Project	IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>
Title	A simplified CINR Measurement using EESM method
Date Submitted	2005-06-08
Source(s)	Jing Wang, Sean Cai jwang@ztesandiego.com ZTE San Diego Inc. 10105 Pacific Heights Blvd. San Diego, CA 92121 USA
Re:	Response to Sponsor Ballot on IEEE802.16e/D8 document
Abstract	In this contribution, we propose a simplified version of CINR measurement method based on EESM
Purpose	To incorporate the text changes proposed in this contribution into the 802.16e/D8 draft.
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	

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>.

A simplified CINR Measurement using EESM method

Jing Wang, Sean Cai
ZTE San Diego Inc.
10105 Pacific Heights Blvd.
San Diego, CA 92121
USA

Overview

In contribution C802.16e-05/141r3 [1], an EESM based CINR measurement technique has proposed to estimate effective CINR. Several scenarios have been studied. One problem associated with this method is its complexity. More specifically, the MSS has to estimate CINR for the code rate, code type, permutation and channel conditions. In addition, the method require complicated reporting mechanism and high overhead. In this contribution, we propose a simplified version of the EESM method, which suggest we only need to report the average CINR, currently supported in the standard. The effective CINR will be computed by the BS, which has the knowledge of the data permutation of the MSS and other information. For wideband permutations, such as PUCS and FUCS, the estimation of the effective CINR is outlined as follows.

From [1], the effective CINR is defined as

$$_{eff} \quad \ln \frac{1}{N} \sum_{i=1}^{N} \exp \left(\frac{}{}_{i} \right) \qquad (1)$$

As the number of sub-~~carreri~~carrier N is large, as in the case where this is used unto preamble, the argument of the above expression can be approximated by its mean by invoking the law of large numbers ~~theorem~~. Furthermore, we can approximate the mean by

$$\exp \quad \frac{}{} \; f(\;)d \qquad (2)$$

In a wideband system where multiplaths are rich and NLOS, we can regard the instantaneous CINR follows the independent Rayleigh fading. In this case, the pdf of is given as

$$f(\;) \quad \frac{1}{}\exp \quad \frac{}{}, \qquad (3)$$

where $\bar{}$ is the average CINR over all the relevant sub-carriers. Hence, we can compute the effective CINR $_{eff}$ as

$$_{eff} \quad \ln \frac{}{} \;. \qquad (4)$$

The fitting parameter, , shall be determined by the BS.
For narrow bandwidth permutations, such as AMC channel, the channel may be regarded as uniform across the narrow band. In this case, $_{eff} = \bar{}$. In either narrow or wide-band case, MSS needs only to

report . ~~Notice that this calculation can be done in either SS or BS. In the latter case, all the SS needs to report to BS is still the average CINR, , like before.~~

Detailed Text Changes

Insert following text at the end of Sec. 8.4.11.3

The effective CINR may be used for more realistic MCS assignment by the BS. Based on the different channel conditions and data permutations of MSS, the BS may estimate the effective CINR for the MSS in the following way.

For AMC and other narrow-band data permutations, the effective CINR $_{eff}$ = , the average CINR across the band. For wide-band data permutations, such as PUSC and FUSC, $_{eff}$ can be estimated as

$_{eff}$ ln , where fitting parameter shall be determined by the BS, based on different code rate, code types.

Reference

[1] IEEE C802.16e-05/141r3 CINR measurements using the EESM method (Ran Yaniv, Danny Stopler, Tal Kaitz, Kfir Blum, Kevin Baum, Yufei Blankenship, Brian Classon, Mark Cudak Philippe Sartori, 2005-04-29)