3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

***Document* R1-99l59**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.214	CR	042r1	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG RAN #6	For approval	X	Strategic		*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic		*use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*

(U)SIM		ME		UTRAN / Radio	X	Core Network	

Source: NEC **Date:** 1999-12-3

Subject: Inclusion of adjustment loop in downlink power control

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	X
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: To align with Layer 2/3 specifications, regarding adjustment loop control.

Clauses affected: 5.2.1.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

5.2.1.2 Ordinary transmit power control

5.2.1.2.1 General

The downlink inner-loop power control adjusts the network transmit power in order to keep the received downlink SIR at a given SIR target, SIR_{target}. A higher layer outer loop adjusts SIR_{target} independently for each connection.

The UE should estimate the received downlink DPCCH/DPDCH power of the connection to be power controlled. Simultaneously, the UE should estimate the received interference. The obtained SIR estimate SIR_{est} is then used by the UE to generate TPC commands according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", requesting a transmit power decrease, while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1", requesting a transmit power increase.

When the UE is not in soft handover the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH.

When the UE is in soft handover it should check the downlink power control mode (DPC_MODE) before generating the TPC command

- if DPC_MODE = 0 : the UE sends a unique TPC command in each slot and the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH
- if DPC_MODE = 1 : the UE repeats the same TPC command over 3 slots and the new TPC command is transmitted such that there is a new command at the beginning of the frame.

The DPC_MODE parameter is a UE specific parameter controlled by the UTRAN.

As a response to the received TPC commands, UTRAN may adjust the downlink DPCCH/DPDCH power. The transmitted DPCCH/DPDCH power may not exceed Maximum_DL_Power, nor may it be below Minimum_DL_Power.

< Note: It should be clarified with WG3 if Maximum_DL_Power and Minimum_DL_Power are given as absolute values or relative. >

< Note: It is not clear to what extent the UTRAN response to the received TPC commands should be specified. Until this has been clarified, the text in the paragraph below should be seen as an example of UTRAN behaviour. >

Changes of power shall be a multiple of the minimum step size $\Delta_{TPC,min}$ dB. It is mandatory for UTRAN to support $\Delta_{TPC,min}$ of 1 dB, while support of 0.5 dB is optional.

< Note: It needs to be clarified if an upper limit on the downlink power step should be specified. >

When SIR measurements cannot be performed due to downlink out-of-synchronisation, the TPC command transmitted shall be set as "1" during the period of out-of-synchronisation.

5.2.1.2.2 Adjustment loop

UTRAN may further employ adjustment loop, in which they change their calculated transmission powers *P(i)* in every slot according to the following equation:

$$P(i+1) = P(i) + S_{INNER}(i) + S_{ADJ}(i)$$

$$S_{ADJ}(i) = sign\{(1 - r)(P_{REF} - P(i))\} \min\{|(1 - r)(P_{REF} - P(i))|, S_{ADJ\_MAX}\}$$

where

$P(i)$: calculated transmission power of UTRAN access point in dBm,

$S_{INNER}(i)$: inner loop control in dB,

$S_{ADJ}(i)$: adjustment loop control in dB,

sign{x}: sign function of the value *x*, i.e. +1 when x>0, 0 when x=0, and –1 when x<0,

r: convergence coefficient ($0 \le r \le 1$),

P_{REF}: reference transmission power in dBm,

S_{ADJ_MAX}: maximum power change limit by adjustment loop in dB.

The actual change in the transmitted power level due to the adjustment loop is a value which is the nearest allowed TPC step to $S_{ADJ}(i)$. The parameters, *r*, P_{REF}, and S_{ADJ_MAX} shall be signalled by higher layers. S_{ADJ_MAX} shall be a multiple of the minimum step size $_{\text{TPC,min}}$ dB.