

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	<b>Recommended Sampling Factor for OFDMA PHY</b>	
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Re:	Sponsor Ballot Comment	
Abstract	This document proposes a modification to the OFDMA sampling factor for consistency between OFDM and OFDMA systems.	
Purpose	For consideration as a modification to D6 during Sponsor Ballot resolution.	
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## Recommended Sampling Factor for OFDMA PHY

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### Summary

The current sampling factor for OFDMA is 8/7 for all values of BW. This is in contrast to the sampling factor(s) for OFDM, which are bandwidth dependent. ***We recommend that for the case of scalable OFDMA, the sampling factors be revised for consistency with OFDM.*** This will have the effect of making the usable part of all salable OFDMA symbols an integer multiple of that for OFDM symbols, ***delivering the advantages of design reuse and network synchronization compatibility between the two types of systems (OFDM and OFDMA).*** These advantages will in turn speed deployments of scalable OFDMA systems.

This contribution offers a comment, and a proposed remedy.

### Proposed Sampling Factors

Table 1 shows the proposed sampling factors and the corresponding sampling rates. In addition, it shows the number of samples per 125 us period to provide the rationale for using these sampling factors.

Table 1. Proposed OFDMA Sampling Factors			
SF (n)	BW (MHz)	Sample Rate (MSPS)	Samples per 125 usec
8/7	1.75	2.00000	250.0
	3.50	4.00000	500.0
	7.00	8.00000	1000.0
144/125	2.5	2.88000	360.0
	5.0	5.76000	720.0
	10.0	11.52000	1440.0
	20.0	23.04000	2880.0
86/75	1.5	1.72000	215.0
	3.0	3.44000	430.0
	6.0	6.88000	860.0
316/275	2.75	3.16000	395.0
	5.50	6.32000	790.0
	11.00	12.64000	1580.0
	16.50	18.96000	2370.0
57/50	2.0	2.28000	285.0
	4.0	4.56000	570.0
	8.0	9.12000	1140.0

### Existing Sampling Factors

Table 2 shows the how the sample rate and the number of samples per 125 us period vary when the sampling rate is 8/7 for all bandwidth cases. Note that the sampling rates require smaller step sizes, which will lead to greater phase noise in the symbol timing recovery subsystems. In addition, the number of samples per 125 us period is

not a factor of 10, as it is for the proposed sampling rates<sup>1</sup>.

Table 2. Current OFDMA Sampling Factors			
SF	BW	Rate (MHz)	Samples per 125 usec
8/7	1.75	2.00000	250.0
	3.50	4.00000	500.0
	7.00	8.00000	1000.0
	2.5	2.85600	357.0
	5.0	5.71200	714.0
	10.0	11.42400	1428.0
	20.0	22.85600	2857.0
	1.5	1.71200	214.0
	3.0	3.42400	428.0
	6.0	6.85600	857.0
	2.75	3.13600	392.0
	5.50	6.28000	785.0
	11.00	12.56800	1571.0
	16.50	18.85600	2357.0
	2.0	2.28000	285.0
	4.0	4.56800	571.0
	8.0	9.13600	1142.0

## Comment

There is no text in 8.4.2.3 to indicate whether the values of Sampling Factor for scalable OFDMA have been revised from the values for 2048-OFDM specified in IEEE STD 802.16-2004. This omission creates the possibility of an ambiguity, allowing variations in the sampling rate across scale points of OFDMA, or alternatively imposing the same sampling factor in every bandplan.

## Suggested Remedy

[Replace the following text in 8.4.2.3.]

This value is set to 8/7.

[with the text]

For channel bandwidths that are a multiple of 1.75 MHz, then  $n = 8/7$  else for channel bandwidths that are a multiple of 1.5 MHz then  $n = 86/75$  else for channel bandwidths that are a multiple of 1.25 MHz then  $n = 144/125$  else for channel bandwidths that are a multiple of 2.75 MHz then  $n = 316/275$  else for channels bandwidths that are a multiple of 2.0 MHz the  $n = 57/50$  else for channel bandwidths not otherwise specified then  $n = 8/7$ .

<sup>1</sup> Except for BW = 1.5 MHz, 2.0 MHz, and 2.75 MHz

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