Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Corrections on Open loop power control for uplink**
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Re:	Recirculation of P802.16 REVe/D5
Abstract	The current description of open loop power control has some errors. This contribution presents corrections for them.
Purpose	Adoption of suggested changes into P802.16e/D6
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Problem Definition

The current text of open loop power control contains come errors and ambiguity. This contribution provides some correction and clarifications.

Suggested text changes to 16.e standard

[Delete the subclause of 8.4.10.3 “Power control” in 802.16e D5 except table 333a]

[Change the text as follows in 8.4.10.3.1 “Open loop power control”]

8.4.10.3.1 Open loop power control

When the open loop power control is supported and the uplink power control mode is changed to open loop power control by PCS_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.

~~$P\ (dBm) = L + C/N + NI \angle 10\log10(R) + Offset_{perSS}$ (1 3 5)~~

$P\ (dBm) = L + C/N + NI - 10\log10(R) + Offset\_SS_{perSS} + Offset\_BS_{perSS}$ (1 3 5)

Where,

P	is the TX Power level (dBm) per a subcarrier for the current transmission.
L	is the estimated current UL propagation loss. It includes Tx/Rx antenna gain, and path loss..
C/N	is the normalized C/N of the modulation/FEC rate for the current transmission, as appearing in Table 332. Table 332 can be modified by UCD (Normalized C/N override). Additionally, the normalized C/N values for UL ACK region and QPSK 1/3 also can be obtained through UCD.
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 BS.
Offset_SS$_{perSS}$	is the correction term for SS-specific power offset. It is controlled by SS. Its initial value is zero. ~~SS may use the Offset value signaled by BS through PMC_RSP MAC message as its initial value.~~
Offset_BS$_{perSS}$	is the correction term for SS-specific power offset. It is controlled by BS with power control messages. Its initial value is zero.

The actual power setting shall be quantized to the nearest implementable value, subject to the specification (8.4.12.1). For each transmission, the SS shall limit the power, as required to satisfy the spectral masks and EVM requirements.

A SS may adjust *Offset_SS*$_{perSS}$ value within a range.

~~$Offset\_Bound_{lower} \le Offset_{perSS} \le Offset\_Bound_{upper}$ (1 3 6)~~

$Offset\_Bound_{lower} \le Offset\_SS_{perSS} \le Offset\_Bound_{upper}$ (1 3 6)

where,

Offset_Bound$_{upper}$	is the upper bound of ~~power offset adjustment~~ *Offset_SS*$_{perSS}$
Offset_Bound$_{lower}$	is the lower bound of ~~power offset adjustment~~ *Offset_SS*$_{perSS}$

Or the *Offset_SS*$_{perSS}$ may be updated automatically based on the Ack/Nack of uplink burst within the range as specified by (136). The specific algorithm is described as follows (in dB).

~~$$\begin{cases} Offset_{perSS} = Offset_{perSS} + UP\_STEP & if\ NAK\ is\ received \\ Offset_{perSS} = Offset_{perSS} - \dfrac{1}{1/FER_{target} - 1} \cdot UP\_STEP & else\ if\ ACK\ is\ received \\ Offset_{perSS} = Offset_{perSS} & elsewhere \end{cases} \quad (137)$$~~

$$\begin{cases} Offset\_SS_{perSS} = Offset\_SS_{perSS} + UP\_STEP & if\ NAK\ is\ received \\ Offset\_SS_{perSS} = Offset\_SS_{perSS} - \dfrac{1}{1/FER_{target} - 1} \cdot UP\_STEP & else\ if\ ACK\ is\ received \\ Offset\_SS_{perSS} = Offset\_SS_{perSS} & elsewhere \end{cases} \quad (137)$$

Where,

UP_STEP	is the adjustment step
FER_{TARGET}	is the target frame error rate

The operating parameters *UP_STEP*, FER_{TARGET}, $Offset\_Bound_{upper}$, $Offset\_Bound_{lower}$ are signaled by a dedicated UCD message TLV. The default normalized C/N values per modulation are given by Table 332.

~~Additionally, BS may change the $Offset_{perSS}$ using Fast Power Control (FPC) message (6.3.2.3.34) and Power Control IE (8.4.5.4.5). In this mode, the power control value shall be added to the current $Offset_{perSS}$ value rather than to the current transmission power.~~

Additionally, BS may control the $Offset\_BS_{perSS}$ using PCS_RSP message (6.3.2.3.58), Fast Power Control (FPC) message (6.3.2.3.34) and Power Control IE (8.4.5.4.5). In this mode, the power control values delivered by the power control messages from the PMC_RSP that orders a SS to use the open loop power control, shall be accumulated. The accumulated power control value shall be used for $Offset\_BS_{perSS}$.

[Change the text as follows in 6.3.2.1.5]

6.3.2.1.5 Bandwidth request and UL Tx power report header

The Bandwidth Request and UL Tx power report PDU shall consist of bandwidth request and UL Tx power report header alone and shall not contain a payload. The bandwidth request and UL Tx power report header is illustrated in Figure 20c.

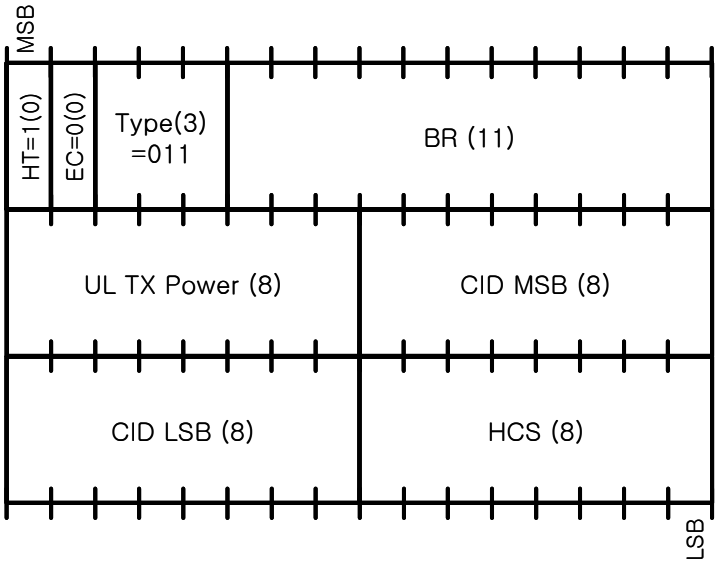

Figure 20c - Bandwidth request and UL Tx power report header format

The ~~The~~ bandwidth request and UL Tx power report header shall have the following properties:

a) The length of the header shall always be 6 bytes.
b) The EC field shall be set to 0, indicating no encryption.
c) The CID shall indicate the SS basic CID.
d) The TYPE field should be “011”.

The fields of the PHY channel report header are defined in Table ~~eee~~7c.

Table 7c – Description of fields of the PHY channel report header

Name	Length (bits)	Description
HT	1	Header Type = 1
EC	1	Always set to zero
Type	3	Type = 011
BR	11	Bandwidth Request The number of bytes of uplink bandwidth requested by the SS. The bandwidth request is for the CID. The request shall not include any PHY overhead. It is aggregate BW request.
UL Tx power	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, the maximum value is reported.
CID	16	SS basic CID
HCS	8	Header Check Sequence (same usage as HCS entry in Table 5).

[Change the text as follows in 6.3.2.3.58]

6.3.2.3.58 Power control mode change response (PMC_RSP) message

PMC_RSP is sent from BS as a confirmation of SS's uplink power control change intention with PMC_REQ message or it is sent unsolicited manner to command SS to change the uplink power control mode as indicated in the PMC_RSP. When the open loop power control is indicated, Offset_BS_{perSS} is included. When the closed loop power control is indicated, power adjust can be signaled. ~~BS may allocate the CQICH or update the CQICH allocation using PMC_RSP.~~

Table 107b— PMC_RSP message format

Syntax	Size	Notes
PMC_REQ message format{		
Management Message Type = 63	8 bits	Type = 63
Power control mode change	1 bits	0: Closed loop power control mode 1: Open loop power control mode
Start frame	7 bits	7 LSBs of frame number when the indicated power control mode is activated. When it is same with the current frame number, the mode change shall be applied from the current frame.
If (Power control mode change=0)		
Power adjust	8 bits	Signed integer, which expresses the change in power level (in multiples of 0.25 dB) that the SS shall apply to its current transmission power. When subchannelization is employed, the subscriber shall interpret the power offset adjustment as a required change to the transmitted power density.
else		
Offset_BS_{perSS}	8 bits	Signed integer, which expresses the change in power level (in multiples of 0.2 dB) that the SS shall apply to the open loop power control formula in 8.4.10.3.1.
}		

CID shall be the basic CID of SS. SS shall generate the PMC_REQ message including the following parameters.

Power control mode change

0: Closed loop power control mode
1: Open loop power control mode

Start frame

3 LSBs of frame number when the indicated power control mode is activated. When it is same with the current frame number, the mode change shall be applied from the current frame.

Power adjust

Signed integer, which expresses the change in power level (in multiples of 0.25 dB) that the SS shall apply to its current transmission power. When subchannelization is employed, the subscriber shall interpret the power offset adjustment as a required change to the transmitted power density.

Offset_BSperSS

Signed integer, which expresses the change in power level (in multiples of 0.2 dB) that the SS shall apply to the open loop power control formula in 8.4.10.3.1.

[Change the text as follows in 8.4.5.3.18]

8.4.5.3.18 UL noise and interference level IE format

For the open loop power control, UL interference and noise level shall be broadcast to MSSs in the given BS coverage by BS. UL interference and noise level IE broadcast the UL interference and noise level (dBm) estimated in BS. All the UL interference and noise level are quantized in 0.25 dBm steps from – 110 dBm (encoded 0x00) to – 46.25 dBm (encoded 0xFF).

Table 284i— UL interference and noise level extended IE

Syntax	Size	Notes
UL interference and noise level_IE{		
Extended ~~U~~DIUC	4 bits	UL NI = 0x0~~D~~F
Length	4 bits	Length = 0x0~~5~~3~6
Bitmap	8 bits	LSB indicates the there exists "CQI/ACK/Ranging region NI" field (1). Otherwise, it is '0' The 2nd LSB indicates the there exists "PUSC region NI" field (1). Otherwise, it is '0' The 3rd LSB indicates the there exists "Optional PUSC region NI" field (1). Otherwise, it is '0' The 4th LSB indicates the there exists "AMC region NI" field (1). Otherwise, it is '0'
If (LSB of Bitmap = 1) {		
CQI/ACK/Ranging region NI	8 bits	Estimated average power level (dBm) per a subcarrier in CQI/ACK region.
}		
If (The 2nd LSB of Bitmap = 1) {		
PUSC region NI	8 bits	Estimated average power level (dBm) per a subcarrier in PUSC region.
}		
If (The 3rd LSB of Bitmap = 1) {		
Optional PUSC region NI	8 bits	Estimated average power level (dBm) per a subcarrier in optional PUSC region.
}		
If (The 4th LSB of Bitmap = 1) {		
AMC region NI	8 bits	Estimated average power level (dBm) per a subcarrier in AMC region.
}		
}		