

[Transmit Diversity scheme for BCH transmission]

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Venue:

Call for Comments on Project 802.16m System Description Document (IEEE 802.16m-08/052)

Purpose:

To be reviewed and adopted by TGM for the 802.16m SDD

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Transmit Diversity Schemes for BCH transmission: 2 streams vs 1 stream

January, 2009

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Summary

- Purpose
 - To resolve the issue related to Tx diversity scheme for BCH transmission(which is currently FFS)
 - Transmit Diversity Schemes for 2 x 2
 - 2 stream (i.e. $M = 2$): Data and pilots are different among antennas
 - 1 stream (i.e. $M=1$): Data and pilots are the same among antennas
 - This contribution provides the considerations and the evaluation results
- Recommendation
 - Suggests 2 stream transmission for Tx diversity

PBCH/SBCH related Working Assumptions

- Resource allocation [1]
 - PBCH and SBCH use **DRU**
- Multiplexing [1]
 - PBCH and SBCH in SFH are **FDM** with data within same subframe
- Transmission format
 - The AMS is not required to know the antenna configuration prior to decoding the PBCH [1]
 - Minimum DL antenna configuration: **2 x 2** [2]

Considerations for Evaluation

- Need performance evaluation using 2 stream pilots as common pilot
 - For FDM of PBCH/SBCH and data within the distributed region, both channels are transmitted in shared PRUs with DRU allocation. This can be achieved in following two ways:
 - Option 1: Uses rank-1 precoder in shared PRUs, data channels in the DRU region are restricted to use the same precoded pilot.
 - Option 2: Uses pilot pattern A as specified in section 11.5.3 [1] to share the pilot tones
- Using option1 means that data channels use only rank-1 transmission → unacceptable limitation

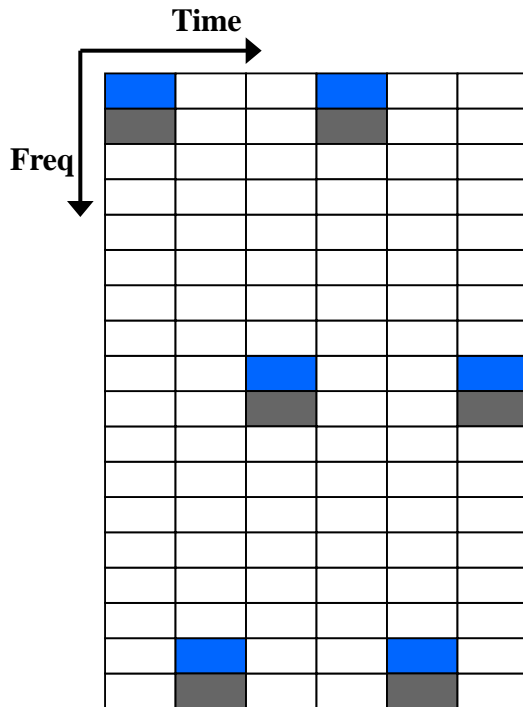
Simulation Environments



Contents	Value
Carrier frequency	2.5 GHz
OFDM symbol	102.86 us (with 1/8 CP)
Bandwidth / FFT size	5 MHz / 512 (used subcarrier : 432 subcarriers)
Channel Codig	CTC
Payload size	96 bits (for using full diversity)
Modulation & Code rate	QPSK $\frac{1}{2}$ with 8 repetitions
Antenna configuration	2 Tx - 2 Rx
Channel estimation	PRU based 2D MMSE
Tx Diversity Schemes	1 stream: Phase rotation (rotation value = 1/256) 2 stream: SFBC
Resource unit	DRU
Pilot pattern	Pilot pattern A (no boosting)
Channel Model	Ped-B 3 km/hr, Veh-A 120 km/hr (Uncorrelated channel)

Pilot Patterns

- **1 stream transmission**

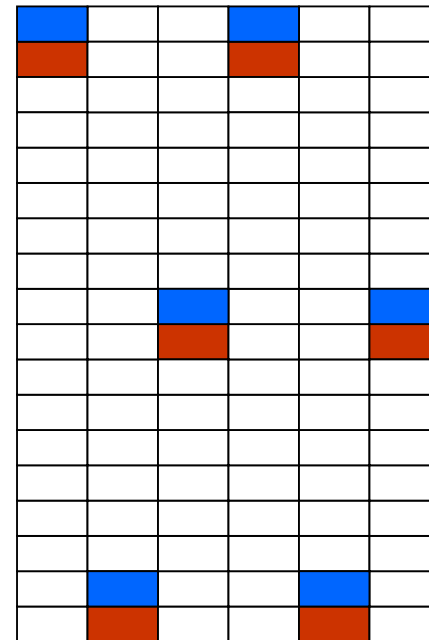
- Uses pilot stream 1





 Pilot stream 1
 Pilot stream 2 (not used for 1 stream transmission)

- **2 stream transmission**

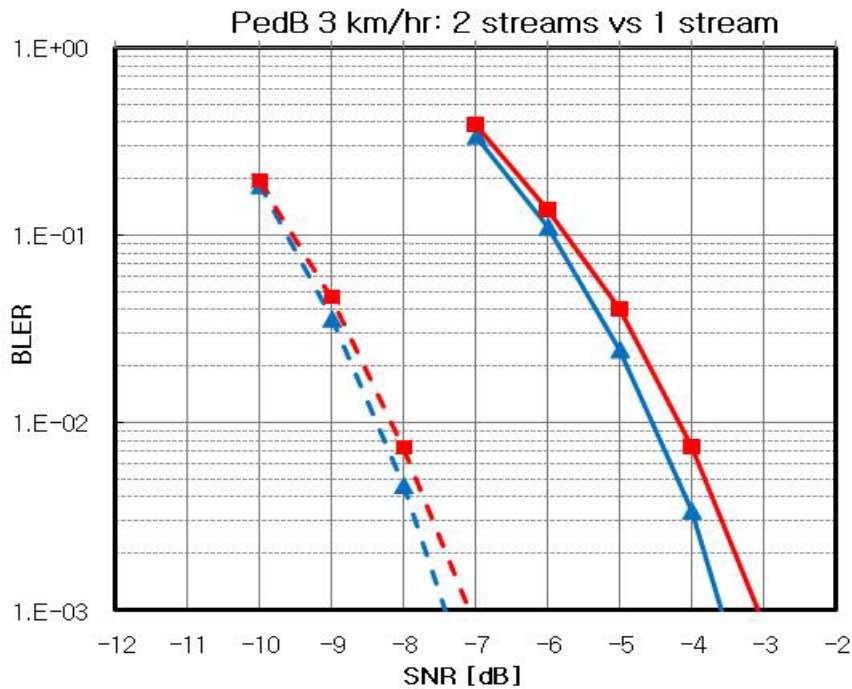
- Uses both pilot stream 1 and pilot stream 2



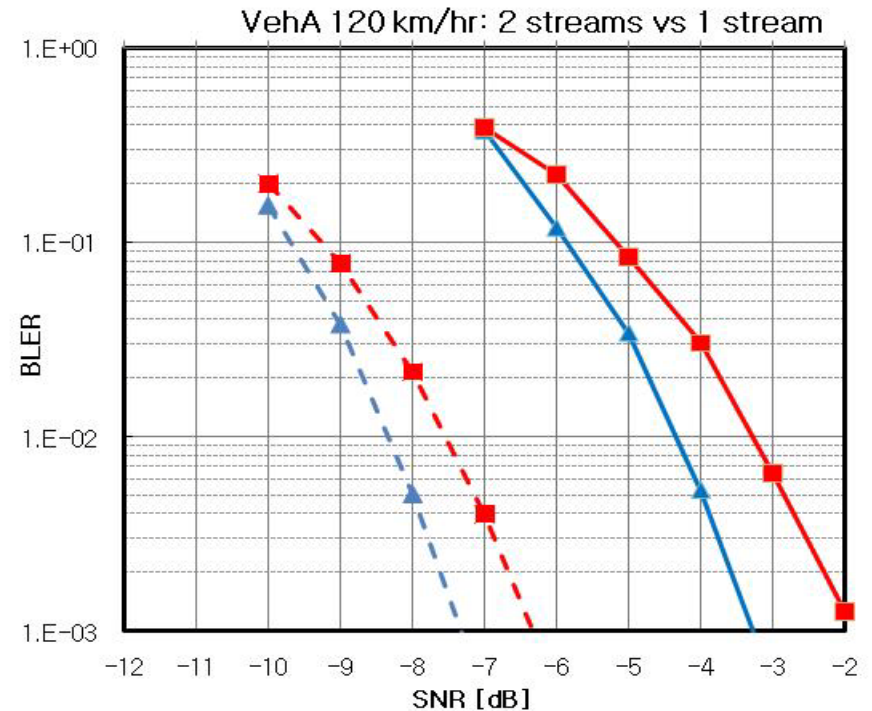
 Pilot stream 1
 Pilot stream 2

Performance Comparison

- Summary
 - With 2 streams pilot, SFBC is better than 1 stream transmission



—▲— SFBC (Ideal CH) —■— 1 stream (Ideal CH)
—▲— SFBC (Estimated CH) —■— 1 stream (Estimated CH)



—▲— SFBC (Ideal CH) —■— 1 stream (Ideal CH)
—▲— SFBC (Estimated CH) —■— 1 stream (Estimated CH)

Text Proposal for 80216m SDD

===== Start of text proposal =====

Modify the sentence in section 11.7.2.2.4, page 92, line 13 as follows

Multiple antenna schemes for transmission of the PBCH/SBCH are supported. ~~Transmission of PBCH and SBCH as one stream or two stream is FFS.~~ Transmission of PBCH and SBCH uses transmit diversity scheme of rate 1 with two streams.

===== End of text proposal =====

References

- [1] IEEE 802.16m-08/003r6, “Project 802.16m System Description Document (SDD)”
- [2] IEEE 802.16m-07/002r7, “IEEE 802.16m System Requirements”