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Title	Proposed numerology and basic frame structure	
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Re:	IEEE 802.16m-08/016r1, Call for SDD Comments and Contributions (2008-03-20)	
Abstract	This contribution provides updated numerology for IEEE 802.16m OFDMA. Introduce varieties of fractional symbols.	
Purpose	To be discussed and approved by TGm for use in the 802.16m SDD.	
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Proposed numerology and basic frame structure

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Introduction

This contribution proposes some updates and clarifications for the set of OFDMA numerology for IEEE802.16m proposed in the 16m SDD document IEEE 802.16m-008/003r1. This contribution also proposes the frame structure that supports multiple CP sizes within the same cell/frame. The introduction of fractional symbols enables smaller idle time and higher throughput together with legacy support.

Baseline Frame Structure

The baseline frame structure prepared by the 16m SDD document IEEE 802.16m-008/003r1 [1] provides multiple CP size to support various communication environments. In such cases, existence of nonnegligible idle time is generally unavoidable and it leads to waste of radio resource. To combat with this issue, half symbol is proposed in [2]. Introduction of half symbol may reduce the idle time in the subframe. We expand the usage of fractional symbols to 1/3 and 1/4 symbols. Introduction of varieties of fractional symbols enables flexible subframe size with small idle time.

Proposed numerology leads to minimized idle time and maximized radio resource usage.

Proposed numerology is based on [3].

Proposed Text Change

To modify the proposed SDD text in C802.16m-08/118r1 as follows:

----- Start of Text-----

Insert the following text and table after the existing Table 1 in Section '11.3 OFDMA Parameters'

The OFDMA parameters for the IEEE 802.16m are specified as follows when the 12.5 kHz subcarrier spacing is used in IEEE 802.16m operation:

Parameter		Unit	Parameter Values							
Channel Bandwidth(BW)		MHz	5	6	7	8.75	10	12	14	20
FFT size			512	1024	1024	1024	1024	2048	2048	2048
Sampling Frequency (F_s)		MHz	6.4	12.8	12.8	12.8	12.8	25.6	25.6	25.6
Sub-carrier Spacing (Δf)		KHz	12.5							
Number of Used sub-carriers	Full symbol		400	480	560	700	800	960	1120	1600
	Half symbol		200	240	280	350	400	480	560	800
	1/3 symbol		133	160	186	233	266	320	373	533

(N_{used})	1/4 symbol		100	120	140	175	200	240	280	400
CP Length (T_{cp})	Short CP	μs	2.5							
	Normal CP	μs	10							
	Long CP	μs	15							

Table 1b OFDMA parameters for IEEE 802.16m based on 12.5 KHz subcarrier spacing

Adopt the following text modification at the start of section 11.4.1 Basic Frame structure

11.4.1 Basic Frame structure

The IEEE 802.16m basic frame structure is illustrated in Figure 8. Each 20 ms super-frame is divided into four equally-sized 5ms radio frames. When using the same OFDMA parameters as the reference system with the channel size of 5 MHz, 10 MHz, or 20 MHz, each 5ms radio frame further consists of eight sub-frames. Each sub-frame can be assigned for either downlink or uplink transmission depending on the duplexing scheme. Each subframe may have independent CP length to support various environments. A subframe may include fractional symbols to support legacy MS's subframe timing and to reduce idle time that is not for direction switching.

-----End of Text-----

4. References

- [1] C802.16m-08/003r1, "The Draft IEEE 802.16m System Description Document"
- [2] C802.16m-08/228r1, "Frame Structure to Support Multiple CP Sizes with Fixed Sub-frame Size"
- [3] C802.16m-08/236r3, "Further Considerations on IEEE 802.16m OFDMA Numerology"