Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**IBS entry process in Synchronized IEEE 802.16h Systems having a Common Profile**
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Re:	Call for Comments and Contribution, "IEEE 802.16's License-Exempt (LE) Task Group", 2006-02 Item 3.
Abstract	This document specifies an entry process of a new BS into a Interference Neighborhood and the Creation of a Coexistence Community Using GPS/UTC time Synchronization. This process applies to systems conforming to a common profile.
Purpose	This document specifies an entry process of a new BS into a Interference Neighborhood and the creation of a Coexistence Community using GPS/UTC time synchronization. The systems conform to a common profile. The document IEEE802.16h-06_003 details a synchronized CTS (now CMI) system and describes how it is used to coordinate co-channel networks, resolve entry of new networks and undertake interference control between networks in a co-existing community as well as new interference, some of which may not be due to IEEE 802.16h systems. This is a continuation of document IEEE802.16h-06_003 and IEEE802.16h-06_010r1
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IBS entry process in Synchronized IEEE 802.16h Systems having a Common Profile

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Insert this section at the end of Section 15.2.1.3.1

Entry of a new BS into a Interference Neighborhood and the Creation of a Coexistence Community Using GPS/UTC Time Synchronization and Common System Profile.

In applications where the Coexistence Messaging Intervals (CMI-see 15.2.1.1.3.1) are synchronized to a GPS (or similar precision timing reference) and are given UTC time stamps (Fig H13), entry of a new Base Station (IBS) will be undertaken in 4 steps, with the IBS:

(a) Monitoring the CMI Intervals,
(b) Selecting an Empty CMI interval,
(c) Claiming an empty CMI interval,
(d) Membership in a Coexistence Community.

Prior to entry into a Community of Operating Base Stations (OBS) it is assumed that the IBS will have undertaken Candidate Channel Determination (Section 15.4.1.1) and has selected a candidate channel, is synchronized to a downlink GPS signal and can derive a UTC time stamp, and has no operational SS yet deployed. It is assumed that the IBS is deployed within an Interference Neighborhood: ie: active interference from existing Operating Base Stations is present. It is also assumed that the community which entered is WirelessMAN-CX compliant and uses a common (same) profile. The IBS entry process is shown in Figure 1. Figure 2 shows aspects of the entry procedure with signalling.

(a) Monitoring the CMI

Having tuned to the candidate channel, the IBS monitors and determines the level of activity on each CMI by demodulating the uplink SSURF (Sec 6.3.2.3.70 TBD) messages and storing their parameters in its Base Station Information Table(See Table h2). All demodulated SSURF messages will be from SSs that will interfere with the BS on the uplink and eventually, coexistence will have to be arranged with each of the OBS controlling these SSs via the Coexistence Protocol (CP). Each CMI from CMI-ID-00 to CMI-ID-54 is monitored. Each CMI is monitored for 5 CTS cycles or minutes (TBD). If CMI-ID-54 has detectable power in it, the channel will be construed as occupied by a non-IEEE 802.16 system (See 15.3.1.1.3.1) which may also be synchronized to the GPS/UTC. The channel will be abandoned if CMI-ID-54 is occupied (See 15.3.1.1.3). The signalling seen by an IBS is shown in Figure 2.

(b) Selection of an Empty CMI

The monitored CMI in which no (demodulated) SSURF messages are received becomes a candidate CMI, and is considered empty. Empty CMI indicate that it is still possible for the IBS to create a new Coexistence Community including the OBS (only a maximum of 9(TBD) co-channel systems can be accommodated by a single channel. Full loading is indicated when all 9 (TBD) CMI are occupied by the systems forming a Coexistence Community).

During each candidate CMI a RSSI (see 8.4.11.2) will be undertaken by the IBS during the uplink duration. RSSI is undertaken to determine the presence or absence of low level (un-demodulated) uplink SSURF messages. Each candidate CMI is monitored in this manner over a duration of 10 CMI cycles or minutes (TBD). An interval will be considered as useable and chosen if the mean RSSI

power measurement in it is no greater than {[N] +3 dB) (TBD); where [N] is the thermal noise floor of the IBS receiver as determined by the Candidate Channel Determination process (See 15.4.1.1).

The absence of uplink SSURFs means that the CMI is free of uplink (and possibly downlink occupancy). The particular CMI is now considered as being ready for claiming.

(c) Claiming Procedure.

The purpose of the claiming process is to make all adjacent OBS aware of the presence of the IBS. This process results in the delimitation of the Interference Neighborhood…that is, identification of all the adjacent systems that will see interference from the IBS. Claiming is undertaken by having the IBS broadcast its BSD during an empty CMI. Since all the OBS (both base stations and their SS) are silent and are monitoring the downlink on each CMI other than their own, the broadcast BSD message will likely be detected during what was previously an empty CMI (see discussion on undetected broadcasts below).

To begin the claiming procedure the IBS broadcasts at maximum EIRP a BSD (see 6.3.2.3.70) message. This message, when received by SS belonging to adjacent OBS systems that form the Interference Neighborhood, will result in those SS informing their home base stations (OBS) of the presence of a new base station (the IBS). The SS inform their BS of this by using a MAC message called the BS_CCID_IND (TBD). This MAC message contains the Proxy IP address of the IBS, which was extracted by the SS from the interfering BSD message. Now having the proxy IP address, the OBS respond back to the IBS via a backhaul IP link, informing the IBS that it has been detected and is a de facto interferer on the co-channel RF downlink. Having received this communication from the OBS, the IBS will now have discovered the systems in the Interference Neighborhood, and as part of this discovery process now has the identities of the adjacent OBS. The OBS identities are included in the IBS Information Table (see H2). The IBS continues its BSD broadcast routine until no new OBS make themselves evident to the IBS. The IBS continues its BSD broadcasts every CMI cycle (every minute), and does so as long as it confirms to itself that it has formed a Coexistence Community with adjacent systems.

(d) Membership in the Coexistence Community

All of the adjacent systems with which the IBS creates or sustains interference to/from become listed in the BS Information Table (See H2) of the IBS. This table contains the BS_IDs and related IP addresses derived either from uplink SSURF messages that the IBS demodulated during its monitoring phase (above (a)) or from the BS_CCID_IND and IP messages that it received via the IP backhaul from the OBS as part of the claiming procedure ((c) above).

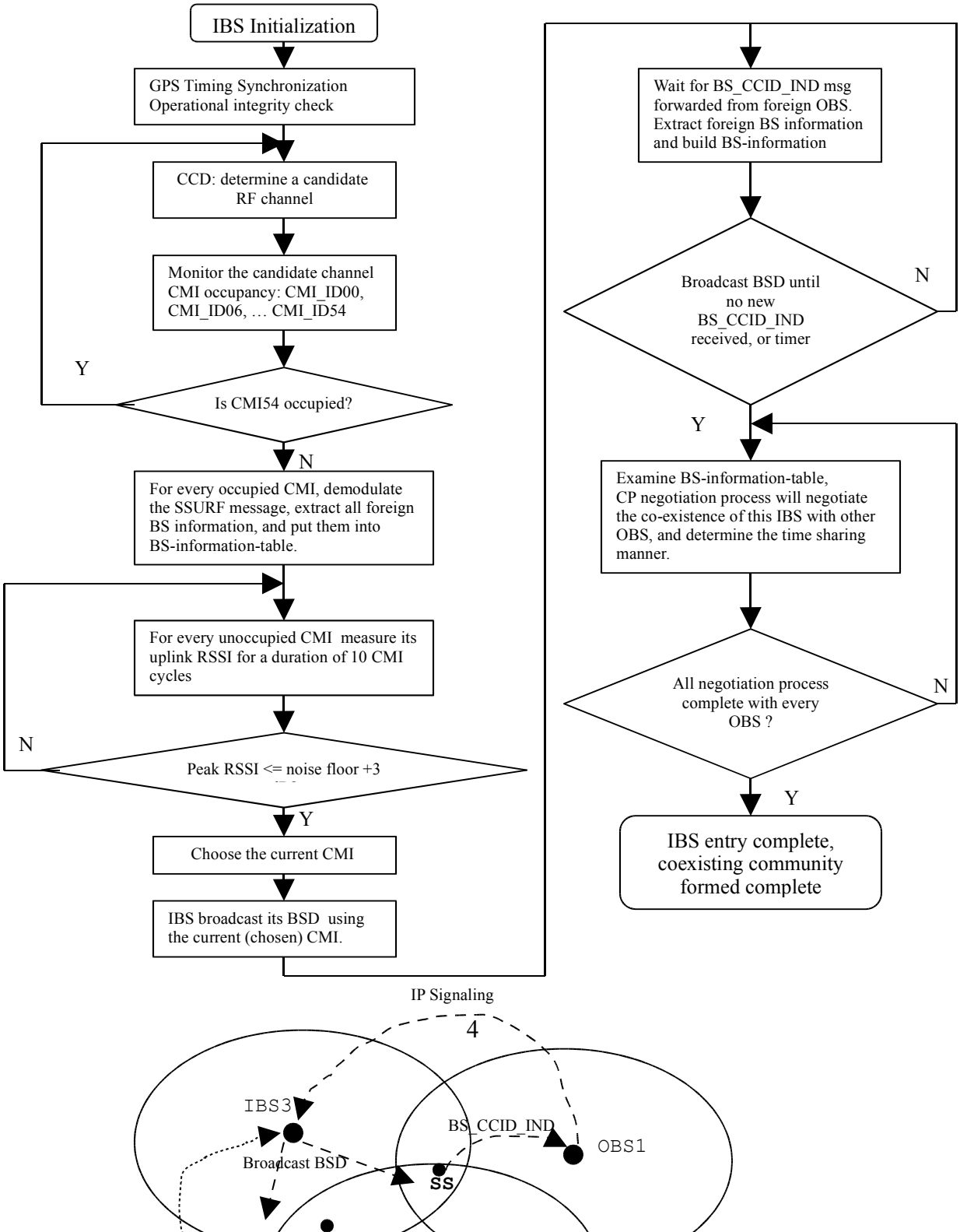
Communication and negotiation with each OBS listed in the BS Information Table is undertaken via the {TBD} Coexistence Protocol (CP). Coexistence entails allocation of uplink and downlink transmission intervals in a manner that eliminates co-channel interference amongst users that would otherwise experience it and sustain degraded communications. This is done by parsing uplink and downlink intervals and establishing master subframes (see Sec 15.2.1.1.2). Each OBS that the IBS has listed in its BS Information Table as an interfering network must partake in such a resolution procedure. By undertaking this process the IBS thus creates a Coexistence Community for itself, and consequently becomes accommodated by the neighbouring networks of its interference neighbourhood. If the IBS for some reason cannot resolve all the interference it creates or sustains, then the entry process is repeated on a new channel taken from the rankings provided by the CCD procedures (see 15.4.1.1). In doing so the IBS would then abandon the CMI that it claimed in (c). If the CP process is successful, then the IBS (now OBS) continues its claim to the CMI, thereby now informing all other systems of its active presence in the Coexistence Community.

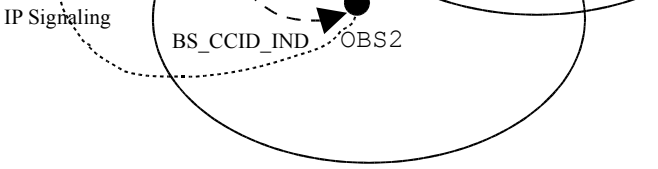
<u>Undetected BSD Broadcasts/Undetected Uplink SSURF messages.</u>

The BSD and SSURF messages are sent at the lowest, most robust modulation rate specified for IEEE 802.16 transmissions. However, because of the statistical variation in the propagation channel whose variance can exceed 10 dB, there is a finite probability that eventually such signals shall eventually exceed demodulation threshold levels and be detected. The time to achieve this is TBD.

Furthermore, below threshold signals can be detected by power detectors or detection techniques that will provide indication of signals below demodulation thresholds. These techniques can be instituted either as part of the RF system or in parallel with the demodulation process..

Figure 1. IBS community entry process.





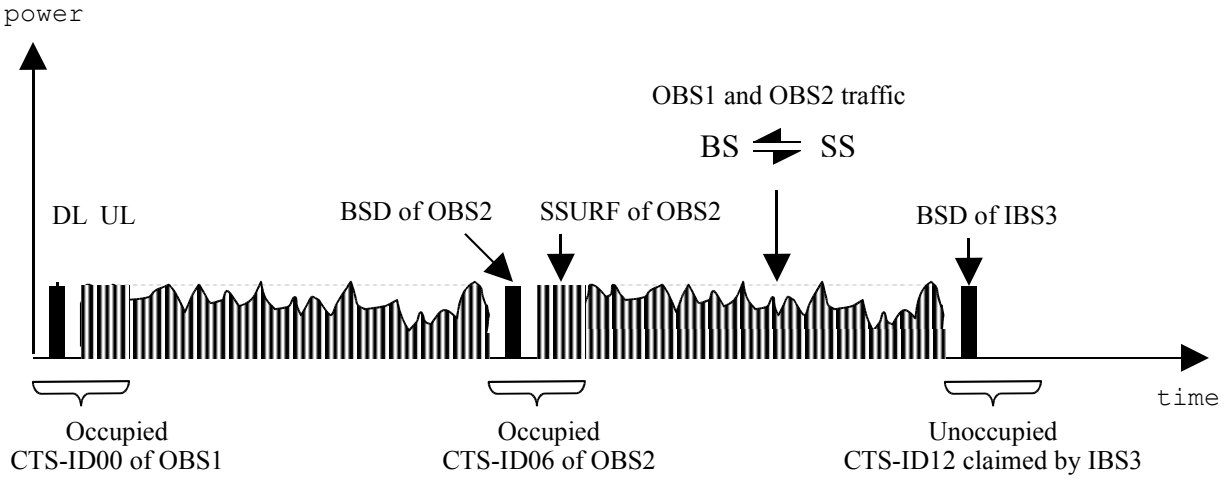


Figure 2 IBS3 Entry Signalling