

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	Improving link budget for FCH and DL_MAP	
Date Submitted	<b>2004-11-04</b>	
Source(s)	Weidong Yang Navini Networks 2240 Campbell Creek Blvd Suite 110 Richardson, TX 75082	Voice: 972-852-4314 Fax: <a href="mailto:weidong_yang@navini.com">weidong_yang@navini.com</a>
Re:	802.16e D5 September 2004	
Abstract	Link budget improvement for FCH and DL_MAP through limiting subchannels that DL_MAP can take.	
Purpose	Modification of DLFP	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures < <a href="http://ieee802.org/16/ipr/patents/policy.html">http://ieee802.org/16/ipr/patents/policy.html</a> >, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair < <a href="mailto:chair@wirelessman.org">mailto:chair@wirelessman.org</a> > as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site < <a href="http://ieee802.org/16/ipr/patents/notices">http://ieee802.org/16/ipr/patents/notices</a> >.	

# Improving link budget for FCH and DL\_MAP

*Weidong Yang*  
*Navini Networks*

## 1. Introduction

In the current 802.16e, it looks that DL\_MAP will use all the available channels as specified in the FCH following FCH. FCH has to divide the total BTS power between itself and those sub-channels carrying DL\_MAP. If one can limit the sub-channels that DL\_MAP can occupy, then the link budget for FCH can be improved for mobility and/or cell boundary. If DL\_MAP can be restricted to part of the subchannels specified in FCH, then the FCH and DL\_MAP link budget can be improved.

## 2. A proposal to improve control channel coverage for 802.16e

In figure 1 and figure 2, the FCH structure as in 802.16d is given. In 802.16e, it is expected that the same FCH will remain. It can be seen that there are 4 reserved bits at the end of FCH. One way to increase the control channel coverage is to limit the sub-channels that DL\_MAP can occupy. Those 4 reserved bits can be put to use. In the following table, the proposed modification is given for OFDMA 1024, 512 and 128,. In option 1, the number of used subchannels is specified. In option 2, the fraction of used sub-channels is specified. it is proposed that table 266 be changed.

## 3. Specific text changes

Add table 266b

### 1. Option 1 for table 266b

Value for 4 bits	Meaning
b0000	All subchannels are used
b0001	Only the first 1 subchannel is used for DL_MAP
b0010	Only the first 2 subchannels are used for DL_MAP
b0011	Only the first 3 subchannels are used for DL_MAP
....	....
b1111	Only the first 15 subchannels are used for DL_MAP

### 2. Option 2 for table 266b

Value for 4 bits	Meaning
b0000	All subchannels are used for DL_MAP

b0001	Only the $\_$ subchannels is used for DL_MAP
b0010	Only the 1/3 subchannels are used for DL_MAP
b0011	Only the $\_$ subchannels are used for DL_MAP
....	....
b1111	Only the 1/15 subchannels are used for DL_MAP

As the number of slots the first DL burst is defined, the time duration can be derived from the number of slots along with the number subchannels the first burst will take.

In figure 3, the idea is illustrated.

**Table 266—OFDMA downlink Frame Prefix format**

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
<b>Used subchannel bitmap</b>	6 bits	Bit #0: Subchannels 0-11 are used Bit #1: Subchannels 12-19 are used Bit #2: Subchannels 20-31 are used Bit #3: Subchannels 32-39 are used Bit #4: Subchannels 40-51 are used Bit #5: Subchannels 52-59 are used
<b>Ranging_Change_Indication</b>	1 bit	
<b>Repetition_Coding_Indication</b>	2 bits	00 - No repetition coding on DL-MAP 01 - Repetition coding of 2 used on DL-MAP 10 - Repetition coding of 4 used on DL-MAP 11 - Repetition coding of 6 used on DL-MAP
<b>Coding_Indication</b>	3 bits	0b000 - CC encoding used on DL-MAP 0b001 - BTC encoding used on DL-MAP 0b010 - CTC encoding used on DL-MAP 0b011 = ZT CC used on DL-MAP 0b100 to 0b111 -Reserved

Figure 1 DL frame prefix as defined in 802.16d/e

Table 266—OFDMA downlink Frame Prefix format

Syntax	Size	Notes
DL-Map_Length	8 bits	
<i>reserved</i>	4 bits	Shall be set to zero
}		

Figure 2 DL frame prefix as defined in 802.16d/e (second part)

ub-channel group  
index



**4 bits in DL frame prefix can be used specified how many subchannels will be used for DL\_MAP.**

3



First burst for DL\_MAP etc

