TSG-RAN Working Group 1 meeting #11
San Diego, USA
February 29 – March 3, 2000

TSGR1#11(00)0442

Agenda item:

Source: Nokia

7Title: CR 25.214-072r1: "Limited power raise used" - parameter in DL PC

Document for: Decision

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1. Introduction

In last RAN meeting, RAN #6, it was agreed that "RLC mode"- parameter is among those WG3 specific items that are still to be covered in release 99.

The status of this "RLC mode" -parameter is such that R3-99F23, "Indication of the used RLC mode to the Node B" from Nokia was accepted in R3 #8 meeting, and the RLC parameter was included to R3 specifications. The contents of the R3-99F23 is given as an annex of this contribution.

As it was pointed out in RAN #6 meeting, details of this issue are still missing from R3 specification. For this reason contributions R3-00464 an R3-00465 are targeted to include the details of the parameter to R3 specification, presented in next R3 meeting, and this contribution , to include the relevant parts to R1 specification, 25.214, in WG#11 meeting.

Both the R3 and R1 contributions contain the same idea that was in the original paper. The reason why these contributions are coming so late, that it was just realised pretty late, that the details were not sufficiently described in the present specification, even the idea was already accepted.

Both the R3 and R1 contributions suggest now that the name of "RLC mode" parameter is changed into "Limited power raise used", since it describes the issue more clearly, and since talking about RLC is not sensible in R1 specification.

2. Usage of "Limited power raise used" – parameter in DL PC (old "RLC mode" –parameter)

The idea was already described in the original R3 contribution, see the annex of this contribution, which contains the R3-99f23. Note, once again, that the old R3-99f23 talks about "RLC mode"-parameter, even in this contribution we suggest to change the name into "Limited power raise used".

Some simulation results are shown below, in figures 1 and 2. The solid line means normal power control, since limit is so high.

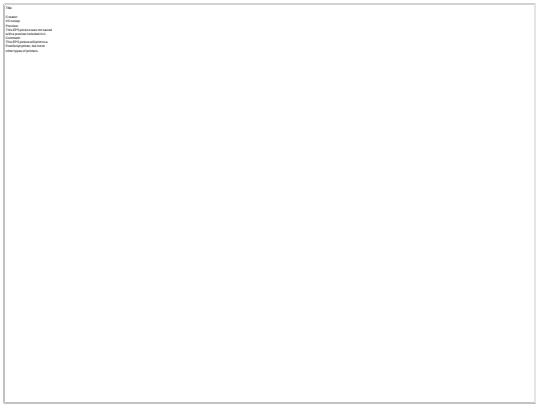

Figure 1. Tx Eb/No vs FER in 1-path channel.

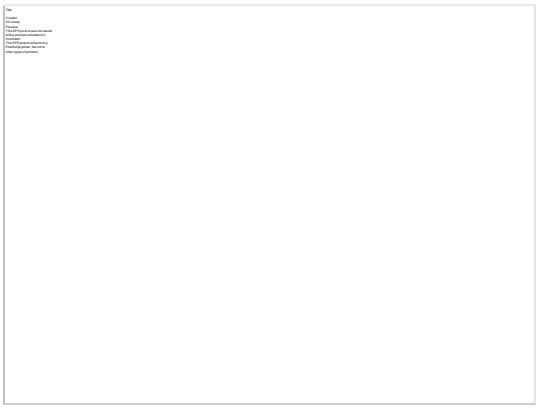

Figure 2. Tx Eb/No vs FER in Outdoor_to_Indoor_A channel.

The main results are gathered in the tables below:

1-path Rayleigh channel

20% FER- target	**Speed = 3 km/h**
W = 32, L = 20 dB	13.0 dB
W = 32, L = 5 dB	10.1 dB
W = 32, L = 3 dB	9.3 dB
W = 32, L = 1 dB	9.4 dB

Outdoor_to_Indoor_A channel

20% FER- target	**Speed = 3 km/h**
W = 32, L = 20 dB	9.9 dB
W = 32, L = 3 dB	8.4 dB
W = 32, L = 1 dB	8.7 dB

3. Conclusion and proposal to 25.214

As it is described in R3-99f23, the idea is that inner loop power control does not follow the fading dips , if the transmitter power exceeds a certain level. This is beneficial, since it minimises the created interference, when at the same time RLC retransmission takes care that required service quality is met.

The following text is proposed into 25.214:

If the value of Limited Power Raise Used parameter is 'Acknowledged', NodeB shall not increase the DL power of the RL if it exceeds by more than *Power_Raise_Limit* dB the averaged DL power used in the last *DL_power_averaging_window_size* timeslots of the same RL. *Power_Raise_Limit* and *DL_power_averaging_window_size* are parameters configured in the Node B.

Annex 1, Contents of R3-99f23, accepted in R3 #8 meeting

TSG-RAN Working Group 3, meeting # 8 *TSGR3#8(99)F23*
Abiko, Japan, 25-29 October 1999

Agenda Item: 15.3, 16.3

Source: Nokia

Title: Indication of the used RLC mode to the Node B

Document for: Approval

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1 Introduction

This contribution proposes to indicate to the Node B if one DCH is using RLC retransmission or not, in order to use the appropriate power control algorithm.

2 Discussion

The fast power control algorithm reacts to fades by increasing the transmitted power level in order to maintain the Eb/No target. This sudden increase of transmitted power can be very fast (the power control command is given 15 times per radio frame) and if the fades is deep, this causes a sensible increase of interference level.

Such sudden increase of the transmitted level shall be avoided, or at least controlled, when a RLC retransmission is used, because the radio frame received during the deep fade can be discarded and retransmitted later.

For this reason a power control algorithm optimized especially for packet data (RLC retransmission) shall be used. The optimum algorithm does not increase the transmitted power over a dynamic threshold, which reduces high power spikes caused by deep fading dips. The gain of such an optimised algorithm compared with normal 1 dB up/down power control algorithm can be up to 1 dB.

In order to use this essential features, it is needed that the indication of RLC retransmission used/not used shall be included in the message used to setup the DCH in the Node B.

Node B may then use the power control algorithm optimised for packet data when all (or part of) the DCHs multiplexed on the RL are using RLC retransmission. Note that the use of this optimised algorithm is not mandatory.

3 Proposal

It is proposed to include the 'RLC mode' parameter as a DCH parameter in the RNSAP and NBAP RL SETUP REQUEST, RL RECONFIGURATION REQUEST (in DCH to be added) and RL RECONFIGURATION PREPARE (in DCH to be added), with the following description:

> ***DCH Mode***
>
> *This parameter defines the RLC mode of the logical channels multiplexed on the transport channel. Following values are possible: 'RLC Assured Mode' and 'RLC Non Assured Mode'. This parameter can be used for an optimised power control.*

4 References

[25.423] *RNSAP specification v.1.4.1*

[25.433] *NBAP specification v.1.3.2*

3GPP TSG RAN WG1 Meeting #11
San Diego, USA, Feb 29 – Mar 3, 2000

Document R1(00)442
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	072r1	Current Version:	3.1.0

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

For submission to:	TSG-RAN #7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Nokia **Date:** 28-02-2000

Subject: Limited power raise used -parameter in DL PC

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: This parameter "Limited power raise used" has already been accepted to WG3 specification. This CR includes the definition for the usage of the parameter in Node B in downlink power control.

Clauses affected: 5.2.1.2.1

Other specs affected:

Other 3G core specifications	[ ]	→ 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:

help.doc

<--------- double-click here for help and instructions on how to create a CR

5.2 Downlink power control

The transmit power of the downlink channels is determined by the network. In general the ratio of the transmit power between different downlink channels is not specified and may change with time. However, regulations exist as described in the following sub-clauses.

5.2.1 DPCCH/DPDCH

5.2.1.1 General

The downlink transmit power control procedure controls simultaneously the power of a DPCCH and its corresponding DPDCHs. The power control loop adjusts the power of the DPCCH and DPDCHs with the same amount, i.e. the relative power difference between the DPCCH and DPDCHs is not changed.

The relative transmit power offset between DPCCH fields and DPDCHs is determined by the network The TFCI, TPC and pilot fields of the DPCCH are offset relative to the DPDCHs power by PO1, PO2 and PO3 dB respectively. The power offsets may vary in time.

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 average power of transmitted DPDCH symbols over one timeslot shall not exceed Maximum_DL_Power(dBm), nor shall it be below Minimum_DL_Power (dBm). Transmitted DPDCH symbol means here a complex QPSK symbol before spreading which does not contain DTX.

NOTE: It should still be clarified whether Maximum_DL_Power and Minimum_DL_Power are defined for one code or for one CCTrCH

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.

UTRAN may further employ following method. If the value of *Limited Power Raise Used* parameter is 'Used', UTRAN shall not increase the DL power of the RL if it would exceed by more than *Power_Raise_Limit* dB the averaged DL

power used in the last *DL_Power_Averaging_Window_Size* timeslots of the same RL. This shall only be applied after the first *DL_Power_Averaging_Window_Size* timeslots after the activation of this method.

Power_Raise_Limit and *DL_Power_Averaging_Window_Size* are parameters configured in the UTRAN.

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.