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Re:	Call for comments, maintenance task group
Abstract	
Purpose	
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Corrections to definitions of Uplink MIMO in OFDMA PHY

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1 Problem Statement

Several inconsistencies and ambiguities exist in the definitions of uplink MIMO in 802.16REVd/D5, specifically:

1. The data-subcarrier mapping scheme for UL STTD is not defined (8.4.8.1.5). Note that encoding subcarrier pairs across multiple tiles is not possible due to the existence of the subchannel rotation scheme.

2. MIMO_UL_Basic_IE (8.4.5.4.11):

    a. This IE describes UL allocations, however the first paragraph in this section contradicts the content of the IE. The paragraph refers to subsequent allocation and implies that this IE is a context switch IE.

    b. *Duration* is specified for each burst in the IE. It is unclear how an SS should sum over semi-overlapping durations when computing slot offset (for instance when multiple allocations are specified in the IE, each with a different duration), and how it should calculate the slot offset for a regular UL-MAP_IE (or an additional MIMO IE) that follows a MIMO IE.

    c. The *MIMO_Control* field is defined differently for a 'dual transmission capable' SS and for a 'Collaborative SM capable SS'. It is not clear what an SS that supports both schemes should use.

    d. STTD can currently only be defined as part of the MIMO_UL_Basic_IE(). However it should be supported by regular UL-MAP_IEs, as is the case for downlink STC. Interpreting this IE as having the operation of a switch IE enables this support.

3. Pilot boosting level for UL PUSC in SM and collaborative SM modes: a boost of 3dB per pilot is warranted since each power amplifier (antenna) transmits only half of the pilots in each symbol. This is not noted in the original text.

4. Definition of uplink MIMO capability negotiation is missing.

2 Detailed Text Changes

1. Correct section 8.4.8.1.5: provide missing definition of STTD mode, define data subcarrier mapping in STTD mode.

[Modify section 8.4.8.1.5 as follows]

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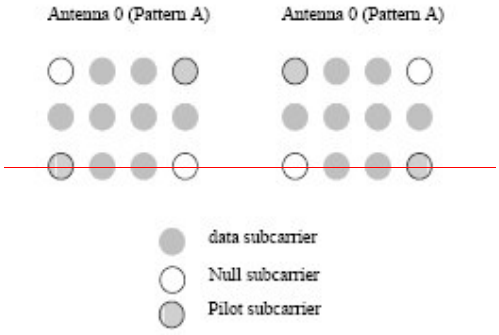
8.4.8.1.5 Uplink using STC

A user supporting transmission using STC configuration in the uplink, shall use a modified uplink tile~~.~~, 2-transmit diversity ('STTD mode') data or 2-transmit spatial multiplexing ('SM mode') data can be mapped onto each subcarrier~~.~~. The mandatory tile shall be modified to ~~accumudate~~ accommodate those configurations. ~~Figure 249 depicts the UL tile for STC transmission.~~



~~Figure 249 – UL STC tile~~

In STTD mode, the tiles shall be allocated to subchannels and the data subcarriers enumerated as defined in 8.4.6.2. The pilots in each tile shall be split between the two antennas and the data subcarriers shall be encoded in pairs after constellation mapping, as depicted in figure 249. The data subcarriers transmitted from Antenna #0 follow the original mapping defined in 8.4.6.2.

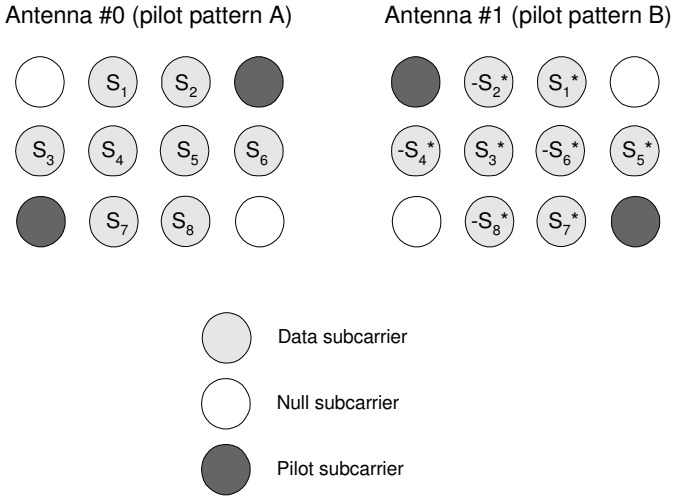


Figure 249 – Mapping of data subcarriers in STTD mode.

Two single transmit antenna SS's can perform collaborative spatial multiplexing onto the same subcarrier. In this case, ~~the~~ one SS shall ~~should~~ use the uplink tile with pilot-pattern A, and the other SS shall ~~should~~ use the uplink tile with pilot-pattern B. The pilot patterns are depicted in figure 249.

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2. Section 8.4.5.4.11: Clarify text and role of MIMO_UL_Basic_IE():

[Modify section 8.4.5.4.11 as follows]

-------- BEGIN --------

8.4.5.4.11 MIMO UL Basic IE format

In the UL-MAP, a MIMO-enabled BS may transmit UIUC=15 with the MIMO_UL_Basic_IE() to indicate the MIMO mode of ~~the subsequent~~ uplink allocations described following this IE and to modify the absolute starting slot of the next allocation ~~to a specific MIMO enabled SS CID~~. The MIMO mode indicated in the MIMO_UL_Basic_IE() shall remain in effect ~~only apply to the subsequent uplink allocations~~ until the next MIMO_UL_Basic_IE() or until the end of the zone ~~frame~~. Allocations to non-MIMO SSs shall not be described following this IE until the end of the UL-MAP. The IE may also be used to assign allocations in AAS zones to AAS-enabled SSs that are capable of collaborative SM.

Table 297—MIMO UL basic IE format

Syntax	Size	Notes
MIMO_UL_Basic_IE() {		
Extended UIUC	4 bits	MIMO = 0x02
Length	4 bits	~~Length of the message in bytes (variable)~~
~~**Num_Assign**~~	~~4 bits~~	~~Number of burst assignment~~
~~For (j=0; j<Num_assign; j++) {~~		
~~**CID**~~	~~16 bits~~	~~SS basic CID~~
~~**UIUC**~~	~~4 bits~~	
MIMO_Control	2 ~~1~~ bits	~~For dual transmission capable SS~~ ~~0: STTD~~ ~~1: SM~~ ~~For Collaborative SM capable SS~~ ~~0: pilot pattern A~~ ~~1: pilot pattern B~~ 0b00: STTD 0b01: Collaborative SM, pilot pattern A 0b10: Collaborative SM, pilot pattern B 0b11: SM
Slot Offset ~~**Duration**~~	10 bits	In OFDMA slots (see 8.4.3.1)
Padding	4 bits	Shall be set to zero
~~}~~		
}		

~~**Num_assign**~~
~~This field specifies the number of assignments in this IE.~~

MIMO_Control
MIMO_Control field specifies the MIMO mode of subsequent UL bursts. ~~For a dual transmission capable SS,the value of 0 indicates STTD mode, the value of 1 indicates SM mode; For a collaborative SM capable SS, the value of 0 indicates pilot pattern A, the value of 1 indicates pilot pattern B.~~

Slot Offset
The offset of the slot in which the next allocation shall begin, relative to the start of the zone,

-------- END --------

Add 3dB boosting for SM and collaborative SM modes.

[Modify section 8.4.9.4.3, page 621 lines 1-3]

-------- BEGIN --------

In the downlink, and for the optional uplink tile structure each pilot shall be transmitted with a boosting of 2.5 dB over the average power of each data tone. For the mandatory uplink tile structure in SM and collaborative SM modes, each pilot shall be transmitted with a boosting of 3dB over the average power of each data tone. The Pilot subcarriers shall be modulated according to the following formula:

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3. Add section 11.8.3.7.7: define uplink MIMO capability negotiation.

[Add new section 11.8.3.7.7]

-------- BEGIN --------

11.8.3.7.7 OFDMA SS MIMO uplink support

This field indicates the different MIMO options supported by a WirelessMAN-OFDMA PHY SS in the uplink. This field is not used for other PHY specifications. A bit value of 0 indicates "not supported" while 1 indicates "supported."

Type	Length	Value	Scope
155	1	Bit #0: 2-antenna STTD Bit #1: 2-antenna SM Bit #2: single-antenna cooperative SM Bit #3-#7: *reserved*	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

-------- END --------