Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**Proposal for Uplink Physical Resource Allocation Unit**	
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Re:	The IEEE 802.16 Working Group's *Task Group m* (TGm) 's Call for Contributions on Project 802.16m System Description Document (SDD), IEEE 802.16m-08/016r1.	
Abstract	This document describes a proposal for 802.16m UL Physical resource allocation unit. This proposal applies to the 802.16m portion in an 802.16m frame that allows new PHY resource block designs. The legacy system resource allocations are supported in the legacy portion in an 802.16m frame through the same allocation mechanisms in the Legacy systems.	
Purpose	To be discussed and adopted by 802.16m SDD.	
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Proposal for Uplink Physical Resource Allocation Unit

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Introduction

This document describes a proposal for 802.16m UL Physical resource allocation unit. This proposal applies to the 802.16m portion in an 802.16m frame that allows new PHY resource block designs. The legacy system resource allocations are supported in the legacy portion in an 802.16m frame through the same allocation mechanisms in the Legacy systems.

Proposed UL Physical Resource Allocation Unit

The proposed 802.16m UL physical resource allocation unit is 1 subchannel * 1 subframe, where 1 subchannel consists of 16 adjacent subcarriers in frequency domain, and 1 subframe consists of 6 continuous OFDMA symbols in time domain, as shown in Figure 1.

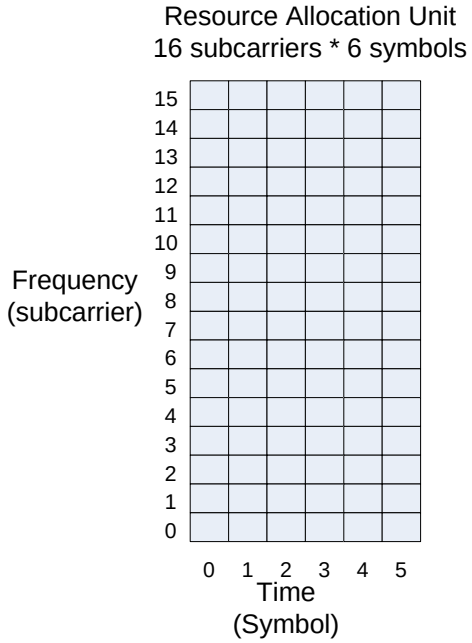

Figure 1. Proposed Physical Resource Allocation Unit

The proposed 16-subcarrier * 6-Symbol Physical allocation unit is permutation type independent, i.e., one resource allocation unit for all permutation types. This is different from the Legacy system where the Physical allocation unit varies with the permutation type, e.g., PUSC and AMC have different allocation units.

We propose that the same resource allocation unit applies to both DL and UL for 802.16m.

In the time domain, we propose 6 symbols as the size for a subframe, i.e., the unit of resource allocations, with the considerations that the 6-symbol subframe size fits nicely into the OFDMA

parameters as discussed in the 802.16m frame structure development.

In the frequency domain, we propose 16 adjacent subcarrires as the size of a subchannel, i.e., the unit of resource allocations, with the following considerations:

1. The 16 subcarriers give a nice integer-number incremental step in frequency domain for the proposed subcarrier spacing numbers, e.g.,

    - if subcarrier-spacing = 10.9375 KHz as proposed in many 802.16m frame structure contributions; the frequency domain incremental step is 16*10.9375 = 175 KHz;

    - if subcarrier-spacing = 12.5 KHz as proposed by some 802.16m frame structure contributions, the frequency domain incremental step is 16*12.5 = 200KHz.

2. 16 is a power of 2, which provides flexible numerology:

    - Simple and power efficient DFT implementations;

    - regular pilot placement across the frequency band;

    - regular structure for subcarrier assignments for control channels;

3. The subchannel size of 16 subcarriers fits nicely into different bandwidth (e.g., 5/10/20 MHz) and different FFTs to maximize the utilization of the used subcarriers, as illustrated in the Table 1.

Table 1. Number of 16-Subcarrier Subchannels for Different Channel Sizes

BW (MHz)	N_{sub}	802.16m N_{used}	802.16m Occupied BW (MHz)	Subcarrier Spacing (kHz)	PUSC N_{used}	PUSC Occupied (MHz)	AMC N_{used}	AMC Occupied BW (MHz)
5.00	27	433	4.74	10.9375	409	4.47	433	4.74
10.00	54	865	9.46	10.9375	841	9.20	865	9.46
20.00	108	1729	18.91	10.9375	1681	18.39	1729	18.91