

Agenda Item: 14.2
Source: QUALCOMM Europe
Title: **UE Measurement Schemes for Intra-Frequency Measurements**
Document for: Discussion

1 Introduction

In chapter 15 of 25.331 [1] six intra-frequency reporting events are outlined. In this contribution two additional intra-frequency reporting events are proposed. The major difference between the existing and the new reporting events is that the new ones take into account that the combined signal received by all the Primary CCPCH in the active set drive the performance of the UE. In particular the proposed UE reporting events are based on multiple Primary CCPCH at the same time and give a good indication to UTRAN of the need to add or delete Primary CCPCH from the active set. The definition of the new reporting events is structured as a natural extension of the existing reporting events and the same mechanisms for modifying intra-frequency measurement reporting behaviour (hysteresis, time-to-trigger, cell individual offset) as defined in [1] and [2] can be applied to the proposed reporting events.

2 Description of the proposed schemes

The six intra-frequency reporting events already defined in chapter 15 of 25.331 [1] are:

- Reporting event 1A - A Primary CCPCH enters the reporting range;
- Reporting event 1B - A primary CCPCH leaves the reporting range;
- Reporting event 1C - A non-active primary CCPCH becomes better than an active primary CCPCH;
- Reporting event 1D - Change of best cell;
- Reporting event 1E - A Primary CCPCH becomes better than an absolute threshold;
- Reporting event 1F - A Primary CCPCH becomes worse than an absolute threshold.

All the above reporting events are based on the measurement of one or two Primary CCPCH; the events are triggered when an inequality between the measurement values (or between a measurement value and a fixed quantity) is no more satisfied.

We propose to extend the above schemes by using a measurement that is function of more than one Primary CCPCH. In particular we propose the introduction of a dynamic reporting range, to be used in the following two cases:

- Reporting event 1G – A Primary CCPCH enters the dynamic reporting range;
- Reporting event 1H – A Primary CCPCH leaves the dynamic reporting range.

3 Reporting event 1G – A Primary CCPCH enters the dynamic reporting range

If the UE measures the E_c/I_o of the Primary CCPCH, this event is triggered when:

$$10 \cdot \text{Log} \left(\frac{\text{NewPCCPCH} - E_c}{I_o} \right) \geq \text{Max} \left\{ \begin{array}{l} \text{AbsoluteThreshold(Add)} \\ S \cdot 10 \cdot \text{Log} \left(\sum_{i=1}^{N_A} \frac{\text{PCCPCH}_i - E_c}{I_o} \right) + I_A \end{array} \right.$$

where: NewP-CCPCH belongs to a cell not in the active set

N_A = Number of P-CCPCH in A (Active set)

S = Slope

I_A = Add Intercept

If the UE monitors the SIR of the Primary CCPCH, this event is triggered when:

$$10 \cdot \text{Log} \left(\frac{\text{NewPCCPCH} - \text{RSCP}}{\text{ISCP}} \right) \geq \text{Max} \left\{ \begin{array}{l} \text{AbsoluteThreshold(Add)} \\ S \cdot 10 \cdot \text{Log} \left(\sum_{i=1}^{N_A} \frac{\text{PCCPCH}_i - \text{RSCP}}{\text{ISCP}} \right) + I_A \end{array} \right.$$

where: RSCP = Received Signal Code Power

ISCP = Interference on Signal Code Power

NewP-CCPCH belongs to a cell not in the active set

N_A = Number of P-CCPCH in A (Active set)

S = Slope

I_A = Add Intercept

Note that if S is set to 0, then this reporting event is equivalent to the reporting event 1E described in Chapter 15 of TS RAN 25.331 [1].

4 Reporting event 1H – A Primary CCPCH leaves the dynamic reporting range

If the UE measures the E_c/I_o of the Primary CCPCH, this event is triggered when:

$$10 \cdot \text{Log} \left(\frac{\text{OldPCCPCH} - E_c}{I_o} \right) \leq \text{Max} \left\{ \begin{array}{l} \text{AbsoluteThreshold(Drop)} \\ S \cdot 10 \cdot \text{Log} \left(\sum_{i=1}^{N_{A'}} \frac{\text{PCCPCH}_i - E_c}{I_o} \right) + I_D \end{array} \right.$$

where: OldP-CCPCH belongs to a cell in the active set

$N_{A'}$ = Number of P-CCPCH in A' (Active Set excluding the OldP-CCPCH under investigation)

S = Slope

I_D = Drop Intercept

If the UE monitors the SIR of the Primary CCPCH, this event is triggered when:

$$10 \cdot \text{Log} \left(\frac{\text{OldPCCPCH} - \text{RSCP}}{\text{ISCP}} \right) \leq \text{Max} \left\{ \begin{array}{l} \text{AbsoluteThreshold(Drop)} \\ S \cdot 10 \cdot \text{Log} \left(\sum_{i=1}^{N_{A'}} \frac{\text{PCCPCH}_i - \text{RSCP}}{\text{ISCP}} \right) + I_D \end{array} \right.$$

where: RSCP = Received Signal Code Power

ISCP = Interference on Signal Code Power

OldP-CCPCH belongs to a cell in the active set

$N_{A'}$ = Number of P-CCPCH in A' (Active Set excluding the OldP-CCPCH under investigation)

S = Slope

I_D = Drop Intercept

Note that if S is set to 0, then this reporting event is equivalent to the reporting event 1F described in Chapter 15 of TS RAN 25.331 [1].

5 Conclusions

In this contribution two intra-frequency reporting events are proposed. They are based on the measurements of multiple Primary CCPCH and are aimed at optimising the report measurements when macro-diversity (soft handoff) is applied. When the active set is constituted by a single Primary CCPCH (no macro-diversity), the proposed schemes fall back to the already existing intra-frequency reporting events.

In the proposed schemes the measurements of the Primary CCPCH can be replaced by the measurements of the Common Pilot Channel (CPICH), if applicable.

6 References

- [1] TS RAN 25.331 V1.2.0, "RRC protocol specification"
Source: TSG RAN WG 2
- [2] TSGR2#5(99)591, "UE Measurement Concept for Intra-Frequency Measurements"
Source: Ericsson