Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Concurrent UL Burst Capability in OFDMA PHY
Date Submitted	**2004-05-14**
Source(s)	Yigal Eliaspur Yigal.eliaspur@intel.com Voice: +972-547-884877 Intel
Re:	IEEE P802.16e/D2-2004
Abstract	Concurrent UL Burst Capability in OFDMA
Purpose	The purpose of this document is to specify a fix number of UL OFDMA concurrent bursts supported by the SS and the grad time requirements between subsequent SS bursts.
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Concurrent UL Burst Capability in OFDMA

Yigal Eliaspur

Motivation:

The standard doesn't specify any limitations on the UL allocations, and we view this contribution as a clarification to the standard.

1. The UL concurrency limitation simplifies the PHY implementation in the following perspective:
    a. It doesn't concurrently modulate several bursts.
    b. Concurrent transmission requires the transmitter to plan ahead the power allocations, so that it doesn't run out of PA power when additional tones need to be added to the modulation, which is difficult to implement as well as inefficient.
2. The gap between two successive (time) UL allocations is required in order to ramp down one UL burst before starting the ramp-up of the next burst. Different bursts may require different transmission power, and therefore switching of analog circuits may be required, which cannot be performed during active transmission.
3. Allocation efficiency in the uplink is not affected, because the BS can aggregate all bandwidth allocations of the same SS to a single burst. In a normal system, UL Bursts from the same SS are expected to have the same burst profile, although formally, the BS may allocate different burst profiles for different bursts. It is expected that UL burst profile will be determined based on the link quality, as defined in the standard for DL burst profile (DBPC-REQ or RNG-REQ, see 6.3.10.1).
4. Note that concurrent allocations are not efficient in terms of transmission power, since in a PA-power limited scenario (edge of cell) the transmitted power is constant, and power spectral density (power/tone) is scaled by the number of tones.

Details:

Add the following sentence to the spec:

In the uplink, the BS shall not allocate to any SS more than one UL PHY bursts in a single frame that sheared the same OFDMA symbol. In the case that more than one UL burst is allocated to the same SS in an OFDMA frame, a gap of at least one OFDMA symbol shall be kept between the allocations.

Changes summary:

8.4.4.6 Uplink transmission allocations

[Insert the following rows at the end of the section]

In the uplink, the BS shall not allocate to any SS more than one UL PHY bursts in a single frame that sheared the same OFDMA symbol. In the case that more than one UL burst is allocated to the same SS in an OFDMA frame, a gap of at least one OFDMA symbol shall be kept between the allocations.