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Title	**Comment on Sub-Channel Reuse for CQICH Fast Feedback Channels**
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Re:	Response to Sponsor Ballot call for comment
Abstract	To improve the CQICH Fast Feedback Channels
Purpose	Comment on Sub-Channel Reuse for CQICH Fast Feedback Channels
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Comment on Sub-Channel Reuse for CQICH Fast Feedback Channels

1 Introduction

Contribution IEEEC802.16e-04/448 proposes to re-use the CQICH sub-channel to increase the feedback throughput and reduce the UL capacity penalty, such a reuse is based on the additional reception antenna at BS. However, we would like to comment that in addition to this approach, several other techniques are available to achieve the same objective. For example:

1. Improve the coding scheme of current CQICH
2. Use transmit diversity STC at MSS
3. Use collaborative spatial multiplexing at MSS

Solutions 2 and 3 are addressed in contribution IEEEC802.16e-04/518, in this comment as addressed the enhancement of Solution 1.

2 Proposed Solution

The code used in currently 4-bit, 5-bit, 5-bit CQICH channels has a minimum distance of 40 and diversity order 5. The code length is 96, we propose to use a first order Reed-Muller code, concatenated with a repetition code as enhanced CQICH channel. The minimum distance is increased to 48 with a guarantees diversity order a 6 (maximum possible). This results in about 1dB gain in performance as shown in the numerical results. In addition, the decoding complexity substantially reduced. See Table 1.

Table 1: Decoding Complexity and Hamming distance of the codes

Method		**Complexity of Decoding 1x1**	**Hamming Distance**
4-bit	Current	910	40
	Enhanced	110	48
5-bit	Current	1010	40
	Enhanced	140	48
6-bit	Current	1200	40
	Enhanced	240	48

3 Simulation Results

Figure 1 and Figure 2 present the simulation results, as we can see the enhanced CQICH has coding gain of 1dB and for 2x2 STC coded CQICH has 2dB gain. This benefit can be translated into performance improvement when the sub-channel reuse is employed or can be translated into battery life enhancement.

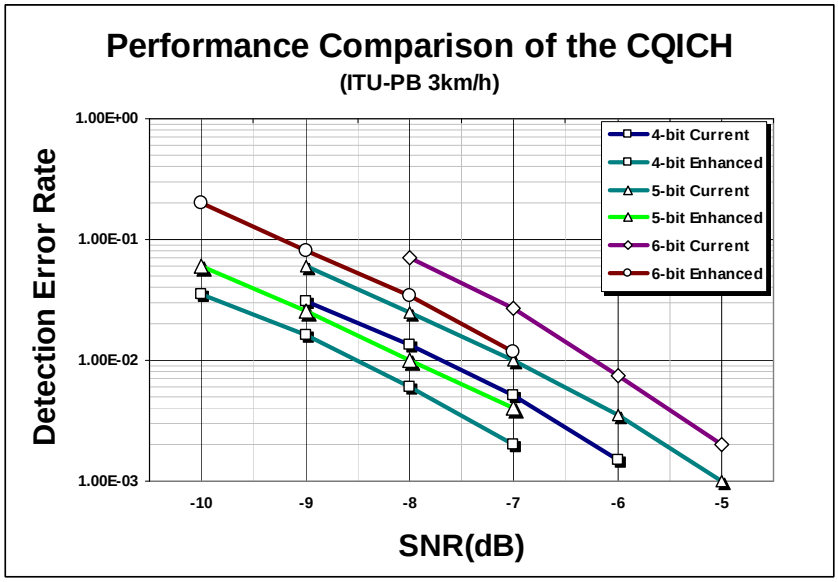

Figure 1 Performance enhancement of 4/5/6 bits CQICH channels

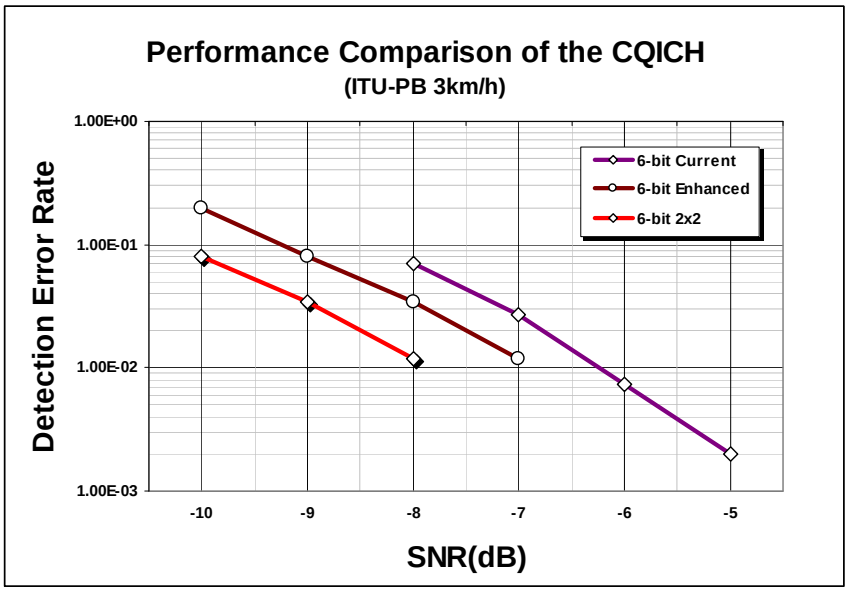

Figure 2 Performance enhancement of 6 bits CQICH channels