Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**PHY Evaluation Criteria for Session #12**
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Re:	Task Group 3 of the 802.16 Working Group is undertaking a proposal evaluation process for Physical Layer proposals for an Air Interface Standard.
Abstract	This document provides the evaluation criteria by which competing PHY proposals will be evaluated at Working Group session #12 (March 12-16, 2001). Proposers should insure all topics listed are properly described in their proposals.
Purpose	The purpose of this document is to inform all proposers into the 802.16.3 PHY standards process of the criteria by which members and observers of 802.16 will evaluate their proposals.
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Evaluation Criteria List for Session #12 Voting Purposes

1. Meets system requirements

How well does the proposed PHY protocol meet the requirements described in the current version of the 802.16.3 Functional Requirements (FRD)?

FRD Compliance Table (List of essential requirements):

- Support of both TDD and/or FDD duplex scheme (M32)
- Multi-rate support (M23)
- Support of optional repeater function? (M7)
- Support of various quality of services (QoS) (M11)
- Support of channel width between 1.75 to 14MHz for ETSI Mask and 1.5 to 25 MHz for other masks (M35).

2. Channel and System efficiency

a) Describe channel spectrum efficiency (Uplink/Downlink) in terms of single channel capacity, assuming a total occupied BW = 3.5 and 10 MHz (see TM4 definition):

- Gross Bit Rate @ PHY to MAC Interface for each mode supported
- Modulation Scheme
- Gross Transmission Bit Rate (including FEC)
- TDD or FDD
- Sensitivity at NF = 5 dB and PER = 10^{-2} for packet size = 400 Bytes
- Channel efficiency; %(capacity - overhead) / capacity
- Spectral efficiency; bits/sec/Hz for each modulation.

An Example Of System Capacity Objectives.

Channel Spacing	Downstream Transmission		Upstream Transmission	
	Rate (Mb/s)		Rate (Mb/s)	
	(16 QAM) 3.0 bps/Hz	(64 QAM) 5.07 bps/Hz	(QPSK) 1.46 bps/Hz	(16 QAM) 2.92 bps/Hz
3.5 MHz	10.5			
5 MHz				
6 MHz				
7 MHz				

b)Describe system efficiency in terms of:

- System Link Budget required per each proposed modulation (including Fade margin) for
  a) Dense urban area
  b) Suburban Area
  c) Rural area
- Single cell and multi-cell coverage (in bits/sec/Hz/cell)
- Account for Re-use factor (C/I evaluation).
- Effect of Re-use factor on capacity

Assume the following system configuration and requirements:

- Sectoral BS Antenna (60 degrees)
- SS antenna (30 degree)
- Cell size; 2, 6, and 10 Km
- Link Availability of 99.99%
- Channel Model in accordance with IEEE 802.16.3-01/29r1 http://www.ieee802.org/16/tg3/docs/802163c-01_29r1.pdf
- Traffic model in accordance with IEEE 802.16.3c-01/30r1, http://www.ieee802.org/16/tg3/docs/802163c-01_30r1.pdf

3. Simplicity of Realization

How well does the proposed PHY allow for simple implementation or how does it leverage on existing technologies? For example:

a) SS cost optimization

How does the proposed PHY affect SS cost?

b) BS cost optimization

How does the proposed PHY affect BS cost?

c) Installation Cost

4. Spectrum resource flexibility

a) Flexibility in the use of the frequency band (i.e., channelization, modularity, band pairing, and Upstream/DownStream data Asymmetry).

b) Channel Rate Flexibility:
Channel Rate adjustment (e.g., application of adaptive coding and modulation) capability used at PHY to accommodate channel quality variations.

5. System Robustness to channel fading, interference, and radio impairments

Provide data on impacts of small and large scale fading (Rain fading, multipath, N(non or near)LOS, Foliage effects, Freq. Selective fading, atmospheric effects.)

Provide information on co-channel, and adjacent channel interference levels and spectral spillage resulting from modulation.

Specify the degradation due to radio impairments such as phase noise group delay of filters, amplifier nonlinearities, etc.

6. Support of advanced antenna techniques

Specify how the system would support advanced techniques, such as smart antennas, Diversity, or space-time coding.

7. Compatibility with existing relevant standards and regulations

State any known standards or regulations that the proposed PHY currently complies with.