Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Enhancements for AAS support in IEEE 802.16-REVd**
Date Submitted	**2003-11-07**
Source(s)	Yigal Leiba Zion Hadad Yossi Segal Itzik Kitroser Runcom Ltd. Hachoma 2 St. 75655 Rishon Lezion, Israel Voice: +972-3-9528440 Fax: +972-3-9528805 yigall@runcom.co.il yossis@runcom.co.il zionh@runcom.co.il Itzikk@runcom.co.il
Re:	Working Group re-circulation Ballot #13a Announcement
Abstract	Enhancements for AAS support, to enable operation in degraded S/N environment with improved dynamic response of the antenna array
Purpose	Adoption of proposed enhancement into P802.16-REVd/D3-2003
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 (Version 1.0) <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, if there is technical justification in the opinion of the standards-developing committee and provided the IEEE receives assurance from the patent holder that it will license applicants under reasonable terms and conditions for the purpose of implementing 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:r.b.marks@ieee.org> as early as possible, in written or electronic form, of any patents (granted or under application) that may cover technology that is under consideration by or has been approved by IEEE 802.16. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Enhancement on AAS support in IEEE 802.16-REVd

1 Motivation and explanation of changes

The proposed additions to AAS mode in this contribution enable an ASS SS to perform channel estimation that is not based on the FL frame preamble. This is essential, as the DL frame preamble is broadcast, and therefore represents different channel conditions that those expect when the AAS beam is directed at the AAS SS. Further, an active DL scan mechanism is introduced which enables faster network entry for an ASS SS.

2 Proposed changes

2.1 Change #1

	Comment type	Starting page	Starting line	Fig./Table	Section
	Technical, Non-binding	159	63		6.4.7.6.3
Comment	In high S/N conditions, synchronization based on DL preamble alone may not suffice				

Suggested Remedy:
Add the following sentence:
"The BS may further employ active scanning methods to speed up and enhance the process of downlink synchronization. These methods are PHY-specific, and described in the respective PHY section."

2.2 Change #2

	Comment type	Starting page	Starting line	Fig./Table	Section
	Technical, Non-binding	457	32		8.4.4.7
Comment	In high S/N conditions, synchronization based on DL preamble alone may not suffice				

Suggested Remedy:
Add the following paragraph:
"**8.4.4.7 Optional active DL AAS scan**
Sub-channels 30 and 31 of the DL frame may be dedicated at the discretion of the BS for active AAS scanning. When these sub-channels are used for this purpose, they shall not be allocated in the normal DL_MAP message.
These sub-channels will be used to transmit the AAS_DL_SCAN_IE(), whose physical construction is shown in figure aaa. The AAS_DL_SCAN_IE() is transmitted with a well known modulation and coding, namely QPSK rate _ with 4 repetitions.

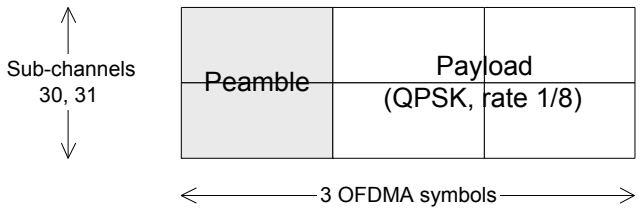

Figure aaa

The contents of the AAS_DL_SCAN_IE() payload is described by table bbb below,

Syntax	Size	Notes
AAS_DL_SCAN_IE() {		
AAS beam direction index	6 bits	This index shall correspond to the direction the AAS beam is pointing at. The range of angles the AAS element should be linearly covered by the range

		0-63 of this field.
Private_Ranging_Allocation_IE(){		
OFDMA Symbol offset	10 bits	
Sub-channel offset	6 bits	
No. OFDMA Symbols	8 bits	
Ranging Method	2 bits	00 - Initial Ranging over two symbols 01 - Initial Ranging over four symbols 10 - BW Request/Periodic Ranging over one symbol 11 - BW Request/Periodic Ranging over three symbols
}		
Private_MAP_Allocation_IE(){		
OFDMA Symbol offset	10 bits	
Sub-channel offset	5 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
No. OFDMA Symbols	9 bits	
No. Sub-channels	5 bits	
}		
}		

Table bbb

The AAS_DL_SCAN_IE() is transmitted by the BS with in a specific direction of the AAS beam, and includes a preamble to facilitate channel equalization by the AAS SS. The preamble used in sub-channels 30, 31 is defined in section 8.4.6.1.1, and shall be selected to have the same segment number as the DL frame preamble, and the cell ID shall equal (*DL-Preamble cell-ID* + 16) mod 32.
The IE is composed of the Private_Ranging_Allocation_IE() that indicates to the AAS SS a suitable slot to perform UL ranging. The BS should point its AAS beam to appropriate direction in the time indicated by this IE, such that it can receive the SS UL ranging. Should a response to the UL ranging attempt by the SS fail to arrive, the SS shall apply the exponential backoff algorithm for selecting the next opportunity to perform UL ranging.
The other part of the AAS_DL_SCAN_IE() is a Private_MAP_Allocation_IE(). This IE indicates to the AAS SS where and when it might find its private DL_MAP and, such that AAS SS can start the process of network entry.
An AAS SS may respond to the AAS_DL_SCAN_IE() when performing initial network entry, and also as a means of tracking whether it has shifted position with regards to the direction the AAS beam should be pointing in order to communicate with it."

2.3 Change #3

	Comment type	Starting page	Starting line	Fig./Table	Section
	Technical, Non-binding	460	8		8.5.4.3.2
Comment	Messages directed to ASS SS require dedicated preamble, as the frame preamble transmitted in broadcast fashion does not represent the correct channel compared to the directed beam				

Suggested Remedy:
Add the following sentence:
"All DL bursts in the AAS portion of the frame shall be preceded by a preamble. The preamble is defined in section 8.4.6.1.1, and shall be selected to have the same segment number as the DL frame preamble, and the cell ID shall equal (*DL-Preamble cell-ID* + 16) mod 32. The preamble shall exist only on those sub-channels used by the DL burst."

2.4 Change #4

	Comment type	Starting page	Starting line	Fig./Table	Section
	Technical, Non-binding	120	5		6.4.2.3.41
Comment	Faster ASS beam selection can be done with unsolicited feedback from the SS, based on scanning				

Suggested Remedy:
Add the following paragraph:
"**6.4.2.3.42 AAS Beam Select message**
The AAS Beam Select message may be used by a system supporting AAS. This message may be sent by the SS in an unsolicited manner, to inform the BS about the preferred beam direction for the AAS SS sending this message.

Syntax	Size	Notes
AAS-Beam-Select() {		
Management Message Type = 46		
AAS beam direction index	6 bits	
Reserved	2 bits	
}		

Table ccc

AAS beam direction index

This index shall correspond to the direction the AAS beam is pointing at during the AAS_DL_SCAN_IE() preferred by the SS (see 8.4.4.7).

“