

## IEEE 802.16 Working Group on Broadband Wireless Access

<http://WirelessMAN.org>



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To: Ron Resnick  
President, WiMAX Forum

Subject: Liaison Statement to WiMAX Forum on the ITU-R WP 5D Liaison Statement to IEEE and WiMAX Forum on ACS

At IEEE 802.16 Session #54, the WG considered the WP 5D liaison statement (Document 5D/TEMP/6(Rev. 1)) and we propose to work cooperatively with the WiMAX Forum in order to develop a response. Since IEEE 802.16 had no involvement with the development of Report ITU-R M.2116, we believe the WiMAX Forum should take the lead in the response.

The information in Attachment 1 is provided to the WiMAX Forum to assist in developing a response.

We had some discussion to try to understand the rationale for the formula in the WP 5D liaison statement. We have sent a liaison contribution to WP 5D seeking clarification, copied to the WiMAX Forum.

The next meeting of IEEE 802.16 will be held from 12-15 May 2008 and we would appreciate your views in time for that meeting.

We look forward to working cooperatively.

**Attachment 1:** Information relevant to liaison statement from ITU-R Working Party 5D on ACS values

cc: Paul Nikolich, Chair, IEEE 802 Executive Committee

## Attachment 1

### **Information relevant to liaison statement from ITU-R Working Party 5D on ACS values**

ITU-R WP 5D's liaison statement (D/TEMP/6(Rev.1), or IEEE L802.16-08/003), entitled "Request for clarification on OFDMA TDD WMAN BS and MS ACS values," was addressed to IEEE and the WiMAX Forum. That document concerned ACS values as computed from ACR and SNR values.

Viewing the liaison statement from an IEEE 802.16 perspective:

(i) The key issue in the liaison is a contradiction between M.1457 and M.2116. However, IEEE has not participated in and has any position regarding M.2116. Therefore, it is not responsible for any contradiction.

(ii) The calculations in the liaison statement make use of numbers in OFDMA TDD WMAN, but those numbers are not in IEEE Std 802.16.

This attachment provides relevant background information on ACR and SNR values in IEEE Std 802.16 and Recommendation ITU-R M.1457.

#### **ACR in IEEE 802.16 and ITU-R M.1457**

OFDMA TDD WMAN, in Recommendation ITU-R M.1457, uses the requirements:

-Min adjacent channel rejection at BER =  $10^{-6}$  for 3 dB degradation C/I

\* 16-QAM-3/4 11 dB

\* 64-QAM-2/3 4 dB

-Min alternate channel rejection at BER =  $10^{-6}$  for 3 dB degradation C/I

\* 16-QAM-3/4 30 dB

\* 64-QAM-2/3 23 dB

The recommendation quotes IEEE 802.16 subclause 8.4.13.2 as the source of these figures.

Here is the historical track in IEEE 802.16:

(1) These same numbers originated in IEEE 802.16a for WirelessMAN-OFDMA. However, IEEE 802.16a doesn't detail the conditions, including the BER.

(2) IEEE 802.16-2004 uses these same numbers as well. It still does not mention  $10^{-6}$  BER normatively. However, it does mention it in Clause 12 (Profiles), where it says:

-First adjacent channel rejection at BER= $10^{-6}$  for 3 dB degradation C/I

\* 16-QAM-3/4 11 dB

\* 64-QAM-3/4 4 dB

-Second adjacent channel rejection at BER= $10^{-6}$  for 3 dB degradation C/I

\* 16-QAM-3/4 30 dB

\* 64-QAM-3/4 23 dB

This looks a lot like the OFDMA TDD WMAN numbers. However, it specifies 64-QAM-3/4, while the OFDMA TDD WMAN text says 64-QAM-2/3. It is not clear why there is a difference.

(3) IEEE Std 802.16e did not change any of these numbers.

(4) The current revision draft 802.16Rev2D3 is proposing to change the numbers to:

-Adjacent

\* 16-QAM-3/4 10 dB

\* 64-QAM-3/4 4 dB

-Nonadjacent

\* 16-QAM-3/4 29 dB

\* 64-QAM-3/4 23 dB

So it is proposing to change all four of the specs (the ACR in two cases and the specified coding rate in the other two).

## SNR in IEEE 802.16 and ITU-R M.1457

Regarding SNR, OFDMA TDD WMAN uses the requirements as follow:

- Min SNR requirements for BER =  $10^{-6}$  with CTC in AWGN channel (the min SNR requirements are used along with Eq. 149b to define sensitivity specifications for CTC)

\* 16-QAM-3/4 with 54 bytes block size 12.7 dB

\* 64-QAM-2/3 with 48 bytes block size 16.9 dB

\* 64-QAM-3/4 with 54 bytes block size 18 dB

(Other modulation/coding are also specified)

OFDMA TDD WMAN quotes IEEE 802.16 subclause 8.4.13.1 as the source of these figures. However, those figures do not exist in IEEE Std 802.16.

Here is the historical track in 802.16:

IEEE 802.16-2004 does not specify any minimum SNR. In 8.4.13.1, it specifies minimum receiver sensitivity, and it includes a table of “assumptions” (not minimum requirements) about the SNR.

The “assumptions” for the three main cases are:

\* 16-QAM-3/4 18.2 dB

\* 64-QAM-2/3 22.7 dB

\* 64-QAM-3/4 24.4 dB

IEEE Std 802.16e (including Corrigendum 1) revised the receiver requirements, renaming them as “requirements for enhanced handover performance.” It still has no requirements on SNR, but it adds detail explaining how the SNR assumption are used to calculate the receiver minimum sensitivity.

The “assumptions” on SNR were lowered:

\* 16-QAM-3/4 14 dB

\* 64-QAM-2/3 18 dB

\* 64-QAM-3/4 20 dB

The revision draft P802.16Rev2D3 is not proposing any change.

The sensitivity modifications came as a result of contribution C802.16maint-05/112r8:

[http://ieee802.org/16/maint/contrib/C80216maint-05\\_112r8.pdf](http://ieee802.org/16/maint/contrib/C80216maint-05_112r8.pdf)

which talked about addressing inconsistencies but did not address ACR.

## **Summary**

This material may be useful to the WiMAX Forum in drafting appropriate documents, such as liaison statements to WP 5D.

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