

Project	IEEE 802.16 Broadband Wireless Access Working Group < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	A method which can Improve Capacity of WirelessMAN-CX	
Date Submitted	2006-11-10	
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Re:	IEEE 802.16 Working Group Letter Ballot #24, on P802.16h/D1	
Abstract	This contribution proposes to perform channel detection using quiet period, including slave sub-frame, extended quiet period and quiet period during CSI/CMI.	
Purpose	Define how to find another free channel or sense primary user during operating stage.	
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2006-11-10

IEEE C802.16h-06/103r0

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being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <<http://ieee802.org/16/ipr/patents/notices>>.

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# A method which can Improve Capacity of WirelessMAN-CX

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## Introduction

The current 16h draft standard, if there is not enough idle channel, BS must share channel with other system. BS and SS associated with it can do nothing during their slave sub-frame except channel measurement. Then the total capacity of BS is decreased.

Considering the slave sub-frame is periodic and longer enough, so we suggest during slave sub-frame, system may switch to another channel that may be free for this BS. Because the slave sub-frame is periodic and longer enough, BS which works in slave channel is also periodic and then everything can do during this period, including SS registration and data transmission. Following figure gives an example for type 2 sub-frame with N=3.

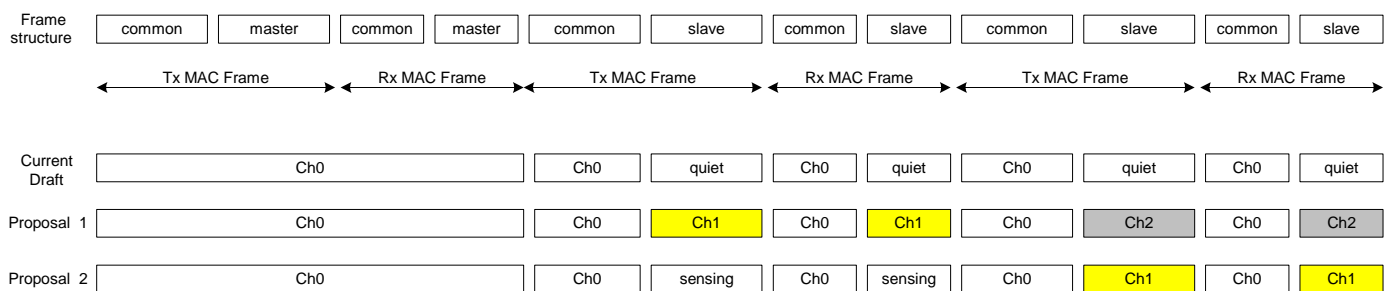


Figure 1 one example of multiple working channels

Since BS works at all time and the capacity of system is improved. And another benefit of this scheme is the probability of blind area is decrease since every BS may work independently in more than one channel.

For BS that doesn't share channel with its neighbor, it also can work at more than channel. In this case, a frame is also divided into common sub-frame and interference sub-frame and BS select one of interference sub-frame as its master sub-frame and the other sub-frame as slave sub-frame. During common sub-frame and master sub-frame, system works on working channel, during slave sub-channel, system works on another channel. This solution is back compatible with current draft standard [1].

To support this feature, effective channel measurement should be supported [2] and some elements should be added into the information table.

## Reference

[1] IEEE 802.16h-D1: Air Interface for Fixed Broadband Wireless Access Systems: Amendment for Improved Coexistence Mechanisms for License-Exempt Operation  
 [2] C80216h-06\_105, Using Quiet Period for Channel Measurement

## Proposed Text

### 15.3.3 Information table

#### 15.3.3.1 Information table in distributed database

**Table h6—Information table for the BS containing this database**

Syntax	Size	Notes
This BS information table(){		
BSID	48bits	
Operator ID	24bits	
IP version	1bit	0- IPv4 1- IPv6
if (IP version = 0){		
IPv4 address	32bits	IPv4 address of this BS
CXPRX IPv4 address	32bits	CXPRX IPv4 address
}		
Else{		
IPv6 address	128bits	IPv6 address of this BS
CXPRX IPv6 address	128bits	CXPRX IPv6 address
}		
RTK	16bits	Random Temporary Key
Extended Channel Number (ExChNr)	16bits	2 byte base reference to frequency range or deployment band. This reference maps to an absolute frequency value.
Base Channel Reference (BaseChRef)	8bits	1 byte specific channel number reference
Channel spacing (ChSp)	16bits	2 bytes channel spacing value (10kHz increments)
OCSI ID	8bits	CSIN of OCSI allocation
Negotiation status	8bits	Bit0: get communication in the IP network Bit1: be registered in Bit2: registered to Bit3: done for resource sharing (if neighboring) Bit4-7: tbc.
CSI parameter(){		Regulated by region/country
Tcsi_start	16bits	In microseconds
Tcsi_duration	8bits	In microseconds
Period of frames	8bits	frames
Starting frames offset	16bits	frame serial number of the first frame that CSI presented
Length of Symbols	8bits	In microseconds, need to be 1/n of Tcsi_duration
ICSI cycle	8bits	ICSI cycle counted in CSI cycles
OCSI cycle	8bits	OCSI cycle counted in ICSI cycles
}		
Number of CoNBRs	8bits	m: The number of coexistence neighbors of this BS
for (i= 1; i <= m; i++) {		
Index	16bits	Each Index here is referring to a BS in the neighborhood, and points to a set of information described in <i>Table h 7</i>
BSID	48bits	
}		
Profile(){		
Band		
PHY mode(){		
Modulation		
Working Channel ID	8bits	Identifier of the working channel of this BS.
Master Subframe ID	8bits	Sub-frame number:

		Bit7: sub-frame structure supported not supported supported Bit6: master subframe allocated do not have a master subframe have a master subframe Bit5-3: number of subframes in frame structure Bit2-1: the master subframe index this BS is using.
Number of ALTCH	8bits	p: The number of alternative channels to which this BS can switch without interference.
For (i = 1; i <= p; i++){		
Channel ID for ALTCH	8bits	Identifier of the alternative channel.
}		
Number of ALTSF	8bits	q: The number of ALTSF to which this BS can switch to without interference.
for (i = 1; i <= q; i++){		
Resource ID for the ALTSF	16bits	
}		
}		
Maximum power	8 bits	dBm
Number of registered SS <u>on working channel</u>	12bits	n
For (i = 1; i <= n; i++) {		
Index		
SSID		
}		
<u>Number of slave sub-frame</u>	<u>2bits</u>	<u>r: Number of slave subframes in frame structure</u>
<u>For (i=0; i &lt;= r; i++) {</u>		
<u>Subframe index</u>	<u>2bits</u>	<u>Sub-frame index</u>
<u>Slave Channel ID</u>	<u>8bits</u>	<u>The working channel ID during this slave sub-frame.</u>
<u>Number of registered SS on Slave Channel</u>	<u>12bits</u>	<u>s: number of SS registered on slave channel</u>
<u>For( i=1; i &lt;= s; i++) {</u>		
<u>SSID</u>		
<u>}</u>		
}		
}		

#### 15.4.4 Multiple working channel

System may work on multiple channels. For back compatibility, a MAC frame is divided into sub-frame, and each sub-frame may works on different channel or same channel.

When BS enters network, it may follow the defined in 15.1.3 and find a suitable working channel or master sub-frame. During the operating stage, system will sense the other channel using its quiet period (see 15.3.4 [2]). If a new idle channel or idle sub-frame on other channel is found, system may work on this channel during corresponding sub-frame.

For example, if system can select an idle channel to work during its initialization, system may let all its sub-frame works on that channel. During the operating stage, system may find another idle channel. Then during one of its sub-frame, system may work on the newest idle channel.

If system can't find an idle channel and must share channel with other systems, system may work during its common sub-frame and master sub-frame, and quiet during slave sub-frame. During the operating stage, system

may find there is a channel which is idle during its slave sub-frame. Then it will work on that channel during corresponding slave sub-frame.

To perform channel measurement effectively, system may reserve some slave sub-frame for channel measurement.