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Title	Comments and further considerations for Uncoordinated Coexistence Protocol	
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Re:	The first Letter Ballot to IEEE P80216h_D1	
Abstract	Comments and further considerations reflects ongoing Work Group discussion on the Enhancement for uncoordinated coexistence	
Purpose	Revised comments	
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Comments and Further Considerations for Uncoordinated Coexistence Protocol

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Introduction

The UCP (Uncoordinated Coexistence Protocol) supports 16 system coexistence operation on Non-exclusively assigned and non-exclusively licensed band which contains SSUs (Specific Spectrum Users) and Non-SSUs. Especially, with UCP, the problem of coexistence with 11y (OFDM PHY for the 3650 MHz Band) should be well resolved achieving the CBP requirements of FCC.

Together with the CBP requirements, considering the business use, the UCP should be

- ✓ A simple mechanism to reduce the design/deployment cost
- ✓ An applicable mechanism with more consideration on full scenarios.
- ✓ A compatible mechanism, with the best effort on reducing the necessity to change the coexisted system.
- ✓ An efficient mechanism to make the best usage of the non-exclusively licensed band, and especially preserve the 16 system advantages of supporting real-time services.

The drafted UCP in 16h Draft1 give us a good guide to a simple uncoordinated scheme, providing DFS/DCS for coexistence with SSU and non-SSU; EQP for providing other user access opportunities; and adaptive EQP for better resource usage. Whereas there are still some problems exist in the current scheme. I'd here to point them out for discussion and improvement.

Existing Problems

1. Different Reactions with SSU (Specific Spectrum Users, Incumbent user) and non-SSU

The uncoordinated coexistence mechanism may conduct the following different reactions of channel allocation for SSU and non-SSU:

	Initialization Stage	Operation Stage
SSU presents/occurs	Find the best frequency without a SSU. Will conduct DFS.	If SSU occurs, should vacate the physical frequency and select and change to new available frequency. Will conduct DFS.
Non-SSU presents/occurs	Can coexistence with Non-SSU system, Wait and find a less interfered area of the frame Will conduct DCS.	Coexistence with Non-SSU system, May maintain the allocation usage, find a less interfered area of the frame and provide opportunity for other to access. Will conduct DCS, EQP, etc

In initialization stage, when detected the SSU or non-SSU presents, UCP will have different reactions. For SSU, UCP will update the available channel list, and try another channel. As for non-SSU, UCP may expect to coexistence with it, and find an available opportunity.

The similar situation is in operation stage, if SSU occurs in the operation channel, UCP have no choice but to vacant the channel; while if non-SSU occurs, UCP will consider about whether or not to release some channel resource.

When to release and which to release, the decisions may be variable basing the UCP, the current transmission/receive status and other factors.

So the UCP description section should fully consider the full scenarios, and give a complete introduction in section 6.4.2.4.

2. EQP usage

The relationship of duty cycle and EQP haven't been clearly clarified in the draft. The BS presented duty cycle may be calculated basing EQP. If EQP is a long period and occurs frequently, then in the duty cycle, BS usage proportion will be small; other wise, BS will get a larger percentage of duty cycle usage.

As for the case of no non-SSU coexisting in the same channel, UCP will set the duty cycle occupation percentage of no more than **max_duty_cycle**, EQP may be very short and occurs seldom. Unless there have non-SSU in the channel, UCP won't reduce the duty cycle occupation percentage to share the channel with others.

But it is difficult to determine when to begin EQP, and the duration of EQP. It is an issue of the time domain channel resource allocation between non-SSUs. And is there any consideration about that to give a more efficient solution?

3. Support the Difference Service Classes of 16 and 11 systems

Can 16's real time services be supported by UCP?

Since the UCP should perform EQP to provide access opportunity for other coexistence system, and need to listen before talk after the EQP to get access opportunity again, so there exists the possibility that UCP fail to support real time service transmission/reception in the right time.

It seems that 16 and 11 system should have coordination in some extents. May there any "slight" communication between coexistence system can be introduced in to the UCP to resolve this problem?

4. Retransmission/Resume Scheme for collision

A contention based protocol should consider about the retransmission scheme for collision. Though the draft assumes each of the coexistence systems should perform listen before talk, there still exists the possibility that collision will occurs, if coexisted systems begin to transmit at the same time after monitoring on a vacant channel. The Retransmission/Resume Scheme should be added in the draft.

Suggested Revisions for section 6.4.2.4

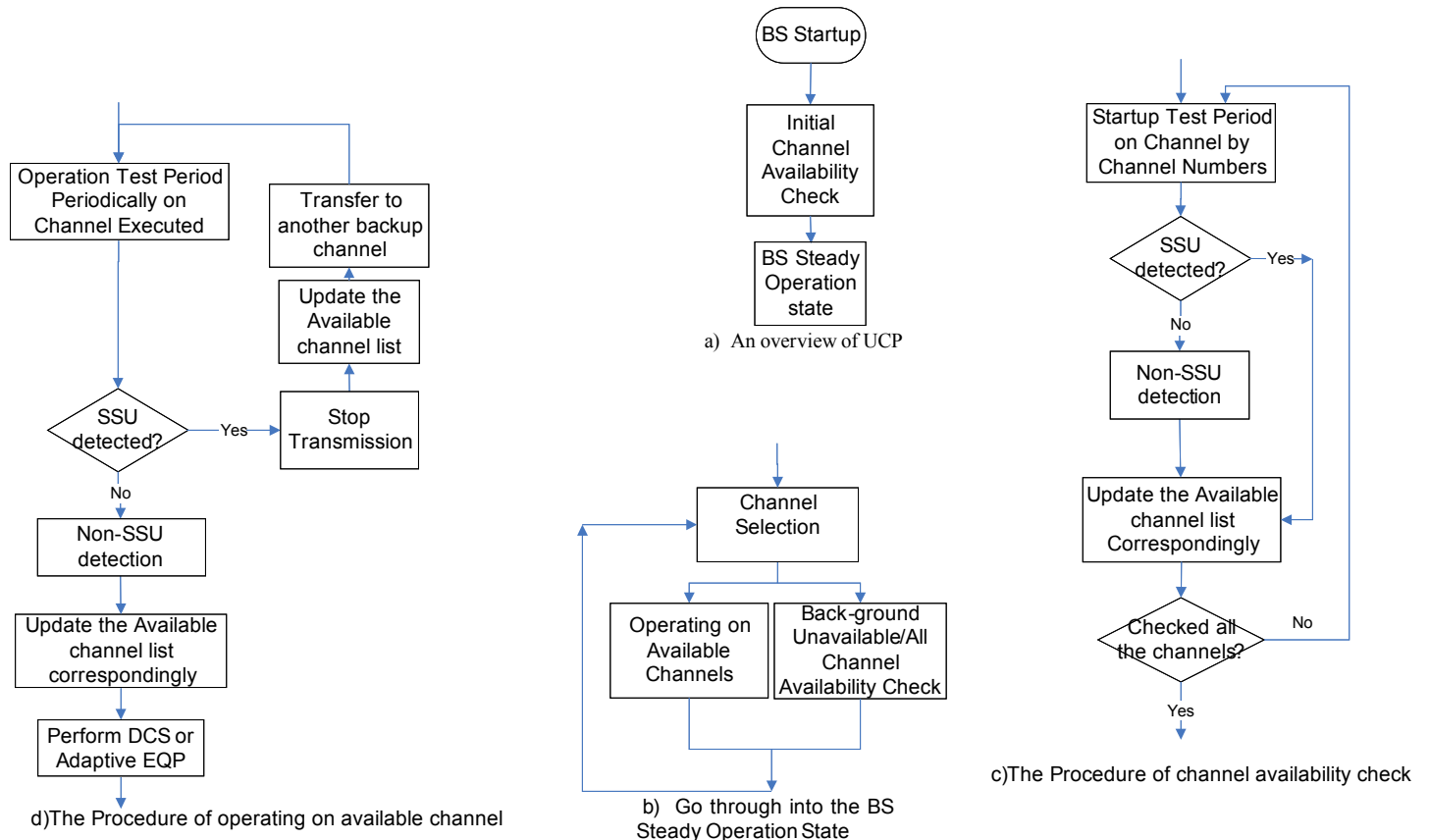
6Uncoordinated Coexistence Protocol (UCP)

The clause describes the use of an Uncoordinated Coexistence Protocol (UCP).

Upon system startup, the BS shall undertake ~~perform DFS/DCS~~ protocols, depending upon the requirements for operation given in the band, to choose a suitable ~~the~~ channel on which to operate. If the band has SSUs, the BS shall use a protocol termed in this sub clause DFS to find a channel free of SSUs; this protocol is described in sub clause 6.4.2.2. DCS shall be used to choose the *best* channels in bands that ~~are not~~ occupied by ~~a non-SSU~~; this protocol is described in sub clause 6.4.2.3.2. The definition of *best* for this purpose shall be left for vendor differentiation.

The BS shall continue to perform DFS and DCS, as required for a given band, selecting the most appropriate *physical* (frequency only component), based on the prevailing conditions and reacting to measurement and reporting from SSs. For the case SSUs are

detected on a channel then the DFS protocol shall attempt to select a new *physical* channel based on that described in 6.4.2.2. For non-SSU detection the BS shall use the DCS protocol in order to select an alternative *physical* channel or shall ~~The BS shall implement~~ use adaptive EQPs, as described in clause 6.4.3.3, to ensure other systems that are detected have an opportunity to transmit. The BS shall require measurement and reporting from the SSs per the DFS/DCS protocol, and move to a better channel should one come available. If systems other than ~~other 802.16 systems and~~ SSUs are may be present in the channel, the BS shall use the listen-before-talk (LBT) protocol of 6.4.3.5 to avoid scheduling a frame when another system is transmitting on the channel.



Open issues

The following issues are suggested to discuss as open issues in meeting or ad-hoc after meeting:

1. Time domain channel resource allocation between non-SSUs.
2. Support the difference Service Classes of 16 and 11 systems.
3. Retransmission/Resume Scheme for collision

Reference

- [1] IEEE P80216h_D1 Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems: Improved Coexistence Mechanisms for License-Exempt Operation; Working Document
- [2] C80216h-06_074r2: Uncoordinated Coexistence Protocol (UCP), Paul Piggin, NextWave Broadband