Simulation Results for 8Tx Codebook for 802.16m

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Venue:

Re: 802.16m amendment working document - Chapter 15.3.7 (DL-MIMO)

Abstract:

Proposal for modification to 16m 8Tx codebook

Purpose:

Adoption of proposed text/content for 802.16m AWD

System Level Results (16m EMD)

Relative sector throughput – 16m EMD

UL Model	**ULA**		**XPOL**	
Feedback method	CB-AWD	CB-381r1	CB-AWD	CB-381r1
SU-MIMO	100	104	100	102
MU-MIMO	100	113	100	109

Note: The sector throughput with CB-AWD codebook is normalized to 100 for ULA and XPOLs separately. It is also normalized for SU and MU-MIMO with CB-AWD separately.

System Simulation Setup (1/3)

- System Layout:
  - 19 cell (57 sector) classical layout; statistics in the center cell;
  - Cell radius = 866 m
  - 10 MS per sector; final statistics on about ~600 MS in the center cell
  - 10 MHz, full frequency reuse across cells/sectors
- Channel:
  - Pathloss model: 130.19 + 37.6*log10(R), where R in km + 10dB penetration loss + 2 dB cable loss
  - SCM channel details: PedB multipath profile, AS = 15 degrees, v = 3km/h, f = 2.5GHz;
  - Dominant interferers (path loss within 20dB of desired) are modeled as frequency and spatially selective
- BS:
  - 4 Transmit antennas, 4 Receive antennas (power fair TX power allocation per antenna)
  - TX power = 46 dBm;
  - ULA with 0.7λ spacing;
  - Sector antenna: parabolic (70 degrees 3 dB beamwidth), 17 dBi gain, 20 dB front-to-back ratio
- MS:
  - 2 receive antenna
  - MMSE receiver at the MS

System Simulation Setup (2/3)

- Downlink:
  - Permutation: distributed CRUs (48 randomly permuted PRUs; subband allocation count = 0).
  - Full buffer
  - Equal bandwidth scheduler: N_PRU = floor(48/N_USERS)); for MU-MIMO this applies per MU-MIMO group
  - 24 symbols per 5 ms frame; 12 pilots per PRU assumed
- Feedback methods
  - A) CB-AWD: 8Tx codebook as in 16m 80216m-09_0010r1a.pdf
  - B) CB-381r1: 8Tx codebook as in C80216m-09_0381r1_Samsung.doc
- DL TX methods
  - SU-MIMO (realistic rank adaptation and PMI selection based on wideband broadcast interference estimate at the MS on midamble)
  - MU-MIMO (realistic user grouping at the BS based on wideband PMI & CQI feedback or eigenvector & CQI feedback, both based on midamble)
- Wideband feedback
  - Rank, CQI, PMI calculation based on wideband midamble
  - Ideal DL channel estimation for Rank adaptation, CQI, PMI selection, and eigenvector calculation
  - Rank-one feedback for MU-MIMO (for both PMI and eigenvector)

System Simulation Setup (3/3)

- UL models for PMI & AFB:
  - Ideal (PMI known at BS)
- UL Models for Rank and CQI feedback
  - Rank feedback for SU-MIMO is Ideal
  - CQI feedback is ideal
- Link adaptation
  - Realistic: based on wideband CQI feedback from the MS; 1 frame delay
  - Chase HARQ is modeled (max 3 attempts)
- Feedback delays:
  - 5 ms (1 frame) delay for PMI
- Link-to-system mapping: EESM
- The effect of precoded interference seen on the DL data versus the midamble-only interference seen during CQI and PMI calculations is captured

Comments

- CB-381r1 has better performance than CB-AWD
  - Also has better distance properties
- CB-381r1 maintains a unitary structure (CB-AWD rank1 is non-unitary)
  - Enables CQI computation for MU-MIMO (as described in section 15.3.7.2.6.1 of AWD)
  - CB-AWD disables unitary MU-MIMO (CB-381r1 enables PU2RC MU-MIMO especially for uncorrelated scenarios)
- CB-381r1 enables low complexity search for MS due to 8-PSK alphabet and rank nesting
  - Search complexity is especially a concern for 8Tx due to more channel coefficients