Status Report for WI to TSG

Work Item Name: MIMO in UTRA

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Ref. to WI sheet: RAN_Work_Items.doc

Progress Report since the last TSG (for all involved WGs):

RAN WG1 #36 in Malaga, Spain:

- The updated MIMO TR [1] from the previous meeting was approved.
- Few companies proposed text proposals for MIMO candidates into the TR. One text proposal was agreed and incorporated into the TR while 6 text proposals are agreed to be accepted into the TR with changes to take into account the comments received on them.
- Text proposal accepted into the TR:
  - Double space time transmit diversity with sub-group rate control (DSTTD-SGRC)
- Text proposals agreed to be accepted, with some revisions to address comments made in the meeting, in the next RAN1 meeting WG1#37:
  - Closed Loop MIMO with 4 Tx and 2 Rx antennas
  - Double TxAA
  - Per-User Unitary Rate Control (PU^2RC)
  - Code Domain Successive Interference Cancellation (CD-SIC) V-BLAST with Transmit Power Ratio Control (TPRC)
  - Selective Per Antenna Rate Control
- One contribution on system simulation setup and another on backward compatibility and simulation methodology were discussed the contributions noted with continuing discussions till next meeting.
- One contribution on the multiplexing chain for MIMO noted with continued discussions till next meeting.
- One contribution on MIMO TDD comparing Code Reuse link level results with TxAA when applied to HSDPA.

Summary of the existing candidates:

The proposed MIMO candidates so far are from Lucent (PARC), Nortel (MPD), Mitsubishi (DSTTD), Samsung (PU2RC), Samsung (CD-SIC with TPRC), Nokia (Closed Loop MIMO with 4Tx and 2Rx), LGE (Double TxAA) and Ericsson (S-PARC). The following gives a background description on each of the proposed candidate:

- The Lucent proposal (per-antenna rate control, or PARC) transmits independent streams on each antenna, which are modulated with a common set of spreading codes. The data rates on each of the streams can be adjusted to account for each antenna's channel characteristics.

- The Ericsson proposal (selective PARC) is an adaptation of the PARC proposal.

- The Mitsubishi proposal (DSTTD-SGRC: Double Space Time Transmit Diversity with Sub-Group Rate Control) uses both spatial multiplexing and transmit diversity. Transmit diversity is achieved using STTD

- The Samsung proposal (per-user unitary rate control, or PU2RC) uses spatial multiplexing to transmit simultaneously to multiple users. Hence multiple streams are transmitted to multiple users, unlike the other MIMO proposals where multiple streams are transmitted to a single user. The transmissions are beamformed (weighted) using a unitary matrix based on the singular-value decompositions of the MIMO channels.

- The Nortel proposal (multipaths diversity, or MPD) uses spatial multiplexing with rate control on each stream. However, the difference is that each stream is transmitted each from two antennas with the spreading codes differentiated by a delay of one chip interval.

- The Nokia proposal (closed loop MIMO with 4Tx and 2Rx) is an extension to the closed loop TxD used in Rel99 using receiver diversity .

- The LGE proposal (double TxAA) is an extention to TxAA and simultaneously employs TxAA in each sub-group and spatial multiplexing with rate control.

RAN WG2:
The WI has not been treated yet.
RAN WG3:
The WI has not been treated yet.
RAN WG4:
The WI was not treated.

List of completed elements:

- Requirements
- Link level channel model
- System level channel model

List of open issues:

- System level simulation methodology
- Evaluation of MIMO proposals
- Impacts to UE and UTRAN implementation.
- Impacts to physical layer operation.
- Conclusion

Estimates of the level of completion (when possible):

50%

WI completion date review resulting from the discussion at the working group:

09/2004 (TSG-RAN#25)

References to WG's internal documentation and/or TRs:

[1] R1-040336, MIMO TR 25.876 v1.3.0