Agenda item: R99 Cleanup

Source: Motorola

Title: Closed Loop Transmit diversity status/summary in Rel99

Document for : Discussion

1. History: Rel'99 TxAA

During the last joint R1/R2 Meeting in Sophia Antipolis, one of the items discussed for deferring to Rel 4' was closed loop transmit diversity mode 2. Acording to 12A020009, "it was explained that most of these had recently been discussed in WG1. The features were discussed, with the question whether it would be beneficial from a mobile implementation/testing point of view to defer the feature." And the arguments related to WG1 discussions were

- In WG1 the verification algorithm was missing.
- Mode 2 had been shown in the past to be more complicated than Mode 1

In this summary paper, Motorola intend to reflect the status of closed loop Mode 2 and Mode 1 from performance, specification and procedural points of views and recommends that mode 2 should not be deferred alone. If the UE is implementing mode 1 then the extra effort to develop and test mode 2 is relatively small and so should not cause problems to mobile availability.

1. STABILITY IN THE WG1 SPECIFICATIONS :

- Closed loop transmit diversity, both mode 1 and 2, were included in the specification at the same time in 1999, thus mode 2 have been in the specifications as long as mode 1. When the specification were developed it was recognised that mode 2 offers better performance than mode 1 at lower UE speeds (Motorola estimates up to 40km/h), including complexity issues [1], [2], [6].

- UE performance and testing specs in 25.101 and 34.121 are exactly the same, except that mode 2 performance requirements are better (lower transmit power needed for same Rx performance, giving higher system capacity) [3], [4], [6]. The single clause dealing with modes 1 and 2 in 25.101 is appended to this document.

- Moreover, it should be noted that verification is an optional feature for mode 1 which is only described in an informative annex. An example verification algorithm for mode 2 was described in August 2000 in R1-00-1087 [5]. Text could easily be added from R1-00-1087 to the informative annex of 25.214 describing verification for mode 2, if RAN feels that more informative information in the R99 specs is desirable. Alternatively the relevant informative annex could be removed altogether

2. RECENT CONSOLIDATING RESULTS

- Recent results for the extensions of mode 2, for example, system capacity vs STTD [6], for more than 2 elements [6], [7] or for packet data application [8] have consolidated the benefits of mode 2. Moreover, for the 4 elements extensions, mode 2 provides better results than mode 1 extensions with respect to the main draw back of closed loop transmit diversity, i.e. speed.

3. CONCLUSION

Given the above summary on the status of mode 1 and mode 2, it does not seem reasonable to defer mode 2 alone. Furthermore if mode 2 is deferred to release 4, the benefits of mode 2 may not be fully exploitable in the future due to the presence of legacy R99 UEs. If the UE is implementing mode 1 then the extra effort to develop and test mode 2 is relatively small and so should not cause problems to mobile availability.

References

[1] Motorola, Progressive Refined Tx AA Modes, TSGR1#7(99)c11, Aug 30-Sep 3, Hannover Germany.

[2] Motorola, UE Complexity Considerations of Feedback Mode Transmit Diversity, TSG TSGR1#3(99) 297, 22-26th March 1999, Stockholm.

[3] Motorola, Performance of closed loop transmit diversity mode 1 and 2, TSGR4#12(00)0517, 22-26 May 2000, Turku, Finland

[4] Motorola, DL demodulation of DCH in closed loop transmit diversity mode simulation, TSGR4#9 (99) 99903, 7-10th November1999, Bath , UK

[5] Motorola, Verification algorithm for closed loop transmit diversity mode 2, TSGR1#15(00)1087, 22-26th, August, 2000, Berlin, Germany

[6] Motorola, Text proposal for TR 25.869 on Tx Diversity mode 2 extensions to more than 2 transmitting antennas, and comments on R1-02-0117, TSGR1#24, Febuary 18-22, Orlando, USA.

[7] Motorola, Text proposal for TR 25.869 on Tx Diversity mode 2 extensions to more than 2 transmitting antennas, R1-02-0122, 3GPP TSG RAN WG1#23

[8] Motorola, Closed Loop Transmit Diversity for DSCH during SHO, TSGR1#24(02)0392, TSGR1#24, Febuary 18-22, Orlando, USA.

Annex – Extract from 25.101 v3.9.0

8.6.2   Demodulation of DCH in closed loop transmit diversity mode

The receive characteristic of the dedicated channel (DCH) in closed loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.2.1 Minimum requirement

For the parameters specified in Table 8.21 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power shall be below the specified value for the BLER shown in Table 8.22.

Table 8.21: Test Parameters for DCH Reception in closed loop transmit diversity mode (Propagation condition: Case 1)

Parameter	Unit	Test 1 (Mode 1)	Test 2 (Mode 2)
$\hat{I}_{or}/I_{oc}$	dB	9	9
I_{oc}	dBm/3.84 MHz	-60	-60
Information data rate	kbps	12.2	12.2
Feedback error rate	%	4	4

Table 8.22: Test requirements for DCH reception in closed loop transmit diversity mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (see note)	BLER
1	-18.0 dB	10^{-2}
2	-18.3 dB	10^{-2}
NOTE: This is the total power from both antennas. Power sharing between antennas are feedback mode dependent as specified in TS25.214.		