

<b>Project</b>	<b>IEEE 802.16 Broadband Wireless Access Working Group &lt;<a href="http://ieee802.org/16">http://ieee802.org/16</a>&gt;</b>	
<b>Title</b>	Integration of comments #5482, #5484, #5487, their reply comments, contribution 289, 305 and 118r4 on fast DL S/N measurements	
<b>Date Submitted</b>	2005-06-16	
<b>Source(s)</b>	Masoud Olfat Nextel Communications 12000 Sunrise valley Dr.  <b>Reston VA 20191</b>	Masoud Olfat Nextel Communications 12000 Sunrise valley Dr.  <b>Reston VA 20191</b>
<b>Re:</b>	IEEE P802.16e/D8	
<b>Abstract</b>	This contribution integrates comments #5482, #5484, #5487, their reply comments, contribution 289, 305 and 118r4 on fast DL S/N measurements, and changes some portions based on the D8 draft.	
<b>Purpose</b>	Discuss and approve.	
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## Integration of Comments 5482, 5484, 5487 and all their reply comments, contributions 289, 118r4, 305

*Masoud Olfat*  
*Nextel Communications*

### Introduction

The contribution 118r3, which was based on draft IEEE P802.16e/D8 was approved in Atlanta meeting. However, comments 5482 and 5484 suggested some changes to section 8.4.5.4.10, which was approved in BRC in Schumburg IL. Comment 5484 was based on contribution 289 from Motorola, which was replied by contribution 305 from Nortel. In BRC contribution 305 was approved and it superceded comment #5482. However, comment #5487 suggest correct implementation of the approved contribution 118r3 that was modified based on draft D8. There are several inconsistencies and conflicts between these comments. This contribution tries to incorporate the modifications suggested by 118r4, and 305, all reply comments for comments 5482, 5484, and 5487, and at the same time fix some bugs in those documents. The contribution suggests changes based upon baseline document IEEE802.16-2004.

### Proposed text changes:

**[Add the following text before the first paragraph of 8.4.5.4.10.1 (page 321, line 51. It should replace the contents of 8.4.5.4.10.1 in the baseline document):**

When the Feedback\_type field in CQICH\_Enhanced\_Alloc\_IE() is 0b000 with CQICH type 0b101 the following formula shall be used:

$$\text{payload\_bits} = \begin{cases} 0, & S/N < 1 - B \\ n, & (2n - 1 - B) \leq S/N < (2n - 1 + B), \quad 0 \leq n \leq 15 \\ 15, & S/N \geq 29 - B \end{cases} \quad \text{[Add proper equation number here](say xx)}$$

**[It should be payload bits Nibble rather than payload\_bits, as it corresponds to 4 bit CQICH]**

where B is the positive integer value indicated in the SN Reporting Base IE (see 11.7.27). B shall default to "3" if the SN Reporting Base IE was not included in the REG-RSP.

**[Insert following text at the end of section 8.4.5.4.10.]:**

MIMO capable MS shall measure post processing S/N for each individual layers as shown in Figure 230a. When the FAST\_FEEDBACK subheader Feedback Type field is "00", the MS shall report the post processing Effective SNR (Eff\_SNR) for S/N in (xx) [please use appropriate eq#], as defined below. When BS requests MS feedback through CQICH\_Alloc\_IE() or CQICH\_Enhanced\_Alloc\_IE() with '00' feedback\_type field, MS shall report average S/N Eff\_SNR or individual layer S/N as described in 8.4.5.4.12 and 8.4.5.4.15

For vertically encoded MIMO system, defined the effective SNR (Eff\_SNR) as

$$\text{Eff\_SNR} = e^{C(d,y|H)} - 1 \quad \text{[Add proper equation number here](a)}$$

where  $C(d,y|H)$  is the receiver-constrained mutual information conditioned on knowing the channel knowledge. Note that  $d$  is the transmitted signal,  $y$  is the post-processing receive signal and  $H$  is the channel matrix between transmit and receive antennas. For LMMSE receiver, the individual post-detector-processing signal to noise ratios are given as  $SNR_1, \dots, SNR_N$ , as shown in Figure 230a,

and  $C(d,y|H) = \frac{1}{N} \sum_{n=1}^N \log(1 + SNR_n)$ . In this case  $Eff\_SNR = \frac{1}{N} \sum_{n=1}^N (1 + SNR_n)^{\frac{1}{2}}$ , [add -1 at the end of this equation]

when the individual post-detector-processing SNR is high, the effective SNR is  $Eff\_SNR \approx \frac{1}{N} \sum_{n=1}^N SNR_n$  (in dB). For ML

MIMO detectors case:  $C(d,y|H) = \frac{1}{N} \log \det(I_N + H^H R^{-1} H)$ , where  $I_N$  is an  $N$  by  $N$  identity matrix and  $R$  is the correlation matrix of interference plus noise measured at SS.

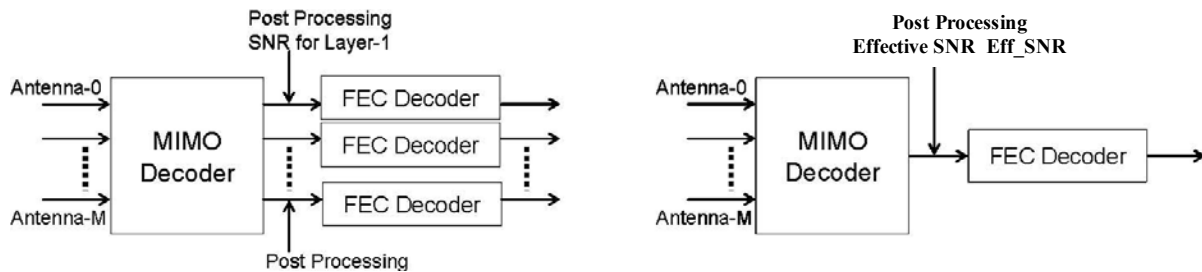


Figure 230a – Post Processing S/N for MIMO Region

[\[Replace the first half of the figure 230a with the one from contribution 305\]](#)

***[Replace the contents of 8.4.5.4.10.5 (page 328, line 33 thru page 329, line 19) with the following text]:***

When the FAST\_FEEDBACK allocation subheader Feedback Type field is 0b00 or the feedback is requested through CQICH Alloc IE (see section 8.4.5.4.12), or the Feedback\_type field in CQICH\_Enhanced\_Alloc\_IE() is 0b000-0b010 with CQICH type 0b000, 0b001 or (see 8.4.5.4.15), the MS shall report the S/N it measures on the DL. The following formula shall be used:

$$\begin{aligned}
 & 0, & S/N & B \\
 \text{payload\_bits} & n, & (n-1) & B) & S/N & (n-B), & 0 & n & 31 & (107a) \\
 & 31, & S/N & 30 & B
 \end{aligned}$$

where  $B$  is the positive integer value indicated in the SN Reporting Base IE (see 11.7.27).  $B$  shall default to “3” if the SN Reporting Base IE was not included in the REG-RSP

For MIMO capable MSs, if BS allocates a single CQICH to the MS in UL\_MAP for the purposes of Fast DL Measurement, MS shall report the effective post processing S/R Eff\_SNR as defined in 8.4.5.4.10.1. Otherwise, if BS allocate multiple CQICHs to the MS in UL\_MAP for the purposes of Fast DL Measurement, the MS shall report post processing S/N of individual layers in order of layer indices.

***[Modify the text in section 8.4.5.4.11.1 after line 4 in page 347]***

For MIMO capable MSs, BS may allocate one or multiple CQICH channels to the MS in UL\_MAP. IF CQICH\_Num=0 and feedback type is ‘00’, MS shall report the effective post processing S/R Eff\_SNR as defined in 8.4.5.4.10.1 [\[It was 8.4.5.4.10.5 in 305 but I changed it based on this which comes from 305\]](#). For CQICH\_Num>0 and feedback type is ‘00’, MS shall report post processing SNR of individual layers, the order of CQICH channel allocation shall match the order of layer index.

***[On page 527, line 21, insert new subclause 11.7.27]:***

11.7.27 SN Reporting Base

SN Reporting Base indicates the (negative of the) base value that the MS shall use in sending fast DL measurement feedback on an enhanced fast-feedback channel.

Type	Length	Value	Scope
-	1	A positive integer in the range 0-255; the base value used in reporting shall be the negative of this value.	REG-RSP