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Title | AAS capability negotiation  
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Re: | IEEE P802.16e/D5  
Abstract | Definitions for AAS capability bits in SBC-REQ/RSP  
Purpose | Adopt changes  
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AAS capability negotiation
Yuval Lomnitz, Yigal Eliaspur, Dov Andelman

Motivation
The AAS capability bits don’t provide the granularity to support various AAS schemes.

There can be very basic schemes that are suitable for beamforming, however capability bit of "Diversity map scan" method encompasses, together with the basic scheme, some complex and advanced AAS features that were added on top of the basic features. Therefore they should have separate capability bits:

1. The permutation for AAS could be different from the permutation used for normal DL transmissions, so that for example an SS could support mandatory PUSC/FUSC for normal mode, but only AMC for AAS (there are severe problems in using PUSC for AAS, for example the fact that pilots are broadcast and not part of subchannel).
2. The support of AAS-DLFP should be optional since the basic features of AAS (AAS_IE, AAS preamble, preamble modifier) are enough for AAS operation. AAS-DLFP is an enhancement designed to increase the range of the system by polling users that cannot receive the maps. However simple operation of AAS for users that can receive the maps should be allowed.
3. The AAS preamble is required mainly for support of advanced techniques such as SDMA and interference cancellation, but not for basic beamforming. The AAS preamble breaks the UL and DL slot structure and introduces high complexity in the receivers (in both SS and BS).
4. AAS-FBCK-REQ/RSP is not required for most AAS schemes. Currently it's definition is not sufficient (in aspects such as lacking estimation of channel from multiple BS antennas, over decimation of frequency samples which causes limitation on delay spread, etc).

Additional problems:
Currently there are different definitions for UL and DL AAS. For example, according to the current capability bits, a SS may support AAS only in the UL/DL or worst, support "diversity map scan" in the DL and "direct signaling" in the UL (it is not clear what this means in practice). So we propose to define 1 capability bit for each feature which will hold for UL and DL.

Changes summary
We present two alternatives:
1. Using the existing capability fields
2. One capability field for AAS

Alternative 1 – using the existing capability fields
11.8.3.7.2 OFDMA SS demodulator
[make the following changes to the table]

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Value</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>2</td>
<td>Bit #0: 64-QAM</td>
<td>SBC-REQ (see 6.3.2.3.23)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #1: BTC</td>
<td>SBC-RSP (see 6.3.2.3.24)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #2: CTC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #3: STC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #4: AAS Diversity Map Scan</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #5: AAS Direct Signaling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #6: H-ARQ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #7: Reserved; shall be set to zero - AAS zone</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit #8: AAS preamble</td>
<td></td>
</tr>
</tbody>
</table>
A subscriber supporting any mode of AAS should set bit#7 to indicate support of AAS zone (as specified in 8.4.5.3.3. It may in addition use bit#4 to indicate use of AAS-DLFP channel specified in 8.4.4.6, or bit#5 to indicate support of the direct signaling channels specified in 8.4.4.7. The SS may indicate support of AAS preamble. An SS not supporting the preamble in downlink expects preamble length of 0. Support of the AAS zone as well as support of the signaling methods "AAS Diversity Map Scan" and "AAS Direct Signaling" is relevant to both UL and DL.

11.8.3.7.5 OFDMA SS Permutation support
[Change the text as follows]
This field indicates the different optional OFDMA permutation modes (optional PUSC, optional FUSC and AMC) supported by a WirelessMAN-OFDMA SS. A bit value of 0 indicates “not supported” while 1 indicates “supported.”. Field XX indicates support for permutations in the AAS zone. The permutations supported for this zone may be different from the ones supported for non-AAS mode. If bit#3 is set to indicate AMC permutation support in AAS, then the type of AMC tiles will be 2 bins by 3 symbols.

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Value</th>
<th>Scope</th>
</tr>
</thead>
</table>
| 154  | 1      | Bit# 0: Optional PUSC support  
       |        | Bit# 1: Optional FUSC support  
       |        | Bit# 2: AMC support  
       |        | Bits# 3–7: Reserved, shall be set to zero  | SBC-REQ (see 6.3.2.3.23)  
       |        | SBC-RSP (see 6.3.2.3.24)  |

XX 1 Permutation support for AAS zone  
   Bit# 0: DL-PUSC  
   Bit# 1: DL-FUSC  
   Bit# 2: DL-Optional FUSC  
   Bit# 3: AMC (DL and UL)  
   Bit# 4: UL-PUSC  
   Bit# 5: UL- Optional PUSC

[Note for the editor: please allocate type number for XX]

11.8.3.7.3 OFDMA SS modulator
[make the following changes to the table]

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
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<th>Scope</th>
</tr>
</thead>
</table>
| 152  | 1      | Bit# 0: 64-QAM  
       |        | Bit# 1: BTC  
       |        | Bit# 2: CTC  
       |        | Bit# 3: AAS Diversity Map Scan  
       |        | Uplink AAS preamble  
       |        | Bit# 4: AAS Direct Signaling AAS-FBCK-RSP support  
       |        | Bit# 5: H-ARQ  
       |        | Bits# 6–7: Reserved; shall be set to zero  | SBC-REQ (see 6.3.2.3.23)  
       |        | SBC-RSP (see 6.3.2.3.24)  |

<table>
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<tr>
<th>Type</th>
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<th>Value</th>
<th>Scope</th>
</tr>
</thead>
</table>
| 153  | 1      | The number of HARQ ACK Channel SBC-REQ (see 6.3.2.3.23)  | SBC-REQ (see 6.3.2.3.23)  
       |        | SBC-RSP (see 6.3.2.3.24)  |

Note: support for AAS zone and AAS signaling methods is indicated in 11.8.3.7.2 and relevant for both UL and DL.

**Alternative 2 – one capability field for AAS**
[Add new section 11.8.3.7.6]

11.8.3.7.6 OFDMA AAS capabilities

<table>
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<th>Type</th>
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</table>
A subscriber supporting any mode of AAS should set bit#0 to indicate support of AAS zone (as specified in 8.4.5.3.3. It may in addition use bit#1 to indicate use of AAS-DLFP channel specified in 8.4.4.6, or bit#2 to indicate support of the direct signaling channels specified in 8.4.4.7. The SS may indicate support of AAS preamble. An SS not supporting the preamble in downlink/uplink expects preamble length of 0. Support of the AAS zone as well as support of the signaling methods "AAS Diversity Map Scan" and "AAS Direct Signaling" is relevant to both UL and DL.

Bits 3–7 indicate support for permutations in the AAS zone. The permutations supported for this zone may be different from the ones supported for non-AAS mode. If bit#5 is set to indicate AMC permutation support in AAS, then the type of AMC tiles will be the same as supported by the same SS in non-AAS mode.

### 11.8.3.7.2 OFDMA SS demodulator

[make the following changes to the table]

<table>
<thead>
<tr>
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<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>151 4 2</td>
<td>SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)</td>
</tr>
</tbody>
</table>

- Bit #0: 64-QAM
- Bit #1: BTC
- Bit #2: CTC
- Bit #3: STC
- Bit #4: AAS Diversity Map Scan
- Bit #5: AAS Direct Signaling
- Bit #6: H-ARQ
- Bit #7: Reserved; shall be set to zero

### 11.8.3.7.3 OFDMA SS modulator

[make the following changes to the table]

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<tbody>
<tr>
<td>152 1</td>
<td>SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)</td>
</tr>
</tbody>
</table>

- Bit #0: 64-QAM
- Bit #1: BTC
- Bit #2: CTC
- Bit #3: AAS Diversity Map Scan
- Bit #4: AAS Direct Signaling
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- Bits 6–7: Reserved; shall be set to zero

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<tr>
<td>153 1</td>
<td>SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)</td>
</tr>
</tbody>
</table>

- The number of HARQ ACK Channel SBC-REQ (see 6.3.2.3.23)