Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	AAS capability negotiation	
Date Submitted	**2004-11-11**	
Source(s)	Yuval Lomnitz	Yuval.Lomnitz@intel.com
	Yigal Eliaspur	Yigal.Eliaspur@intel.com
	Dov Andelman	
	Intel Corp.	
Re:	IEEE P802.16e/D5	
Abstract	Definitions for AAS capability bits in SBC-REQ/RSP	
Purpose	Adopt changes	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.	

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 feautures 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]

Type	Length	Value	Scope
151	+ 2	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~~ AAS zone Bit #8: AAS preamble	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

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.

Type	Length	Value	Scope
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]

Type	Length	Value	Scope
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)
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

Type	Length	Value	Scope

TBD [please allocate]	2	Bit# 0: AAS Zone Bit# 1: AAS Diversity Map Scan (AAS-DLFP) Bit# 2: AAS Direct Signaling Bit# 3: AAS supported with DL-PUSC permutation Bit# 4: AAS supported with DL-FUSC permutation Bit# 5: AAS supported with DL-Optional FUSC permutation Bit# 5: AAS supported with AMC (DL and UL) permutation Bit# 6: AAS supported with UL-PUSC permutation Bit# 7: AAS supported with UL- Optional PUSC permutation Bit# 8: AAS-FBCK-RSP support Bit# 9: Downlink AAS preamble Bit# 10: Uplink AAS preamble	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

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]

Type	Length	Value	Scope
151	~~1~~ 2	Bit #0: 64-QAM Bit #1: BTC Bit #2: CTC Bit #3: STC Bit #4: ~~AAS Diversity Map Scan~~ Reserved; shall be set to zero Bit #5: ~~AAS Direct Signaling~~ Reserved; shall be set to zero Bit #6: H-ARQ Bit #7: Reserved; shall be set to zero	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

11.8.3.7.3 OFDMA SS modulator

[make the following changes to the table]

Type	Length	Value	Scope
152	1	Bit# 0: 64-QAM Bit# 1: BTC Bit# 2: CTC Bit# 3: ~~AAS Diversity Map Scan~~ Reserved; shall be set to zero Bit# 4: ~~AAS Direct Signaling~~ Reserved; shall be set to zero 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)
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)