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| Re: | 802.16-REVd Sponsor ballot recirc |
| Abstract | This document contains supplemental material for 802.16-REVd sponsor ballot |
| Purpose | Adopt suggested changes into P802.16-REVd/D4 draft |
| Notice |  |
| Release |  |
| Patent Policy and Procedures |  |

# Supplemental material for Tgd comments

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## General

This contribution provides specific text changes instructions as a supplemental text for 802.16-REVd sponsor ballot. Editorial instruction is indicated by a **red bold** text with square brackets. Deletions are indicated by a ~~strikethrough~~ text and new text insertion is indicated by an underline.

## Specific changes

## 1. OFDMA Basic definitions and mapping

### 1.1 Comment:

Comment #257. The current OFDMA PHY contain usage of concepts as Zone and a Segment which are not clearly defined anywhere. A clear definition of the terms is required for a consistency reasons. In addition the OFDMA data mapping refers to FEC block, while the correct term is OFDMA slot.

### 1.2 Suggested Remedy

**[Page 465, line 25, section 8.4.3, change:]**

**8.4.3 OFDMA ~~slot~~basic terms definition**

**8.4.3.1 Slot and Data region**

A slot in the OFDMA PHY requires both a time and subchannel dimension for completeness (subchannels are defined in 8.4.6.). An OFDMA slot is one subchannel by ~~two~~one OFDMA symbol.

In OFDMA, a Data Region is a two-dimensional allocation of a group of contiguous subchannels, in a group of contiguous OFDMA symbols. This allocation may be visualized as a rectangle, such as the 4x3 rectangle shown in Figure 209.

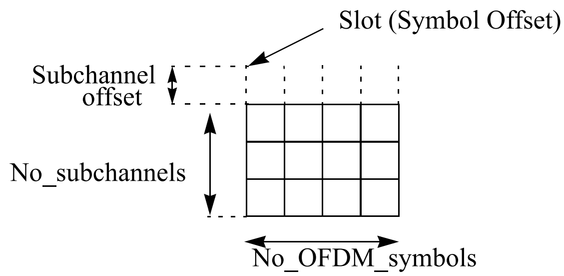


**Figure 209—Example of the data region which defines the OFDMA allocation**

~~Such a~~A data region can be assigned in the uplink to a specific SS (or a group of subscribers) or can be transmitted in the downlink by the BS as a transmission to a (group of) SS(s).

## [Insert new section 8.4.3.2]

### 8.4.3.2 Segment

A Segment is a subdivision of the set of available OFDMA sub-channels (that may include all available sub-channels). One segment is used for deploying a single instance of the MAC.

### 8.4.3.3 Permutation Zone

Permutation Zone is a number of contiguous OFDMA symbols, in the DL or the UL, that use the same permutation formula. The DL subframe or the UL subframe may contain more than one permutation zone.

## [Remunerate section 8.4.3.2 as 8.4.3.4]

### 8.4.3.4 OFDMA data mapping

MAC data shall be processed as described in 8.4.9 and shall be mapped to an OFDMA Data Region (see 8.4.3.1) for downlink and uplink using the ~~following~~ algorithm~~:~~s defined below.

Downlink:

1) Segment the data into blocks sized to fit into one ~~FEC block~~OFDMA slot.
2) Each ~~FEC block may~~slot shall span one or more subchannels in the subchannel axis and two ~~or three~~ OFDMA symbol in the time axis (see ~~Figure 210 and~~ Figure 211). Map the ~~FEC blocks~~slots such that the lowest numbered ~~FEC block~~slot occupies the lowest numbered subchannel in the lowest numbered OFDMA symbol.
3) Continue the mapping such that the OFDMA symbol index is increased. When the edge of the Data Region is reached, continue the mapping from the lowest numbered OFDMA symbol in the next subchannel.

Uplink:

1) Segment the data into blocks sized to fit into one OFDMA slot.

2) Each slot shall span one or more subchannels in the subchannel axis and three OFDMA symbol in the time axis (see Figure 210). Map the slots such that the lowest numbered slot occupies the lowest numbered subchannel in the lowest numbered OFDMA symbol.

3) Continue the mapping such that the OFDMA symbol index is increased. When the edge of the UL zone (which is marked with Zone_switch_IE) is reached, continue the mapping from the lowest numbered OFDMA symbol in the next available subchannel.

Figure 210 and Figure 211 illustrates the order in which ~~FEC blocks~~OFDMA slots are mapped to subchannels and OFDMA symbols.

**[replace figure 210 with the following figure]**

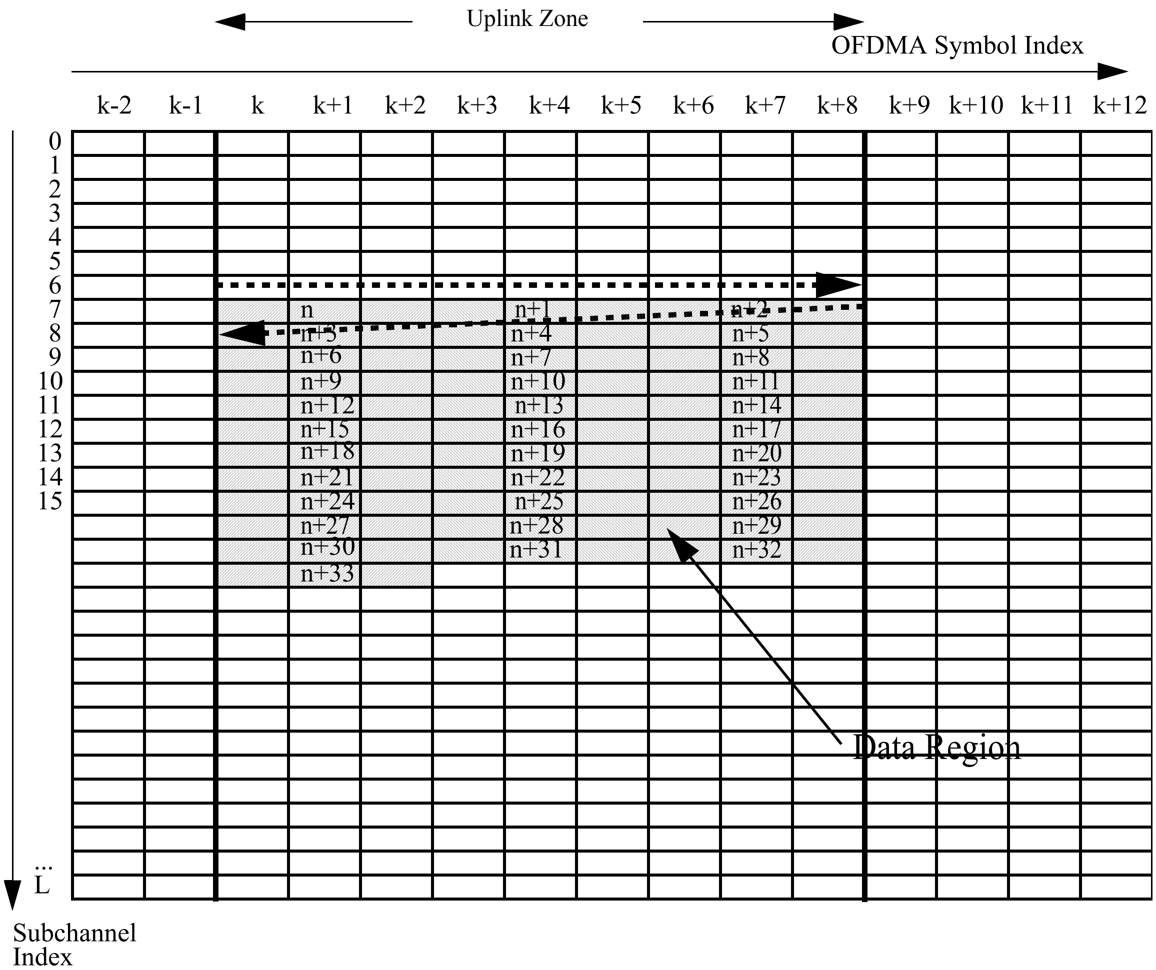


**Figure 210—Example of mapping ~~FEC blocks~~OFDMA slots to subchannels and symbols in the uplink**

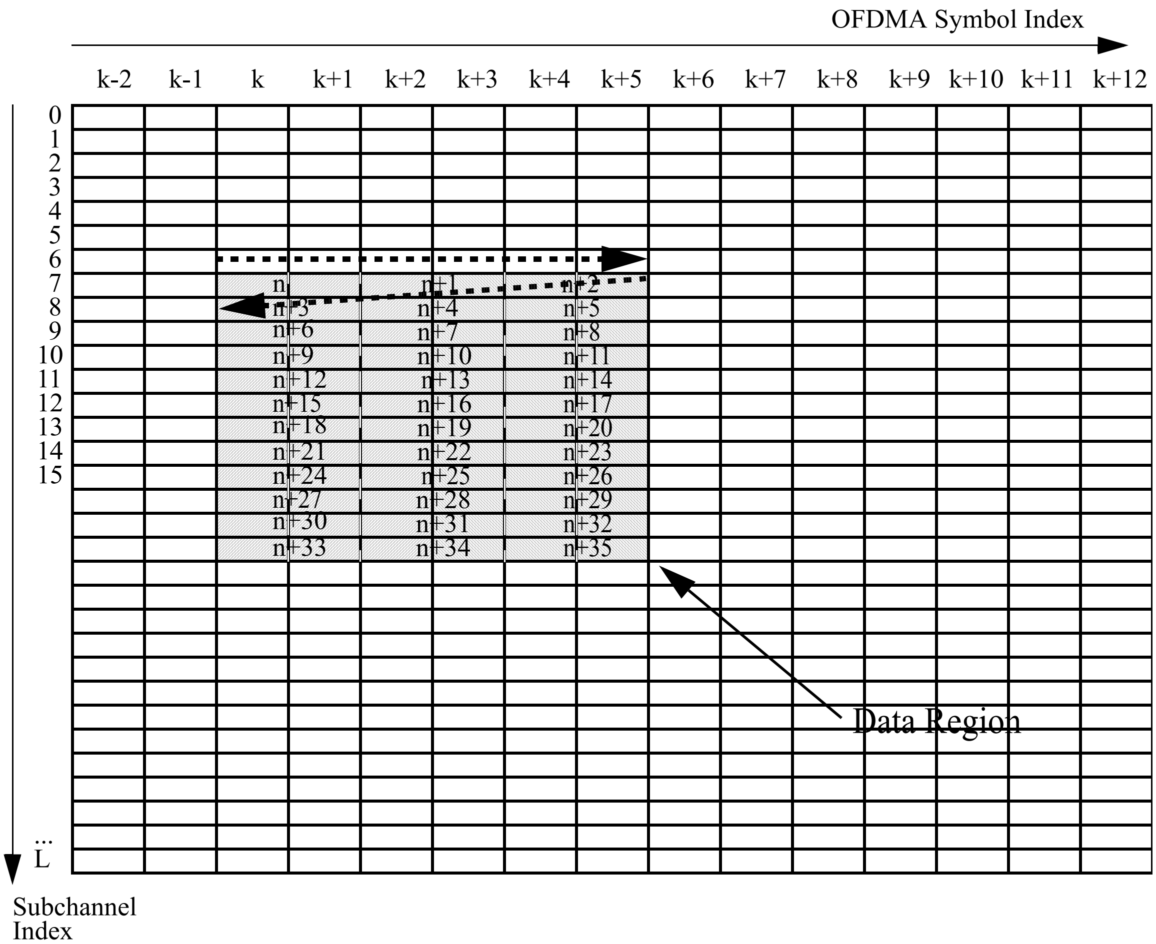


**Figure 211—Example of mapping ~~FEC blocks~~OFDMA slots to subchannels and symbols in the downlink (in PUSC mode)**

## 2. Figure 213 changes

### 2.1 Comment:

Comment #350 changed the UL allocating scheme to a uni-dimensional scheme. This means that the UL allocations are no longer rectangles, this should be reflected in figure 213. In addition figure 213 does not provide a clear example of the OFDMA frame with multiple zones.

### 2.2 Suggested Remedy

**[Page 468, line 5, section 8.4.4.2, change figure 213 (and title) as follows:]**

.

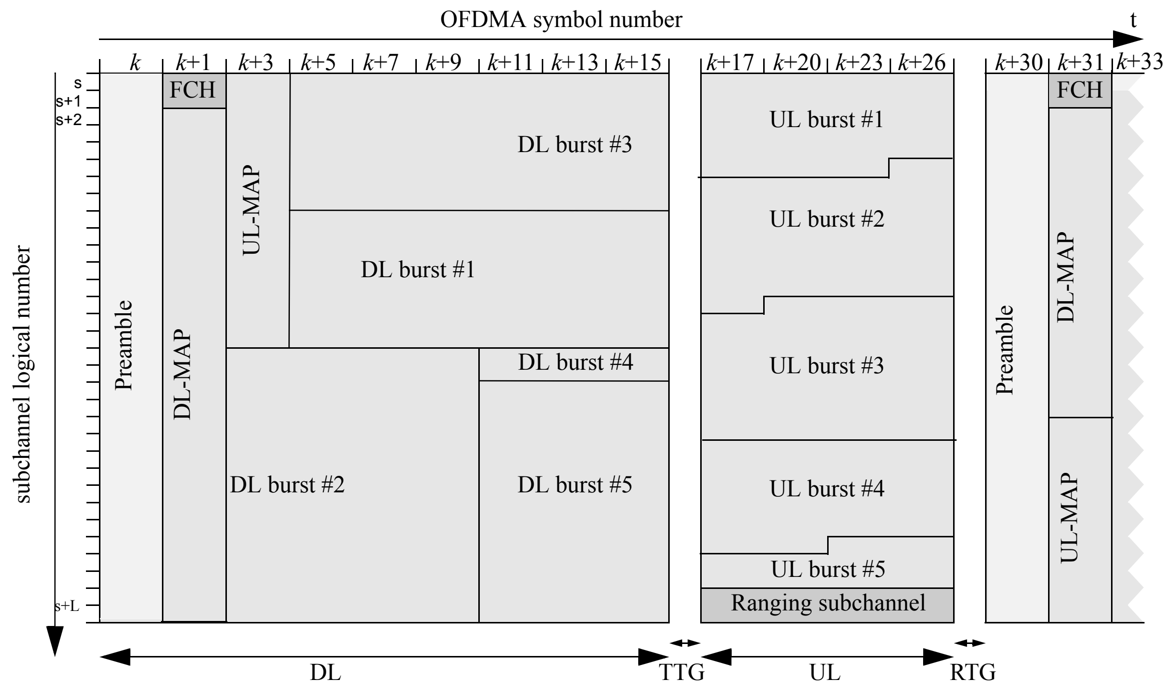


**Figure 213—Time plan - one TDD time frame (with only mandatory zone)**

**[Page 468, line 52, section 8.4.4.2, add before last paragraph:]**

The OFDMA frame may include multiple zones (such as PUSC, FUSC, PUSC with all subchannels, optional FUSC,AMC and optional FUSC with all subchannels), the transition between zones is indicated in the DL-Map by the Zone_switch IE (see 8.4.5.3.4). No DL-Map or UL-Map allocations can span over multiple zones. Figure 214 depict OFDMA frame with multiple zones.

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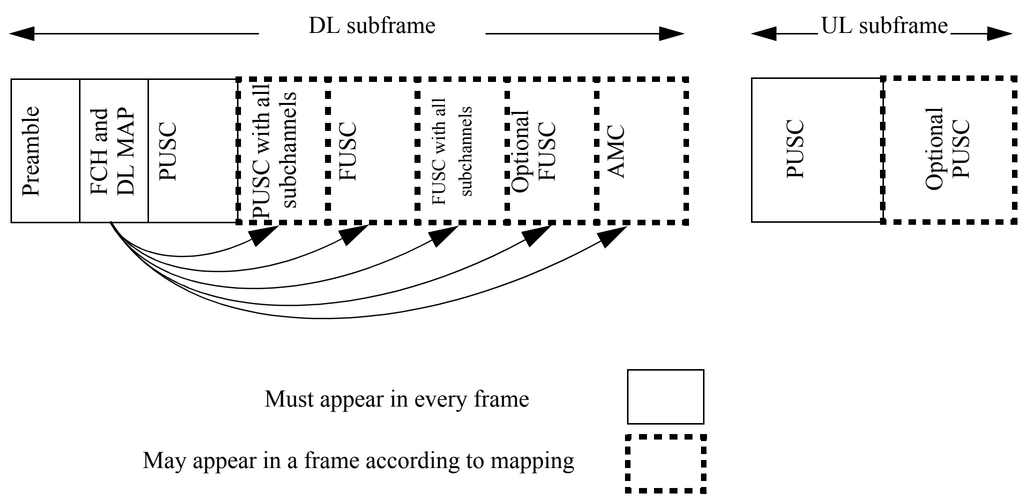


**Figure 214—Illustration of OFDMA frame with multiple zones**

## 3. UL and DL Renumbering

### 3.1 Comment

Comment #339.

The current subchannels renumbering definition for the UL stating that "no renumbering is done" is wrong, since obviously a renumbering scheme is required.

In addition, figure 215 describes the FCH as transmitted over one OFDMA symbol and two sub-channels, and should be two OFDMA symbols over one subchannel.

The example given in figure 216 is wrong, since the standard defines that the FCH is transmitted using a duration of 4 OFDMA subchannels.

### 3.2 Suggested Remedy

**[Page 471, line 4, section 8.4.4.5, replace figure 215 with the following figure]**

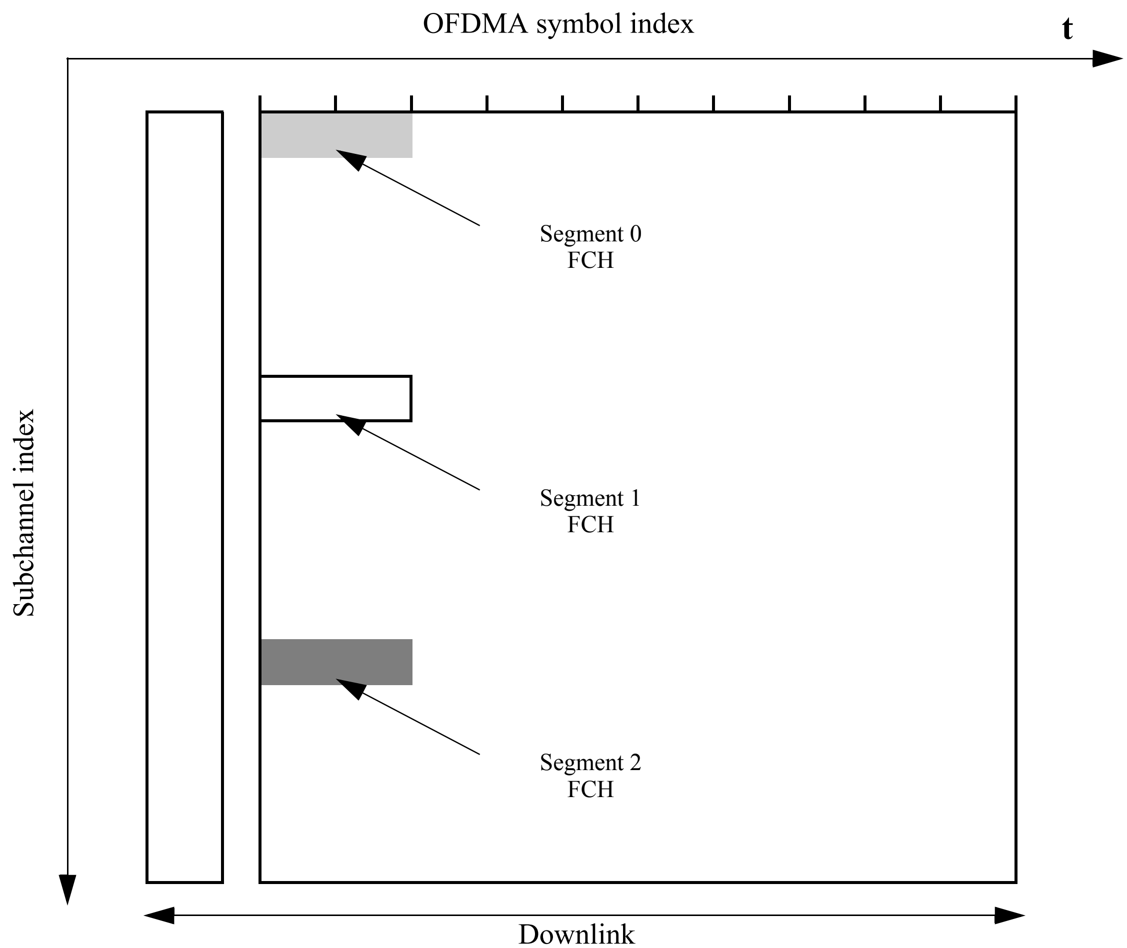


**Figure 215—FCH subchannel allocation for all 3 segments**

**[Page 471, line 42, section 8.4.4.5, Change the paragraph as indicated]**

After decoding the DL_Frame_Prefix message within the FCH, the SS has the knowledge of how many and which subchannels are allocated to the PUSC segment. In order to observe the allocation of the subchannels in the downlink as a contiguous allocation block, the subchannels shall be renumbered, the renumbering shall start from the FCH subchannels (renumbered to values 0…11), then continue numbering the subchannels in a cyclic manner to the last allocated subchannel and from the first allocated subchannel to the FCH Subchannels, Figure 217 gives an example of such renumbering for segment 1. ~~For uplink allocation purposes, no renumeration is done after the subchannels definition and the subchannel with the lowest index shall be considered as subchannel 0~~. <u>For uplink, in order to observe the allocation of the subchannels as a contiguous allocation block, the subchannels shall be renumbered, the renumbering shall start from the lowest numbered allocated subchannel (renumbered to value 0), up to the highest numbered allocated sub-channel, skipping non-allocated sub-channels. Figure 217 gives an example of such renumbering for segment 1.</u>

**[Page 472, line 2, section 8.4.4.5, Change figure 216]**

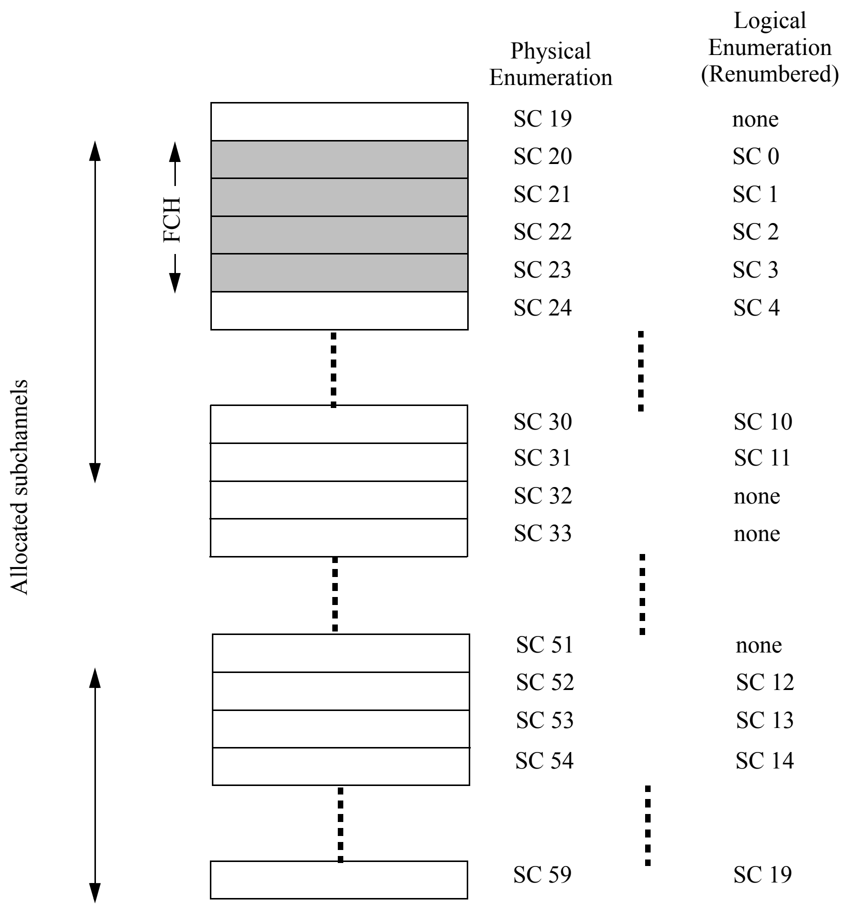


**Figure 216—Example of renumbering the allocated subchannels for segment 1 in PUSC**

**[Page 472, line 2, section 8.4.4.5, Insert new figure 217]**

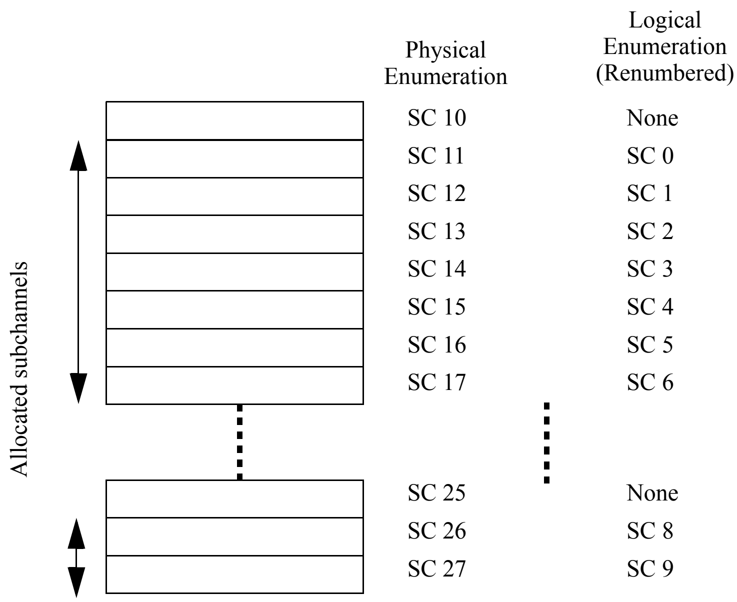


**Figure 217—Example of UL renumbering the allocated subchannels for a segment in PUSC**

## 4. Data location in another BS IE

### 4.1 Comment

Comment #359.

The current structure of Data location in another BS IE does not aligned with the changes done to the OFDMA subchannels mapping in the previous receirc.

### 4.2 Suggested Remedy

**[Page 479, line 38, section 8.4.5.3.6, Change Table 254 as indicated:]**

**Table 254—OFDMA ~~channel measurement~~Data location in another BS IE**

| Syntax | Size | Notes |
|---|---|---|
| Data_location_in_another_BS_IE() { | | |
| **Extended DIUC** | 4 bits | Data_location_in_another_BS = 0x3 |
| **Length** | 4 bits | Length = 0x0A |
| **Reserved** | 6 bits | |
| **Segment** | 2 bits | Segment number |
| **Used subchannels** | ~~32~~6 bits | Used subchannels at other BS<br>Bit 0: 0-11<br>Bit 1: 12-19<br>Bit 2: 20-31<br>Bit 3: 32-39<br>Bit 4: 40-51<br>Bit 5: 52-59 |
| **Cell_ID** | 5 bits | Cell ID of other BS |
| **Frame Advance** | 3 bits | The number of frames offset from the current frame where the data will be transmitted (0=Next frame) |
| **OFDMA Symbol offset** | ~~10~~8 bits | |
| **Subchannel offset** | ~~5~~6 bits | |
| **Boosting** | 3 bits | 000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB; |
| **No. OFDM Symbols** | ~~9~~8 bits | |
| **No. Subchannels** | ~~5~~6 bits | |
| **Repetition Coding Indication** | 2 bits | 00 - No repetition coding<br>01 - Repetition coding of 2 used<br>10 - Repetition coding of 4 used<br>11 - Repetition coding of 6 used |
| } | | |

## 5. STC figure changes

### 5.1 Comment

Comment #362 contained instruction to change figure 235, this comment wasn’t implemented due to an unclear instruction, this comment provide the required changes. In addition, the existing figure is relevant for FUSC only, an additional figure is required for the PUSC case.

### 5.2 Suggested Remedy

**[Page 519, line 3, section 8.4.8.2.1, change figure 235 as indicated, change title to make figure relavant to FUSC]**

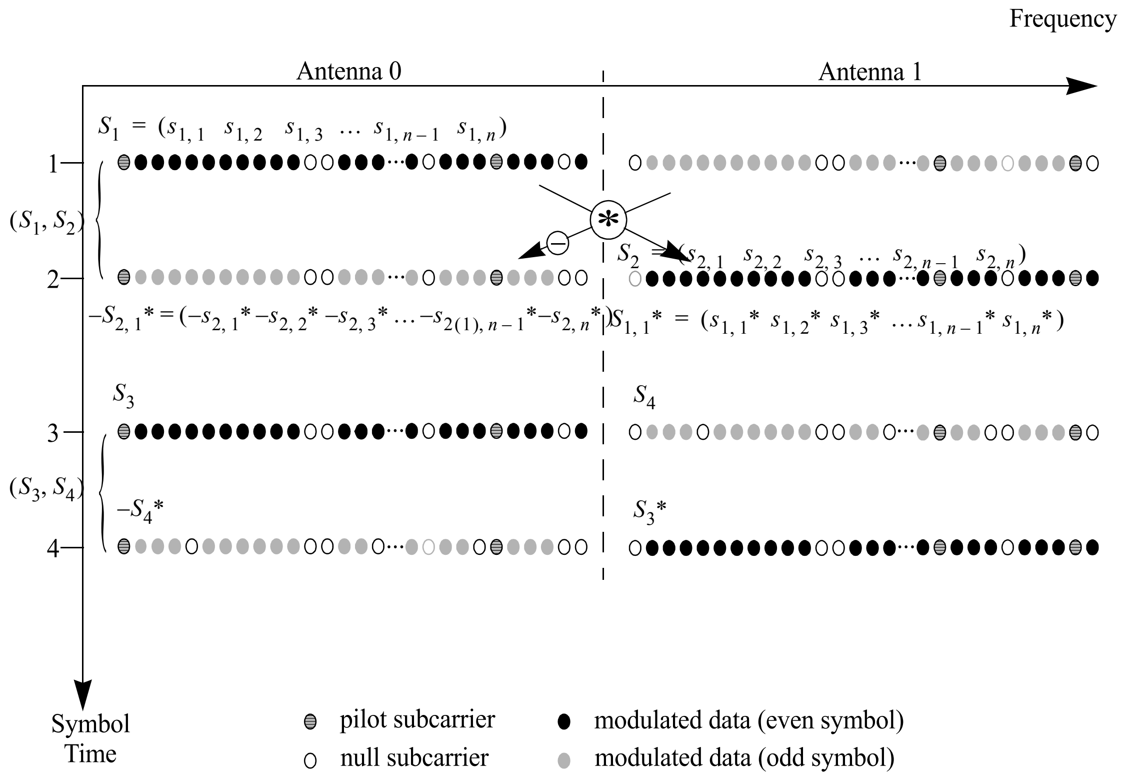


**Figure 235— STC usage with OFDMA <u>for FUSC</u>**

**[Page 519, line 35, section 8.4.8.2.1, Add figure 236 as indicated]**

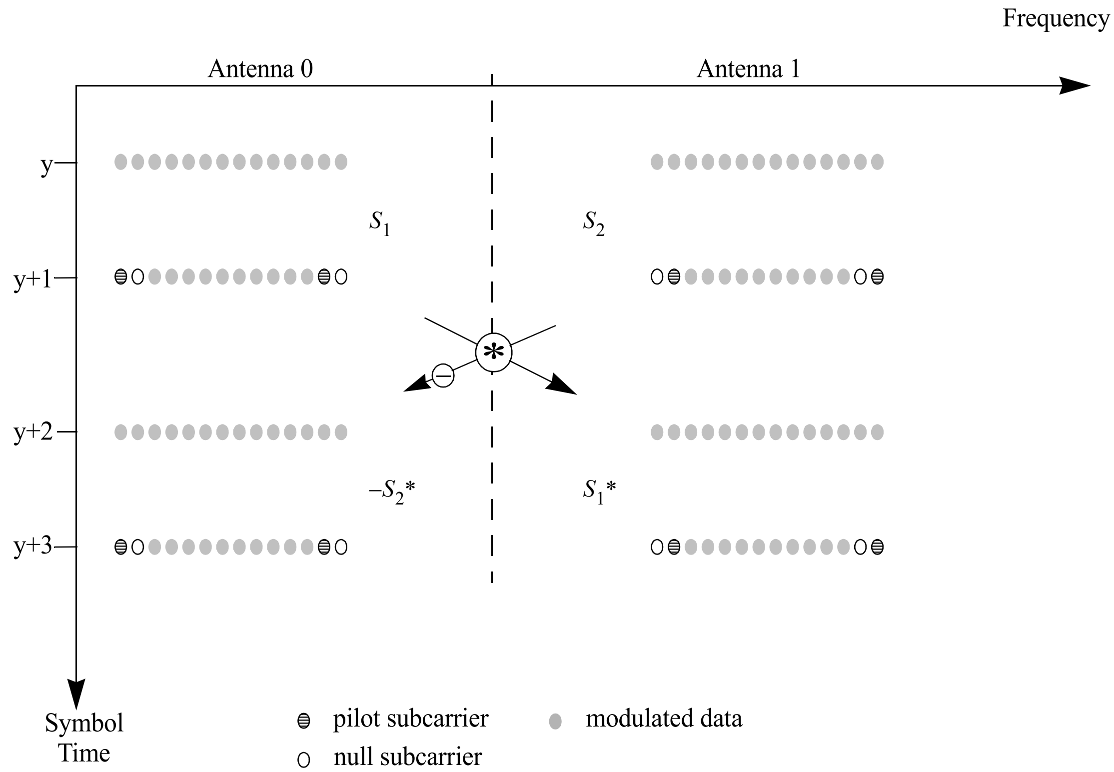


**Figure 236— STC usage with OFDMA for PUSC**

# 6. Support of optional features

## 6.1 Comment

In comment #257, additional optional features where inserted into the OFDMA section. Since new additions are optional, the SS must be able to indicate whether or not it supports those features.

## 6.2 Suggested Remedy

**[Page 607, line 46, Add the following new sections]**

**11.8.3.7.4 OFDMA SS H-ARQ support**

This field indicates whether the SS supports H-ARQ (see 6.3.17). A bit value of 0 indicates “not supported” while 1 indicates “supported”.

| Type | Length | Value | Scope |
|---|---|---|---|
| 153 | 1 | Bit# 0: H-ARQ support<br>Bits# 1–7: *reserved*, shall be set to 0 | SBC-REQ (see 6.3.2.3.23)<br>SBC-RSP (see 6.3.2.3.24) |

**11.8.3.7.5 OFDMA SS Permutation support**

This field indicates the different optional OFDMA permutation modes (optional PUSC, see 8.4.6.2.4, optional FUSC, see NNN, AMC see 8.4.6.3) supported by a WirelessMAN-OFDMA SS. A bit value of 0 indicates “not supported” while 1 indicates “supported.”

| Type | Length | Value | Scope |
|---|---|---|---|
| 154 | 1 | Bit# 0: Optional PUSC support<br>Bit# 1: Optional FUSC support<br>Bit# 2: AMC support<br>Bits# 3–7: *reserved*, shall be set to 0 | SBC-REQ (see 6.3.2.3.23)<br>SBC-RSP (see 6.3.2.3.24) |

## 7. Additional PHY profile

### 7.1 Comment

The current OFDMA profiles for the licensed bands contains profiles for 1.25MHz, 3.5MHz, 7MHz, 14MHz and 28MHz channel bandwidths. In some scenarios a channel profiles of 8.75MHz and 17.5MHz is also desirable and is currently missing from the spec. Since we see the IEEE802.16 as a worldwide standard, it is recommended that the supporting/recommended band-widths will enable in reality a worldwide deployment, and in particular, in the Korean market. It was strongly indicated by the Korean members of the IEEE802.16 group, that 8.75MHz and 17.5MHz channel bandwidths are a MUST in Korea, and therefore they are recommended to be added to the standard.

### 7.2 Suggested Remedy

**[Page 700, line 42, Add the following new section and renumber all subsequent sections]**

### 12.4.3.5 WirelessMAN-OFDMA 8.75 MHz channel basic PHY Profile

Profile identifier: OFDMA_ProfP4.

Systems implementing OFDMA_ProfP4 shall meet the minimum performance requirements listed in Table 371:

**Table 371—Minimum Performance requirements for OFDMA_ProfP4**

| Capability | Minimum Performance |
|---|---|
| Channel bandwidth | 8.75 MHz |
| Operation mode | Licensed bands only |
| BER performance threshold, BER=$10^{-6}$ (using all subchannels BS/SS)<br>QPSK-1/2<br>QPSK-3/4<br>16QAM-1/2<br>16QAM-3/4<br>64QAM-2/3 (if 64-QAM supported)<br>64QAM-3/4 (if 64-QAM supported)<br><br>(Add to sensitivity 10*log10(NumberOfSub-ChannelsUsed/32) when using less subchannels in the BS Rx) | <br><br>≤ -82.5 dBm<br>≤ -79.5 dBm<br>≤ -75.5 dBm<br>≤ -72.5 dBm<br>≤ -68.5 dBm<br>≤ -66.6 dBm |
| Reference frequency tolerance<br>BS<br>SS to BS synchronization tolerance | <br>≤ +/- 4 ppm<br>≤ 48 Hz |
| Frame duration code set | {2, 4, 6, 8} |
| Spectrum mask | Local regulation |

NOTE—When using this profile, the sampling frequency (see 8.4.2.4) shall be: $F_s$=floor(n×$BW$/0.002)×0.002 (BW in MHz)

**[Page 701, line 42, Add the following new section and renumber all subsequent sections]**

### 12.4.3.7 WirelessMAN-OFDMA 17.5 MHz channel basic PHY Profile

Profile identifier: OFDMA_ProfP6.

Systems implementing OFDMA_ProfP6 shall meet the minimum performance requirements listed in Table 373:

**Table 373—Minimum Performance requirements for OFDMA_ProfP6**

| Capability | Minimum Performance |
|---|---|
| Channel bandwidth | 17.5 MHz |
| Operation mode | Licensed bands only |
| BER performance threshold, BER=$10^{-6}$ (using all subchannels BS/SS)<br>QPSK-1/2<br>QPSK-3/4<br>16QAM-1/2<br>16QAM-3/4<br>64QAM-2/3 (if 64-QAM supported)<br>64QAM-3/4 (if 64-QAM supported)<br><br>(Add to sensitivity 10*log10(NumberOfSub-ChannelsUsed/32) when using less subchannels in the BS Rx) | <br><br>≤ -79.5 dBm<br>≤ -76.5 dBm<br>≤ -72.5 dBm<br>≤ -69.5 dBm<br>≤ -65.5 dBm<br>≤ -63.6 dBm |
| Reference frequency tolerance<br>BS<br>SS to BS synchronization tolerance | <br>≤ +/- 4 ppm<br>≤ 97 Hz |
| Frame duration code set | {2, 4, 6, 8} |
| Spectrum mask | Local regulation |

NOTE—When using this profile, the sampling frequency (see 8.4.2.4) shall be: $F_s$=floor(n×$BW$/0.002)×0.002 (BW in MHz)

**[Page 706, line 38, section 12.4.4, add the following entry at the end of table 375]**

**Table 375—License bands RF Profiles List**

| RF Profile Name | Channel Bandwidth | Center Frequency step $\Delta F_c$ | Uplink $F_{start}$ | Downlink $F_{start}$ | $N_{range}$ |
|---|---|---|---|---|---|
| OFDMA_ProfR29 | 8.75 | 0.125 | 2304.375 | N/A | {0,1,...,730} |

**[Page 463, line 7, section 8.4.1, modify section 8.4.1 as indicated]**

### 8.4.1 Introduction

The WirelessMAN-OFDMA PHY ([B39]), based on OFDM modulation, is designed for NLOS operation in the below 11 GHz frequency bands per 1.3.4. For licensed bands, channel bandwidths allowed shall be limited to the regulatory provisioned bandwidth divided by any power of 2 no less than ~~1.25~~1.0 MHz.