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Title	Sounding Symbol UL Power Control Algorithm Correction
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Re:	LB23
Abstract	This document suggests changes in Cor2 to clarify sounding symbol Power Control issues.
Purpose	Adopt into the current Cor2 working draft
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Sounding Symbol UL Power Control and HARQ_ACK Corrections

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Background

In the current standard [1], the closed loop UL power control behavior of the sounding symbol (UIUC 13) is not correctly specified. In addition, the HARQ-ACK region is not mentioned in the description of the closed loop power control equations. The purpose of this contribution is to suggest a method to correct these two issues.

Proposed Remedy

According to section 8.4.10.3 in [1] the MS can be operated in either of two power control methods. These methods are:

Closed loop power control.

Open loop power control.

When the BS decides to operate the MS in closed loop mode the per tone transmitted power of the MS is regulated according to:

$$P_{new} = P_{last} + (C/N_{new} - C/N_{last}) - (10\log10(R_{new}) - 10\log10(R_{last})) + Offset \quad (138)$$

where

P_{new} is the temporary TX Power,

P_{last} is the last used TX Power,

C/N_{new} is the normalized C/N of new modulation/FEC rate instructed by the UIUC,

C/N_{last} is the normalized C/N of the last used modulation/FEC rate. When MS transmits UL burst(s) except the region marked with UIUC=0, UIUC=12 or UIUC=14 in the same UL frame, the value shall be set to the normalized C/N of the modulation/FEC rate for the UL burst(s) outside the region marked with UIUC=0, UIUC =12 or UIUC=14 in the same UL frame,

R_{new} is the number of repetitions for the new modulation/FEC rate instructed by the UIUC,

R_{last} is the number of repetitions on the last used modulation/FEC rate. When MS transmits UL burst(s) except the region marked with UIUC=0, UIUC =12 or UIUC=14 in the same UL frame, the value shall be set to the number of repetitions of the modulation/FEC rate for the UL burst(s) outside the region marked with UIUC=0, UIUC =12 or UIUC=14 in the same UL frame. The value fo UIUC=0 or UIUC =12 shall be set to 1,

Offset is an accumulation of power correction terms sent by the BS since the last transmission.

for MS that operates in regions marked by UIUC = 0, UIUC = 12, UIUC = 14.

In all other situations (i.e. data transmissions), the MS shall use TX power values set according to equation 138a (in [dB] which states that the per tone power value is set according to:

$$P_{new} = P_{last} + Offset \qquad (138a)$$

However the standard lacks a description of the closed loop power control mechanism for sounding symbols marked as UIUC = 13 (which are not data). A possible interpretation of the standard that a sounding symbol transmission should be according to eq. 138a is not correct since the sounding symbol has a low PAPR and it is BPSK modulated, i.e., it is definitely not a data symbol but rather a control symbol, and should be transmitted with a power level different than the one used for data. Therefore it is suggested that equation 138 will be valid also for sounding symbols marked by UIUC = 13. Additionaly, HARQ-ACK region (extended UIUC2 = 8) is not mentioned in equation 138. This problem is corrected here.

Proposed Text Changes

[Modify the text as followings on page 636 of IEEE 802.16e-2005]

In the second sentence of 8.4.10.3 change the current text as follows:
There are situations, however, where the SS should automatically update its TX power, without being explicitly instructed by the BS. This happens when the SS transmits in region marked by UIUC = 0,UIUC=12, extended UIUC2 = 8, UIUC = 13, or UIUC = 14.

[Modify the text as follows on page 335 of IEEE 802.16e/Cor2/D2]

In the second sentence that describes C/N_{last} change the current text as follows:
When MS transmits UL burst(s) ~~except~~ other than in the region marked with UIUC = 0, UIUC = 12, extended UIUC2 = 8, UIUC = 13, or UIUC = 14 in the Same UL frame, the value shall be set to the normalized C/N of the modulation/FEC rate for the UL burst(s) outside the region marked with UIUC = 0, UIUC = 12, extended UIUC2 = 8, UIUC = 13 or UIUC = 14 in the same UL frame.

[Modify the text as followings on page 335 of IEEE 802.16e/Cor2/D2]

In the sentences that describe R_{last} , change the current text as follows:
R_{last} is the number of repetitions on the last used modulation/FEC rate. When MS transmits UL burst(s) except the region marked with UIUC=0, UIUC =12, extended UIUC2=8, or UIUC=14 in the same UL frame, the value shall be set to the number of repetitions of the modulation/FEC rate for the UL burst(s) outside the region marked with UIUC=0, UIUC =12, extended UIUC2=8, or UIUC=14 in the same UL frame. The value for UIUC=0, ~~or~~ UIUC =12, UIUC=14 and extended UIUC2=8, shall be set to 1

References

[1] IEEE Std 802.16e 2005 (Corrigendum to IEEE Standard for Local and Metropolitan Area Networks)