Title: Improvements in System Performance with spatial multiplexing for MBS

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Re: Call for comments on DL MIMO SDD text

Purpose: To discuss and adopt the proposal into the IEEE 802.16m SDD .

Improvements in System Performance with Spatial Multiplexing for MBS

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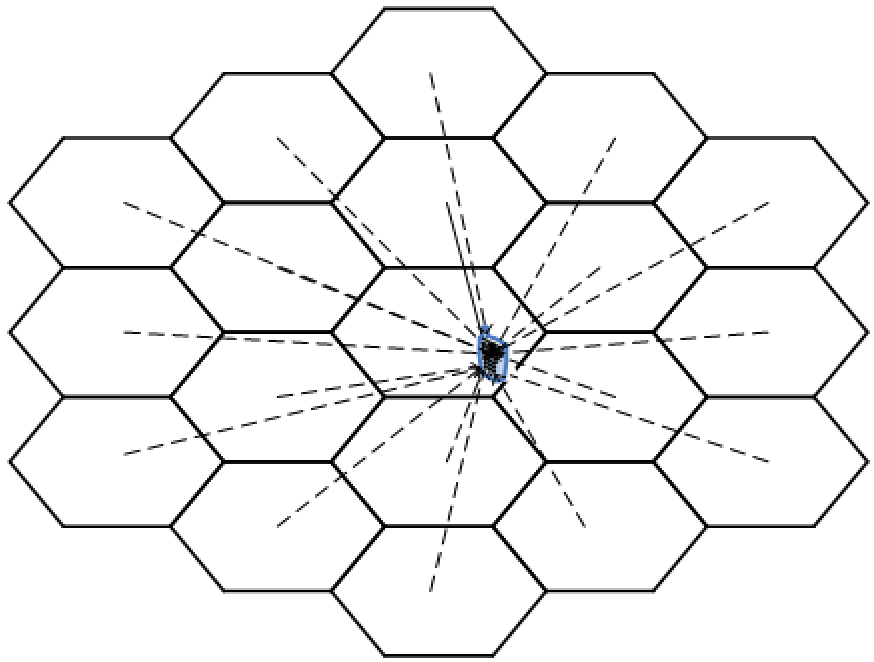
Single-Frequency Network (SFN)



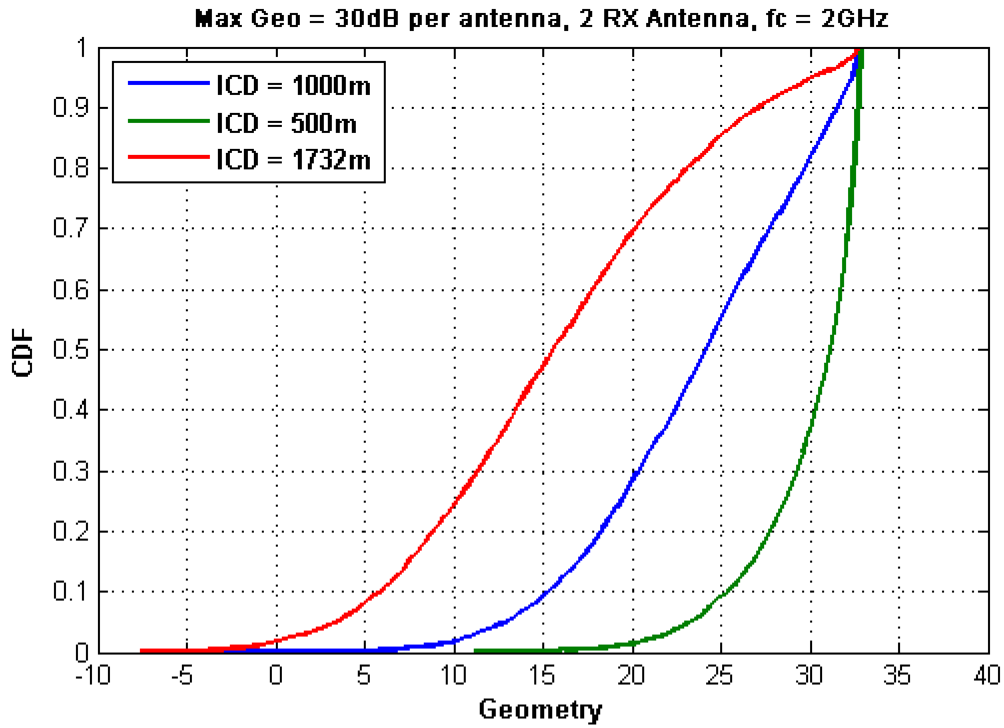
- An SFN operation is realized by transmitting the same information in the same OFDM time-frequency resource from multiple “synchronized” cells:
  - Cell synchronization within the OFDM symbol cyclic prefix required
  - A CP of 18.88μs used for E-MBS

Requirements

- Performance Requirement: 1% average FER
- Coverage Target: 95% of locations
- Desired spectral efficiency targets assuming SFN and ignoring overhead [1]:

Inter-cell Distance	Min Spectral Efficiency (bps/Hz)
500m	4
1500m	2

Broadcast Geometry



Maximum SINR is capped to 30dB per antenna

MIMO for EBM

- Baseline is 1x2 configuration
- Proposed scheme to achieve minimum spectral efficiency targets
  - 2x2 MIMO with open loop spatial multiplexing.
  - 2 layers corresponding to two code words.
  - For this simulation, both code words assumed to have the same MCS.

No significant gains from transmit diversity due to sufficient frequency diversity from SFN

System Simulation Parameters

Layout	19 cells, 3 sectors per cell
Operating Frequency	2000 MHz
Minimum Mobile-to-BS distance	35m
Test Sector	Center cell, any sector
Sector Orientation	Bore-sight pointing
Antenna Pattern	70° sectored beam
Propagation Model	$128.1 + 37.6 \log_{10}(d)$
Shadowing Standard Deviation	8dB
Shadowing Correlation between BSs	0.5
Penetration Loss	20dB
Rx Noise Figure	9dB
SFN Combining	57 Sectors
BS power per sector per antenna	43dBm

System Simulation Parameters

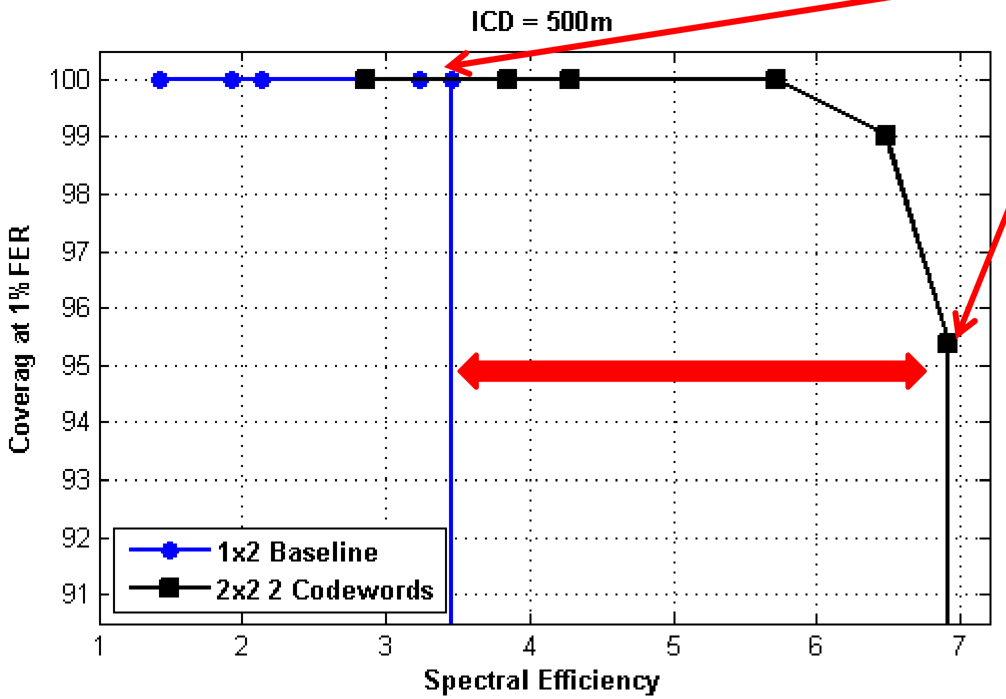
Bandwidth	10 MHz
Tone Spacing	15 KHz
Number of Tones	600
Channel Model	Composite Channel comprised of 3 TU-6 channels, 3 Km/h
TX antennas	1,2
RX antennas	2
Spatial Correlation	None
Receiver	MMSE-SIC
Link-to-system mapping	EESM
Pilot and Cyclic Prefix Overhead	28%
Cyclic Prefix duration	18.88μs
Channel Estimation	Perfect
FEC	Inner Turbo Code, no outer code

MCS and Spectral Efficiency

MCS	Spectral Efficiency (b/s/Hz) (Accounting for pilot and CP overhead)
QPSK Rate ½	0.72
16 QAM Rate 1/3	0.96
16 QAM Rate ½	1.44
16 QAM Rate 2/3	1.92
64 QAM Rate ½	2.16
64 QAM Rate 2/3	2.88
64 QAM Rate ¾	3.24
64 QAM Rate 4/5	3.45

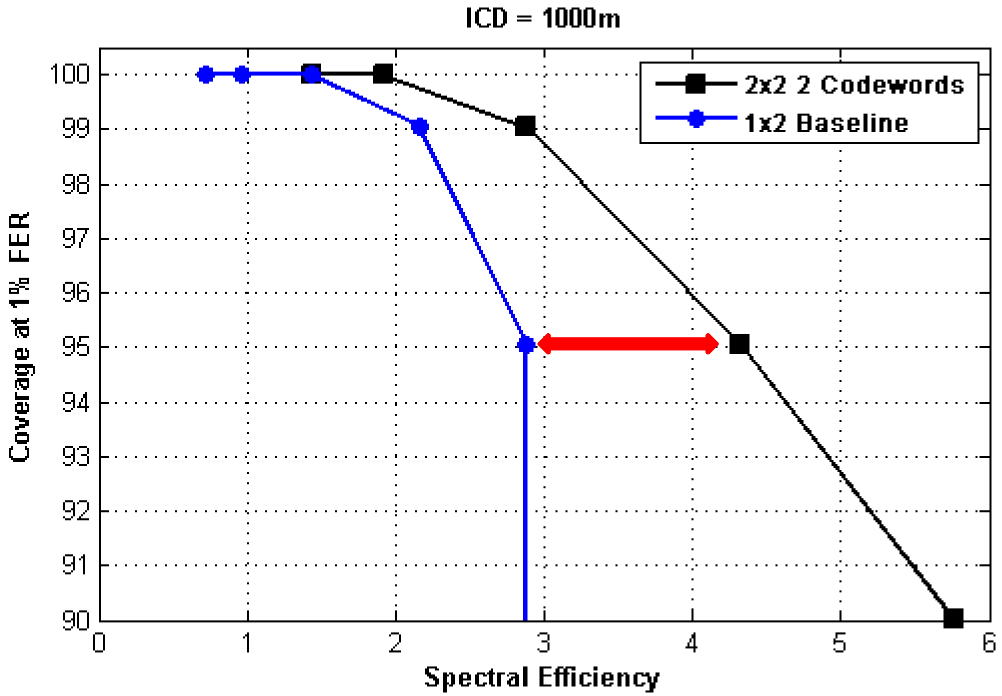
Results: ICD = 500m

Max MCS –
64QAM Rate 4/5



100% improvement in spectral efficiency at 95% coverage

Results: ICD = 1000m



50% improvement in spectral efficiency at 95% coverage

Summary

- For ICD = 500m, we see doubling in spectral efficiency for the same coverage with SFN
- Increasing ICD, reduces this gain in spectral efficiency
  - 50% improvement with ICD 1Km

- Recommendation:

  Adopt text in IEEE-C80216m-DL_MIMO-08_011_MIMO_MBS_Samsung_AlcatelLucent_Nortel.doc into the SDD