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| Re: | IEEE P802.16-REVe/D5-2004 | |
| Abstract | Modifications to H-ARQ Map IEs to enable SDMA allocations | |
| Purpose | Adoption of proposed changes into P802.16e | |
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Enabling SDMA in H-ARQ Map IE's

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1 Introduction

Spatial Division Multiple Access (SDMA) requires the ability to allocate the same subchannels to two or more SS's. Currently, SDMA cannot be used with H-ARQ because the H-ARQ Map IE's do not support the allocation of a subchannel to more than one SS. The main reason is that the time/frequency resource allocations made using H-ARQ based IE's are relative and cumulative in nature. Before any allocations are made, a starting point is defined in the OFDMA frame. Then, the first allocation is assumed to begin at the previously defined starting point, and the second allocation begins at the end of the first allocation, and so forth. Therefore, there is no way to assign the same set of resources to a multiple SS's.

This contribution provides a solution for the downlink by introducing an SDMA flag and an SS identification field into the MIMO-Compact-DL-MAP IE so that the same allocation can be given to multiple SS's. For the uplink, the same problem exists in the MIMO Compact UL-MAP IE. Even though collaborative spatial multiplexing is mentioned in the IE, it does not support allocating the same subchannel to more than one SS. An SDMA flag and an SS identification field are introduced in the MIMO Compact UL-MAP IE to resolve the problem.

2 Specific Text Changes

----- Beginning of Text Changes -----

[In Section **6.3.2.3.43.6.7**, modify Table 97a and add text after it as follows (Modifications in [blue](#)):]

Table 97a—MIMO/[SDMA](#) Compact DL-MAP IE format

| Syntax | Size (bits) | Notes |
|----------------------------|-------------------|---|
| MIMO_Compact_DL-MAP_IE() { | | |
| Compact DL-MAP Type | 3 | Type = 7 |
| DL-MAP Sub-type | 5 | MIMO = 0x01 |
| Length | 4 | Length of the IE in Bytes |
| SDMA flag | 1 | 0 = MIMO allocation 1 =SDMA allocation |
| Matrix indicator | 2 | DL STC matrices (see 8.4.8.3) |
| Num_layer | 2 | Number of multiple coding/modulation layers 00 – 1 layer 01 – 2 layers 10 – 3 layers |

| | | |
|--|-----------------|---|
| | | 11 – 4 layers |
| for (j=1;j<Num_layer;j++) { | | This loop specifies the Nep for layers 2 and above when required for STC. <u>If SDMA flag = 0</u> , The same Nsch and RCID applied for each layer |
| <u>If (SDMA flag = 1) {</u> | | |
| <u>RCID</u> | <u>Variable</u> | <u>SS identifier for the current layer of the SDMA allocation</u> |
| <u>}</u> | | |
| if (H-ARQ Mode =CTC Incremental Redundancy) { Nep } elseif (H-ARQ Mode = Generic Chase) { DIUC } | 4 | H-ARQ Mode is specified in the H-ARQ Compact_DL-MAP IE format for Switch H-ARQ Mode. |
| CQI Feedback_type | 3 | Type of contents on CQICH for this SS 000 = Default feedback 001 = Precoding weight matrix W 010 = Channel matrix H 011 = MIMO mode and permutation zone 100 -111 = Reserved |
| CQICH_Num | 2 | Total number of CQICHs assigned to this SS is (CQICH_Num +1) |
| for (i=1;i<CQICH_Num;i++) { | | |
| Allocation index | 6 | Index to uniquely identify the additional CQICH resources assigned to the SS |
| } | | |
| Padding | variable | The padding bits are used to ensure the IE size is integer number of bytes |
| } | | |

When SDMA flag = 1, Num_layer means the number of SDMA users (2, 3, or 4). The number of SDMA users also sets the pilot format (e.g., for 2 SDMA users, the two-antenna pilot and subchannel format is used for the allocation).

[In Section 6.3.2.3.43.7.5, add the following text):]

Whenever HARQ enabled DL-SDMA allocations are made within a frame, the ACKs for the SDMA users allocated on the second layer shall be appended to the ACKs for the non-SDMA and first-layer SDMA users.

[In Section 6.3.2.3.43.7.8, modify Table 14b and add text after the table as follows (Modifications in [blue](#), deletions in [red](#)):]

Table 14b —MIMO/[SDMA](#) Compact UL-MAP IE format

| Syntax | Size (bits) | Notes |
|--|--------------------------|---|
| MIMO Compact UL-MAP IE() | | |
| Compact UL-MAP Type | 3 | Type = 7 |
| UL-MAP Sub-type | 5 | MIMO = 0x01 |
| Length | 4 | Length of the IE in Bytes |
| SDMA flag | 1 | 0 = MIMO allocation 1 =SDMA allocation |
| Matrix indicator | 1 | UL STC matrices (see 8.4.8.4) For 2-antenna SS, 0 = Matrix A 1 = Matrix B For Collaborative SM capable SS 0 = Pilot pattern A 1 = Pilot pattern B |
| | | |
| Num layer | 1 | Number of multiple coding/modulation layers 00 – 1 layer 01 – 2 layers |
| For (j=1;j<Num_layer; j++) { | | This loop specifies the Nep for layers 2 and above when required for STC. If SDMA flag = 0, then The same Nsch and RCID applied for each layer |
| If (SDMA flag = 1) { | | |
| RCID | variable | SS identifier for the current layer of the SDMA allocation |
| } | | |
| if (H-ARQ Mode =CTC Incremental Redundancy) { Nep } elseif (H-ARQ Mode = Generic Chase) { UIUC } | 4 | H-ARQ Mode is specified in the HARQ Compact_UL-MAP IE format for Switch HARQ Mode. |
| Padding | variable | The padding bits are used to ensure the IE size is integer number of bytes |
| } | | |

[When SDMA flag = 1, Num_layer means the number of SDMA users, and the first layer/user will use pilot pattern A and the second layer/user will use pilot pattern B.](#)

[In Section **6.3.2.3.43.6.5**, add the following text:]

Whenever HARQ enabled UL-SDMA allocations are made within a frame, the ACK BITMAP Length shall be large enough to carry the ACKs for the both the SDMA and non-SDMA allocations. Also, the ACKs for the SDMA users allocated on the second layer shall be appended to the ACKs for the non-SDMA and first-layer SDMA users.

----- End of Text Changes -----