Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Clarifications to sub-carrier to tile mapping in PUSC permutation**
Date Submitted	**2004-07-06**
Source(s)	Yigal Leiba Yossi Segal Zion Hadad Itzik Kitroser Runcom Ltd. Hachoma 2 St. 75655 Rishon Lezion, Israel Voice: +972-3-9528440 Fax: +972-3-9528805 yigall@runcom.co.il yossis@runcom.co.il zionh@runcom.co.il Itzikk@runcom.co.il
Re:	Handling corrections to P802.16-REVd/D5
Abstract	Errata to 802.16-2004
Purpose	Clarifications and completion of missing details in 802.16-2004
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 (Version 1.0) <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, if there is technical justification in the opinion of the standards-developing committee and provided the IEEE receives assurance from the patent holder that it will license applicants under reasonable terms and conditions for the purpose of implementing 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:r.b.marks@ieee.org> as early as possible, in written or electronic form, of any patents (granted or under application) that may cover technology that is under consideration by or has been approved by IEEE 802.16. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Clarifications to sub-carrier to tile mapping in PUSC permutation

1 Statement of the problem

In section 8.4.6.1.2.1 the PUSC permutations is defined, but there is some information missing on the order in which subcharriers are mapped to PUSC tiles

2 Proposed solution

Add clarification that defines the missing information.

3 Specific text changes

[Modify section 8.4.6.1.2.1 as shown below]

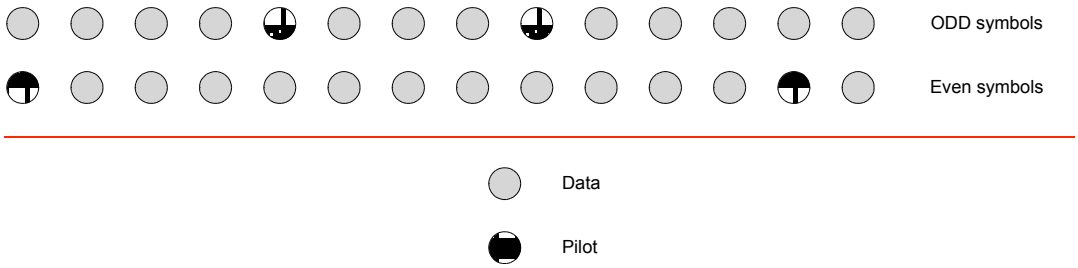
8.4.6.1.2.1 Symbol Structure for PUSC

The symbol structure is constructed using pilots, data and zero subcarriers. The symbol is first divided into basic clusters and zero carriers are allocated. Pilots and data carriers are allocated within each cluster. Table 308 summarizes the parameters of the symbol structure.

Table 308—OFDMA downlink carrier allocations - PUSC

Parameter	Value	Comments
Number of DC subcarriers	1	Index 1024
Number of Guard subcarriers, Left	184	
Number of Guard subcarriers, Right	183	
Number of used subcarriers (N_{used})	1681	Number of all subcarriers used within a symbol, including all possible allocated pilots and the DC carrier.
Number of subcarriers per cluster	14	
Number of clusters	120	
Renumbering sequence	1	used to renumber clusters before allocation to subchannels: 6, 108, 37, 81, 31, 100, 42, 116, 32, 107, 30, 93, 54, 78, 10, 75, 50, 111, 58, 106, 23, 105, 16, 117, 39, 95, 7, 115, 25, 119, 53, 71, 22, 98, 28, 79, 17, 63, 27, 72, 29, 86, 5, 101, 49, 104, 9, 68, 1, 73, 36, 74, 43, 62, 20, 84, 52, 64, 34, 60, 66, 48, 97, 21, 91, 40, 102, 56, 92, 47, 90, 33, 114, 18, 70, 15, 110, 51, 118, 46, 83, 45, 76, 57, 99, 35, 67, 55, 85, 59, 113, 11, 82, 38, 88, 19, 77, 3, 87, 12, 89, 26, 65, 41, 109, 44, 69, 8, 61, 13, 96, 14, 103, 2, 80, 24, 112, 4, 94, 0
Number of data subcarriers in each symbol per subchannel	24	
Number of subchannels	60	
PermutationBase12 (for 12 subchannels)		6,9,4,8,10,11,5,2,7,3,1,0
PermutationBase8 (for 8 subchannels)	4	7,4,0,2,1,5,3,6

Figure 234 depicts the cluster structure:



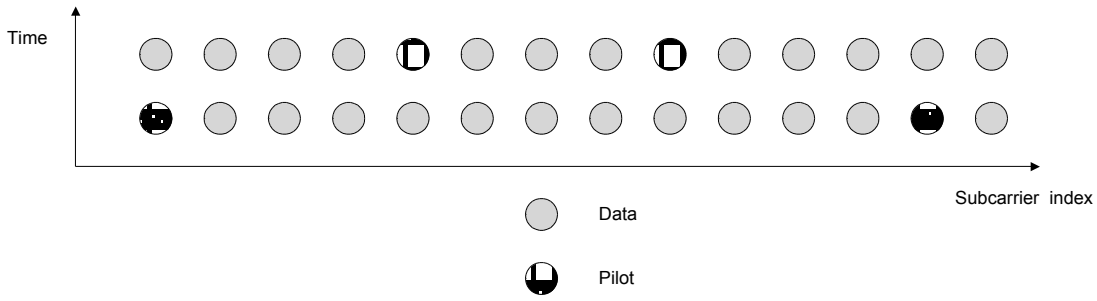


Figure 234—Cluster structure

8.4.6.1.2.1.1 Downlink subchannels subcarrier allocation in PUSC
The carrier allocation to subchannles is performed using the following procedure:

1) Dividing the subcarriers into 120 physical clusters containing 14 ~~adjunct~~ adjacent subcarriers each (starting from subcarrier 0)

2) Renumbering the physical clusters into logical clusters using the following formula:

*LogicalCluster = RenumberingSequence((PhysicalCluster +13*IDcell) mod 120)*

In the first PUSC zone of the downlink (first downlink zone) the default used IDcell is 0.

3) Dividing the clusters into 6 major groups. Group 0 includes clusters 0-23, group 1 includes clusters 24-39, group 2 includes clusters 40-63, group 3 includes clusters 64-79, group 4 includes clusters 80-103, group 5 includes clusters 104-119. These groups may be allocated to segments, if a segment is being used, then at least one group shall be allocated to it (by default group 0 is allocated to sector 0, group 2 is allocated to sector 1 and group 4 to is allocated sector 2).

4) Allocating subcarriers to subchannel in each major group is performed by first allocating the pilot carriers within each cluster, and then taking all remaining data carriers within the symbol and using the same procedure described in 8.4.6.1.2.2.2 (with the parameters from Table 308, using the PermutationBase appropriate for each major group, PermutationBase12 for even numbered major groups and PermutationBase8 for odd numbered major groups) to partition the subcarriers into subchannels containing 24 data subcarriers in each symbol. Note that IDcell used for the first PUSC zone is 0. Note that the subcarrier indexing within each group shall start from 0, where 0 is the lowest number subcarrier in the lowest numbered logical cluster belonging to the group.

5) The data subcarriers shall be mapped to the subchannel such that data subcarriers numbered 0 to 23 reside on the first (time wise) symbol on the subcarriers whose index is 0 to 23 respectively in equation 107 and the data subcarriers numbered 24 to 47 reside on the second symbol on the subcarriers whose index is 0 to 23 respectively in equation 107.