Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**Support for Intercell Interference Mitigations**	
Date Submitted	**2008-03-10**	
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Re:	802.16 Working Group Letter Ballot #26b	
Abstract	This contribution proposes a few minor and backward compatible changes into the 802.16 Rev2/D3 that will provide the required supports to aid interference mitigation schemes for the OFDMA PHY based systems.	
Purpose	To be discussed and adopted by 802.16 Rev2.	
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Support for Intercell Interference Mitigations

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Introduction

Enabling frequency reuse-1 is very important for a wide adoption of 802.16e OFDMA PHY based systems, as spectrum efficiency is one of the most critical performance measures for competing wireless technologies. Intercell interference has been identified as the major problem for effectively achieving frequency reuse-1, therefore, managing interference becomes one of the most important elements to improve the system performance and hence competitive advantage of 802.16e based systems.

Interference management is achieved by a combination of interference avoidance and interference cancellation techniques. Most interference mitigation techniques are based on the knowledge of the interference properties. However, the current 802.16e does not provide adequate supports for making the interference property knowledge available for effective implementations of interference mitigation schemes. This contribution proposes a few minor and backward compatible changes into the 802.16 Rev2/D3 that will provide the required supports to aid interference mitigation schemes for the OFDMA PHY based systems.

Proposed Solution

In order to provide the required supports to aid the implementations of the interference mitigation schemes, we propose to introduce a concept, called coordinated DL zone, which is a DL zone coordinated between the servicing BS and all its neighbor BSs, including:

1. the same zone boundary;
2. the same zone permutation type, e.g., PUSC, STC PUSC, AMC, STC AMC, and FUSC;
3. no dedicated pilots;
4. no MIMO (either Matrix-A or Matrix-B).

In such a coordinated DL zone, the same zone boundary and the same zone permutation type allow for the interference to be stable, and also allow the interference properties of the neighbor BSs to be learnt by using pilot subcarriers, as the pilot subcarriers from all neighbor BSs are transmitted at the same time and the same locations. By gaining the knowledge of the interference properties from all neighbor BSs, the interference mitigation schemes can be effectively implemented.

A frame can have zero, one, or multiple coordinated DL zones. The first PUSC zone can also be a coordinated DL zone.

Permutation types, PUSC, STC-PUSC, AMC, STC-AMC, and FUSC are allowed to be used in a coordinated DL zone. Each permutation type can have zero or one coordinated zone in a frame, except for the PUSC. For the PUSC, in addition to the first DL PUSC zone, there can be another coordinated DL PUSC zone.

To enable the interference mitigation schemes based on the coordinated DL zone concept, the supports are needed at air interface to signal the presences of such coordinated DL zones and some PHY

properties. The current 802.16 Rev2/D3 spec does not provide adequate supports for such coordinated DL zone based signaling, thus the following few minor changes are needed in the 802.16 Rev2/D3:

1. add a TLV in SBC-REQ and SBC-RSP messages to signal the BS's supports for the coordinated DL zones and MSS's interference cancellation capability in the coordinated DL Zones;
2. add a TLV in DCD message to signal that the first DL PUSC zone is a DL Coordinated zone;
3. use 1 currently reserved bit in the DL zone switch IE to signal that the zone is a DL Coordinated zone;
4. add a TLV in the MOB_NBR-ADV message for each neighbor BS to specify its DL_PermBase and PRBS_ID.

In summary, this contribution proposes few minor and backward compatible changes to the 802.16 Rev2/D3, to provide the required supports for the implementation of interference mitigation schemes.

Suggested Changes in Rev2/D3

Suggested change #1:

In Rev2/D3, page 1126, line58, insert the following subsection, where the new text is marked by blue and underlined.

11.8.16 DL Coordinated Zone capability

The DL coordinated zone capability field specifies the DL coordinated zone supports for different permutation types. This field is used only for the WirelessMANOFDMA PHY. A bit value of 0 indicates "not supported" while 1 indicates "supported".

Name	Type	Length	Value	Scope
DL Coordinated Zone	185 (??)	1	Bit#0: Support DL coordinated zone for PUSC Bit#1: Support DL coordinated zone for STC PUSC Bit#2: Support DL coordinated zone for AMC Bit#3: Support DL coordinated zone for STC AMC Bit#4: Support DL coordinated zone for FUSC Bit#5 to Bit #7 : reserved	SBC-REQ SBC-RSP

Suggested change #2:

In Rev2/D3, page 129, line54, insert the following line, where the new text is marked by blue and underlined.

DL Coordinated Zone capability (see 11.8.16)

Suggested change #3:

In Rev2/D3, page 131, line 8, replace line 8 to 10 by the following text, where the new text is marked

by blue and underlined.

The following parameters may be included:

MIH Capability Supported (see 11.8.10)

Extended capability (see 11.8.15)

DL Coordinated Zone capability (see 11.8.16)

Suggested change #4:

In Rev2/D3, page 1071, line 14, insert the following row in Table 543 (DCD channel encoding), where the new text is marked by blue and underlined.

Name	Type	Length	Value	PHY Scope
DL Coordinated Zone indication	62 (??)	1	Bit#0: the coordinated first DL PUSC zone indication, if set to 1, indicates the first DL PUSC zone is a coordinated zone, in which servicing BS coordinates with its neighbor BSs to have the same zone boundary and use the same "used-subchannel bitmap". Bit#1 to Bit #7: reserved	OFDMA

Suggested change #5:

In Rev2/D3, page 704, line 49, Table 325, make the following changes, where the new text is marked by blue and underlined.

Syntax	Size (bits)	Notes
Reserved	~~4~~ 3	Shall be set to zero
Coordinated_zone_inidication	1	If set to 1, indicates this zone is a coordinated zone, in which the servicing BS coordinates with its neighbor BSs to have the same zone boundary and the same permutation type.

Suggested change #6:

In Rev2/D3, page 1189, line 20, append the following rows in Table 576, where the new text is marked by blue and underlined.

Name	Type	Length	Value
Coordinated PUSC zone parameters	5	1	Specify the DL_PermBase and PRBS_ID for the coordinated DL PUSC zone that is not the first DL zone: Bit#0 to Bit #4: DL_PermBase Bit#5 to Bit #6: PRBS_ID

			Bit #7 : reserved
Coordinated STC PUSC zone parameters	6	1	Specify the DL_PermBase and PRBS_ID for the coordinated DL STC PUSC zone: Bit#0 to Bit #4: DL_PermBase Bit#5 to Bit #6: PRBS_ID Bit #7 : reserved
Coordinated AMC zone parameters	7	1	Specify the DL_PermBase and PRBS_ID for the coordinated DL AMC zone: Bit#0 to Bit #4: DL_PermBase Bit#5 to Bit #6: PRBS_ID Bit #7 : reserved
Coordinated STC AMC zone parameters	8	1	Specify the DL_PermBase and PRBS_ID for the coordinated DL STC AMC zone: Bit#0 to Bit #4: DL_PermBase Bit#5 to Bit #6: PRBS_ID Bit #7 : reserved
Coordinated FUSC zone parameters	9	1	Specify the DL_PermBase and PRBS_ID for the coordinated DL FUSC zone: Bit#0 to Bit #4: DL_PermBase Bit#5 to Bit #6: PRBS_ID Bit #7 : reserved

Suggested change #7:

In Rev2/D3, page 196, line 63, insert the following text, where the new text is marked by blue and underlined.

Coordinated PUSC zone parameters **(see 11.18.2).**
Coordinated STC PUSC zone parameters **(see 11.18.2).**
Coordinated AMC zone parameters **(see 11.18.2).**
Coordinated STC AMC zone parameters **(see 11.18.2).**
Coordinated FUSC zone parameters **(see 11.18.2).**