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Title	**Clarifications on UL power control and zone boosting**
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Re:	Recirculation of P802.16 REVe/D6
Abstract	Clarifications on UL power control and zone boosting
Purpose	Adoption of suggested changes into P802.16e/D6
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Introduction

This contribution contains 3 separate items for clarification: UL power control and zone boosting. Each item will be submitted as separate comments.

Motivation/Remedy

1. Open loop power control
   A. For the open loop power control, UL Tx power or UL Tx headroom is necessary for the scheduling in BS side. For the PHY channel report header, the definitions of Tx power and UL Tx headroom is not clear.
      i. We clarify the definitions.
   B. For the open loop power control, SS shall send its current Tx power or headroom to inform BS that its estimated UL path loss changes and BS shall change the old headroom with the newly reported one. In current specifications, there is no description for the transmission condition for the values.
      i. We add the text for the transmission condition for the revised UL Tx power or UL Tx headroom.
2. Extended Subheader for Open loop power control
   A. For the open loop power control, the current UL Tx power or headroom is necessary for scheduling in BS. Currently, Bandwidth request and downlink burst profile change request header (6.3.2.1.2.2) or PHY channel report header (6.3.2.1.3) are provided for that purpose.
   B. However, the UL tx power report will occur very frequently, the report overhead should be minimized as small as possible.
   C. Using the extended subheader, we can reduce the report overhead to 24 bits while the header formats above requires 48bits. The difference mainly comes from CID in the header format. Further, the Tx power reported indicates the Tx power of the burst that carriers Tx power report, the subheader is right place for that purpose.
3. Zone boosting
   A. In 802.16e specification, DL PUSC and DL band AMC can be used in frequency reuse factor more than 1. In such case, it is desirable to boost the corresponding zone to utilize the power amplifier to its full capacity.
      i. We propose zone boosting scheme only for 128, 512, 1024 FFT size considering backward compatibility.

Suggested text change – 1: open loop power control

[Modify 6.3.2.1.2.1~~1.2.2.2~~ as follows in page 16 line 22]

Name	Length	Dscription
UL-TX-POWER	7~~8~~	UL Tx power level for the burst that carries this Header (11.1.1). ~~When the Tx power is different from slot to slot, t~~The maximum value ~~is~~ shall be reported for the burst.
Rererved	1	Set to 0

[Modify 6.3.2.1.3~~1.2.3~~ as follows in page 18 line 25]

Name	Length	Dscription
UL-TX-POWER	7	UL Tx power level in dBm for the burst that carries this Header, from +63 to -64 in dBm ~~EIRP~~. It is encoded as unsigned integer. The maximum value is shall be reported for the burst.
UL-HEADROOM	6	Headroom to UL maximum power level in dB, for the burst that carries this Header from 0 to 63. Should the headroom exceed 63 dB, the value 63 shall be used. The minimum value is shall be reported for the burst.

[Add 8.4.10.3.1.1 at the end of 8.4.10.3.1 in pp. 458 line 40]

8.4.10.3.1.1 UL Tx power and Headroom transmission condition.

SS may report its transmission power status using Bandwidth request and downlink burst profile change request header (6.3.2.1.2.2), PHY channel report header (6.3.2.1.3) or UL Tx Power Report Extended Subheader (6.3.2.2.7.~~5~~6). Further, when the following conditions are met, SS may send its transmission power status using Bandwidth request and downlink burst profile change request header (6.3.2.1.2.2), PHY channel report header (6.3.2.1.3) or UL Tx Power Report Extended Subheader (6.3.2.2.7.~~5~~6).

$$\left|M(n_{last}) - M_{avg}(n)\right| \geq Tx\_Power\_\mathrm{Re}port\_Threshold(dB)$$

or

$$n - n_{last} \geq Tx\_Power\_\mathrm{Re}port\_Interval \quad (183d)$$

where

$$M(n) = L + Offset\_SS_{perSS} + Offset\_BS_{perSS}(dB)$$

$$M_{avg}(n) = 10\log(\alpha_{p\_avg} \cdot 10^{M(n)/10} + (1-\alpha_{p\_avg}) \cdot 10^{M_{avg}(n-1)})$$

n_{last}: Time index when the last SS Tx power report is sent. The unit is frame.

Tx_Power_Report_Threshold, Tx_Power_Report_Interval and α_{p_avg} are indicated in UCD. In UCD, there are sets of those parameters sets: Depending on the allocation CQICH to SS, the corresponding parameter set shall be used.

[Add the following entry at the end of table 353a in page 472 line 52]

Name	Type	Length(Bytes)	Value
Tx power report	181	3	Bit#0~3: Tx_Power_Report_Threshold, It is unsigned integer and shall be read in dB scale. When “0b111” it means infinite. Bit#4~7: It is unsigned integer whose value is d. Its value ‘d’ shall be interpreted as Tx_Power_Report_Interval =2^d. When “0b111” it means infinite. Bit#8~11: α_{p_avg} in multiples of 1/16 (range [1/16,16/16]) Bit#12~15: Tx_Power_Report_Threshold, It is unsigned integer and shall be read in dB scale. When “0b111” it means infinite. It shall be used when

			CQICH is allocated to the SS. Bit#16~19: It is unsigned integer whose value is d. Its value 'd' shall be interpreted as Tx_Power_Report_Interval =2^d. When "0b111" it means infinite. It shall be used when CQICH is allocated to the SS. Bit#20~24: α_{p_avg} in multiples of 1/16 (range [1/16,16/16]), It shall be used when CQICH is allocated to the SS.

Suggested text change – 2: UL extended subheader for UL Tx power report.

~~[Modify the table 13c in page 28 line 53]~~
~~6.3.2.2.7 Extended Subheader Field~~

~~Table 13c—Description of extended subheaders (UL)~~

~~ESF bit~~	~~Name~~	~~Length~~	~~Description~~
~~Bit #0 (LSB)~~	~~Mode selection feedback~~	~~1~~	~~See 6.3.2.2.7.1~~
~~Bit#1~~	~~UL Tx power report~~	~~1~~	~~See 6.3.2.2.7.5~~
~~Bits #1~~2~~ 10~~	~~Reserved~~		

[Add 6.3.2.2.7.~~5~~6 at the end of 6.3.2.2.7.4 in page 31 line 8]
6.3.2.2.7.~~5~~6 UL Tx Power Report Extended Subheader
This subheader is sent from SS to BS to report the Tx power of the burst that carriers this subheader.

Table 13j— UL Tx power report extended subheader format

Name	Length	Description
UL Tx power	~~8~~7 bits	UL Tx power level for the burst that carries this Header (11.1.1). The maximum value shall be reported for the burst.
Reserved	1 bit	Set to 0

Suggested text change – 3: Zone boosting

Option-1 (For all FFT modes)

[Add 8.4.9.6 at the end of 8.4.9.5.2 in page 455 line 59]

8.4.9.6 Zone boosting.

When the usage of the subchannels of a DL PUSC zone is limited by the “Used subchannel bitmap” in FCH and the usage of the subchannels of a DL Band AMC zone is limited by the "DL allocated subchannel bitmap for optional AMC permutation" in DCD, the all subcarriers including pilot subcarriers in the corresponding zones shall be boosted. The amount of subcarrier boosting is the ratio of the number of the useful subcarriers excluding DC subcarrier and the number of the allowed subcarriers. The allowed subcarriers means the data and pilot subcarriers that are allowed to be used in the zone by the “Used subchannel bitmap” in FCH or "DL allocated subchannel bitmap for optional AMC permutation" in DCD. When the amount of boosting results in exceeding the Tx amplifier capacity, the boosting shall be reduced to keep the Tx power below its maximum value.

Option-2 (Only for 128, 512 and 1024 FFT modes)

[Add 8.4.9.6 at the end of 8.4.9.5.2 in page 455 line 59]

8.4.9.6 Zone boosting.

When the usage of the subchannels of a DL PUSC zone is limited by the “Used subchannel bitmap” in FCH and the usage of the subchannels of a DL Band AMC zone is limited by the "DL allocated subchannel bitmap for optional AMC permutation" in DCD, the all subcarriers including pilot subcarriers in the corresponding zones shall be boosted. The amount of subcarrier boosting is the ratio of the number of the useful subcarriers excluding DC subcarrier and the number of the allowed subcarriers. The allowed subcarriers means the data and pilot subcarriers that are allowed to be used in the zone by the “Used subchannel bitmap” in FCH or "DL allocated subchannel bitmap for optional AMC permutation" in DCD. When the amount of boosting results in exceeding the Tx amplifier capacity, the boosting shall be reduced to keep the Tx power below its maximum value.

This zone boosting scheme shall be applied only for 128, 512, 1024 FFT OFDMA mode.