

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	<b>Proposed 802.16m DL Control Channel Scheme to Use More Subcarriers in Guard Band</b>	
Date Submitted	<b>2008-03-11</b>	
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Re:	IEEE 802.16m-08/005, "Call for Contributions on Project 802.16m System Description Document (SDD)" for the following topic:  ● Downlink Control Structure	
Abstract	This contribution describes a method to use subcarriers in guard band to enhance resource usability in frequency overlay mode	
Purpose	To be discussed and adopted by TGm for use in 802.16m SDD	
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# Proposed 802.16m DL Control Channel Scheme to Use More Subcarriers in Guard Band

## 1. Introduction

This contribution describes a method to use more subcarriers in guard band by setting frequency separation between two adjacent FAs as multiple of subcarrier spacing. In this case, subcarriers in guard band can be used as data subcarriers without causing ICI between two adjacent FAs.

## 2. Using subcarriers in guard band

In current IEEE 802.16e system, the center frequency of each FA shall be located on multiple of 250kHz. Thus the separation of any 2 FAs will be also multiple of 250kHz (e.g. 10MHz center freq. separation for 10MHz channel bandwidth). In this case, sampling frequency is 11.2MHz and thus the subcarrier spacing is 10.9375kHz. Because 10MHz is not multiple of the subcarrier spacing, using subcarriers in guard band will cause severe ICI problem. Figure 1 shows an example of ICI problem caused by using subcarriers in guard band between FA1 and FA2. On the other hand, if the frequency raster is modified to ensure the separation of center frequency is multiple of subcarrier spacing, then subcarriers in guard band can be used for data transmission.

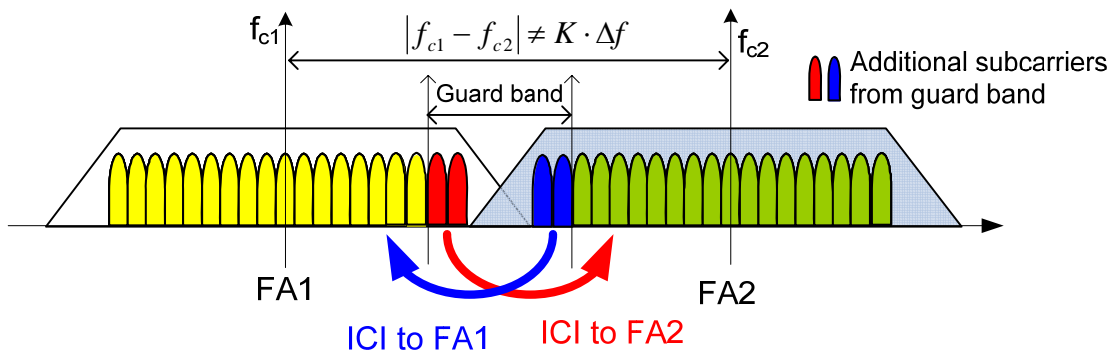
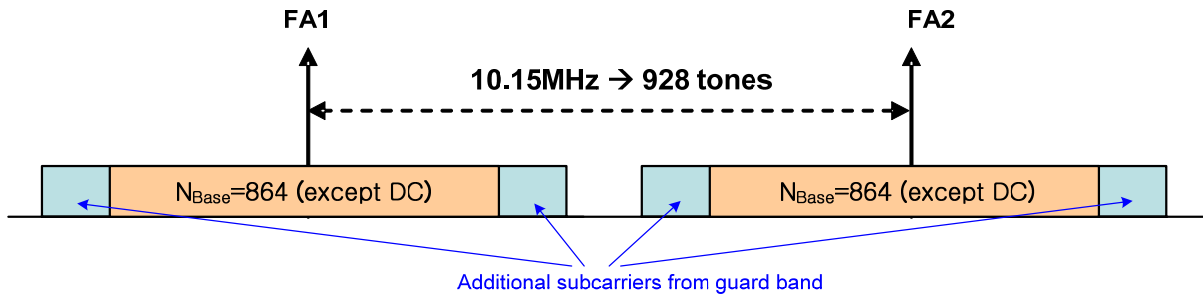


Figure 1. ICI problem when using subcarriers in guard band

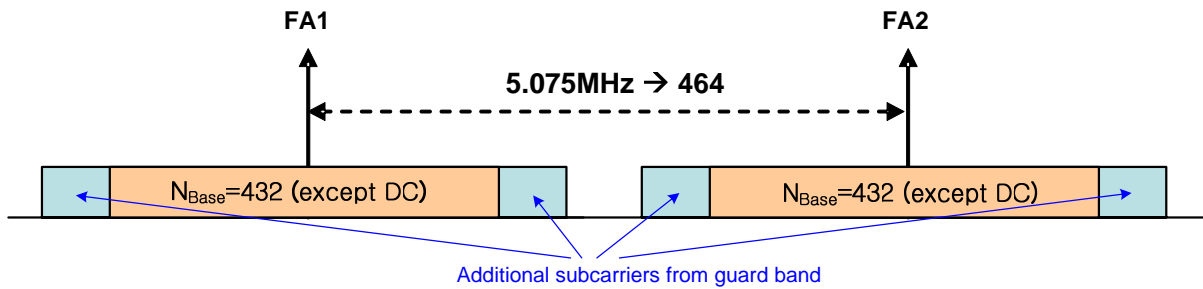
## 3. Proposed Solution

ICI can be avoided by setting the separation of center frequency between two adjacent FAs as multiple of subcarrier spacing. For 11.2MHz sampling frequency case, suggested frequency raster is 175kHz which is 16 times of subcarrier spacing ( $16 \times 10.9375\text{kHz} = 175\text{kHz}$ ). In this case, the center frequency spacing can be set to 10.15MHz ( $175\text{kHz} \times 58$ ) which is a multiple of subcarrier spacing. Then subcarriers in guard band can be used for data transmission as depicted in Figure 2. The number of subcarriers except guard subcarrier is 864.

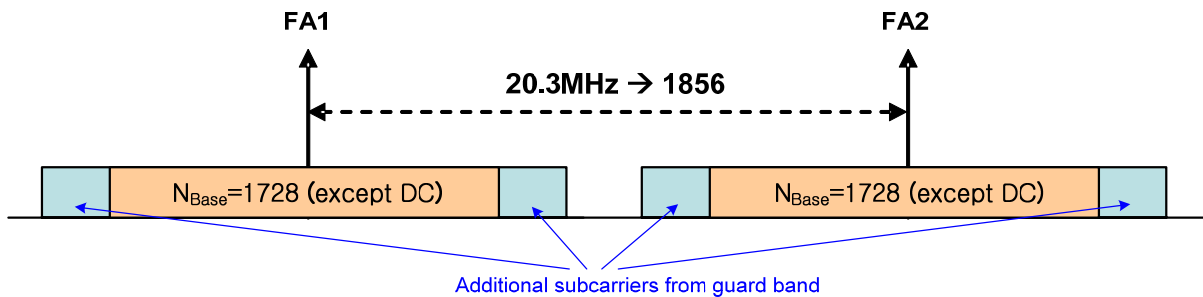


**Figure 2. Using additional subcarriers in guard band (1024 FFT)**

Also, Figure 3 and Figure 4 show another example for 512 and 2048 FFT case respectively.



**Figure 3. Using additional subcarriers in guard band (512 FFT)**



**Figure 4. Using additional subcarriers in guard band (2048 FFT)**

## 4. Proposed Text

[Add the following sub-section in Downlink control structure section]

### xx.1 Superframe header design

If the separation of center frequency between two adjacent FA is multiple of subcarrier spacing, the subcarriers once reserved for guard band can be used for the data transmission. The superframe header design shall take into account of the amount of additional subcarriers used in data region symbols.