I. Introduction

In association with the IEEE 802.20 practice letter ballot 1, a new feature is proposed to enhance the performance of the standard. The proposed feature as described in this contribution has also been included as parts of the partial proposal on channel multiplexing, which was submitted in response to the Call for Proposal in March 2007. Some initial text changes required for the D0.1m to support the proposed feature are suggested. Further details on the proposed text will be submitted in the next meeting as the standard text for the core standard stabilized.

II. Proposed feature

A. Flexible Tile structure with reduced pilot overhead

1. Description

In the current 802.20 standard draft D0.1m, the tile size is fixed to the dimensions of 16 subcarriers x 8 OFDM symbols, which is the duration of one PHY frame. In addition, there are 3 formats for the dedicated pilot patterns associated with the forward link and 2 dedicated pilot formats for the reverse link. The number of dedicated pilot tones per tile is either 18 or 24, independent of the primary pilot locations. The pilot overhead is significant especially when transmission is only in SISO mode.

In this proposal, the basic tile size is flexible. Thus, it can be relatively smaller than the current tile size which spans ~ 1ms x 153.6 kHz. If necessary, 2 pilot tones can be included at diagonally opposite corners of the tile. This structure enables channel estimation using a combination of common primary (and staggered) pilots and dedicated pilots on the tile, in the case of forward link. A maximum of 4 pilot tones, each located at a corner of the tile, can be supported. Note that in the case of reverse link, the tile pilot tones are mandatory.

The structure of the allocation is in the form of a tile as it spans the space of frequency and time contiguously. Structure of the tile is depicted in Figure 1 below. As the pilot tones are located at two diagonally opposite corners of the tile, there are two possible orientations of the pilots. The orientation of the pilots is selected depending on the location of the tile in the entire time-frequency space of the system, relative to the locations of the common primary pilot tones.

In the case of forward link SISO mode, the pilot orientation is selected such that channel estimation can be performed using a combination of the tile pilot, the primary and staggered pilot tones in its vicinity.

To facilitate channel estimation using a combination of the common primary pilot and dedicated pilots on the tile, the difference in the transmit power level of the tile pilots, as compared to the primary pilots can be signaled to the user, i.e., Delta_pilot_power,

can be included in the forward link assignment message as shown in the next section. Alternatively, the tile pilots may be transmitted at the same power level as the common primary pilot tones.

2. Required changes to the standard text

   i. Include Figure 1 as Forward link dedicated pilot Format 3 to Figure 120.

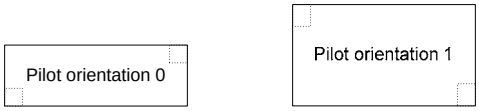

Figure 1 BRCH Tile structure and pilot orientations

   ii. Include Figure 1 as Reverse link dedicated pilot Format 4 to Figure 97.

   iii. Add the following new subsection:

5.3.1.3.3.2.4 Forward Dedicated Pilot Channel Format 3

For Forward Dedicated Pilot Channel Format 3,when the optional dedicated (tile) pilots are present, the Forward Dedicated Pilot Channel shall occupy the modulation symbol of the tile if the hop-port index is in the set {TBD} and the OFDM symbol index, t, is in the set {TBD}. The complex value of the Forward Dedicated Pilot Channel modulation symbol … {TBD}

   iv. Add the following fields to Table 32 for the forward link and reverse link assignment block, FLAB, RLAB. If this new pilot format is chosen, then the following fields need to included:

Field	Number of bits
Num_OFDM_Sym	1
Num_Subcarriers	1
Optional_pilot	2
Delta_pilot_power	2

where the values of the field are interpreted as follows:

Field Value	Num_OFDM_Sym	Num_Subcarriers
0	2 [TBD]	4 [TBD]
1	4 [TBD]	8 [TBD]

Values shown in the Table may be used by default.

Field Value	Optional_Pilot [Figure 1]	Delta_pilot_power (dB)
00	Absent	Δ [TBD]
01	Located at NE & SW corners	2Δ
10	Located at SE & NW corners	3Δ
11	Located at all corners	4Δ

For example, Δ = 0.5 dB may be used as the default value.

The entries that are shown as 'TBD' can be system parameters that the network transmits as part of the system information through the Forward Primary Broadcast Control Channel at the beginning of each superframe. Additional fields can be added to the System information block, to indicate the interpretation of these field values, in case they are different from the default values.

III. Conclusion

A new tile structure which is flexible in size with lower pilot overhead has been proposed. The flexible tile size is beneficial especially for bursty traffic that may consist of small data packets, as the granularity of resource assignment is increased. On the other hand, as the technology supports non-MIMO users, the extra pilot tones in the fixed tile design in the current 802.20 standard draft become unnecessary overhead for those users. Therefore, the proposed tile structure will increase the efficiency of the system.

References

[1] 'Draft Standard for Local and Metropolitan Area Networks - Standard Air Interface for Mobile Broadband Wireless Access Systems Supporting Vehicular Mobility - Physical and Media Access Control Layer Specification', IEEE P802.20/D0.1m, April 2007.

[2] 'Partial proposal on channel multiplexing', C802.20-07/19r1, March 5, 2007.