Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Specifying TDD for the proposed WirelessHUMAN Standard
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Re:	In response to a Call for Contributions, to assist the Study Group in deciding on the applicability of existing/proposed standards (such as the IEEE 802.16.1 PHY and the ETSI BRAN Hiperlan/2 and Hiperaccess PHYs) to the proposed WirelessHUMAN Standard.
Abstract	The contribution identifies some key benefits to specifying Time Division Duplexing for the PHY layer of the proposed WirelessHUMAN Standard-based PMP Fixed Broadband Wireless Access Systems (as was done for the ETSI BRAN Hiperlan/2, and included in the IEEE802.16.1 PHY, and the Hiperaccess PHY)
Purpose	The WirelessHUMAN Study Group should propose that a TDD be used in the PHY layer of the proposed WirelessHUMAN Standard (as was done in the ETSI BRAN Hiperlan/2, and included in the IEEE 802.16.1 PHY and the Hiperaccess PHY).
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Specifying TDD for the proposed WirelessHUMAN Standard

BACKGROUND

Traditionally point-to-point microwave telecommunication and mobile telecommunication systems were based on Frequency Division Duplexing(FDD) as these were readily compatible with the existing analogue telecommunications plant. As the telecommunications plant has evolved to digital, the technical flexibilities of using TDD have become practical, resulting in performance improvements and more cost-effective PMP FWA.

The IEEE 802.16 WirelessHUMAN Study Group (SG) at its previous Session called on all interested parties to submit contributions "to assist in the decision, the SG to identify applicability & modifications of existing/proposed MAC/PHY standards for WirelessHUMAN systems". What follows identifies some key benefits to specifying TDD for the PHY layer of the proposed WirelessHUMAN Standard-based PMP Fixed Broadband Wireless Access Systems (as was done for the IEEE 802.16.1 PHY, and the ETSI BRAN Hiperlan/2 and Hiperaccess PHYs)

1. TDD allows simple and efficient dynamic(e.g., frame-by-frame) allocation of a radio channel bandwidth to the uplink and downlink of the radio channel.
2. TDD does not require paired frequencies allocation. This results in much simpler procedures and algorithms for frequency allocation and frequency rearrangements required to overcome changes of interference with time, and taking out-of-service an access point for maintenance purposes.
Note: The probability of interference is also decreased with TDD, since it reduces the number of carrier frequencies transmitted in a given area.
3.   TDD has simpler hardware since no diplexer and the additional components required by a second radio channel such as mixer, oscillator, and synchronizer are used; Diplexer is replaced in TDD with a more cost-effective solid state transmit/receive switch
4.   Because of TDD reciprocity of signal paths in both traffic directions, using the same carrier frequencies particularly efficient antenna spatial diversity algorithms and implementations become available, as spatial diversity can be implemented only at Base Stations. This can very effectively reduce CPE equipment cost.
5.   The reciprocity of TDD allows for channel equalization to be performed at Base Station only, resulting in a more flexible trade-off between CPE and Base Station equipment costs
6.   With TDD, adaptive channel equalization combined with transmitter pre-distortion can improve resistance to multipath
7.   TDD enables the use of simpler and more effective implementation of adaptive antennas.
8.   The reciprocity of TDD can yield more effective power control.
9.   TDD is easier to self-test facilities by closing the transmit-receive loop at each modem.
10.   The recently approved ETSI Technical Report(DTR/TM-0487), Digital TDD PMP FWA Systems concludes "that it is not easy to make general statements about the impact of duplex method on interference - and, in appropriate circumstances, TDD FWA systems can coexist with other TDD systems or with FDD systems in adjacent frequencies without undue interference."

PROPOSAL

This contribution proposes that that TDD be used in the PHY layer of the proposed WirelessHUMAN Standard (as was done in the ETSI BRAN Hiperlan/2, and included in the IEEE 802.16.1 PHY and Hiperaccess PHY).