Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Summary of Open PHY Issues in IEEE 802.16.1-00/01**	
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Re:	IEEE 802.16.1-00/01	
Abstract	This contribution summarizes the open physical layer issues that still must be addressed in the new working document. The intent is to help people easily identify the open issues without having to carefully go through the whole draft standard.	
Purpose	To help foster comments on the current version of the document.	
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Summary of Open PHY Issues in IEEE 802.16.1-00/01

Jeff Foerster, 802.16.1 PHY Technical Editor

The purpose of this contribution is to summarize some of the open issues yet to be addressed in the current document. Any contributions to help address the items listed below can be made through the comment resolution process. For significant changes, a simple comment can be submitted (i.e., "Replace Section 3.2.1.5 with the text outlined in the contribution by XXX.") followed by a formal contribution explaining the actual text changes as well as the justification for the change. Of course, any contributions that help to strengthen this standard, above and beyond what is listed here, are always welcomed.

Following is a summary of some of the current open physical layer issues/TBDs that still need to be addressed in the 802.16.1 draft standard:

1. Transmission convergence layer CRC checksum generator polynomial.

2. Minimum shortened last codeword parameters for the terminal capability set exchange MAC messages.

3. Additional bit level shortening method for downlink Mode B BTC.

4. Further specifics on the encoder model for the BTC, so that the decoder is unambiguous.

5. Modulation/FEC for the PHY/MAC control portion of the downlink frame (Mode B).

6. Scrambling primitive polynomial for the downlink Mode B PHY.

7. Downlink frame start preamble definition (length/value and justification to meet receiver characteristics and support for equalizer training).

8. Downlink TDMA burst preamble definition (length/value and justification to meet receiver characteristics and support for equalizer training).

9. Additional modulation schemes for the uplink channel.

10. Symbol rate definition for the uplink channel descriptor MAC message.

11. Frame time parameters.

12. Additional bit level shortening method for uplink BTC.

13. Further specifics on the encoder model for the BTC, so that the decoder is unambiguous.

14. Baud rates and channel bandwidths for uplink and downlink, taking into account roll-off factor, frame times, and number of PSs per frame.

15. Power control algorithm recommended parameters for rates of fades, depths of fades, and expected power compensation due to distance loss.

16. Possible constraints on adjacent codeword lengths in the uplink and downlink FEC schemes.

In addition to the above open issues, the 802.16.1 working group is looking for comments/contributions for the following Transmitter/Receiver characteristics that have been identified as important to be included in the standard.

Transmitter/Receiver Characteristics	Comments
Transmitter characteristics	Each item must be addressed for both the base station and subscriber station
Output power	Max. output level at antenna, dynamic range, accuracy, and AM tolerance
Phase noise	Max. integrated phase noise requirement or phase noise mask
Tx symbol timing accuracy	
Tx RF frequency range and accuracy	
Spectral mask (out-of-band)	
Spectral mask (in-band)	
Filter distortion	Group delay variation and amplitude ripple
Adjacent channel interference	
Co-channel interference	
Spurious emissions	Unwanted conducted emissions and radiated emissions
CPE Channel Switching Time	For TDD and FSDD operation
Tx / Rx Carrier Switching Time	For TDD and FSDD operation
Off to On Carrier Switching Time	For TDD and FSDD operation
On to Off Carrier Release Time	For TDD and FSDD operation
Special Co-Location Requirements	
Expected channel impairments	
Propagation channel model	Expected multipath delay spread, time-variability, and amplitude levels

Rain fade model	
Receiver Characteristics	Each item must be addressed for both the base station and subscriber station
Blocking Characteristics	
Spurious Response Rejection	
Intermodulation Response Rejection	
Unwanted Conducted Emissions	
Unwanted Radiated Emissions	
Received Signal Strength Indication	
Special Co-Location Requirements - Receiver	
Transmitter/Receiver Performance	
Modulation Accuracy	
Receiver Performance	
Nominal Error Rates	
Static Reference Sensitivity Performance	
Dynamic Reference Sensitivity Performance	
Reference Interference Performance	
CPE receiver performance for synchronization acquisition	

Other areas that may be useful to define in the standard include:

1. Define a bit stuffing capability after the encoder process in order to simplify bandwidth allocations and transmissions that need to fill up an integer number of physical slots. This may be preferable, in some cases, to byte stuffing in the transmission convergence sublayer, or can be used in combination with byte stuffing.

2. Recommend a set of FEC parameters (codeword sizes, rates, error correction capability, etc.) that can be included in the standard as a MUST, while all other FEC parameters are optional. This may help to simplify implementation and conformance testing in order to ensure interoperability.