

Title: Requirements for flexibility of Tx diversity

Source: NTT DoCoMo

1. Introduction

In RAN WGs, it seems that Tx diversity has been discussed and specified assuming that

- 1) Any Tx diversity mode can be used in any cells,
- 2) Adjustment timing of closed loop mode is common among all cells in the active set of the UE.

Considering practical operation of commercial system, however, it is needed to allow difference of Tx diversity mode and on/off status between cells and difference of adjustment timing for closed-loop mode between cells. For these flexibility, further studies in WG1, WG2 and WG3 are needed. In order to proceed and conclude these issues, this document clarifies requirements for these flexibilities.

2. Difference of Tx diversity mode and on/off status between cell sites

It seems that Tx diversity has been discussed and specified in WGs assuming that any Tx diversity mode can be used in any cells. In practical operation, it is expected that there are cell sites to which Tx diversity cannot be applied due to no space to set two tx antennas or no space to lay tx antenna cables. And, lower cost BTSs might implement part of or none of Tx diversity modes.

Considering these practical operation scenarios, WG1, WG2 and WG3 need to study flexibility for difference of Tx diversity mode and on/off status between cells.

Requirement for this flexibility is as following.

PCCPCH

- UE can know STTD on/off of PCCPCH via SCH demodulation output or signalling on BCH. There is no requirement to higher layer for the flexibility of STTD on/off in each cell.

SCCPCH, PICH, AICH

- **It is needed that UE can know STTD on/off of SCCPCH, PICH, and AICH, separately, before receiving these physical channels by the UE. Broadcasting the on/off status of each physical channel via BCH seems to be preferable.**

DPCH

- From layer 1 point of view, there is serious problem if Tx diversity mode used in the UE is different from that of the BTS which communicates with the UE. On the other hand, there is no serious problem (except for a little performance degradation) if on/off status is different between the UE and the BTS. **Therefore, it is needed to use same Tx diversity mode between the UE and the BTSs in the active set of the UE. It is not needed to set same Tx diversity on/off status between the UE and the BTSs in the active set of the UE.**

(Initial establishment case)

- **It is needed that UE can know Tx diversity mode to be applied to the DPCH and Tx diversity on/off via signalling before DPCH establishment.**

(HHO case)

- **It is needed that the UE can switch Tx diversity mode or on/off status when establishing the new DPCH.**
- **It is needed that UE can know Tx diversity mode and Tx diversity on/off to be applied to the target DPCH via signalling before new DPCH establishment.**

(SHO case)

- From UE implementation point of view, it is needed that Tx diversity mode and on/off status should be same among cells in the active set of the UE. Therefore, **it is needed that UTRAN can designate Tx diversity mode and on/off to the UE as information to be applied to all cells in the active set.**
- **Tx diversity mode and on/off status should be designated to BTS on UE basis, not cell basis, because it is needed that Tx diversity mode and on/off can be changed according to Tx diversity implementation status of BTSs in the active set of the UE.**
- **It is needed that Tx diversity mode and on/off status can be changed during communications according to change of cells in the active set of the UE.**

3. Difference of adjustment timing for closed-loop mode between cells

In practical operation, it is expected that variety of cell size will be used, and the adjustment timing might be different between neighbouring cells. However, current specifications seem not to be enough to cope with this difference. Considering practical cell design, WG1, WG2 and WG3 need to study flexibility for difference of adjustment timing for closed-loop mode between cells.

Requirement for this flexibility is as following.

DPCH

(Initial establishment case)

- **It is needed that UE can know adjustment timing via signalling before DPCH establishment.**

(HHO case)

- **It is needed that the UE can switch adjustment timing when establishing the new DPCH.**
- **It is needed that UE can know adjustment timing to be applied to the new DPCH via signalling before new DPCH establishment.**

(SHO case)

- From UE implementation point of view, it can be allowed to use different adjustment timing among cells in the active set of the UE. From performance point of view, it is preferable to use shorter control delay for adjustment if cell size is not so big. Therefore, **it is needed that UTRAN can designate adjustment timing of each cell to the UE. And UE can operate different adjustment timing among cells in the active set of the UE. The adjustment timing should be set to the BTS on cell basis. It is not needed to set it on UE basis.**

4. Conclusion

In this document, requirements for flexibility of difference of Tx diversity mode and on/off status between cells and difference of adjustment timing for closed-loop mode between cells are clarified. If above requirements are noted in WG1, LS should be sent to WG2 and WG3 to inform these requirements as requirements for release 99. Concerning layer 1 specifications, no CR seems to be needed for these flexibility. However, further study is expected in WG1#11.