3GPP TSG RAN WG1#19 **Tdoc R1-01-0285**

Las Vegas, USA, February 27th – March 2nd , 2001

Agenda Item: Rel -99 CRs

Document for: Decision

Source: Nokia

Title: Definition of power control step size for algorithm 2

Introduction

Currently, TS25.214 Section 5.1.2.2.1 specifies that delta_TPC is a layer 1 parameter which is derived from the UE-specific higher layer parameter "TPC-StepSize", which is under the control of UTRAN. Further, there is an equation: delta_DPCCH = delta_TPC * TPC_cmd.

The problem is that UTRAN signals TPC-StepSize for PC algorithm 1 only, but not for algorithm 2 (See 25.331, Section 10.3.6.91 Uplink DPCH power control info).

10.3.6.91 Uplink DPCH power control info

Parameters used by UE to set DPCH initial output power and to use for closed-loop power control in FDD and parameters for uplink open loop power control in TDD.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
CHOICE *mode*	MP			
>FDD				
>>DPCCH Power offset	MP		Integer(-164,..-6 by step of 2)	In dB
>>PC Preamble	MP		Integer (0, 15)	
>>Power Control Algorithm	MP		Enumerated (algorithm 1, algorithm 2)	Specifies algorithm to be used by UE to interpret TPC commands
>>TPC step size	CV algo		Integer (1, 2)	In dB
>TDD				
>>UL target SIR	MP		Real (-11 .. 20 by step of 0.5dB)	In dB
>>CHOICE UL OL PC info	MP			
>>>Broadcast UL OL PC info			Null	No data
>>>Individually Signalled	OP			
>>>>Individual timeslot interference info	MP	1 to <maxTS>		
>>>>> Individual timeslot interference	MP		Individual timeslot interference 10.3.6.38	
>>>>DPCH Constant Value	OP		Constant Value 10.3.6.11	Quality Margin
>>>>Primary CCPCH Tx Power	OP		Primary CCPCH Tx Power 10.3.6.59	For Pathloss Calculation

Condition	Explanation
Algo	The IE is mandatory if "Power Control Algorithm" is set to "algorithm 1", otherwise the IE is not needed

Proposal for correction

Now, a change is needed either for TS 25.331 (TSG RAN WG2 specification) to propose that "TPC-StepSize" is signaled also for Algorithm 2, or a CR is needed for TS25.214 to specify that delta_TPC is always 1 dB for Algorithm 2. Since power control algorithm 2 is mainly supposed to emulate small step sizes, Nokia believes that there is no need to use any larger step size for algorithm 2 than 1 dB.

The proposal is to clearly state in section 5.1.2.2.1 of UL power control description that algorithm 2 only employs step size of 1 dB.

References

[1] TS25.331-v3.5.0 "RRC protocol specification", TSG RAN WG2 specification

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CR-Form-v3

CHANGE REQUEST

✍ **25.214** **CR** **158** ✍ rev **-** ✍ Current version: **3.5.0** ✍

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Proposed change affects: ✍ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title: ✍	Definition of power control step size for algorithm 2	
Source: ✍	Nokia	
Work item code: ✍		***Date:*** ✍
Category: ✍	**F**	***Release:*** ✍ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ✍	TS25.331 (RRC) speficication only defines PC step size IE for algorithm 1. Since algorithm two is used for emulating small step sizes or no PC, it does not need the 2 dB step size.
Summary of change: ✍	It is stated in section 5.1.2.2.1 that algorithm 2 will always use step size of 1 dB.
Consequences if not approved: ✍	There is ambiguity between signaling elements in RRC and L1 specification

Clauses affected: ✍	5.1.2.2.1		
Other specs affected: ✍	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	✍	
Other comments: ✍			

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Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ✍ contain pop-up help information about the field that they are closest to.
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.1.2.2 Ordinary transmit power control

5.1.2.2.1 General

The uplink inner-loop power control adjusts the UE transmit power in order to keep the received uplink signal-to-interference ratio (SIR) at a given SIR target, SIR_{target}.

The serving cells (cells in the active set) should estimate signal-to-interference ratio SIR_{est} of the received uplink DPCH. The serving cells should then generate TPC commands and transmit the commands once per slot according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1".

Upon reception of one or more TPC commands in a slot, the UE shall derive a single TPC command, TPC_cmd, for each slot, combining multiple TPC commands if more than one is received in a slot. Two algorithms shall be supported by the UE for deriving a TPC_cmd. Which of these two algorithms is used is determined by a UE-specific higher-layer parameter, "PowerControlAlgorithm", and is under the control of the UTRAN. If "PowerControlAlgorithm" indicates "algorithm1", then the layer 1 parameter PCA shall take the value 1 and if "PowerControlAlgorithm" indicates "algorithm2" then PCA shall take the value 2.

If PCA has the value 1, Algorithm 1, described in subclause 5.1.2.2.2, shall be used for processing TPC commands.

If PCA has the value 2, Algorithm 2, described in subclause 5.1.2.2.3, shall be used for processing TPC commands.

The step size $?_{TPC}$ is a layer 1 parameter which is derived from the UE-specific higher-layer parameter "TPC-StepSize" which is under the control of the UTRAN. If "TPC-StepSize" has the value "dB1", then the layer 1 parameter $?_{TPC}$ shall take the value 1 dB and if "TPC-StepSize" has the value "dB2", then $?_{TPC}$ shall take the value 2 dB. The parameter "TPC-StepSize" only applies to Algorithm 1 as stated in [5]. For Algorithm 2 $?_{TPC}$ shall always take the value 1 dB.

After deriving of the combined TPC command TPC_cmd using one of the two supported algorithms, the UE shall adjust the transmit power of the uplink DPCCH with a step of $?_{DPCCH}$ (in dB) which is given by:

$?_{DPCCH} = ?_{TPC} ?$ TPC_cmd.

5.1.2.2.1.1 Out of synchronisation handling

After 160 ms after physical channel establishment (defined in [5]), the UE shall control its transmitter according to a downlink DPCCH quality criterion as follows:

- The UE shall shut its transmitter off when the UE estimates the DPCCH quality over the last 160 ms period to be worse than a threshold Q_{out}. Q_{out} is defined implicitly by the relevant tests in [7].
- The UE can turn its transmitter on again when the UE estimates the DPCCH quality over the last 160 ms period to be better than a threshold Q_{in}. Q_{in} is defined implicitly by the relevant tests in [7]. When transmission is resumed, the power of the DPCCH shall be the same as when the UE transmitter was shut off.

5.1.2.2.1.2 TPC command generation on downlink during RL initialisation

When commanded by higher layers the TPC commands sent on a downlink radio link from Node Bs that have not yet achieved uplink synchronisation shall follow a pattern as follows:

If higher layers indicate by "First RLS indicator" that the radio link is part of the first radio link set sent to the UE

- a value 'n' is obtained from the parameter "DL TPC pattern 01 count" passed by higher layers,
- the TPC pattern shall consist of n instances of "01" plus one instance of "1",
- the TPC pattern continuously repeat but shall be forcibly re-started at the beginning of each frame where CFN mod 4 = 0.

else

- The TPC pattern shall consist of all "1".

The TPC pattern shall terminate once uplink synchronisation is achieved.

5.1.2.2.2 Algorithm 1 for processing TPC commands

5.1.2.2.2.1 Derivation of TPC_cmd when only one TPC command is received in each slot

When a UE is not in soft handover, only one TPC command will be received in each slot. In this case, the value of TPC_cmd shall be derived as follows: