Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**TDD Subband Diversity**
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Re:	Call for contributions, IEEE 802.16-02/28, 28 May 2002, regarding document IEEE P802.16a/D4-2002
Abstract	Proposal is to add an additional section on TDD subband frequency diversity to the OFDMA PHY section.
Purpose	Make the normatitive changes in the proposal.
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TDD Subband Diversity

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Introduction

This proposal is to add an additional section on TDD subband frequency diversity to the OFDMA PHY section. As a result, Section 8.3.3.8.2 is added, Sections 8.3.3.8.1-3 are renumbered, and the heading for Section 8.3.3.8 is modified to reflect these changes. There is no change to any content within existing sections on Alamouti Space-Time Coding. (The proposal is generic, and can be included in the other PHY sections if desired.)

Background

Some frequency diversity is achieved by allocating data to tones within a subchannel. However, for very short delay channels with strong multipath, a multipath fade may stretch across an entire subband or significant portion of it. The motivation for the additional section is to permit the use of TDD subband frequency diversity to achieve greater link reliability.

For most frequency allocations, a frequency band is composed of lower and upper subbands. Because the frequency separation between these subbands is typically much greater than the coherence bandwidth, sub-channels in different subbands are likely to have uncorrelated multipath fading. Hence, a flat fade affecting a sub-channel in one subband will, with high probability, not occur in the other subband. For four nines of availability, the reduction in fade margin can be on the order of 20 dB. To exploit diversity across subbands, we propose that the same data be transmitted on a subchannel in the lower subband and a sub-channel in the upper subband. If knowledge of the channel is available, a water pouring power allocation scheme can be used to achieve optimal performance.

Proposed Changes

The text below reflects these changes and provides the additional normative text.

8.3.3.8 Transmit Diversity~~: Alamouti's Space-Time Coding~~
8.3.3.8.1 ~~Transmit Diversity:~~ Alamouti's Space-Time Coding
no change in content
8.3.3.8.1.2 MISO channel estimation and synchronization
no change in content
8.3.3.8.1.3 Alamouti STC Encoding
no change in content
8.3.3.8.1.4 Alamouti STC Decoding
no change in content
8.3.3.8.2 TDD Subband Diversity

The frequency allocation in TDD systems is logically divided into lower and upper subbands. Frequency diversity across subbands can be used on the downlink and/or uplink. At the transmitter, the same data is transmitted on nominally two sub-channels. Complex weights may be applied to exploit any available channel information. In particular, power can be allocated to the sub-channels so as to achieve a water-pouring power allocation scheme.

Decoding can be based on a variety of algorithms, such as selection diversity or diversity combining techniques, and requires no special coordination between the transmitter and receiver except to know that subband frequency diversity at the transmitter is being used.