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Title	**Clarification on Uplink PUSC Subcarrier Allocation for OFDMA**
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Re:	IEEE P802.16e/D11.
Abstract	This presentation clarifies uplink PUSC subcarrier allocation for OFDMA.
Purpose	Review and adoption of the proposed text change into IEEE P802.16e/D12.
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Clarification of Uplink PUSC Subcarrier Allocation for OFDMA

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1. Problem Statements

Section 8.4.6.2.2 of IEEE 802.16e/D11 has been modified so that equations and descriptions can be applied to every FFT sizes. However, some common descriptions in section 8.4.6.2.2 of IEEE 802.16e/D11 are different from IEEE 802.16-Cor1/D5.

2. Remedy

[Change 8.4.6.2.2, page 436, line 21 as follows]

8.4.6.2.2 Partitioning of subcarriers into subchannels in the uplink

[Replace the contents of the section with the following text:]

The usable subcarriers in the allocated frequency band shall be divided into N_{tiles} physical tiles as defined in Figure 236 with parameters from Table 314. The allocation of physical tiles to logical tiles in subchannels is performed in the following manner:

1. Logical tiles are mapped to physical tiles in the FFT using Equation (113); for an example refer to 8.4.6.2.3.

$$Tiles(s,n) \quad N_{subchannels} \quad n \quad (Pt[(s \quad n) \bmod N_{subchannels}] \quad UL\_PermBase) \bmod N_{subchannels} \qquad (113)$$

where

Tiles(s,n)	is the physical tile index in the FFT with tiles being ordered consecutively from the most negative to the most positive used subcarrier (0 is the starting tile index)
n	is the tile index 0…5
Pt	is the tile permutation
s	is the subchannel number in the range 0,…,$N_{subchannels}$-1
UL_PermBase	is an integer value in the range 0…69, which is assigned by a management entity
$N_{subchannels}$	is the number of subchannels for the FFT size given in Tables 314a/314b/314c

After mapping the physical tiles in the FFT to logical tiles for each subchannel, the data subcarriers per ~~subchannel~~ slot are enumerated by the following process:

1. After allocating the pilot carriers within each tile, indexing of the data subcarriers within ~~the~~ each ~~subchannel~~ slot is performed starting from the first symbol at the lowest indexed subcarrier ~~from~~ of the lowest indexed tile and continuing in an ascending manner throughout the slot's subcarriers in the same symbol, then going to the next symbol at the lowest indexed data subcarrier, and so on. Data subcarriers shall be indexed from 0 to 47.
2. The ~~enumeration of~~ mapping of data onto the subcarriers will follow Equation (114). ~~This enumeration permutates the data subcarriers within each subchannel, setting the order to which the mapping of the data onto the data subcarriers within a subchannel shall be performed.~~ This equation calculates the subcarrier index (as assigned in item 1) to which the data constellation point is to be mapped.

$$Subcarrier(n,s) \quad (n \quad 13 \quad s) \bmod N_{subcarriers} \qquad (114)$$

where

1*Subcarrier*(*n*,*s*) is the permutated subcarrier index corresponding to data subcarrier *n* is subchannel *s*,
2*n* is a running index 0…47, indicating the data constellation point.
3*s* is the subchannel number,
4$N_{subcarriers}$ is the number of subcarriers per ~~subchannel~~ slot.
5
6For example, for subchannel 1 (s = 1), the first data constellation point (n=0) is mapped onto subcarrier (0,1) = 13,
7where 13 is the subcarrier with index 13 according to item 1 above. Considering the PUSC tile structure, it can be seen
8that this is the second indexed subcarrier on the second symbol within the slot. Similarly, for subchannel 3, the ninth
9data constellation point (n = 8) is mapped onto subcarrier (8, 3) = 47. According to item 1, this is the last indexed
10subcarrier of the third symbol within the slot.
11
12Subcarrier enumeration shall not be applied to the slots in the UL-MAP indicated by either UIUC = 0 or UIUC = 12.
13
14

15## 3. References

16

17[1] IEEE Std 802.16-2004, “IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed
18 Broadband Wireless Access Systems,” Oct. 2004.

19[2] IEEE P802.16-Cor1/D5, “Corrigendum to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air
20 Interface for Fixed Broadband Wireless Access Systems,” Sep. 2005.

21[3] IEEE P802.16e/D11, “Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks Part 16: Air
22 Interface for Fixed and Mobile Broadband Wireless Access Systems —Amendment for Physical and Medium
23 Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands,” Sep. 2005.

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