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Re:	IEEE 802.16h-06/015 – Working Group Review

Abstract	Clarifies the MAC Frame sync and numbering issues

Purpose	
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MAC Frame numbering and synchronization

Mariana Goldhamer (Alvarion)

Introduction

BS synchronization

The existing text mentions the sync request, however it is not clear how the NTI and the MAC Frame are related.

Implement the following changes:

15.6.2.1 BS synchronization

15.6.2.1.1 Synchronization of the WirelessMAN-CX ~~Networks~~Systems
All base stations forming a community of users sharing common radio spectrum will use a common clock to synchronize their MAC frames. The common clock will be available to all outdoor WirelessMAN-CX networks.
Such a clock can be provided by global navigational systems such as GPS (Annex 2) or can be distributed by ~~other mean~~the Control Channel-. Every BS upon activation, will as a first step ensure the derivation of the common system clock.
Systems, which do not see a global navigation system satellite, will synchronize their BS with the operating WirelessMAN-CX systems. Such systems shall check their synchronization status every 60sec.

15.6.2.1.1.1 Network Time Interval and MAC Frame start
All synchronized WirelessMAN-CX base stations will either synthesize or derive a 1 pps clock broadcast by

a global navigational system or other means. The 1 sec duration is called the Network Time Interval (NTI). The rising edge of the 1 pps synchronization pulse will be considered as the start of the NTI and of the WirelessMAN-CX MAC Frame. The 1pps pulse will have a stability of +/- ~~100 XX~~1 microseconds, as measured from rising edge to rising edge.

MAC Frame numbering

The MAC Frame number is used extensively by the Coexistence Protocol. In order to simplify the scheduling information for coordinated actions, will be suitable to use a pre-defined MAC Frame numbering, based on the NTI.

Insert new sub-chapter 6.4.1.3

6.4.1.3 MAC CX-Frame numbering

The MAC Frame number used by the Coexistence Protocol (CX_MAC_NO) is a running number. The MAC Frame no.1 starts at the absolute time of the day 00:00:30sec and includes the first slot of the Control Channel.
CX_MAC_NO has a length of 16bit and wraps-around according to the repetition time of the Control Channel.

6.4.1.4 Synchronization using the Control Channel

The first two time-slots of the Control Channel, scheduled during the DL MAC sub-frames and during the UL sub-frames are used for the synchronization. A synchronization signal will be placed at the start of the Control time-slot, in the following way:
- BS synchronized by GPS will use the first DL slot
- BS synchronized by another BS will use the 2nd DL slot

- SS associated with a BS which is synchronized by GPS will send the synchronization signal in the first UL slot, if instructed by the BS to do so;
- SS associated with a BS, which is synchronized by another BS, will send the synchronization signal in the 2nd UL slot, if instructed by the BS to do so.

The synchronization signal is a sub-set of the radio signals defined in 15.4.4.1.4, Table h6. The Table hx indicates the sequence of the Radio signals to be used for marking the slots of the Control Channel.

Table hx: Sequence of radio signals sent in the Control Channel

	1st signal	2nd signal	3d signal
1st DL slot	Header	Rx_end	Tx_end
2nd DL slot	Header	Rx_start	Tx_start
1st UL slot	CSI_Start	NACK	CSI_Continuation
2nd UL slot	CSI_Start	Tx_end	Rx_start

The interval between the radio signals is 1/8 of the symbol length.

The first 4 slots of the Control Channel are shown in the fig. hy.
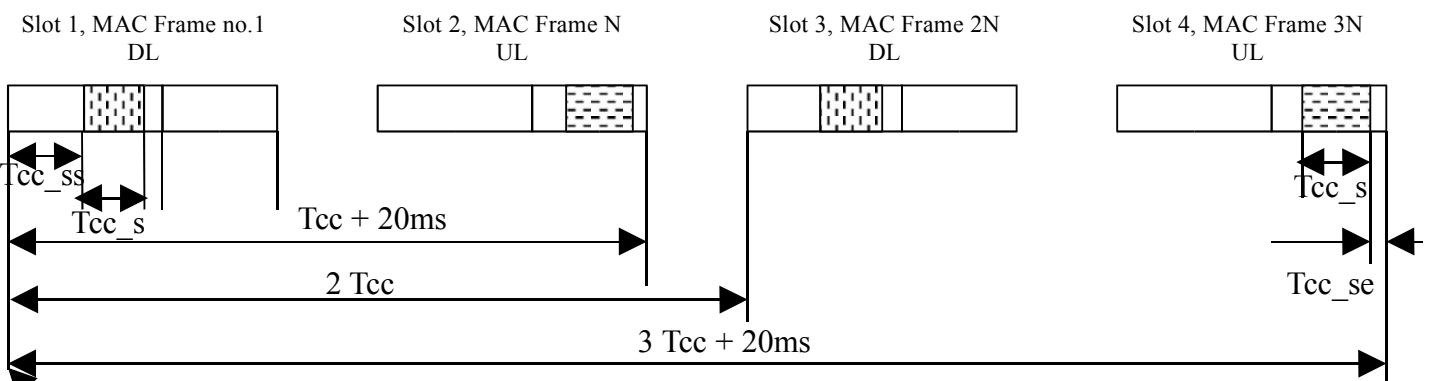
Fig hy: The first 4 slots of the Control Channel

The positioning of the DL/UL Control Channel slots is done in a way that will keep their DL/UL characters for a MAC Frame duration of 5,10 and 20ms. The interval between two consecutive DL slots is 2Tcc and is defined in Chapt.10.5.2.

Insert the new chap. 10.5.2

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10.5.2 Control Channel

Absolute time reference	Chapter	Reference	Value
Tcc	6.4.1.4	Average period of the Control Channel time-slots or ½ period between DL slots or ½ period of the UL slots	200ms
Tcc_s	6.4.1.4	Duration of the Control Channel slots	1ms
Tcc_ss	6.4.1.4	Offset of the DL Control Channel slots from the start of the first MAC Frame	1ms

| Tcc_se | 6.4.1.4 | Duration from the end of the UL Control Channel slots to the end of the MAC Frame, for MAC Frames of 5,10 and 20ms | 0.2ms |