Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Corrections to ACR for 802.16-2004**
Date Submitted	**2005-07-19**
Source(s)	Darcy Poulin [mailto:dp@sige.com] SiGe Semiconductor
Re:	Response to Sponsor Ballot on IEEE802.16-2004/Cor1/D3 document
Abstract	This document describes the reasons why ACR is incorrect in the current version of the 802.16 standard.
Purpose	This document is background material for a correction to ACR required in 802.16-2004
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>.

Correction to ACR in 802.16-2004

Darcy Poulin
SiGe Semiconductor

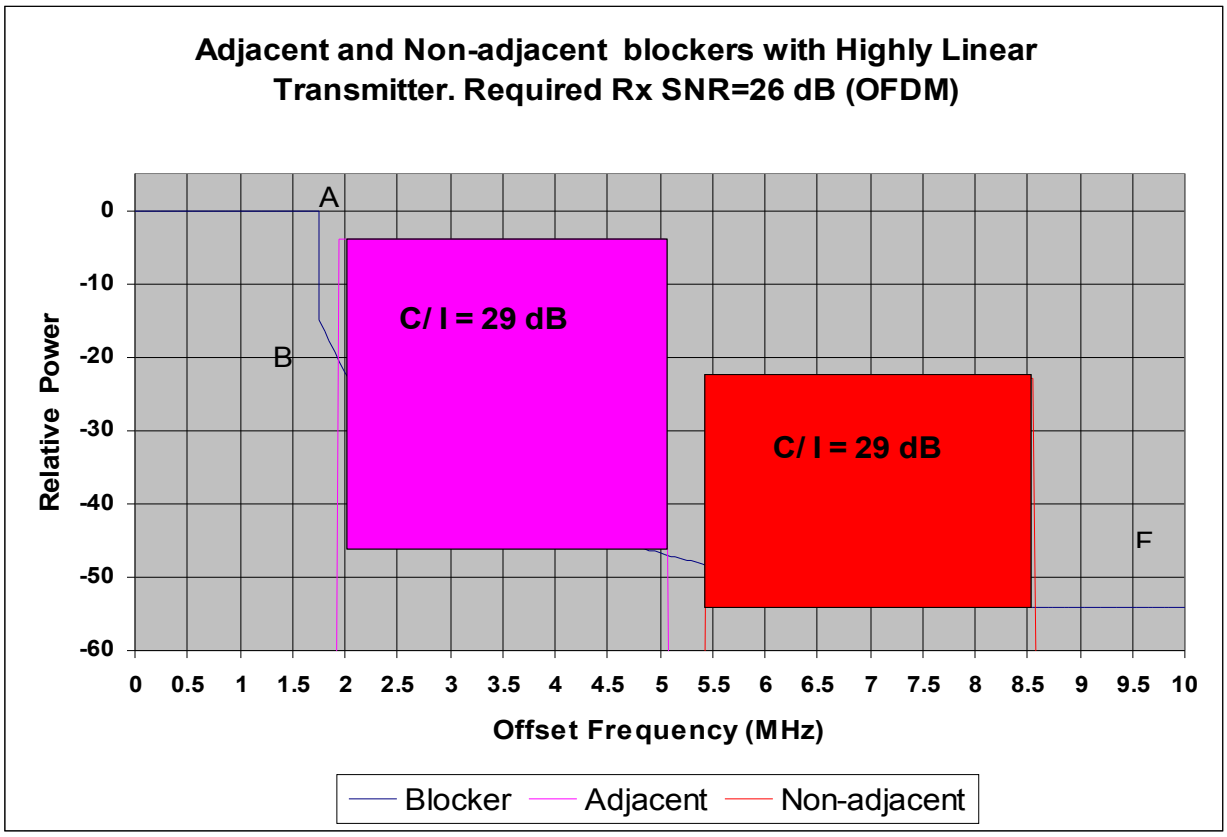
After discussion with a number of conference attendees, we have decided to leave the ACR specifications as they currently are (except that we will correct them so that the difference between 64QAM and 16QAM is 6 dB, and change the OFDMA requirement to take into account the fact that the Rx SNR is 1 dB lower than for OFDM), and we will add a section to specify that ACI must be measured using a highly linear "test transmitter" with an enhanced spectral mask.

The reason for using a "test transmitter" is that we want to isolate the ACR specification to the receiver only. ACR contributions due to emissions from a real transmitter leaking into the desired channel will be dealt with separately through a recommended spectral emissions mask.

When measuring ACR, we wish to ensure that the alternate and adjacent channel power that leaks into the desired channel is at a low enough level so that the resulting C/I is 3 dB below the required Rx SNR. We therefore propose that the alternate or adjacent transmitted signal from the highly linear test transmitter is a modified version of the ETSI Type G mask. Specifically, the transmitter must meet or exceed the following mask:
A=0 dBi; B= -15 dBc; C=- -36 dBc; D= -42dBc; E= -54dBc; F=-54dBc.

Please see ETSI EN301021 for the definition of the location of the frequency offsets.

Note that this transmitter is an "ideal" source, and is used only for test purposes. It will likely be a dedicated piece of test equipment.
The ACR specifications must be met for all channel bandwidths.



Assuming that the transmitter meets this mask, energy leaking into the desired channel from adjacent or non-adjacent channel will be 3 db below the required SNR. This will isolate any ACI issues specifically to the receiver.

Changes to the current standard:
In section 8.3.11.2, change the paragraph beginning with "The interfering signal" to:

The interfering signal shall be a conforming OFDM signal, unsynchronized with the signal in the channel under test. The requirement shall be met on both sides of the desired signal channel. Furthermore, the transmitter shall be a test transmitter with significantly better linearity and lower spectral emissions than normal SS or BS transmitters. In order to guarantee that spectral emissions from the test transmitter do not result in energy appearing in-band, the spectral emissions of the test transmitter shall be based on an ETSI type G emissions mask, as described in ETSI EN 301021. The type G mask must be modified as follows:
Point A=0 dBc; B= -15 dBc; C=- -36 dBc; D= -42dBc; E= -54dBc; F=-54dBc.
If the channel bandwidth used is not listed in ETSI EN301021, then the frequency offsets should be scaled appropriately.

These requirements have been set to guarantee that the C/I resulting from the adjacent or non-adjacent interfering signal is 3 dB higher than the receiver SNR (as defined in table 266) plus 5 dB implementation margin.

For nonadjacent channel testing, the test method is identical except the interfering channel shall be any channel other than the adjacent channel or the co-channel. For the PHY to be compliant, the minimum rejection shall exceed the values shown in Table 267:

Table 267—Adjacent and nonadjacent channel rejection

Modulation	Adjacent Channel Rejection (dB)	Non-adjacent Channel Rejection (dB)
16QAM-3/4	10	29
64QAM-3/4	4	23

In section 8.4.13.2, change the line beginning with "The interfering signal" until the send of the section to:

The interfering signal shall be a conforming OFDMA signal, unsynchronized with the signal in the channel under test. The requirement shall be met on both sides of the desired signal channel. Furthermore, the transmitter shall be a test transmitter with significantly better linearity and lower spectral emissions than normal SS or BS transmitters. In order to guarantee that spectral emissions from the test transmitter do not result in energy appearing in-band, the spectral emissions of the test transmitter shall be based on an ETSI type G emissions mask, as described in ETSI EN 301021. The type G mask must be modified as follows:
Point A=0 dBc; B= -15 dBc; C=- -36 dBc; D= -42dBc; E= -54dBc; F=-54dBc.
If the channel bandwidth used is not listed in ETSI EN301021, then the frequency offsets should be scaled appropriately.

These requirements have been set to guarantee that the C/I resulting from the adjacent or non-adjacent interfering signal is 3 dB higher than the receiver SNR (as defined in table 337) plus 5 dB implementation margin.

For nonadjacent channel testing, the test method is identical except the interfering channel shall be any channel other than the adjacent channel or the co-channel. For the PHY to be compliant, the minimum rejection shall exceed the values shown in Table 339:

Table 339—Adjacent and nonadjacent channel rejection

Modulation	Adjacent Channel Rejection (dB)	Non-adjacent Channel Rejection (dB)
16QAM-3/4	11	30
64QAM-3/4	5	24