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Correction to Power Control for OFDMA PHY

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Problem Definition

A great deal of consideration has gone into designing the power control for the OFDMA PHY in the 802.16e standard. However, there are a number of issues that need clarification or amendment to compliment the work done already. This contribution is aimed at clarifying the previous PC elements, and organizing those elements.

The power control scheme in 8.4.10.3 requires some corrections and clarifications. For example:
1)The definition of closed loop power control and open loop power control and the condition to use it should be clarified.
2) For FDD and TDD mode, the power control scheme should be different. FOR FDD mode, open loop power control should not be used except for initial ranging. FOR TDD mode, the open loop power control can be used during regular transmission and the scheme can be changed using PMC_RSP message.
3) To calculate the open loop TX power, the C/N should not be the normalized C/N, but the absolute value.
4)The SS and BS control the UL transmission power together. If the BS doesn't know the absolute UL transmission power, it can not set Offset_BsperSS correctly. The BS should send message to update the Offset_BSperss parameter only when it receives the reports of UL transmission power and headroom from the SS.

Proposed Text Changes

[change the text in sub-clause 8.4.10.3.2, page485 line 30:]

8.4.10.3.2 Optional open loop power control

In FDD mode, open loop power control can only be used for initial ranging transmission.
In TDD mode, ~~When~~ the open loop power control ~~is~~ can be supported and the uplink power control mode is changed to open loop power control and can be set as passive Uplink open loop power control mode or active Uplink open loop power control mode by PMC_RSP, the power per a subcarrier shall be maintained for the UL transmission as follows.
This open loop power control shall be applied for the all uplink bursts.

$$P = L + C/N + NI - 10 \log 10 (R) + Offset\_SSperSS + Offset\_BsperSS \quad (138a)$$

Where,
P is the TX Power level (dBm) per a subcarrier for the current transmission, not including ~~M~~S Tx antenna gain.

L is the estimated average current UL propagation loss. It shall include SS Tx antenna gain and path loss, but exclude the SS Rx antenna gain.

C/N is the ~~normalized~~ absolute C/N of the modulation/FEC rate for the current transmission, ~~as appearing~~ calculated as follows by the element in Table 334. Table 334 can be modified by UCD (Normalized C/N override).

C/N=C/Nnormalized + C/Nfast_feedback IE (138b)

C/Nfast_feedback IE is the absolute C/N of fast_feedback IE overrided by UCD (Normalized C/N override 2).

R is the number of repetitions for the modulation/FEC rate.
NI is the estimated average power level (dBm) of the noise and interference per a subcarrier at the BS, not including BS Rx antenna gain.

Offset_SSperSS is the correction term for SS-specific power offset. It is controlled by SS. Its initial value is
zero.
Offset_BSperSS is the correction term for SS-specific power offset. It is controlled by BS with power control messages. When Offset_BSperSS is set through the PMC_RSP message, it shall include BS Rx antenna gain.

The estimated average current UL propagation loss, L, shall be calculated by the SS based on the total DL power received on the active subcarriers of the frame preamble, and with reference to the BS_EIRP parameter sent by the BS. In TDD mode ,this calculation is accurate. But in FDD mode ,it's not quite accurate and can only be used in initial ranging .

The default normalized C/N values per modulation are given by Table 334. The operating parameters BS_EIRP
and NI are signaled by a DCD message [Table 358—DCD channel encoding] .
Additionally, the BS controls the Offset_BSperSS using PMC_RSP message (6.3.2.3.58) to override the
Offset_BSperSS value, or using Fast Power Control(FPC) message (6.3.2.3.34) and Power Control IE
(8.4.5.4.5) to adjust the Offset_BSperSS value. The accumulated power control value shall be used for
Offset_BSperSS.
The Offset_BSperSS can be updated using relative or fixed form (as a function of the relevant adjustment
commands used). Fixed form is used when the parameter is obtained from a PMC_RSP message. In this case,
the SS should replace the old Offset_BSperSS value by the new Offset_BSperSS sent by the BS.

With all other
messages mentioned in the previous paragraph, relative form is used. In this case, MS should increase and
decrease the Offset_BSperSS according to the offset value sent by BS.
The BS should send message to update the Offset_BSperss parameter only when it receives the reports of UL transmission power and headroom from the SS.

Passive Uplink open loop power control
In passive Uplink open loop power control the SS will set Offset_SSperSS to zero and modify the TX power
value only according to Offset_BSperSS

Active Uplink open loop power control

An alternative way is that the SS may adjust *Offset_SSperSS* value within a range.
Offset_Boundlower $\leq$ *Offset_SSperSS* $\leq$ *Offset_Boundupper* (138~~b~~c)
where,
Offset_Boundupper is the upper bound of *Offset_SSperSS*
Offset_Boundlower is the lower bound of *Offset_SSperSS*
Or in case ARQ is enabled at some UL connections the *Offset_SSperSS* may be updated automatically based on
the Ack/Nack within the range as specified by Equation (138b). The specific algorithm is described as follows (in dB)
if NAK is recieved Offset_SSperSS = Offset_SSperSS + UP_STEP
else if ACK is receivedOffset_SSperSS = Offset_SSperSS – DOWN_STEP (138~~c~~d)
else where Offset_SSperSS = Offset_SSperSS
Where,
UP_STEP is the up adjustment step as specified by" SS-specific up power offset adjustment step" TLV
DOWN _STEP is the down adjustment step as specified by" SS-specific down power offset adjustment step"
TLV
The operating parameters *UP_STEP*, *DOWN _STEP* , *Offset_Boundupper*, *Offset_Boundlower* are signaled by a dedicated UCD message TLV.

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