

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	<b>Support for Different Channel Bandwidths in DL and UL FDD/HFDD Systems</b>	
Date Submitted	<b>2008-01-14</b>	
Source(s)	Lei Wang, Yair Bourlas, Wee Peng Goh, Erik Colban  NextWave Broadband	Voice: [Telephone Number (optional)] E-mail: <a href="mailto:lwang@nextwave.com">lwang@nextwave.com</a> ; <a href="mailto:ybourlas@nextwave.com">ybourlas@nextwave.com</a> ; <a href="mailto:wgoh@nextwave.com">wgoh@nextwave.com</a> ; <a href="mailto:ecolban@nextwave.com">ecolban@nextwave.com</a>  * <a href="http://standards.ieee.org/faqs/affiliationFAQ.html">http://standards.ieee.org/faqs/affiliationFAQ.html</a> >
Re:	802.16 Working Group Letter Ballot #26a	
Abstract	FDD/HFDD systems have to efficiently support asymmetric traffic loads over the air link, as DL traffic and UL traffic over an air link are naturally not symmetric. The FDD/HFDD systems with different channel in the DL and UL are commonly referred as Asymmetric FDD/HFDD (A-FDD/HFDD) systems, which effectively enable FDD/HFDD systems to support asymmetric DL/UL traffic loads. Some FDD-allowed band classes have clear indications of benefits from Asymmetric FDD/HFDD (e.g., WCS band and 700MHz band). In addition, some service providers' spectrum holdings have the need to support Asymmetric FDD/HFDD. This document describes the required supports in the 802.16 Rev2 spec to enable Asymmetric FDD/HFDD.	
Purpose	To be discussed and adopted by 802.16 Rev2.	
Notice	<i>This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.</i>	
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	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: < <a href="http://standards.ieee.org/guides/bylaws/sect6-7.html#6">http://standards.ieee.org/guides/bylaws/sect6-7.html#6</a> > and < <a href="http://standards.ieee.org/guides/opman/sect6.html#6.3">http://standards.ieee.org/guides/opman/sect6.html#6.3</a> >. Further information is located at < <a href="http://standards.ieee.org/board/pat/pat-material.html">http://standards.ieee.org/board/pat/pat-material.html</a> > and < <a href="http://standards.ieee.org/board/pat">http://standards.ieee.org/board/pat</a> >.	

# Support for Different Channel Bandwidths in DL and UL in FDD/HFDD Systems

*Lei Wang, Yair Bourlas, Wee Peng Goh, Erik Colban*

NextWave Broadband

## Introduction

FDD/HFDD systems have to efficiently support asymmetric traffic loads over the air link, as DL traffic and UL traffic over an air link are naturally not symmetric. The FDD/HFDD systems with different channel sizes in the DL and UL are commonly referred as Asymmetric FDD/HFDD (A-FDD/HFDD) systems, which effectively enable FDD/HFDD systems to support asymmetric DL/UL traffic loads. Some FDD-allowed band classes have clear indications of benefits from Asymmetric FDD/HFDD (e.g., WCS band and 700MHz band). In addition, some service providers' spectrum holdings have the need to support Asymmetric FDD/HFDD. This document describes the required supports in the 802.16 Rev2 spec to enable Asymmetric FDD/HFDD.

## Proposed Solution

In the current 802.16 OFDMA PHY, TDD systems and FDD systems advertise the DL center frequency and UL center frequency as TLVs in the DCD/UCD messages, respectively.

To support Asymmetric FDD/HFDD (A-FDD/HFDD), in addition to UL center frequency, the BS should also advertise the UL channel bandwidth, FFT size, and cyclic prefix (CP) which may be different from DL channel. The proposed solution is to add one TLV in UCD to specify UL channel bandwidth, FFT size, and cyclic prefix.

To support HO between A-FDD/HFDD systems, no additional changes are required, because, if the DL/UL channel characteristics are different from the servicing BS, the MOB\_NRB-ADV will advertise:

- the neighbor BS's DL channel characteristics, including, DL center frequency, channel bandwidth, FFT size, cyclic prefix in its DCD\_setting compound TLV and PHY Mode ID TLV;
- the neighbor BS's UL channel characteristics in the MOB\_NRB-ADV through UCD\_setting compound TLV, where the UL center frequency is covered by the existing UCD TLV; and the UL channel bandwidth, FFT size, and cyclic prefix will be covered by the new UCD TLV proposed by this contribution.

In summary, this contribution proposes an addition, only one TLV to the UCD message, to support Asymmetric FDD/HFDD. It is flexible for all possible asymmetric FDD use cases. No hardware changes are needed.

## Suggested Changes in Rev2/D2

*In Rev2/D2, page 1063, line 23, append one row in Table 540 as follow, where the new row is marked by blue and underlined.*

**Table 540 — UCD PHY-specific channel encodings – WirelessMAN-OFDMA**

Name	Type (1 byte)	Size	Value
<a href="#">UL PHY Mode ID</a>	<a href="#">208</a>	<a href="#">2</a>	<a href="#">Bits 0 – 7: Channel bandwidth in units of 125 kHz;</a> <a href="#">Bits 8 -10: FFT size</a> <a href="#">0b000= 2048</a> <a href="#">0b001= 1024</a> <a href="#">0b010=512</a> <a href="#">0b011=128</a> <a href="#">0b100 – 0b111: reserved</a> <a href="#">Bits 11 – 13: Cycle Prefix (CP)</a> <a href="#">0b000= 1/4</a> <a href="#">0b001= 1/8</a> <a href="#">0b010=1/16</a> <a href="#">0b011=1/32</a> <a href="#">0b100 – 0b111: reserved</a> <a href="#">Bits 14 – 15: reserved</a>