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Re:	IEEE P802.16e/D5a
Abstract	The document contains suggestions for corrections in the usage of the Generic Sleep Headers.
Purpose	To make the Generic Sleep Headers more robust and scalable using the Extended Subheader Field.
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Generic Sleep Corrections

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1. The Document's Goal

The document's goal is to correct the Generic Sleep Header format in 802.16 by using the Extended Subheader Field (ESF).

2. Incentive for Correction of the Generic Sleep Headers

The generic sleep feature contribution that was accepted last session requires some refinements and corrections.

For example, it would be better to change the location of the sleep control header in the 802.16 PDU. As defined today, the Sleep Control Header PDU type changes the GMH and other basic building blocks of the 802.16 standard. These changes are not scalable and are very limited in flexibility.

The suggestion here is to use the ESF (Extended Subheader Field) overriding the MSF bit while retaining the regular GMH. The Sleep Control Headers will be converted into subheaders under the ESF. This allows greater flexibility and robustness in future extensions of the Sleep Control Headers and other functionalities.

The current MAC PDU format is very limited in introducing additional information fields which need to be conveyed along with the PDU. This contribution proposes to extend the PDU format with the ESF bit indicating an additional field containing the Extended Subheader field. The ESF field contains an 8-bit bitmap indicating the presence of up to 8 additional subheaders.

3. Specific changes in the Standard

[Change in section 6.3.2.1.1]

Figure 19a
Change MSF (1) to ESF (1)

Table 5a

Name	Length (Bits)	Description
\<remove MSF\>		
ESF	**1**	**Extended Subheader Field. If ESF = 0, the ESF is absent. If ESF=1, the ESF is present and will follow the GMH immediately. (See section 6.3.2.2.7). The ESF is applicable both in the DL and in the UL.**

[Modify the following sentences]

Six types of subheaders may be present in a MAC PDU with generic MAC header. The per-PDU subheaders (i.e., Extended Subheader Field~~Mode Selection Feedback~~, Mesh, Fragmentation, Fast-feedback_Allocation and Grant Management) may be inserted in MAC PDUs immediately following the Generic MAC header. If both the Fragmentation subheader and Grant Management subheader are indicated, the Grant Management subheader shall come first. If the Mesh subheader is indicated, it shall precede all other subheaders except for the ESF. In the downlink, the Fast-feedback Allocation subheader shall always appear as the last per-PDU subheader~~, while in the uplink the Mode Selection Feedback subheader shall always appear as the last per-PDU subheader. The Mode Selection Feedback subheader, if indicated in UL Generic MAC header, shall always appear as the last per-PDU subheader in a UL MAC PDU~~.

Add the following to end of section

The ESF bit in the GMH indicates that the Extended Subheader Field is present. Using this field, a number of additional subheaders can be used within a PDU. The ESF field shall always appear immediately after the GMH, and before all other subheaders. The ESF field and all extended subheaders related to it are not encrypted. (See section 6.3.2.2.7)

[Change in section 6.3.2.1.6]
Rename section: 6.3.2.1.6 Bandwidth Request and Uplink Sleep Control Header
Delete from p.20 line 26 until end of section
~~The following message is sent by BS ... etc.~~

[Change in section 6.3.2.2.7]

[move old section 6.3.2.2.7 to section 6.3.2.2.7.1]

6.3.2.2.7 Extended Subheader Field

The Extended Subheader Field subheader is specified in Table 13a. The Extended Subheader Field, when used, shall always appear immediately after the GMH and before all other subheaders, as described in 6.3.2.2. The ESF and all extended subheaders related to it shall not be encrypted, but shall be protected by the payload CRC field. The ESF and all extended subheaders associated to it are transmitted sequentially, with the extended subheaders ordered according to the Extended Subheaders Bitmap starting from the MSB.

Table 13a – Extended Subheader Field (ESF)

Name	Length (Bits)	Description
Extended Subheaders Total Length	5	Length (in octets) of all Extended Subheaders present, excluding the ESF field.
Extended Subheaders Bitmap	11	Bitmap indicating which extended subheaders are present.

The list of defined extended subheaders is given in Table 13b for the DL and in Table 13c for the UL.

Table 13b – Description of Extended Subheaders (DL)

ESF Bit	Name	Length (Octets)	Description
Bit #0 (LSB)	*Reserved*		
Bit #1	Generic Downlink Sleep Header	3	See 6.3.2.2.7.2
Bit #2-Bit #10	*Reserved*		

Table 13c - Description of Extended Subheaders (UL)

ESF Bit	Name	Length (Octets)	Description
Bit #0 (LSB)	Mode Selection Feedback	1	See 6.3.2.2.7.1
Bit #1	*Reserved*		
Bit #2-Bit #10	*Reserved*		

[Insert new section 6.3.2.2.7.1]
6.3.2.2.7.1 Mode Selection Feedback Extended Subheader
[move old section 6.3.2.2.7 to section 6.3.2.2.7.1]

The format of the Mode Selection Feedback Extended Subheader is specified in Table 13d. ~~The Mode Selection Feedback Subheader, when used, shall always be the last per PDU subheader as specified in 6.3.2.2~~. The support of the Mode Selection Feedback Extended Subheader is PHY specific.

An MSS uses the Mode Selection Feedback Extended Subheader to provide its feedback in terms of mode selection.

For each MSS, a Mode Selection Feedback Extended subheader may appear only in the first unicast PDU addressed to that SS.

This field shall only be used if the MSS has successfully negotiated the support of Mode Selection Feedback Extended Subheader with the BS through the capabilities exchange dialog (SBC-REQ/RSP).

Table 13d – Mode Selection Feedback extended subheader format

Name	Length (bits)	Description
Feedback type	4	Indicate the type of feedback (see table 13e)
Feedback content	4	Content of the feedback

Table 13e – Mode Selection Feedback types

Feedback type	Description
0b0000	MIMO mode and permutation. If set to this type, the Feedback content is as described in Table 296a
0b0001-0b1111	*Reserved*

[Insert new section 6.3.2.2.7.2]
6.3.2.2.7.2 DL Sleep Control Extended Subheader

This field shall only be used if the MSS has successfully negotiated the support of DL Sleep Control Extended Subheader with the BS through the capabilities exchange dialog (SBC-REQ/RSP).

The following message is sent by the BS to activate / deactivate certain Power Saving Class. The requested operation is effective from the next frame after the one where the message was transmitted.

Table 13f - MOB_SLP_DLC extended subheader format (DL)

Name	Length (bits)	Description
Power_Saving_Class_ID	6	Power Saving Class ID this command refers to.
Operation	1	1 = to activate Power Saving Class 0 = to de-activate Power Saving Class
Final_Sleep_Window_Exponent	3	For Power Saving Class Type 3 only: assigned factor by which the final-sleep window base is multiplied in order to calculate the duration of single sleep window requested by the message.
Final_Sleep_Window_Base	10	For Power Saving Class Type 3 only: the base for duration of single sleep window requested by the message.
Reserved	4	

[Change in section 11.8.2]
11.8.2 Capabilities for Construction and Transmission of MAC PDUs

Type	Length	Value	Scope
4	1	**Bit #2**: Specifies support for MSF extended subheader (see 6.3.2.2.7.1) **Bit #3**: Specifies support for Generic Sleep Extended subheader. (see 6.3.2.2.7.2) **Bit #4-#7**: *Reserved, shall be set to zero*	SBC-REQ, SBC-RSP