Pseudo Random Precoding Matrix Allocation for OL MIMO

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Fan Wang, Bishwarup Mondal, Fred Vook, Mark Cudak, Weidong Yang,
Eugene Visotsky, Amitava Ghosh, Chandy Sankaran, Anup Talukdar
Motorola
E-mail: fanw@motorola.com

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Abstract:
Provide technical justification/details for DL MIMO text proposal for the IEEE 802.16m amendment C802.16m-09/236.

Purpose:
Provide technical justification/details for DL MIMO text proposal for the IEEE 802.16m amendment C802.16m-09/236

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16m DL OL MIMO

• 16m SDD DL OL MIMO supports:
  – One precoding matrix (PM) is allocated over a resource block ($u$ subcarriers by $v$ OFDM symbols)
  – Provide additional diversity over different resource blocks
16m DL OL/CL MIMO Challenges

- **Flash light effect**
  - When serving BS applies a signal-enhancing PM, neighboring BS may applies a interference-enhancing PM on the same RB
  - Without active coordination (coordinating schedulers between BS), this enhanced interference signal can be a “surprise” and unpredictable

- **Mismatch between reported CINR and the CINR when real transmission happens**
  - Again, due to unpredictable interference
  - BF/PM typically increases the variance of the CINR
  - Mismatch exists even for slow/static MS
Pseudo Random Precoding Matrix Allocation

- A zone in time/frequency is dedicated for OL-MIMO
  - Same zone is dedicated in every sector
- Each sector allocates a precoding matrix for each RB (sub-band) within the zone
- The precoding matrices (PM) over RBs in the zone is pre-defined and can change slowly (pseudo random)
- The precoding matrices over subframe/frame is pre-defined and can change slowly (pseudo random)
- The pseudo random sequence of precoding matrices is periodic
  - Period may be configured depending on CINR and scheduler delay
Pseudo Random Precoding Matrix Allocation (cont)

N is a period that the pseudo random sequence of precoding matrices repeats. It may correspond to the delay between CINR feedback and DL scheduler.
Signaling Impacts

• BS DL signaling
  – DL signal on the OL-MIMO zone allocation

• MS UL signaling
  – MS feedbacks CQI corresponding to the RB (or sub-band) in the zone
    • Similar CQI feedback overhead as in B-AMC

• Backhaul signaling for BS coordination (optional)
  – Signal to coordinate the zone allocation for cell-edge mobiles
  – Signal to coordinate PMs or codebook PMIs across sectors
  – Coordination should be on a slow time scale

• In summary
  – No significant signaling overhead
  – Very light use of backhaul (optional) to achieve BS coordination
    • No additional delay introduced as in coordinated BS scheduling
Pseudo Random Precoding Matrix Allocation

• Using MS CQI feedback and choice of RB (sub-band)
  – Enhance desired signal through precoding matrix (or codebook PMI) from the serving sector
  – Avoid interference through precoding matrix (or codebook PMI) from adjacent sectors

• CINR is predictable
  – Avoid flash light effect
  – Improve scheduler efficiency