading assumptions – negligible. Atmospheric multipath fading not considered?
Cell size	Up to 45km radius but typically 7km
Availability objective	99.9 – 99.99% of time for 80 – 90% 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)	2.15 -2.162, 2.305 – 2.32/ 2.345 – 2.360 and 2.50 to 2.69 GHz
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)
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)
emission mask	See figures 6 and 7 of IEEE 802.16ab-01/01
Maximum power	2000W eirp at base station or subscriber
typical power	TBA (100W 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) TBA (use TM4 values or calculate, in the absence of any TG3 data)
Antenna characteristics (base station)	Use ETSI RPE for 90 degree sector Gain = 12.5 dBi
Antenna characteristics (subscriber station)	Use ETSI RPE Gain = 16dBi
Antenna characteristics (repeater station)	TBA
Backhaul links	Separate 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)
Typical sector arrangements and frequencies	Typically 4-sectors per cell, 4 frequencies, V polarization normal. Some systems will use adaptive antennas, pointing at users. TDD Transmitter diversity may be used (base stations only).
Propagation	Partly obstructed paths allowed (channel model available 802.16.3c01_29r2, subject to formal adoption – note 2). Rain fading assumptions – negligible. Atmospheric multipath fading not considered?
Cell size	Typically 7km
Availability objective	99.9 – 99.99% of time for 80 – 90% 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)	3.4 to 3.8 GHz
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)
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)
emission mask	See figures 4 and 5 of IEEE 802.16ab-01/01
Maximum power	? not defined
typical power	TBA (10W 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) TBA (use TM4 values or calculate, in the absence of any TG3 data)
Antenna characteristics (base station)	Use ETSI RPE for 90 degree sector Gain = 12.5 dB1
Antenna characteristics (subscriber station)	Use ETSI RPE Gain = 16dBi – note 3
Antenna characteristics (repeater station)	TBA
Backhaul links	Separate 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. (channel model tbd). Rain fading important – ITU equations to be used. Atmospheric multipath fading not considered?
Cell size	Typically 7km
Availability objective	99.9 – 99.99% of time for approx. 50% 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)
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)
emission mask	Not defined (use ETSI?)
Maximum power	Not defined
typical power	TBA (5W 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) TBA (use TM4 values or calculate, in the absence of any TG3 data)

Antenna characteristics (base station)	Use ETSI RPE for 90 degree sector Gain = tba (RW will research)
Antenna characteristics (subscriber station)	Use ETSI RPE Gain = tba (RW will research)
Antenna characteristics (repeater station)	TBA
Backhaul links	Separate assignments

Note 1: A channel model needs to be identified for each of the above frequency ranges in tables 1-3. TG3 has not yet finalized its work on channel models. FCC appendix D [FCC 98-231] to the 2-way ruling for MMDS provides a channel model, solely applicable to this frequency range.

Note 2 : This channel model may not be sufficient to deal with interference signals. More work may be needed to extend this.

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.

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

One of the planned tasks for TG2 (a) is to produce coexistence recommendations and guidelines for fixed BWA systems operating in the frequency range 2-11 GHz. One of the first tasks is to specify simulation methods, for which one or more system architectures have to be defined.

The system architecture(s) are for the purpose of assessing interference, so that not all system details are needed. The important aspects are listed below. During session # 14, it is hoped that sufficient information can be agreed to allow the simulation work to proceed.

Information required to specify and prepare simulation tools is shown in the attached tables. Table 1 is for systems with a cellular architecture (including the possibility of repeaters). Table 2 is for multipoint to multipoint systems (mesh – like architectures). There may be more than one set of parameters in each category and there may be additional categories specified from the work of TG2. These should be added to the tables below.

The purpose of the tables is as a framework for the preparation of sufficient system information to allow coexistence work to start. Not all system parameters are needed. An output document should include agreed tables of parameters and associated system diagrams (one set of results for each significantly different system variation).

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