Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**System Parameters for IEEE 802.16d**
Date Submitted	**2004-03-11**

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Re:	Contribution supporting Sponsor ballot
Abstract	System parameters to support public cellular operation and scalability
Purpose	Adopting of proposed system parameters into IEEE P802.16-REVd/D3-2004
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System parameters for IEEE 802.16d

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Introduction and problem definition

In order for service providers to operate the system specified in IEEE 802.16d in a public cellular network, the basic system parameters i.e., bandwidth, sampling frequency, FFT size, CP duration, and frame length should be changed from IEEE P802.16-REVd/D3-2004

Proposed parameters change

The solution falls into four categories:

Bandwidth

To meet the requirements from service providers who would like to deploy a high speed public cellular network, the system bandwidths are limited to 1.25, 2.5, 5, and 10 MHz for licensed bands and 10 and 20MHz for unlicensed bands.

Sampling Frequency

According to the allowed bandwidth, the sampling frequency needs to be the same as bandwidth.

FFT Size and CP duration

In order to support full coverage and full mobility with low overhead for CP duration, the FFT size corresponding to the bandwidth should be scalable, i.e., 128-FFT for 1.25 MHz BW, 256-FFT for 2.5 MHz BW, 512-FFT for 5 MHz, 1024-FFT for 10 MHz BW, and 2048-FFT for 20 MHz BW. The CP duration is kept to be 1/8 of the OFDMA symbol duration since the OFDMA symbol durations for all bandwidth configurations are equal and the maximum delay of multipath channel up to 10 us should be supported.

Frame Length

To allow identical frame structure for various channel bandwidths in licensed operation, the frame length should be fixed. Also the short frame length of 5msec can get the benefits of scheduling gain and better quality of VoIP. Therefore, the fixed 5msec frame length is adopted for the proposed system parameter.

Proposed Text Changes

[Change the existing text in “8.4.1 Introduction” as follows]

The WirelessMAN-OFDMA PHY ([B39]), based on OFDM modulation, is designed for NLOS operation in the 2.11 GHz frequency~~bands per 1.3.4. For licensed bands, channel bandwidths allowed shall be limited to the regulatory provisioned bandwidth divided by any power of 2 no less than 1.25 MHz~~.bands. The allowed channel bandwidths shall be 1.25, 2.5, 5, and 10 MHz for licensed bands and 10 and 20MHz for unlicensed bands.

[Insert a following section '8.4.2.6 Basic system parameters' and '8.4.2.7 Winowing' after '8.4.2.5 Transmitted signal']

8.4.2.6 Basic system parameters

System parameters of various bandwidth configurations are designed for the fixed 5 msec frame structure. The basic parameters to characterize an OFDMA signal are described in Table 1.

Table 1 –The basic OFDMA parameters

Parameters	Values			
System bandwidth	2.5 MHz	5 MHz	10 MHz	20 MHz
Sampling frequency (F_s)	2.5 MHz	5 MHz	10 MHz	20 MHz
Sample time ($1/F_s$)	400 nsec	200 nsec	100 nsec	50 nsec
FFT size (N_{FFT})	256	512	1024	2048
Number of used subcarriers	216	432	864	1728
Number of data subcarriers	192	384	768	1536
Number of pilot subcarriers	24	48	96	192
Subcarrier frequency spacing	9.765625 kHz			
Useful symbol time ($T_b=1/f$)	102.4 _s			
CP time ($T_g=T_b/8$)	12.8 _s			
OFDMA symbol time ($T_s=T_b+T_g$)	115.2 _s			
TDD frame length	5 ms			

8.4.2.7 Windowing

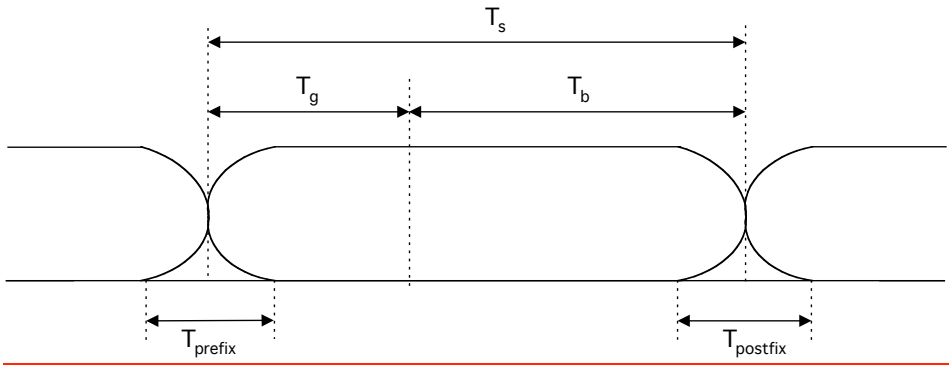

Figure 1 – Windowing on OFDMA symbols

Time window, w(n), is used to reduce the out-of-band emission. The transmitting signal s(n) is represented as:

$$s(n) = w(n) * \sum_{k=-N_{used}/2, k\neq 0}^{N_{used}/2} b_k \exp((j2\pi k\Delta f)(n - N_g)) \qquad n = -m, -m+1, ..., 0, ..., N_s + m \quad , \quad (1.)$$

where bk is the frequency domain signal transmitted on the k-th subcarrier. Ng is the number of OFDM samples for Tg. Time window, w(n), is represented as follows:

$$w(n) = \begin{cases} 0.5\left(1+\cos\left\{\pi\left(1+\frac{n+m}{2m}\right)\right\}\right) & -m \le n \le m \\ 1 & m < n \le (N_s - m) \\ 0.5\left(1+\cos\left\{\pi\left(\frac{n-(N_s-m)}{2m}\right)\right\}\right) & (N_s - m) < n \le (N_s + m) \end{cases}, \quad (2.)$$

where Ns is the number of OFDM samples for Ts. (2*m) is the number of OFDM samples for Tprefix and Tpostfix. Here, m is TBD.

[Delete the existing text in '8.4.2.1 Time domain description']

~~On initialization, an SS should search all possible values of CP until it finds the CP being used by the BS. The SS shall use the same CP on the uplink. Once a specific CP duration has been selected by the BS for operation on the downlink, it should not be changed. Changing the CP would force all the SSs to resynchronize to the BS.~~

[Change the existing text in '8.4.2.3 Primitive parameters' as follows]

- n. Sampling factor. This parameter, in conjunction with and determines the subcarrier spacing, and the useful symbol time. This value is set to ~~8/7.~~ 1

- G. This is the ratio of CP time to "useful" time. The following values shall be supported: ~~1/32, 1/16,~~

~~1/8, and 1/4.~~ 1/8.

[Change the existing text in '8.4.2.4 Derived parameters' as follows]

- Sampling Frequency: Fs=~~floor(n*BW*.008)_.008~~ n·BW