Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Proposed text for Broadcast Channel (BCH)**
Date Submitted	**2008-10-31**
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Re:	SDD Session 57 Cleanup, Call for Comments (IEEE 802.16m-08/040)
Abstract	This contribution provides the proposed text in order to complete some parts of empty or marked TBD or FFS.
Purpose	To be reviewed and adopted by TGm for the 802.16m SDD
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Proposed text for Broadcast Channel (BCH)

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1   Scope

In this contributions, we provide text proposals for updating the BCH related sections of the 802.16m SDD. In particular, we are proposing text to resolve the following issues in the BCH sections:

- BW occupancy (relevant to Section *11.7.2.2.2 of the SDD)*

- Multiplexing of SBCH with PBCH (relevant to Section *11.7.2.2.3)*

- Transmission format of BCH (relevant to section *11.7.2.2.4)*

2   Discussion and Rationale for the proposed changes

I. Transmission Bandwidth

According to the 16m SRD[1], the 16m system shall support scalable BW from 5 MHz to 40 MHz. We suggest that the BCH occupies no more than 5 MHz in order to support scalable BW, effectively.

The physical mapping of BCH region could in fact depend on other designs such as S-SCH. So, the physical mapping could be left open for until stage 3 discussions begin.

II. Modulation & coding rate

The Broadcast control channel requires robust modulation and coding. Note that BCH needs to deliver system information reliably to MSs in the very low geometry.

The 16m SRD specifies that the system should be optimized for cell ranges up to 5 km [1]. The 16m EVM also mentions the mandatory cell size being 1.5km ISD (i.e., 0.87 km cell range) for the baseline configuration [2].

Figure 1 shows the CDF of the SINR for two cell ranges, i.e. 0.87 km and 5 km. The test environments and associated configurations for this system level simulation are based on 16m EVM [2].
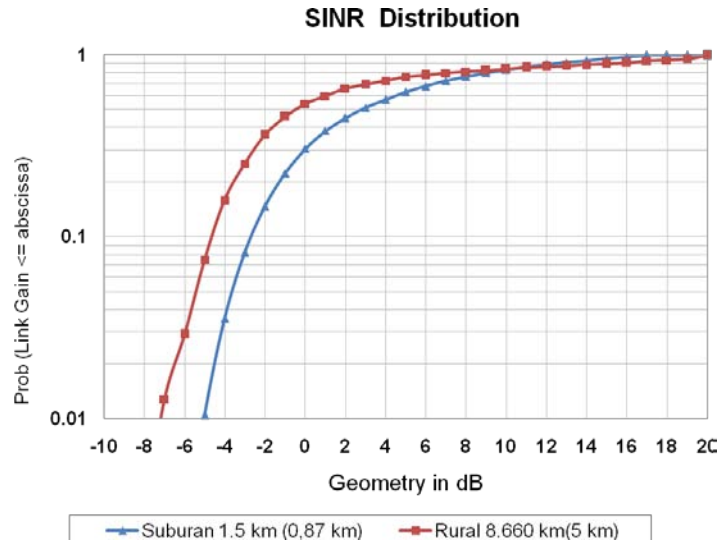
Figure 1. SINR distributions

In order to evaluate the SINR coverage, we can consider the points on the plot corresponding to the 95%, 97 % and 98 % coverage. Based on simulation results, we can make the following observations regarding the target SINR:

Table 1. Target SINR [dB]

Cell range	95 %	97 %	98 %
0.87 Km (1.5 Km ISD)	-3.7	-4	-4.5
5 Km (8.6 Km ISD)	-5.5	-6	-6.5

The target SINR is a minimum threshold which represents the average SINR that must be experienced by a stationary user in order to obtain the required percentage of coverage in the cell.

We also evaluated the link performance to achieve the above target SINRs. The following table summarizes the system parameters that were used for the link level evaluations.

Table 2. Simulation Parameters

Parameters	Value
OFDM symbol	102.86 us (w. 1/8 CP)
Bandwidth/FFT	5 MHz / 512 (used carrier: 432)
Channel coding	CTC

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Modulation & Coding rate	QPSK 1/2 with 8 repetitions (coding rate =1/16)
Antenna configuration	2 Tx – 2 Rx (but, 1 Tx antenna for SIMO)
Channel estimation	2D MMSE
Pilot pattern	8 pilot tones per PRU
CDD delay	4 samples
Channel model	Ped-B 3 km/hr, Veh-A 120 km/hr
Resource mapping	Uniformly distributed over entire band

We use CDD as a single stream which is specified in the current SDD[3] for MIMO schemes.

Figure 2 shows the BLER in Ped-B 3km/hr and Veh-A 120 km/hr. The SIMO transmissions are considered as a reference case.
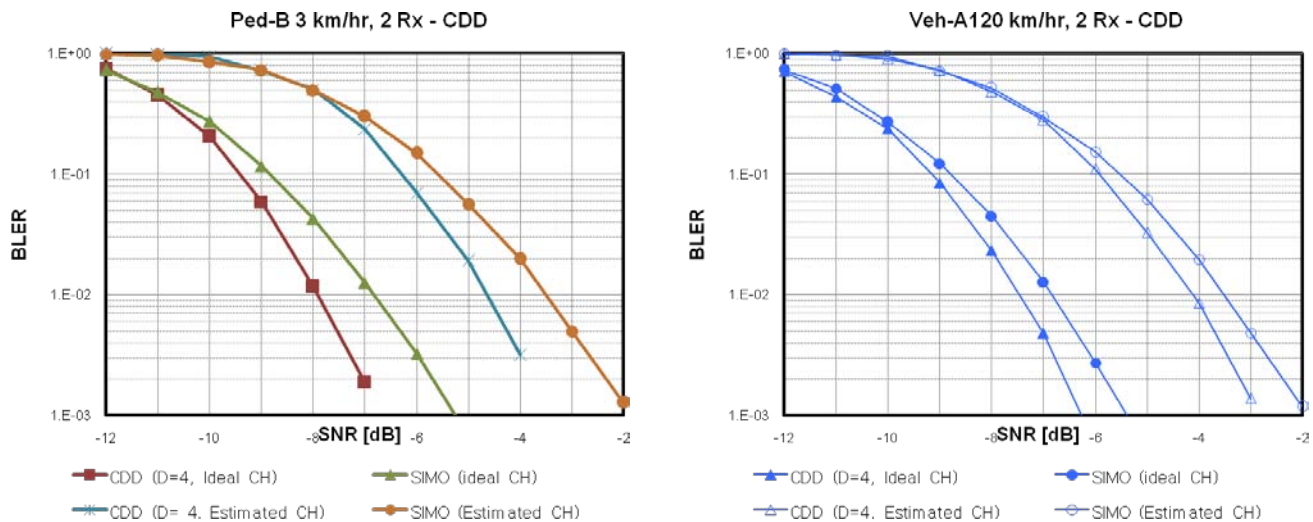

Figure 2. Link Performance - Ped-B 3 km/hr, Veh-A 120 km/hr

Based on these simulation results, we can make the following observations.

- The coding rate with 1/16 can achieve the target SINR for 97 % coverage of 0.86 km cell with a target BLER of 1%.
- The coding rate with 1/16 cannot achieve the target SINR for 95 % coverage of 5 km cell with a target BLER of 1%.

On the basis of the above, we propose that the coding rate of BCH be equal to or less than 1/16.

3 References

[1] IEEE 802.16m-07/002r6, "IEEE 802.16m System Requirements"

[2] IEEE 802.16m-08/004r3, "IEEE 802.16m Evaluation Methodology Document (EMD)"

[3] IEEE 802.16m-08/003r5, "The Draft IEEE 802.16m System Description Document (SDD)"

4 Proposed Text for SDD

[Note to the Editor: The underlined red text *provided below represents the change that we are proposing. The text in black represents the current SDD text.]*

11.7.2.2.2 Location of the BCH

The SFH includes PBCH and the SBCH, and is located in the first subframe within a superframe.
The PBCH and SBCH occupy no more BW than 5 MHz, but the physical mapping (resource allocation) is FFS.

11.7.2.2.3 Multiplexing of the PBCH and SBCH with other control channels and data channels

The PBCH/SBCH is TDM with the SCH.
If SFH occupies narrower BW than system BW, the PBCH and SBCH in SFH are FDM with data within the same subframe.
The PBCH is FDM with the SBCH within the first subframe.

11.7.2.2.4 Transmission format

The PBCH and SBCH are transmitted using predetermined modulation and coding schemes.
The modulation for the PBCH and the SBCH are QPSK.
The ~~modulation and~~ coding rate for PBCH and the ~~modulation and~~ coding rate for SBCH are equal to or less than 1 /16 ~~TBD~~.

11.7.3 Mapping information to DL control channels

To cleanup

[Delete empty cell in Table 3, line 12, page 74 as below,]

Information	Channel	Location
Synchronization information	Synchronization Channel (SCH)	FFS
Essential system parameters and system configuration information	Primary Broadcast Channel (PBCH) and Secondary Broadcast Channel (SBCH)	Inside of SFH
Extended system parameters and system configuration information	FFS	Outside of SFH
Control and signaling for DL notifications	FFS	FFS
Control and signaling for traffic	Unicast Service Control Channel	Outside of SFH