

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	Steps or procedures in the Link Budget calculation	
Date Submitted	2007-09-06	
Source(s)	Yih-Guang Jan, Yang-Han Lee, Hsien-Wei Tseng, Ming-Hsueh Chuang, Jheng-Yao Lin, and Chih-Wei Su	Voice: +886-2-2625-2303 E-mail: yihjan@yahoo.com yhlee@ee.tku.edu.tw
	Institute for Information Industry 7F., No. 218, Sec. 2, Dunhua S. Rd., Taipei City, Taiwan. Department of Electrical Engineering, Tamkang University 151 Ying-chuan Road, Tamsui, Taipei County, Taiwan 25137, R. O. C. [co-authors added here]	
Re:	IEEE 802.16m-07/080r3– Call for Comments on Draft 802.16m Evaluation Methodology Document	
Abstract	This document contains proposed text for the draft evaluation methodology for IEEE 802.16m technical proposals.	
Purpose	For discussion and approval by TGm	
Notice	<i>This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups.</i> It represents only the views of the participants listed in the “Source(s)” field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who 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	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: < http://standards.ieee.org/guides/bylaws/sect6-7.html#6 > and < http://standards.ieee.org/guides/opman/sect6.html#6.3 >. Further information is located at < http://standards.ieee.org/board/pat/pat-material.html > and < http://standards.ieee.org/board/pat >.	

Steps or procedures in the Link Budget calculation

1. Steps or procedures in the Downlink Link Budget calculation (Base Station → Mobile Station (Handset))

Step 1: Base Station EIRP (dBm) = Maximum Base Station Transmit Power Per Sector/Carrier (dBm) + 10
log₁₀ (OFDM Symbol Duration with Cyclic Prefix
(μ s)/OFDM Symbol Duration(μ s)) + Base Station Antenna Gain (dB)

Step 2: Power per Sub-carrier Transmitted from the Base Station (dBm) = Base Station EIRP (dBm) – 10
log₁₀ (Number of Allocated PUSC Downlink Sub-carriers per Base Station Sector/Carrier)

Step 3: Receiver Sensitivity per Sub-carrier (dBm) = -174 (dBm/Hz) +
10 log₁₀ (Sub-carrier Spacing (Hz)) + Required Received SNR (dB) + Mobile Station Noise Figure
(dB)

Step 4: Total Margin (dB) = Log-normal Shadowing Loss (dB) + Fast Fading Loss (dB) + Interference Loss
(dB) + Penetration Loss (dB) + Hardware Loss (dB)

Step 5: Mobile Station Receiver Antenna Diversity Gain (dB) = 10 log₁₀ (Number of Mobile Station
Receiver Antennas)

Step 6: System Gain (dB) = Power per Sub-carrier Transmitted from the Base Station (dBm) + Mobile
Station Antenna Gain (dB) + Mobile Station Receiver Antenna Diversity Gain (dB) - Mobile
Receiver Sensitivity per Sub-carrier (dBm)

Step 7: Maximum Allowable Path Loss (dB) = System Gain (dB) – Total Margin (dB)

2. Steps or procedures in the Uplink Link Budget calculation (Mobile Station Handset → Mobile Station Handset)

Step 1: Mobile Station EIRP (dBm) = Mobile Station Transmit Power (dBm) + Mobile Station Transmit
Antenna Gain (dB)

Step 2: Power per Sub-carrier Transmitted from the Mobile Station (dBm) = Mobile Station EIRP (dBm) –
10 log₁₀ (Number of Allocated PUSC Uplink Sub-carriers per Mobile Station)

Step 3: Receiver Sensitivity per Sub-carrier (dBm) = -174 (dBm/Hz) +
10 log₁₀ (Sub-carrier Spacing (Hz)) + Required Received SNR (dB) + Mobile Station Noise Figure
(dB)

Step 4: Total Margin (dB) = Log-normal Shadowing Loss (dB) + Fast Fading Loss (dB) + Interference Loss
(dB) + Penetration Loss (dB) + Hardware Loss (dB)

Step 5: Mobile Station Receiver Antenna Diversity Gain (dB) = 10 log₁₀ (Number of Mobile Station
Receiver Antennas)

Step 6: System Gain (dB) = Power per Sub-carrier Transmitted from the Mobile Station (dBm) + Mobile
Station Antenna Gain (dB) + Mobile Station Receiver Antenna Diversity Gain (dB) - Mobile
Receiver Sensitivity per Sub-carrier (dBm)

Step 7: Maximum Allowable Path Loss (dB) = System Gain (dB) – Total Margin (dB)