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Title	**Co-Channel Interference CP Messages (SS_CCID_IND & SS_CCID_RSP) For Synchronized WirelessMAN_CX Same Profile Systems**
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Re:	IEEE 802.16h-06/011 – working group review. Ongoing elaboration in response to previous call for comments..
Abstract	This document specifies two CP messages that are needed for synchronized, same profile, WirlessMAN_CX systems. These messages are used by base stations to facilitate detection and identification of uplink channel interference, and resolve it by use of the Coexistence Protocol.
Purpose	This document takes coexistence and co-channel interference messages formerly presented as MAC messages and includes them now as new Coexistence Protocol messages. Its purpose is to reduce the MAC overhead for WirelessMAN-CX, since these messages are not time critical.
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Co-Channel Interference CP Messages (SS_CCID_IND and SS_CCID_RSP) for Synchronized WirelessMAN-CX Same Profile Systems

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Rationale

SS_CCID_IND and SS_CCID_RSP are Coexistence Protocol (CP) messages that are used in same profile IEEE 802.16h WirelessMAN_CX systems which are synchronized to a universal timing standard such as GPS. These messages are used to identify and resolve co-channel interference in systems that share common spectrum resources (such as LE systems).

The purpose of these CP messages is to resolve uplink interference generated by foreign subscriber stations into an affected (home) base station. Such interference is detected as uplink foreign SSURF messages (Section 6.3.2.3.63) at the BS. New interference becomes evident at the BS by examining newly detected SSURF messages transmitted during the CMI against lists contained in the BS Interference Tables (Section 15.2.2.4).

SS_CCID_IND

Uplink interference from foreign subscriber stations is detected at the interfered-with base station by detection of new SSURF messages, which are broadcast on the uplink by the foreign SS during the CMI. To resolve the uplink interference the affected base station must communicate the presence of the new interference to the foreign base station controlling the interference generating SS. This is done using the SS_CCID_IND coexistence protocol message. Once the foreign BS receives this message it either reschedules the interfering SS uplink transmissions to previously identified interfernce free slots, or undertakes a CP negotiation (See Section 15.2.1.1.2). {It should be noted that there may be other options to limit the uplink interference from the foreign SS, such as changing its EIRP, have it change some aspect of its radiation pattern, or move it to another channel. These are not detailed here, suffice to say that they will be handled by more detailed aspects of the TBD CP}. Once resolution of the interference is completed, the foreign BS sends a SS_CCID_RSP message to the home BS, informing it that the change has been made. Upon receipt of this message the home BS then updates its BS Interference Table, thereby indicating to itself that interference from the foreign SS has been resolved. Figure 1 summarizes the messaging described above.
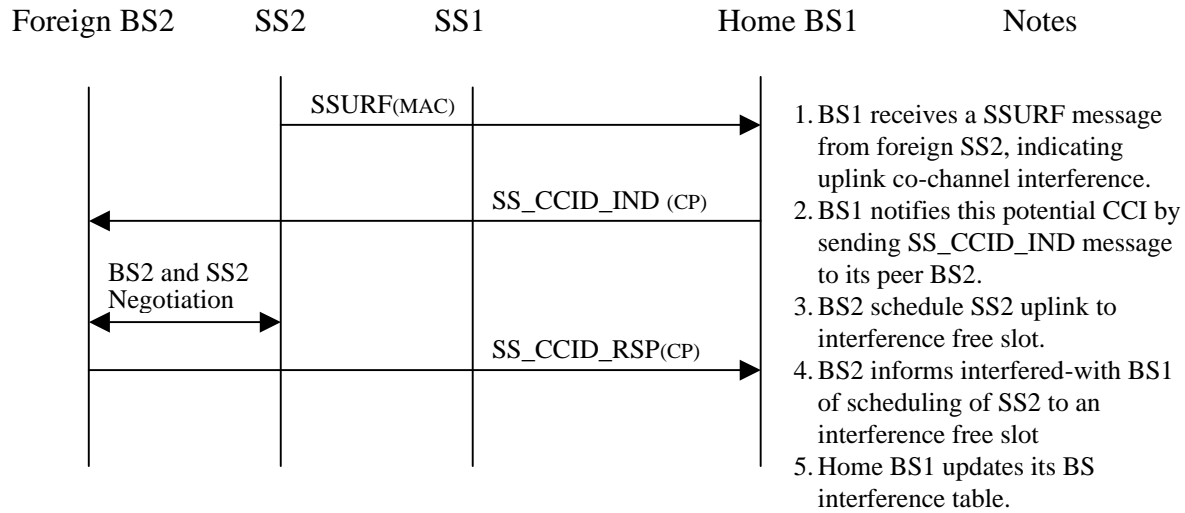
Figure 1. An Example of SS_CCID_IND and CC_CCID_RSP usage

SS_CCID_RSP

This message is sent as a response to the SS_CCID_IND message, indicating the status of the resolution of uplink interference.

Note: The SS_CCID_RSP and SS_CCID_IND messages may be merged with Evaluate_interference_request and Evevaluate_interference_reply. However, since there are no details about Evaluate_interference_request and Evaluate_interference_reply in the current draft, we give details about SS_CCID_IND and SS_CCID_RSP messages.

15.6.1.33 SS_CCID_IND message

[This section is to replace the whole of section 15.6.1.33 of IEEE802.16h-06/010]

This is a message sent by an interfered-with BS to the master BS or its peer BS when co-channel interference due to an interfering SS is detected. This message shall contain the following information to determine the

source of the co-channel interference and its RF emission characteristics. This information is extracted from the SSURF messages sent by the interfering SS.

SS_ID
The interfering subscriber station identity , as derived from the SSURF.

BS_ID _Source

The identity of the base station associated with the interfering SS, as derived from the interfering SSURF

EIRP

EIRP of the interfering base station, as derived from the interfering SSURF.

M_RSSI

Mean RSSI of the interfering SSURF.

Base Station RF Antenna Sector ID

Antenna sector ID of interfering BS system associated with the interfering SS.

BS_ID_Victim

Identity of interfered-with Base Station.

CMI_ID

The Coexistence Messaging Interval during which the interference was received.

INT_SSURF_Frq
The frequency of interference SSURF events detected per CMI cycles (calculated as the number of detected SSURF interference events per N full CMI cycles [1 cycle= 1 min TBD]) . This value relates to the severity of the interference from the foreign SS

SS_CCID_IND TLV encoding are provided in the following table

Name	Type (1 byte)	Length (bytes)	Value (Variable length)	PHY scope
SS_ID	1	6	Foreign Interfering SS ID derived from SSURF	
BS_ID	2	6	Foreign Base Station ID detected at SS Derived from foreign SSURF	
EIRP	3	1	Nominal EIRP of interfering signal () or the per burst EIRP	
CMI_ID	4		Common messaging interval ID	
M_RSSI	5	2	Mean RSSI of detected and identity interference (SSURF)	
INT_SSURF_FRQ	6	2	frequency of interference SSURF events.	
Base station RF antenna sector ID	7	1	The RF antenna sector identifier for a base station. 1 – 255 for FDD only 0 – reserved for TDD only	
BS_ID	8	6	ID of BS generating this message; the interfered-with BS ID	

None of above TLV in this message is repeatable.

15.6.1.34 SS_CCID_RSP Message

[This section is to replace the whole of section 15.6.1.34 of IEEE802.16h-06/010]

This CP message is usually sent in response to a SS_CCID_IND to inform the interfered-with base station on the status of the interference resolution being undertaken at the foreign base station. Since there may be longer timed negotiations being undertaken as a consequence of the SS_CCID_IND message; this message may be used to indicate to the interfered-with BS a wait time. In most instances the message will indicate a resolution to the uplink interference , achieved by scheduling uplink transmissions from the foreign subscriber station..

RES

Information to the inquiring base station (originating SS_CCID_IND) on the status of the resolution of identified interference. This could be a number of options: interference resolved (rescheduling of SS uplink traffic to non-interference zone); lowering EIRP or modulation of SS; unresolved (due to inability to find uplink rescheduling zones) etc.

CNTI_BS_TBD

Pending scheduling changes, as part of CP {TBD}

The message shall have the following information:

SS_CCID_RSP TLV encoding are provided in the following table

Name	Type (1 bytes)	Length	Value (Variable length)	PHY scope
BS-ID	1	6	Foreign Base Station ID detected at SS Derived from foreign SSURF	All
SS_ID	2	6	Foreign SS generating interference.	
EIRP	3		EIRP of Foreign BS	
RES	4	2	Resolution status pertaining to original SS_CCID_IND; Either resolved, pending, unresolved. {TBD}	
CNTI_BS_TBD	5	4	Pending CP scheduling changes directed to BS (TBD)	

None of above TLV in this message is repeatable.