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Agenda Item:
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1. Introduction

During its 8th meeting, RAN WG1 discussed the liaison statement from WG3, R1-99f26, “Liaison statement to RAN-WG1 regarding Adjustment Loop for DL power drifting”. In that liaison statement, RAN WG3 asked questions about the convergence coefficient in adjustment loop, but RAN WG1 has not yet answered to the questions. In this contribution, we would like to explain the benefit of the convergence coefficient and the benefit of setting the parameter per UE.

2. Benefit of convergence coefficient

With the convergence coefficient “r”, it is possible to control the speed of power adjustment. If the value is very close to one, the speed of power adjustment will be very slow. As the value becomes smaller, the speed of adjustment becomes faster. However, this may increase the impact on inner-loop power control if the value is too small. In principle, the convergence coefficient “r” should be determined considering the step size of inner-loop power control and the dynamic range of downlink power so that the impact on inner-loop power control is negligible.

3. Benefit of setting the convergence coefficient per UE

If adjustment loop is employed in all Node-Bs, we do not find any good reasons to dynamically change the value of the convergence coefficient “r”. However, some of the Node-Bs in the UTRAN may not employ adjustment loop, and a UE may be in soft handover mode between a Node-B with adjustment loop capability and a Node-B without adjustment loop capability. In this case, adjustment loop may cause additional power drifting if RNC cannot stop the adjustment loop for the UE. If it is possible to set the convergence coefficient per UE, RNC is able to stop adjustment loop by setting one to “r”.

Appendix: Principle of adjustment loop

Adjustment loop is used for balancing downlink power among active set cells during soft handover. For adjustment loop, DL reference power P_{REF} and DL power convergence coefficient r $(0\ \ r\ \ 1)$ are set in the active set cells during soft handover so that the two parameters are common to the cells. For simplicity, DL powers of two cells are considered in this explanation. Adjustment loop works in addition to inner loop power control, and DL power at slot i of two cells, $P_1(i)$, and $P_2(i)$, are updated at a certain interval (typically in every slot as in this explanation) as follows:

$$P_1(i+1) = P_1(i)+(1 - r)(P_{REF} - P_1(i))+S_{INNERLOOP1}(i) \qquad (1)$$
$$P_2(i+1) = P_2(i)+(1 - r)(P_{REF} - P_2(i))+S_{INNERLOOP2}(i) \qquad (2)$$

The difference is derived from equations (1) and (2) if TPC error does not occur i.e. $S_{INNERLOOP1}(i)$ and $S_{INNERLOOP2}(i)$ are equal.

$$P1(i+1) - P2(i+1) = r(P1(i) - P2(i)) = r^i(P1(1) - P2(1)) \qquad (3)$$

Equation (3) means that the difference converges at zero when r is smaller than one.