

TSG-RAN Meeting #14
Kyoto, Japan, 11 – 14, December, 2001

RP-010749

Title: Agreed CR (Rel-4) to TS 25.224

Source: TSG-RAN WG1

Agenda item: 8.1.4

No.	Spec	CR	Rev	R1 T-doc	Subject	Release	Cat	W/I Code	V_old	V_new
1	25.224	073	1	R1-01-1260	Random access procedure for 1.28Mcps TDD	Rel-4	F	LCRTDD-Phys	4.2.0	4.3.0
2	25.224	074	-	R1-01-1111	Transmit diversity for P-CCPCH and PICH	Rel-4	F	LCRTDD-Phys	4.2.0	4.3.0
3	25.224	075	-	R1-01-1119	Correction of Annex A.3 in 25.224	Rel-4	F	LCRTDD-Phys	4.2.0	4.3.0
4	25.224	076	-	R1-01-1158	Removal of the remark on power control	Rel-4	F	LCRTDD-Phys	4.2.0	4.3.0
5	25.224	077	-	R1-01-1168	Corrections to DL-PC sections for 1.28 Mcps TDD	Rel-4	F	LCRTDD-Phys	4.2.0	4.3.0

CHANGE REQUEST

⌘ **25.224 CR 073** ⌘ rev **1** ⌘ Current version: **4.2.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘ Random access procedure for 1.28Mcps TDD		
Source:	⌘ TSG RAN WG1		
Work item code:	⌘ LCRTDD-Phys	Date:	⌘ 27,09,2001
Category:	⌘ F	Release:	⌘ REL-4
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		REL-4 (Release 4)
			REL-5 (Release 5)

Reason for change:	⌘ 1. The random access procedure is initiated by the PHY-ACCESS-REQ primitive, not the PHY-DATA-REQ primitive 2. Correction of Signature transmission Power setting.
Summary of change:	⌘ The primitive initiate random access procedure is changed to PHY-ACCESS-REQ. Signature transmission Power setting is corrected.
Consequences if not approved:	⌘ Inconsistency with RAN2

Clauses affected:	⌘ 5.6		
Other specs affected:	⌘ <input type="checkbox"/> Other core specifications	⌘ <input type="checkbox"/>	
	<input type="checkbox"/> Test specifications	<input type="checkbox"/>	
	<input type="checkbox"/> O&M Specifications	<input type="checkbox"/>	
Other comments:	⌘		

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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.

5.6 Random Access Procedure

The physical random access procedure described below is invoked whenever a higher layer requests transmission of a message on the RACH. The physical random access procedure is controlled by primitives from RRC and MAC.

5.6.1 Definitions

$FPACH_i$: FPACH number i

L_i : Length of RACH message associated to $FPACH_i$ in sub-frames

N_{RACH_i} : The number of PRACHs associated to the i^{th} FPACH

n_{RACH_i} : The number of a PRACH associated to the i^{th} FPACH ranging from 0 to $N_{RACH_i}-1$

M : Maximum number transmissions in the UpPCH

WT : Maximum number of sub-frames to wait for the network acknowledgement to a sent signature

SFN' : The sub-frame number counting the sub-frames. At the beginning of the frame with the system frame number $SFN=0$ the sub-frame number is set to zero.

5.6.2 Preparation of random access

When the UE is in Idle mode, it will keep the downlink synchronisation and read the cell broadcast information. From the used SYNC-DL code in DwPCH, the UE will get the code set of 8 SYNC-UL codes (signatures) assigned to UpPCH for random access.

The description (codes, spreading factor, midambles, time slots) of the P-RACH, FPACH, and S-CCPCH (carrying the FACH logical channel) channel is broadcast on the BCH.

Thus, when sending a SYNC-UL sequence, the UE knows which FPACH resources, P-RACH resources and CCPCH resources will be used for the access.

The UE needs to decode the BCH information regarding the random access prior to transmission on the UpPCH.

The physical random access procedure described in this sub-clause is initiated upon request of a ~~PHY-DataAccess-REQ~~ primitive from the MAC sub-layer (see [18] and [19]).

Before the physical random-access procedure can be initiated, Layer 1 shall receive the following information by a CPHY-TrCH-Config-REQ from the RRC layer:

- The association between which signatures and which FPACHs; which FPACHs and which PRACHs; which PRACHs and which CCPCHs; including the parameter values for each listed physical channel.
- The length L_i of a RACH message associated to $FPACH_i$ can be configured to be either 1 or 2 or 4 sub-frames corresponding to a length in time of either 5 ms or 10 ms or 20 ms.

NOTE 1: N_{RACH_i} PRACHs can be associated with to $FPACH_i$. The maximum allowed

$$N_{RACH_i} \text{ is } L_i.$$

- The available UpPCH sub-channels for each Access Service Class (ASC);

NOTE 2: An UpPCH sub-channel is defined by a (sub-set of) signature(s) and sub-frame numbers.

- The set of Transport Format parameters for the PRACH message;
- The "M" maximum number transmissions in the UpPCH;
- The "WT" maximum number of sub-frames to wait for the network acknowledgement to a sent signature; (1..4) the maximum value supported by Layer 1 is 4 sub-frames.

- ~~_____~~ The initial signature power "Signature_Initial_Power";

- [The power-ramping factor Power Ramp Step \[Integer\]](#)

NOTE 2: The above parameters may be updated from higher layers before each physical random access procedure is initiated.

At each initiation of the physical random access procedure, Layer 1 shall receive the following information from the higher layers (MAC):

- The Transport Format to be used for the specific PRACH message;
- The ASC for the specific Random Access procedure with the timing and power level indication;
- The data to be transmitted (Transport Block Set).

5.6.3 Random access procedure

The physical random-access procedure shall be performed as follows:

UE side:

- 1 Set the Signature Re-Transmission Counter to M.
- 2 Set the Signature transmission power to Signature_Initial_Power.
- 3 Randomly select the UpPCH sub-channel from the available ones for the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.
- 4 Transmit a signature using the selected UpPCH sub-channel at the signature transmission power. [In the case that the Commanded Signature transmission Power exceeds the maximum allowed value, set the Signature transmission Power to the maximum allowed power.](#)
- 5 After sending a signature, listen to the relevant FPACH for the next WT sub-frames to get the network acknowledgement. The UE will read the FPACH_i associated to the transmitted UpPCH only in the sub-frames fulfilling the following relation:

$$(\text{SFN}' \bmod L_i) = n_{\text{RACH}_i}; n_{\text{RACH}_i} = 0, \dots, N_{\text{RACH}_i} - 1,$$

- ~~6~~ [6](#) In case no valid answer is detected in the due time: [Increase the Signature transmission power by \$\Delta P_0 \equiv\$ Power Ramp Step \[dB\]](#), decrease the Signature Re-transmission counter by one and if it is still greater than 0, then repeat from step 3; else report a random access failure to the MAC sub-layer.
- 7 In case a valid answer is detected in the due time

- a) set the timing and power level values according to the indication received by the network in the FPACH_i;
- b) send at the sub-frame coming 2 sub-frames after the one carrying the signature acknowledgement, the RACH message on the relevant PRACH. In case L_i is bigger than one and the sub-frame number of the acknowledgement is odd the UE will wait one more sub-frame. The relevant PRACH is the n_{RACH_i} th PRACH associated to the FPACH_i if the following equation is fulfilled:

$$(\text{SFN}' \bmod L) = n_{\text{RACH}_i};$$

Here SFN' is the sub-frame number of the arrival of the acknowledgement.

Both on the UpPCH and on the PRACH, the transmit power level shall never exceed the indicated value signalled by the network.

Network side:

- The node B will transmit the FPACH_i associated the transmitted UpPCH only in the sub-frames fulfilling the following relation:

$$(\text{SFN}' \bmod L) = n_{\text{RACH}_i}; n_{\text{RACH}_i} = 0, \dots, N_{\text{RACH}_i} - 1,$$

- The Node B will not acknowledge UpPCHs transmitted more than WT sub-frames ago

At the reception of a valid signature:

- Measure the timing deviation with respect to the reference time T_{ref} of the received first path in time from the UpPCH and acknowledge the detected signature sending the FPACH burst on the relevant FPACH.

For examples on the random access procedure refer to Annex E.

CHANGE REQUEST

⌘ **25.224 CR 074** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘ Transmit Diversity for P-CCPCH and PICH		
Source:	⌘ TSG RAN WG1		
Work item code:	⌘ LCRTDD-Phys	Date:	⌘ 12-11-2001
Category:	⌘ F	Release:	⌘ REL-4
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		REL-4 (Release 4)
			REL-5 (Release 5)

Reason for change:	⌘ Block STTD for the P-CCPCH in TDD is optional for the UTRAN, however, its support is mandatory for the UE. While during the standardisation phase, Block STTD has been evaluated for its computational complexity, less emphasis has been put on HW implementation and practical design aspects of the method. This CR corrects Block STTD by a suitable alternative (SCTD).
Summary of change:	⌘ Replace 'Block STTD' by 'SCTD'
Consequences if not approved:	⌘ The current TxDiversity solution for the P-CCPCH in TDD will lead to major HW and design restrictions that will be burdened to TDD UE manufacturers and that will lead to not acceptable increase in complexity and costs.

Clauses affected:	⌘ 5.5.3		
Other specs Affected:	⌘ <input type="checkbox"/> Other core specifications	⌘	
	<input type="checkbox"/> Test specifications		
	<input type="checkbox"/> O&M Specifications		
Other comments:	⌘		

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5.5.3 Transmit Diversity for P-CCPCH

TSTD or ~~Space Code Block Space Time~~ Transmit Diversity (~~SCTD~~~~Block STTD~~) can be employed as transmit diversity scheme for the Primary Common Control Physical Channel (P-CCPCH).

5.5.3.1 TSTD Transmission Scheme for P-CCPCH

A block diagram of an example of a TSTD transmitter is shown in figure 8. Channel coding, rate matching, interleaving, bit-to-symbol mapping, spreading, and scrambling are performed as in the non-diversity mode. Then the data is time multiplexed with the midamble sequence. Then, after pulse shaping and modulation and amplification, P-CCPCH is transmitted from antenna 1 and antenna 2 alternately every sub-frame. If there is a DPCH that uses TSTD, TSTD is also applied to P-CCPCH. An example of the antenna-switching pattern is shown in figure 9.

5.5.3.2 ~~Block STTD~~~~SCTD~~ Transmission Scheme for P-CCPCH

The open loop downlink transmit diversity ~~employs a Block Space Time Transmit Diversity~~ scheme (~~Block STTD~~) for the P-CCPCH.

~~A block diagram of the Block STTD transmitter~~ is shown in figure 12. ~~Before Block STTD encoding,~~ channel coding, rate matching, interleaving and bit-to-symbol mapping are performed as in the non-diversity mode. In Tx Diversity mode the data sequence on P-CCPCH1 is spread with the channelisation codes $c_{16}^{(k=1)}$ and $c_{16}^{(k=3)}$ and scrambled with the cell specific scrambling code. The data sequence on P-CCPCH2 is spread with the channelisation codes $c_{16}^{(k=2)}$ and $c_{16}^{(k=4)}$ and scrambled with the cell specific scrambling code. The spread sequences on code $c_{16}^{(k=3)}$ and code $c_{16}^{(k=4)}$ are then transmitted on the diversity antenna. The power applied to each antenna shall be equal.

~~Block STTD encoding is separately performed for each of the two data fields present in a burst (each data field contains N data symbols). For each data field at the encoder input, 2 data fields are generated at its output, corresponding to each of the diversity antennas. The Block STTD encoding operation is illustrated in figure 13, where the superscript $*$ stands for complex conjugate. If N is an odd number, the first symbol of the block shall not be STTD encoded and the same symbol will be transmitted with equal power from both antennas.~~

~~After Block STTD encoding both branches are separately spread and scrambled as in the non-diversity mode.~~

The use of ~~SCTD~~ ~~Block STTD encoding~~ will be indicated by higher layers.

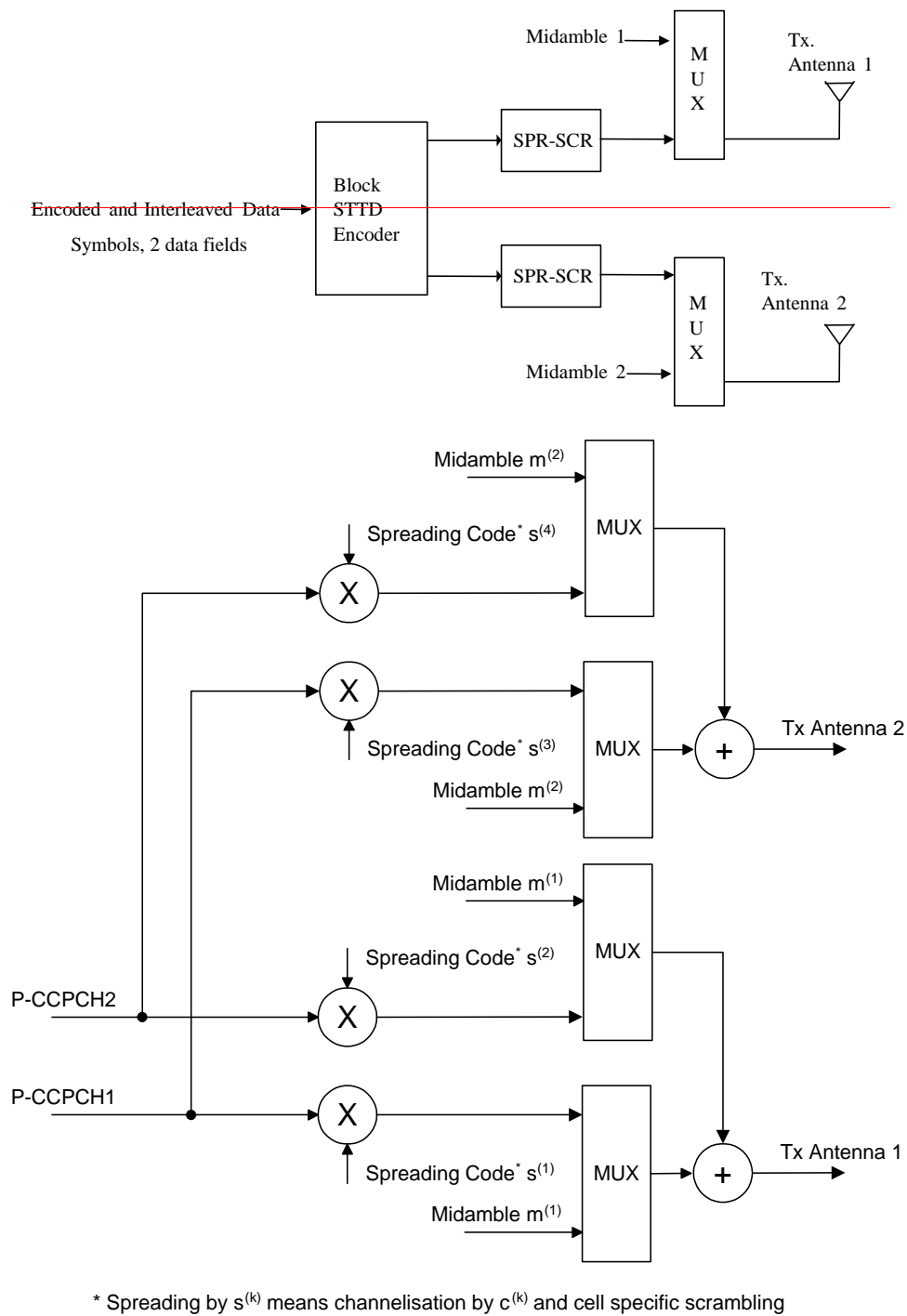


Figure 12: Block Diagram of the transmitter (SC-FTD) in 1,28 Mcps TDD

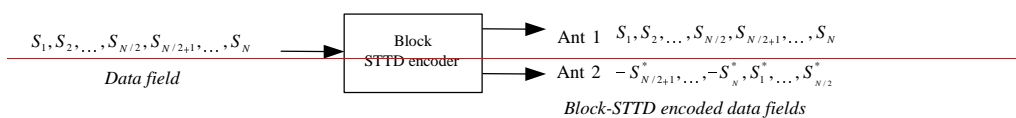


Figure 13: Block Diagram of Block STTD encoder in 1,28 Mcps TDD.

The symbols S_i are QPSK. N is the length of the block to be encoded.

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 Kyoto, Japan, 11th-14th, December, 2001

R1-01-1119

<small>CR-Form-v4</small>
<h2 style="margin: 0;">CHANGE REQUEST</h2>
⌘ 25.224 CR 075 ⌘ rev - ⌘ Current version: 4.2.0 ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘ Correction of Annex A.3 in 25.224	
Source:	⌘ TSG RAN WG1	
Work item code:	⌘ LCRTDD-Phys	Date: ⌘ Nov. 19 th , 2001
Category:	⌘ F Use <u>one</u> of the following categories: F (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.	Release: ⌘ REL-4 Use <u>one</u> 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:	⌘ There is inconsistency between the text and equation in example implementation of downlink power control in Annex A.3.
Summary of change:	⌘ The removal of delta is needed for all equations and the reference shall be changed.
Consequences if not approved:	⌘ There is the possibility of misunderstanding of the specification.

Clauses affected:	⌘ Annex A.3	
Other specs affected:	⌘ <input type="checkbox"/> Other core specifications <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications	⌘
Other comments:	⌘	

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Annex A (informative): Power Control

A.1 Example Implementation of Downlink Power Control in the UE

The power control may be realized by two cascaded control loops. The outer loop controls the transmission quality, whose reference value is set by higher layers [15], by providing the reference value for the inner loop. This reference value should be the SIR at the UE [15]. The inner loop controls the physical quantity for which the outer loop produces the reference value (e. g. the SIR) by generating TPC commands. This may be done by comparing the measured SIR to its reference value. When the measured value is higher than the target SIR value, TPC command = "down". When this is lower than or equal to the target SIR value, TPC command = "up".

In case of a downlink transmission pause on the DPCH or PDSCH, the receive power (RSCP) of the data can no longer be used for inner loop SIR calculations in the UE. In this case the UE should trace the fluctuations of the pathloss based on the P-CCPCH and use these values instead for generating the TPC commands. This pathloss together with the timeslot ISCP measurement in the data timeslot, which is ongoing, should be used to calculate a virtual SIR value:

$$SIR_{virt}(i) = RSCP_{virt}(i) - ISCP(i),$$

$$RSCP_{virt}(i) = RSCP_0 + L_0 - L(i) + \sum_{k=1}^{i-1} TPC(k),$$

RSCP:	Received signal code power in dBm
ISCP:	Interference signal code power in the DPCH / PDSCH timeslot in dBm
L:	pathloss in dB measured on the P-CCPCH. The same weighting of the long- and short-term pathloss should be used as for uplink open loop power control, see Annex A.1
i:	index for the frames during a transmission pause, $1 \leq i \leq$ number of frames in the pause
L_0 :	weighted pathloss in the last frame before the transmission pause in dB
$RSCP_0$:	RSCP of the data that was used in the SIR calculation of the last frame before the pause in dBm
TPC (k):	\pm power control stepsize in dB according to the TPC bit generated and transmitted in frame k, TPC bit "up" = +stepsize, TPC bit "down" = -stepsize

A.2 Example Implementation of Closed Loop Uplink Power Control in Node B for 1,28 Mcps TDD

The measurement of received SIR shall be carried out periodically at Node B. When the measured value is higher than the target SIR value, TPC command = "down". When the measurement is lower than or equal to the target SIR, TPC command = "up".

In case of an uplink transmission pause on DPCH, the initial uplink transmission power of DPCH after the pause can be determined by an open loop power control. After the initial transmission after the pause, a closed loop uplink power control procedure can resume.

A.3 Example Implementation of Downlink Power Control in UE for 1,28 Mcps TDD when TSTD is used

When TSTD is applied, the UE can use the consecutive measurements of SIR to calculate SIR_{AVG} :

$$SIR_{AVG}(i) = w_1 \Delta SIR(i-1) + w_2 \Delta SIR(i),$$

where, $w_1 + w_2 = 1$, $w_1 \geq 0$, $w_2 \geq 0$, and $SIR(i)$ is the measurement of SIR in sub-frame i and $SIR_{AVG}(i)$ is the measurement of SIR_{AVG} in sub-frame i . If SIR_{AVG} is greater than the target SIR value, TPC command = "down". If the SIR_{AVG} is smaller than the target SIR value, TPC command = "up".

In case of a downlink transmission pause on the DPCH, the example in Annex ~~A.2~~A.1 can be used for DL power control with $RSCP_{virt}(i)$ and $ISCP(i)$ replaced by $RSCP_{AVG}(i)$ and $ISCP_{AVG}(i)$, where

$$RSCP_{AVG}(i) = w_1 \Delta RSCP_{virt}(i-1) + w_2 \Delta RSCP_{virt}(i),$$

$$ISCP_{AVG}(i) = w_1 \Delta ISCP(i-1) + w_2 \Delta ISCP(i).$$

A.4 Example Implementation of open Loop Power Control for access procedure for 1,28 Mcps TDD

The higher layer signals (on BCH) a power increment that is applied only for the access procedure. At each new transmission of a SYNC-UL burst during the access procedure, the transmit power level can be increased by this power increment.

CR-Form-v3
CHANGE REQUEST
⌘ 25.224 CR 076 ⌘ rev - ⌘ Current version: 4.2.0 ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘ Removal of the remark on power control		
Source:	⌘ TSG RAN WG1		
Work item code:	⌘ LCRTDD-Phys	Date:	⌘ November 13, 2001
Category:	⌘ F	Release:	⌘ REL-4
	Use <u>one</u> 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)		Use <u>one</u> 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)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900.		

Reason for change:	⌘ The remark in 25.224 Table 2 section has miss-leading information. It is not necessary true that within one time slot the power control of all active code is within 20dB.
Summary of change:	⌘ The remark on power control in Table 2 section 5.1 is removed.
Consequences if not approved:	⌘ Misleading unnecessary information in the specification.

Clauses affected:	⌘ 5.1	
Other specs affected:	⌘ <input type="checkbox"/> Other core specifications <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications	⌘
Other comments:	⌘	

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version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

- 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 Transmitter Power Control

The basic purpose of power control is to limit the interference level within the system thus reducing the intercell interference level and to reduce the power consumption in the UE.

The main characteristics of power control are summarized in the following table.

Table 2: Transmit Power Control characteristics

	Uplink	Downlink
Power control rate	Variable Closed loop: 0-200 cycles/sec. Open loop: (about 200us – 3575us delay)	Variable Closed loop: 0-200 cycles/sec.
Step size	1,2,3 dB (closed loop)	1,2,3 dB (closed loop)
Remarks	All figures are without processing and measurement times	Within one timeslot the powers of all active codes may be balanced to within a range of 20 dB

Note: All codes within one timeslot allocated to the same CCTrCH use the same transmission power in case they have the same Spreading Factor.

CR-Form-v4

CHANGE REQUEST

⌘ **25.224 CR 077** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘ Corrections to DL-PC sections for 1.28 Mcps TDD		
Source:	⌘ TSG RAN WG1		
Work item code:	⌘ LCRTDD-Phys	Date:	⌘ 14.11.2001
Category:	⌘ F	Release:	⌘ REL-4
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900.		REL-4 (Release 4)
			REL-5 (Release 5)

Reason for change:	⌘ Currently the description of CL-PC for 1.28 Mcps does not consider maximum and minimum Tx_Power restrictions and therefore the NodeB has to execute all TPC commands from a UE, even if the resulting TxPower power values go below/beyond the limiting min/max values, signalled by higher layers. In this CR, the behaviour of the NodeB on reception of TPC commands is aligned with that 3.84 Mcps TDD. Furthermore a reference to Annex A.3 is corrected.
Summary of change:	⌘ The wording for CL-PC is now alligned with 3.84 Mcps PC-description. Min/max TxPower restricions do now also apply for the 1.28 Mcps TDD option.
Consequences if not approved:	⌘ Wrong description of CL-PC, leads to unlimited TxPower in the NodeB. Analysis: This CR corrects a function where rules were missing in the specification. It would not affect implementations behaving like indicated in the CR, but would affect implementations supporting the corrected functionality otherwise. It has an isolated impact on the PC functionality.

Clauses affected:	⌘ 5.1.2.4 'DPCH, PDSCH'		
Other specs affected:	⌘ <input type="checkbox"/> Other core specifications	⌘	
	<input type="checkbox"/> Test specifications		
	<input type="checkbox"/> O&M Specifications		
Other comments:	⌘		

How to create CRs using this form:

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.

5.1.2 Downlink Control

5.1.2.1 P-CCPCH

Same as that of 3,84 Mcps TDD, cf.[4.2.3.1 P-CCPCH].

5.1.2.2 The power of the F-PACH

The transmit power for the F-PACH is set by the higher layer signalling.

5.1.2.3 S-CCPCH, PICH

Same as that of 3,84 Mcps TDD, cf.[4.2.3.2 S-CCPCH , PICH].

5.1.2.4 DPCH, PDSCH

The initial transmission power of the downlink Dedicated Physical Channel is set by the higher layer signalling until the first UL DPCH arrives. After the initial transmission, the node B transits into SIR-based closed-loop TPC.

The UE should estimate signal-to-interference ratio SIR_{est} of the received downlink DPCH. The UE should then generate TPC commands and transmit the commands according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "down", while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "up".

At the Node B, soft decision on the TPC bits is performed, and when it is judged as 'down', the transmission power shall ~~may~~ be reduced by one power control step, whereas if judged as 'up', the transmission power shall be raised by one power control step.

When TSTD is applied, the UE can use two consecutive measurements of the received SIR in two consecutive sub-frames to generate the power control command. An example implementation of DL power control procedure for 1,28 Mcps TDD when TSTD is applied is given in Annex A.43.

The transmission power of one DPCH or PDSCH shall not exceed the limits set by higher layer signalling by means of Maximum DL Power (dB) and Minimum DL Power (dB). The transmission power is defined as the average power over one timeslot of the complex QPSK (or 8PSK respectively) symbols of a single DPCH or PDSCH before spreading relative to the power of the P-CCPCH.

During a downlink transmission pause, both UE and Node B shall use the same TPC step size, which is signalled by higher layers. The UTRAN may accumulate the TPC commands received during the pause. TPC commands that shall be regarded as identical may only be counted once. The initial UTRAN transmission power for the first data transmission after the pause may then be set to the sum of transmission power before the pause and a power offset according to the accumulated TPC commands. Additionally this sum may include a constant set by the operator and a correction term due to uncertainties in the reception of the TPC bits. The total downlink transmission power at the Node B within one timeslot shall not exceed Maximum Transmission Power set by higher layer signalling. If the total transmit power of all channels in a timeslot exceeds this limit, then the transmission power of all downlink DPCHs and PDSCHs shall be reduced by the same amount in dB. The value for this power reduction is determined, so that the total transmit power of all channels in this timeslot is equal to the maximum transmission power.