

IEEE 802.16m Uplink Resource Blocks and Pilot

Document Number:

IEEE C802.16m-08/271r1

Date Submitted:

2008-05-05

Source:

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*<http://standards.ieee.org/faqs/affiliationFAQ.html>>

Venue:

TGm – Call for contributions on Project 802.16m System Description Document – IEEE 802.16m-08/016r1
(Uplink Physical Allocation Unit)
(Uplink Pilot Structures)

Base Contribution:

IEEE C802.16m-08/271

Abstract:

Proposal for 16m uplink resource allocation unit and pilot structure.

Purpose:

Adoption of proposed text/content for 802.16m System Description Document

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<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

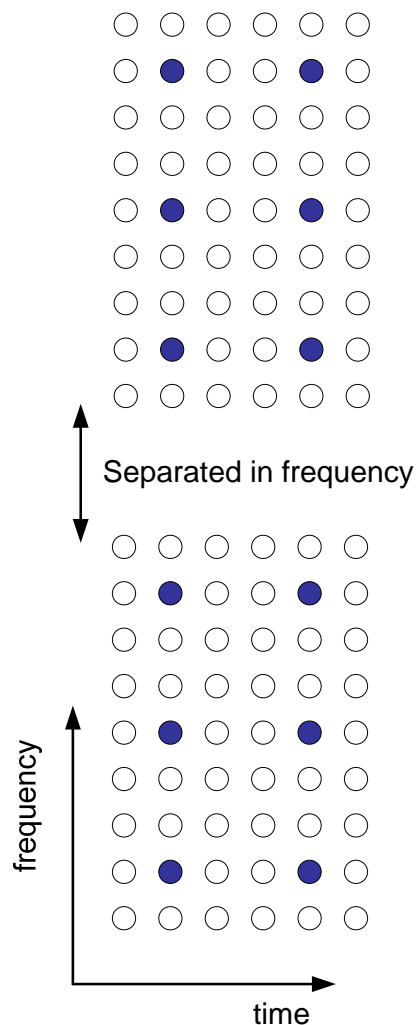
Further information is located at <http://standards.ieee.org/board/pat/pat-material.html>> and <http://standards.ieee.org/board/pat>>.

Considerations on UL Resource Block

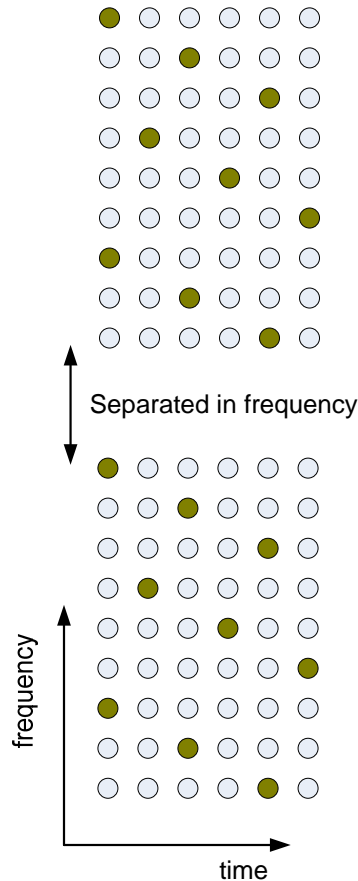
- ❑ Slot (logic resource unit) is 18 subcarriers by 6 OFDM symbols
 - Minimum resource allocation unit
 - Same as DL
- ❑ There are multiple tiles within a slot
 - Small tile size
 - Better frequency/time diversity for small payload
 - Worse channel estimation performance
 - Large tile size
 - Worse frequency/time diversity for small payload
 - Better channel estimation performance
- ❑ SDMA considerations
 - CDM pilots between SDMA users may reduce overhead

Proposed UL Resource Block and Pilot Pattern

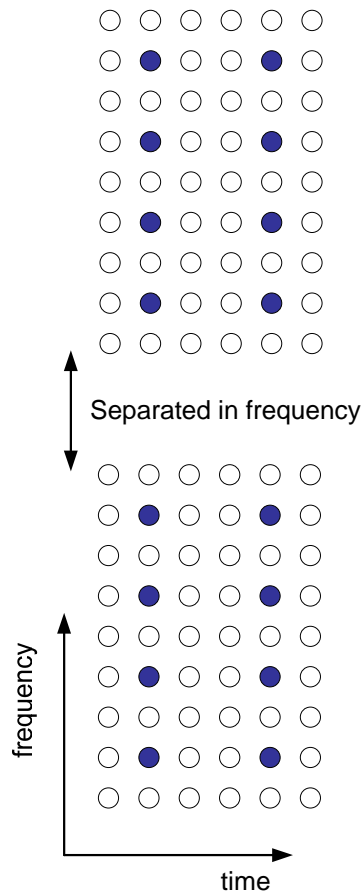
- ❑ Tile size is 9 subcarriers by 6 OFDM symbols
 - With 40 bytes payload, 16-QAM, $\frac{1}{2}$ coding \rightarrow 2 slots, or 4 tiles
- ❑ In distributed mode, two tiles of a slot are separated in frequency
- ❑ In localized mode, two tiles of a slot are contiguous in frequency
- ❑ Pilot overhead 11.1%
 - WiMAX B-AMC \rightarrow 11.1%
 - WiMAX PUSC \rightarrow 33.3%
 - LTE \rightarrow 14.3%
- ❑ Link simulations show acceptable channel estimation performance, with least pilot overhead



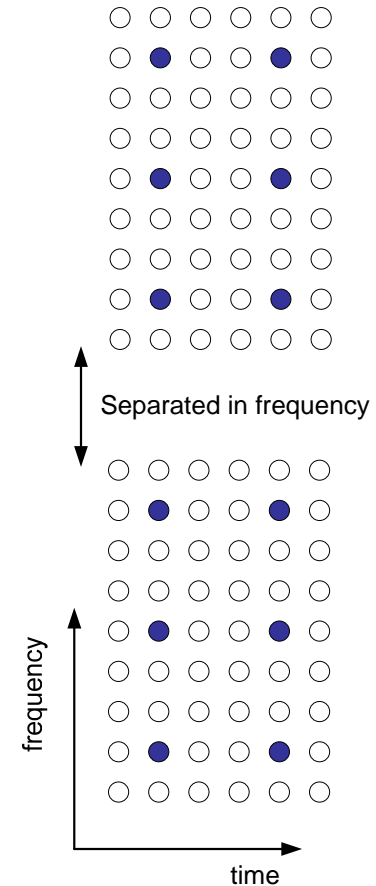
Link Simulations (Slot Structures)



Slot B1: two tiles
 9×6 , $P=9$,
 OH=16.7%



Slot B2: two tiles
 9×6 , $P=8$,
 OH=14.8%



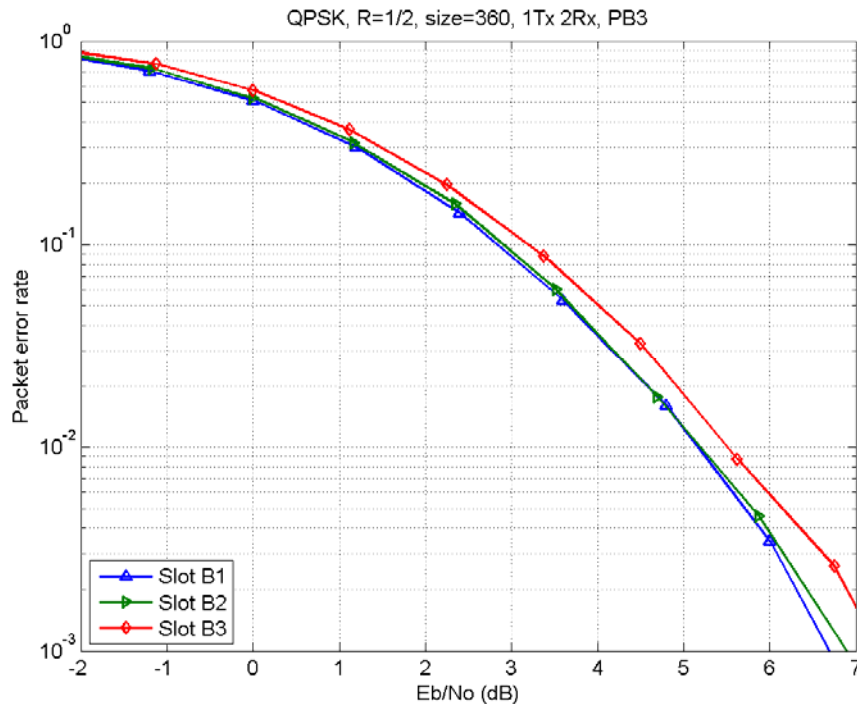
Slot B3: two tiles
 9×6 , $P=6$,
 OH=11.1%

Link Simulation Assumptions

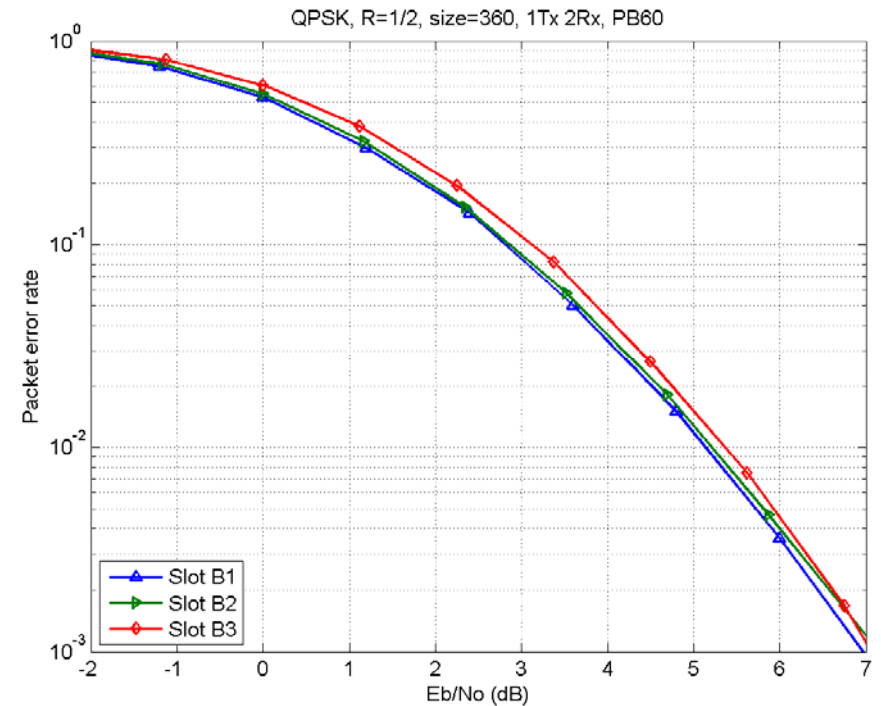
- ❑ WiMAX numerology with 10 MHz bandwidth
- ❑ OFDM waveform with frequency hopping between subframes (6 OFDM symbols)
- ❑ Resource allocation:
 - For QPSK, $r=1/2$ (MPR=1), use 4 slots over 4 subframes
 - For 16QAM, $r=1/2$ (MPR=2), use 2 slots over 2 subframes
- ❑ 802.16e CTC encoder
- ❑ 1Tx antenna at MS
- ❑ 2Rx antennas at BS
- ❑ MMSE 2D channel estimation per tile
- ❑ Channel model: Ped-B 3kmph, 60kmph

$$\frac{E_b}{N_o} = \frac{(N_d + N_p) E_s}{N_{\text{info}} \cdot N_o} = \frac{N_d + N_p}{N_d \cdot \text{MPR}} \cdot \frac{E_s}{N_o} = \frac{1}{\text{MPR}(1 - \text{OH})} \cdot \frac{E_s}{N_o}$$

Link Simulation Results (QPSK)



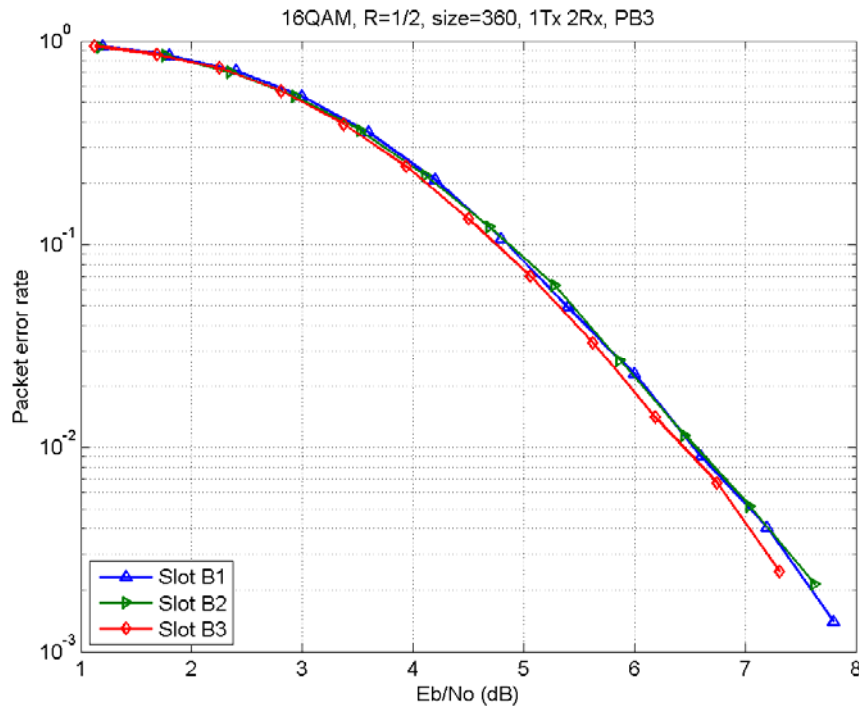
QPSK, rate 1/2, PB3



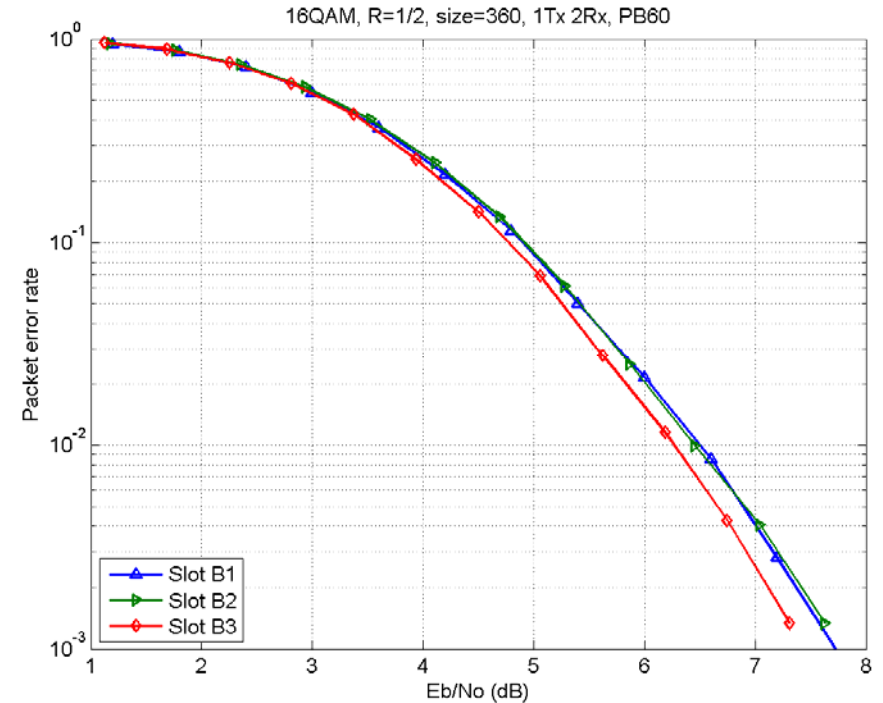
QPSK, rate 1/2, PB60

- ❑ Slot B3 has similar link performance as B1 & B2
- ❑ Slot B3 has least pilot overhead

Link Simulation Results (16-QAM)



16QAM, rate 1/2, PB3



16QAM, rate 1/2, PB60

- ❑ Slot B3 has slight better performance than B1 & B2, due to pilot power
- ❑ Slot B3 has least pilot overhead