
Agenda item: 7.1.2 WG1
Source: Motorola
Title: On the Applicability of Release 5 Closed Loop Transmit Diversity Modes
Document for: Decision

1. SUMMARY AND RECOMMENDATIONS

Closed loop transmit diversity was adopted for use with HSDPA in RAN #17. At that time, closed loop transmit diversity mode 2 was left for further study in RAN1. This contribution discusses the issue identified in RAN1 #28 regarding closed loop transmit diversity mode 2 and more general considerations regarding the selection of closed loop modes in RAN1. Our observations may be summarized:

- **As in release '99, both modes are beneficial under different conditions, although mode 2 performs best at the slow speeds most important to HSDPA [1,2,3].** This greater performance of mode 2 is reflected in its more stringent minimum performance spec for release 99 in 25.101 [4]. Mode 2 is also more flexible, since it can be applied in any slot format. However, mode 1 typically has greater performance at higher speeds.
- **Since verification is not mandatory for the UE at present, it should not be the sole criterion for deciding on the applicability of closed loop modes.** The performance of UE based closed loop weight verification is the sole issue regarding closed loop mode applicability identified as requiring further study in RAN1 [5]. While UE weight verification is beneficial, there has been no suggestion to make it mandatory for HSDPA. In fact, RAN4 recently agreed that it is not mandatory [6] and to exclude it from performance simulation assumptions. Note that additional techniques exist to improve closed loop performance, such as Node B based weight verification, etc. [7], [8].
- **Excluding a closed loop mode complicates the UE implementation of release '99 channels with HSDPA.** Since a single set of closed loop weights must be applied per cell to all channels for a given UE, excluding a closed loop mode from use on the HS-DSCH will exclude its simultaneous use on a release '99 DPCH. Adopting both modes then simplifies compatibility with the mandated use of both closed loop modes in release '99 UEs.
- **Including both closed loop modes in HSDPA is consistent with the reuse of other release '99 features.** It has been discussed (in RAN1 [9] and RAN4, for example) that since HSDPA is an extension of release '99, if there is no technical reason prohibiting co-existence of HSDPA and an existing release '99 feature, by default HSDPA should support that feature. It is our feeling that the benefits of both modes over open-loop and single antenna have been consistently shown [2,10-13], and while there may not be consensus on the two modes' relative performance, there has not been shown a technical reason preventing coexistence of HSDPA and either mode.
- **Closed loop mode 2 has been observed to be particularly beneficial for extensions of closed loop diversity.** Four element diversity techniques showing good performance for an extension of closed loop mode 2 have been reported [14], while a two element multiuser diversity scheduling technique for HSDPA has been shown to have the best performance with mode 2 due to the greater resolution of its code book [15,16].

Recommendations

- a) In view of the higher capacity, greater compatibility with release '99, and consistent use of release '99 features, we recommend that both closed loop modes be adopted for use with HSDPA.
- b) Note that the discussion of performance of UE based closed loop weight verification has not yet reached consensus in RAN1 [17]. If it is felt that verification and the lack of consensus on its performance warrant exclusion of closed loop mode 2, we would suggest that RAN1 clarify if verification will be mandatory in release 5 UEs supporting HS-DSCH. If it is mandatory, the performance assumptions in RAN4 will require revision.

2. REFERENCES

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