Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Combining the 2 IEEE 802.16.1 PHY proposals**
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Re:	Call for Evaluations, Improvements, and Mergers, 802.16.1 (Document IEEE 802.16-00/11) and Document IEEE 802.16.1pc-00/27
Abstract	802.16 may consider adopting an initial 802.16.1 PHY draft that is a combination of the two invited proposals. In this case, the two proposals should be included into the draft in their entirety.
Purpose	This document serves to explain the intent of IEEE 802.16.1pc-00/27.
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Combining the 2 IEEE 802.16.1 PHY proposals

Jay Klein

Currently IEEE 802.16.1 is evaluating 2 **PHY** proposals:

(1) "E+" by Jay Klein *et al*

(2) "D+" by Jeff R. Foerster *et al*

The "D+" proposal took a first step in a direction of having 2 PHYs under the umbrella of 802.16.1 in the following way. The previous "D+" proposal (Session #6) contains only one mode of operation. In this mode only Frequency Division Duplex scheme is supported (FDD). The downlink is a continuous stream, time division multiplexed. This allows for a strong FEC scheme which is based on the concatenation of a Reed Solomon and a convolutional code. The uplink uses TDMA as its multiple access with Reed Solomon coding. The following features are not supported by the previous "D+" proposal:

1. Half duplex terminal operation (in FDD mode operation)
2. TDD mode of operation
3. Subscriber level adaptive modulation (SLAM)

Appreciating the need of the features above, the new "D+" proposal has added a new mode of operation to their PHY proposal, ***based*** on the "E+" proposal, referred as ***Mode B***. Nevertheless, even if there is an agreement to deal with ***both*** the "E+" and the "D+" PHY proposals by the 802.16.1 then the question is what will be the right way of doing so.

The current "D+" proposal borrowed some parts of the "E+" proposal yet some parts were ignored. The "E+" contributors could have done the same thing, meaning, taking some parts of the "D+" proposal which could be relevant yet we do not think that this "borrowing" "adopting" and "adapting" is the right approach. Here are 2 examples why such a process could be harmful to the original "D+" proposal as well:

- ***"D+" Downlink Modulation Scheme:*** if we review the "D+" downlink proposal it contains one mandatory modulation scheme (QPSK) and ***numerous*** optional schemes. Some of the schemes are presented with both gray code mapping and differential coding. One could propose to mandate QPSK and remove all other schemes. If the working group wishes other schemes could be defined in the future.

However we can take a safer approach, which is to leave what was proposed and to allow the working group to fine tune the proposal and to allow the original contributors to justify what was proposed.

- ***"D+" FEC scheme:*** The current "D+" proposal can employ a strong coding scheme for its downlink which is based concatenated coding. As turbo codes are excellent candidates to replace a concatenated one could recommend to force gray coding for the modulation schemes and even propose a new and better code. However it seems that the current FEC proposal is quite matured while the issue of advanced coding schemes maybe still under discussions. Therefore it would be better that the working group to process, analyze and recommend relevant changes if at all.

The "bottom line" is that it is ***dangerous and premature*** to cut out pieces of the proposals and try to perform some level of adaptation at this stage. We need to recognize the fact that the proposals were prepared by numerous knowledgeable contributors, which conveyed excellent ideas. Consequently our recommendation is combine both PHY proposals into one document. This is the right start for a "first take" draft. Using this document would allow the working group to move forward into fruitful technical discussions, which would allow for fine-tuning and even additions (or deletions) as the group guides.