

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	Corrections to sounding protocol	
Date Submitted	<b>2005-03-08</b>	
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Re:	IEEE P802.16e/D2-2004	
Abstract	Corrections to sounding definitions	
Purpose	Adopt changes	
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# Corrections to sounding protocol

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## 1. Motivation

The following corrections are required to the sounding protocol:

1. Capability negotiation for sub-features of the sounding
2. Bound on the required response time
3. Reference to the UL-sounding IE from a section under UL-MAP (for clarity).

## 2. Details

### 2.1. Capability negotiation for sub-features of the sounding

Currently there are two options for sounding - type A and type B. Each type has more than 3 possible formats of the sounding symbol, and in addition there are 3 modes for power assignment. The total number of different modes is about 21. Since for actual systems not all modes will be used, it makes sense to separate different codes by different capability bits. The power assignment is also a different capability since it requires to feed-back parameters from the downlink channel into the UL transmission pattern (whereas the default mode only requires transmission of a predefined pattern).

Also there is no limitation to the total number of sounding transmissions required from one SS.

### 2.2. Bound on the required response time

The current definition is that the response is in the same frame as the request. However, in worst case the UL map (carrying the request) may end at the end of the DL subframe, leaving no time for response. We suggest to add a bit to the sounding IE that indicates if the response is on current or next frame, a capability to support sounding in current frame, and a limitation that the processing time between the end of the UL-MAP carrying the sounding IE and the beginning of the UL should not exceed 2ms.

### 2.3. Reference to the UL-sounding IE from a section under UL-MAP (for clarity)

UL-sounding IE is defined under section 8.4.6.2 (Uplink), and is the only UL-MAP IE that is not referred to from 8.4.5.4 (UL-MAP format).

## 3. Changes summary

*[Add a new section 8.4.5.4.X]*

### **8.4.5.4.X UL\_Sounding\_Command\_IE**

UL\_Sounding\_Command\_IE is defined in 8.4.6.2.8.1, table 315k.

*[Replace the last sentence in the first paragraph of 8.4.6.2.8.1 with the following text]*

~~In this case, the first sounding symbol is transmitted within the frame containing the relevant sounding instruction.~~

The first sounding symbol is transmitted in the frame containing the relevant sounding instruction if Sounding\_Relevance is set to 0 and the SS indicates support of sounding response in one frame, and

otherwise in the next frame. In addition, there should be at least 2ms processing time between the end of the UL-MAP carrying the sounding instruction and the beginning of the UL subframe carrying the sounding signal.

**[Add the following line to table 315k, p.418 line 24, under Send Sounding Report Flag]:**

Sounding_Relevance	1 bit	0 = response in the frame carrying the instruction 1 = response in next frame
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**[make the following changes in table in 11.8.3.7.11 p.522]**

Type	Length	Value	Scope
161	1	<del>Bit #0: CSIT compatibility type A.</del> <del>Bit #1: CSIT compatibility type B.</del> <del>Bit #2-7: reserved</del>  Bit #0: CSIT type A, sperability type 0 (cyclic shift seperability) Bit #1: CSIT type A, sperability type 1 (decimation seperability) Bit #2: CSIT type B Bit #3: Power assignment capability (indicate support for non equal power assignment) Bit #4: Sounding response in one frame Bits #5-6: max number of simultaneous sounding instructions (0 = unlimited) Bit #7: reserved	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)