Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Corrections to OFDMA ranging definitions
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Re:	IEEE P802.16e/D3-2004
Abstract	The document proposes changes to correct two errors in the ranging definition.
Purpose	Correct erratas in 802.16REVd_D5 ranging definitions, concerning time domain description of ranging code, and ranging/BW request opportunity slot size.
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Release	
Patent Policy and Procedures	

Corrections to OFDMA ranging definitions

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1. Motivation

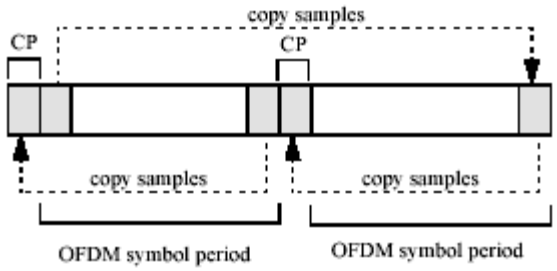
This document proposes two corrections to the ranging definitions in OFDMA PHY:

1. Correction to the time-structure of the initial ranging transmission, as the current structure depicted in fig.239 doesn't guarantee phase continuity.
2. Correction to the BW request opportunity size and ranging request opportunity size.

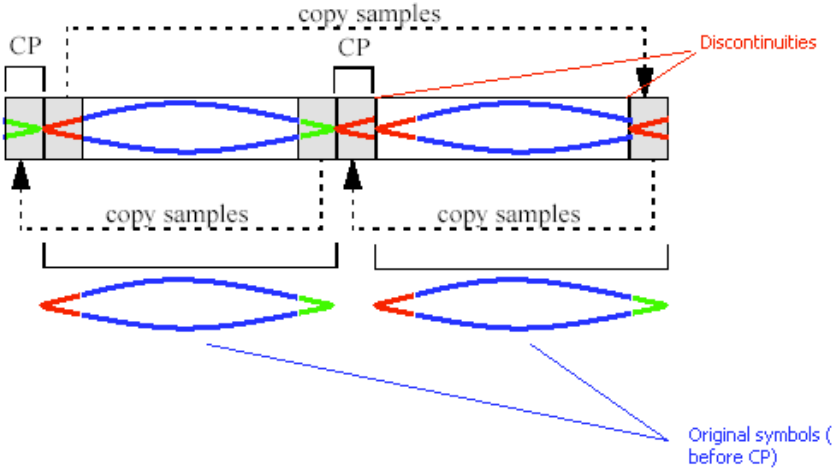
2. Details

2.1. Time structure of initial ranging transmission

The time structure of initial ranging transmission appears in Fig.239:



This diagram contradicts the text in 8.4.7.1, which requires phase continuity between the two symbols. The following diagram shows why:



The correct structure would be that the second symbol starts immediately at the end of the first symbol, and the remaining guard interval at the end of the second symbol is a cyclic extension.

2.2. CDMA code opportunity size

The contention mechanism defined in chapter 6 doesn't directly apply to OFDMA PHY. For example, 6.3.7.4.3.2 defines that RNG-REQ messages are transmitted in slots in the initial ranging zone. The slot size is "Ranging request opportunity size", and conveyed in the UCD. However, in OFDMA PHY,

CDMA codes rather than RNG-REQ messages are transmitted in the initial ranging zone, and the "Ranging request opportunity size" doesn't appear in the UCD.

The OFDMA PHY is different from the other PHYs also in the following facts:

1. Since CMDA codes can be transmitted by multiple SS-s on the same slot, and this transmission is concurrent with data transmissions of other SS, alignment of the transmission opportunities to OFDMA symbols is required (to guarantee orthogonality, as much as possible).
2. A guard interval of RTD is not necessarily required between ranging slots, since the code properties allow separation in the case of partial overlap between slots.
3. The OFDMA PHY defines 4 different code lengths (2,4 for initial ranging, and 1,3 for periodic ranging and BW request), whereas in other PHYs the length of the RNG-REQ is constant. This requires a different mechanism to define the opportunity size, which in other PHYs is constant.

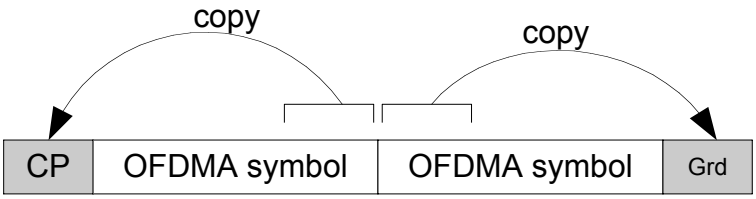
We propose to define the opportunity size in OFDMA as the length of the CDMA code.

3. Changes summary

3.1. Changes for ranging code structure

8.4.7.1 Initial-ranging transmissions

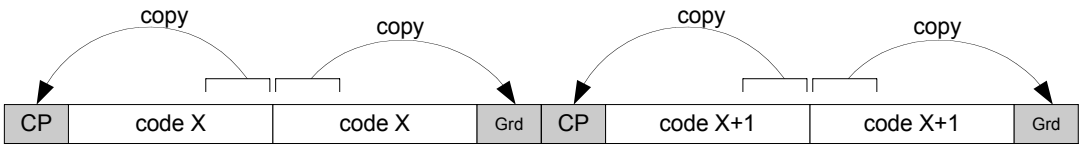
[Replace figure 239 with the following figure]



[Insert the following rows after figure 239]

The transmitted signal is according to 8.4.2.5, equation (96), except that $0 \le t \le 2T_s$.

[Replace figure 240 with the following figure]



3.2. Changes for ranging opportunity size

6.3.7.4.3.2 Initial Ranging IE

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

This clause does not apply to the OFDMA PHY, in which CDMA-based ranging is used, as described in 6.3.10.3.

6.3.10.3 OFDMA-based ranging

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

For OFDMA PHY the allocation of ranging opportunity inside a ranging allocation is defined in 8.4.7.4.

[Add the following section under 8.4.7 (OFDMA ranging)]

8.4.7.4 Ranging and BW request opportunity size

For CDMA ranging and BW request, the ranging opportunity size is the number of symbols required to transmit the appropriate ranging/BW request code (1,2,3 or 4 symbols), and is denoted N1. N2 denotes the number of subchannels required to transmit a ranging code (6 or 8, see 8.4.7.3). In each ranging / BW request allocation, the opportunity size (N1) is fixed and conveyed by the corresponding UL_MAP_IE that defines the allocation.

The ranging allocation is subdivided into slots of N1 OFDMA symbols by N2 subchannels, in a time-first order, i.e. the first opportunity begins on the first symbol of the first subchannel of the ranging allocation, the next opportunities appear in ascending order in the same subchannel, until the end of the ranging/BW request allocation (or until there are less than N1 slots in the current subchannel), and then the number of subchannel is incremented by N2. The ranging allocation is not required to be a whole multiple of N1 symbols, so a gap may be formed (that can be used to mitigate interference between ranging and data transmissions). Each CMDA code will be transmitted at the beginning of the corresponding slot. See Figure 243a

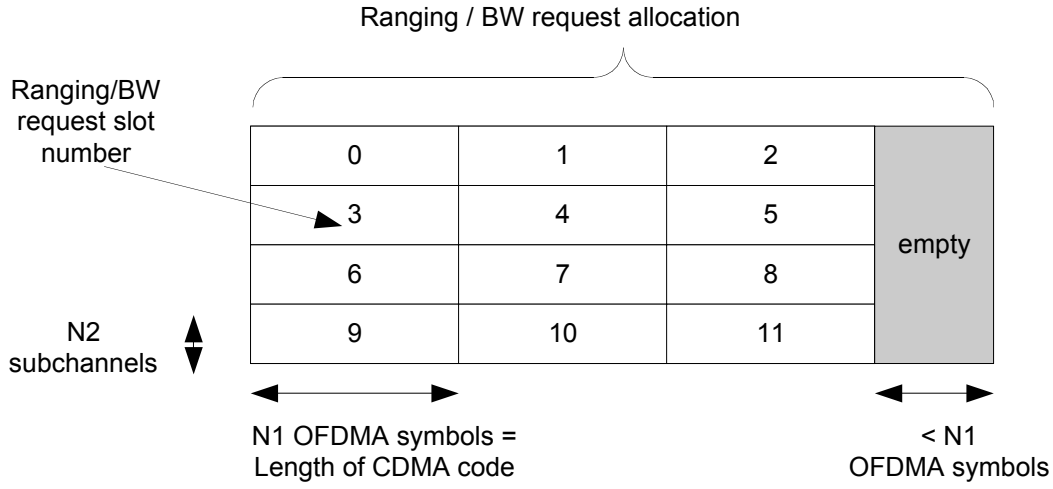


Figure 243a : Ranging/BW request opportunities