3GPP TSG-RAN Meeting #16 *RP-020315*
Marco Island, FL, U.S.A., 4 – 7, June, 2002

Title: **Agreed CRs (Rel-4 and Rel-5 Category A) to TS 25.224**

Source: **TSG-RAN WG1**

Agenda item: **7.1.4**

No.	Spec	CR	Rev	R1 T-doc	Subject	Phase	Cat	Work Item	V_old	V_new
1	25.224	087	-	R1-02-0397	Clarification on power control and Tx diversity procedure for 1.28 Mcps TDD	Rel-4	F	LCRTDD-Phys	4.4.0	4.5.0
2	25.224	088	-	R1-02-0397	Clarification on power control and Tx diversity procedure for 1.28 Mcps TDD	Rel-5	A	LCRTDD-Phys	5.0.0	5.1.0

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R1-02-0397

CR-Form-v5.1

CHANGE REQUEST

z	**25.224**	**CR**	**087**	z **rev**	**-**	z Current version:	**4.4.0** z

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

Proposed change affects: z (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

Title:	z	Clarification on power control and TxDiversity procedure for 1.28 Mcps TDD		
Source:	z	TSG RAN WG1		
Work item code:	z	LCRTDD-Phys	***Date:*** z	04.04.2002
Category:	z	**F**	***Release:*** z	REL-4
		Use one 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.		*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:	z	Clean up of PC/TxDiversity sections for 1.28 Mcps TDD, in order to align the WG1 specs and to avoid redundant information in different WGs.
Summary of change:	z	• Gain factors are included for the description of Power Control in 1.28 Mcps TDD, since they already exist in 25.223, also for 1.28 Mcps TDD. • The setting of PC is described redundantly in 25.331/25.433 and 25.224. It is removed from 25.224 since 25.331/25.433 is the proper place. • The use of TxDiversity for Shared Channels is aligned with what is specified in 25.221 • DwPTS replaced by DwPCH, where necessary • F-PACH replaced by FPACH, as used in 25.221, 25.222
Consequences if not approved:	z	Missing information in PC section, inconsistent description within WG1 between 25.223 and 25.224, redundant information in WG1/WG2/WG3 specifications

Clauses affected:	z	5.1 and subclauses, 5.5 and subclauses		
Other specs affected:	z	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	z	
Other comments:	z			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

5 Physical layer procedures for the 1.,28 Mcps option

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	

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

5.1.1 Uplink Control

5.1.1.1 General limits

By means of higher layer signalling, the Maximum_Allowed_UL_TX_ power for uplink may be set to a value lower than what the terminal power class is capable of. The total transmit power shall not exceed the allowed maximum. If this would be the case, then the transmit power of all uplink physical channels in a timeslot is reduced by the same amount in dB.

5.1.1.2 UpPCHTS

The transmit power for the UpPCH is set by higher layers on Oopen loop power control as described in [15]is used for UpPTS.

The transmit power level by a UE on the UpPTS shall be calculated based on the following equation:

$$P_{UpPTS} = L_{P\text{-}CCPCH} + PRX_{UpPTS,des}$$

where, P_{UpPTS} : transmit power level in dBm,

$L_{P\text{-}CCPCH}$: measured path loss in dB (P-CCPCH reference transmit power level is broadcast on BCH),

$PRX_{UpPTS,des}$: desired RX power level at cell's receiver in dBm, which is an average value and is broadcast on BCH.

5.1.1.3 PRACH

In 1.,28 Mcps TDD, the F-PACHFPACH is the response of a node B to the SYNC-UL burst of the UE. The response, a one burst long message, shall bring besides the acknowledgement to the received SYNC-UL burst, the timing and power level indications to prepare the transmission of the RACH burstPRACH.

The transmit power level on the PRACH is calculated by the following equation:

$$P_{PRACH} = L_{P\text{-}CCPCH} + PRX_{PRACH,des}$$

Where, P_{PRACH} is the UE transmit power level on the PRACH;

$PRX_{PRACH,des}$ is the desired receive power level on the PRACH, which is signalled by the higher layer signalling on the F-PACHFPACH.

5.1.1.4 DPCH and PUSCH

The closed loop power control makes use of layer 1 symbols in the DPCH and PUSCH. The power control step can take the values 1,2,3 dB within the overall dynamic range 80dB. The initial transmission power of the uplink Dedicated Physical Channelfor uplink DPCH and PUSCH is signalled by higher layers.

Closed-loop TPC is based on SIR and the TPC processing procedures are described in this section.

The node B should estimate signal-to-interference ratio SIR_{est} of the received uplink DPCH or PUSCH, respectively. The node B 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 UE, soft decision on the TPC bits is performed, and when it is judged as ‘down’, the mobile transmit power shall be reduced by one power control step, whereas if it is judged as ‘up’, the mobile transmit power shall be raised by one power control step. A higher layer outer loop adjusts the target SIR. This scheme allows quality based power control.

The closed loop power control procedure for UL DPCH and PUSCH is not affected by the use of TSTD.

An example of UL power control procedure for DPCH is given in Annex A.3.

5.1.1.4.1 Gain Factors

Same as that of 3.84 Mcps TDD, cf. [4.2.2.3.1 Gain Factors].

5.1.1.4.12 Out of synchronization handling

Same as that of 3,.84 Mcps TDD, cf.[4.2.2.3.3 Out of synchronisation handling].

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 FPACHF-PACH

The transmit power for the F-PACHFPACH is set by the higher layer signalling [16].

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 or PUSCH 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 or PDSCH, respectively. 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 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.3.

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.

5.1.2.4.1 Out of synchronisation handling

Same as that of 3,.84 Mcps TDD, cf.[4.2.3.5.1 Out of synchronisation handling].

5.5 Downlink Transmit Diversity

Downlink transmit diversity for PDSCH, DPCH, P-CCPCH, and ~~DwPTS~~ DwPCH is optional in UTRAN. Its support is mandatory at the UE.

5.5.1 Transmit Diversity for PDSCH and DPCH

Closed loop Transmit Diversity or Time Switched Transmit Diversity (TSTD) may be employed as transmit diversity scheme for downlink DPCH and PDSCH.

5.5.1.1 TSTD for PDSCH and DPCH

TSTD can be employed as transmit diversity scheme for PDSCH and downlink DPCH. An example for the transmitter structure of the TSTD transmitter is shown in figure 7. 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, modulation and amplification, DPCH and/or PDSCH is transmitted from antenna 1 and antenna 2 alternately every sub-frame. Not all DPCHs and/or PDSCHs in the sub-frame need to be transmitted on the same antenna and not all DPCHs and/or PDSCHs within a sub-frame have to use TSTD. Figure 8 shows an example for the antenna switching pattern for the transmission of DPCH/PDSCH for the case that all physical channels are transmitted with TSTD and are using the same antenna in the sub-frame.

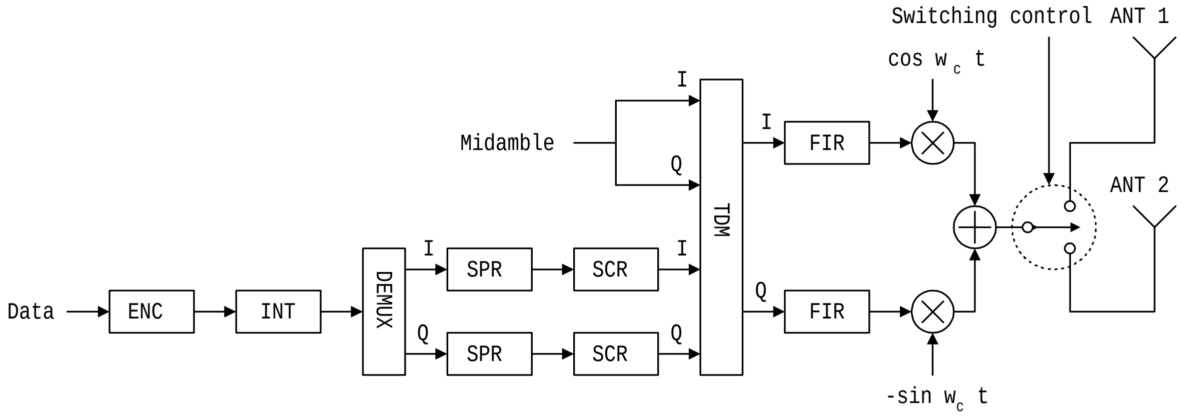

Figure 7: Example for TSTD Transmitter structure for DPCH/PDSCH and P-CCPCH.

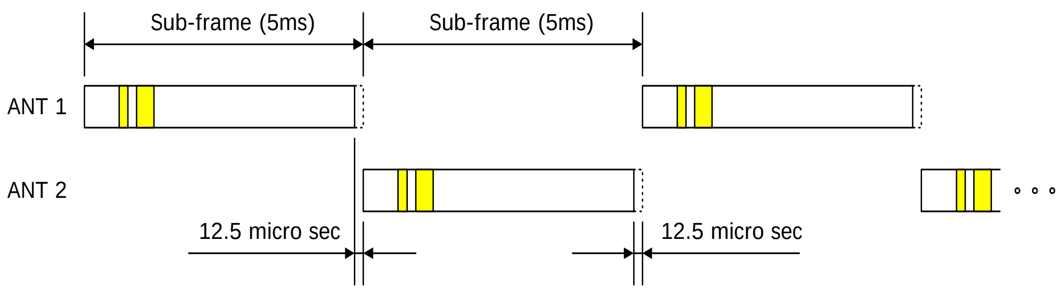

Figure 8: Example for the antenna swithing pattern for TSTD transmission of DPCH/PDSCH and P-CCPCH: all physical channels are transmitted with TSTD and are using the same antenna in the sub-frame.

5.5.1.2 Closed Loop Tx Diversity for PDSCH and DPCH

The transmitter structure to support transmit diversity for DPCH and/or PDSCH transmission is shown in figure 9. Channel coding, interleaving and spreading are done as in non-diversity mode. The spread complex valued signal is fed to both TX antenna branches, and weighted with antenna specific weight factors w_1 and w_2. The weight factors are complex valued signals (i.e., $w_i = a_i + jb_i$), in general. These weight factors are calculated on a per slot and per user basis.

The weight factors are determined by the UTRAN.

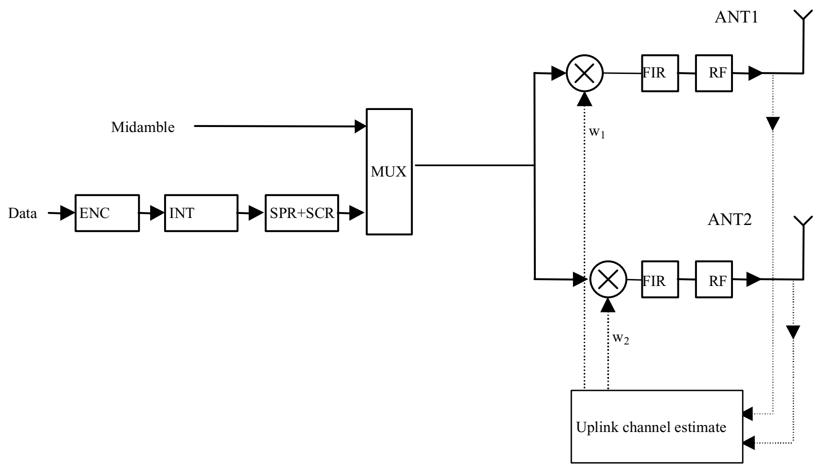

Figure 9: Downlink transmitter structure to support Transmit Diversity for DPCH and/or PDSCH transmission (UTRAN Access Point) in 1,.28 Mcps TDD

5.5.2 Transmit Diversity for DwPCHDwPTS

The transmitter structure to support transmit diversity for DwPCH transmission is shown in figure 10. DwPCH is transmitted from antenna 1 and antenna 2 alternatively.

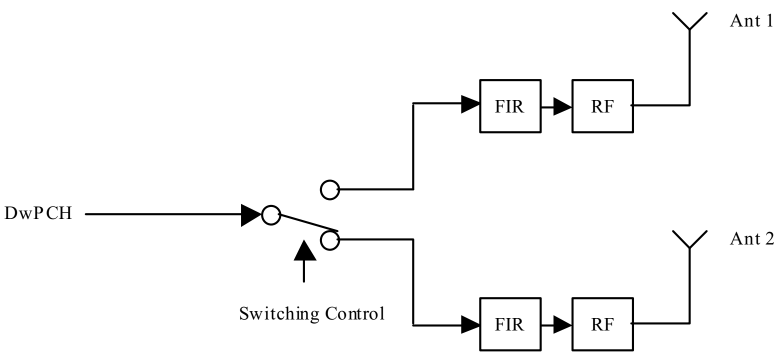

Figure 10: Downlink transmitter structure to support Transmit Diversity for DwPCH transmission (UTRAN Access Point) in 1,.28 Mcps TDdTDD

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R1-02-0397

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Work item code:	z	LCRTDD-Phys
Date:	z	04.04.2002
Category:	z	**A**
Release:	z	REL-5

Use one of the following categories:
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An example of UL power control procedure for DPCH is given in Annex A.3.

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Same as that of 3.84 Mcps TDD, cf. [4.2.2.3.1 Gain Factors].

5.1.1.4.12 Out of synchronization handling

Same as that of 3,.84 Mcps TDD, cf.[4.2.2.3.3 Out of synchronisation handling].

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The transmit power for the ~~F-PACH~~FPACH is set by the higher layer signalling [16].

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

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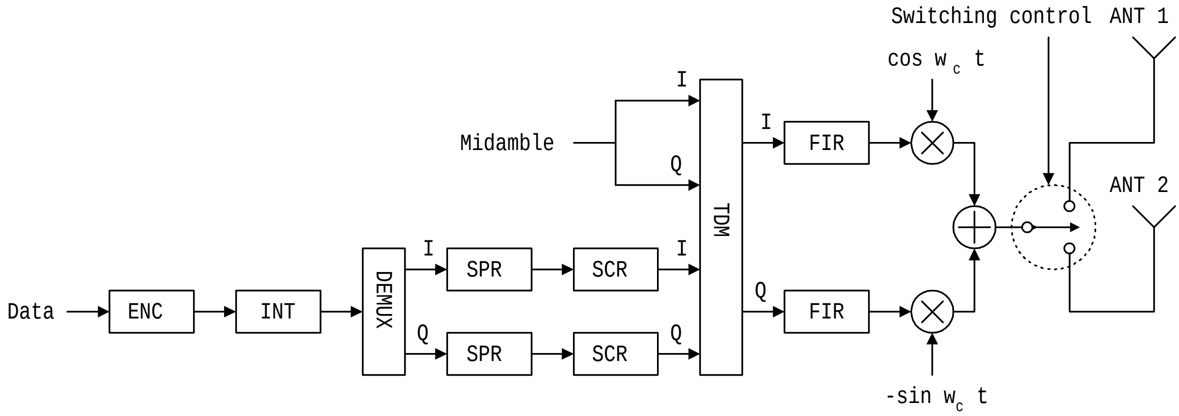

Figure 7: Example for TSTD Transmitter structure for DPCH/PDSCH and P-CCPCH.

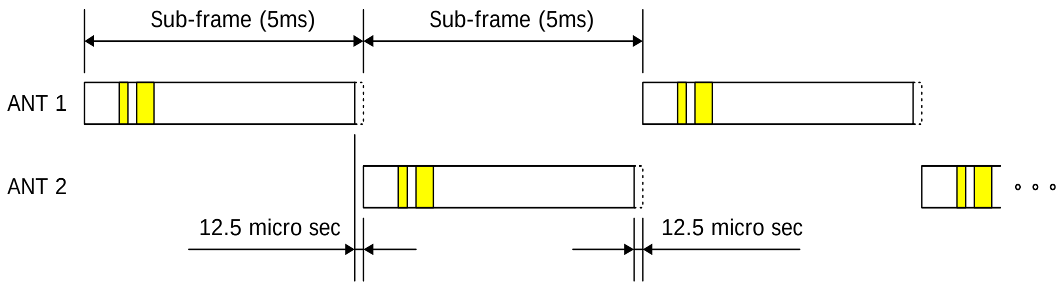

Figure 8: Example for the antenna swithing pattern for TSTD transmission of DPCH/PDSCH and P-CCPCH: all physical channels are transmitted with TSTD and are using the same antenna in the sub-frame.

5.5.1.2 Closed Loop Tx Diversity for PDSCH and DPCH

The transmitter structure to support transmit diversity for DPCH and/or PDSCH transmission is shown in figure 9. Channel coding, interleaving and spreading are done as in non-diversity mode. The spread complex valued signal is fed to both TX antenna branches, and weighted with antenna specific weight factors w_1 and w_2. The weight factors are complex valued signals (i.e., $w_i = a_i + jb_i$), in general. These weight factors are calculated on a per slot and per user basis.

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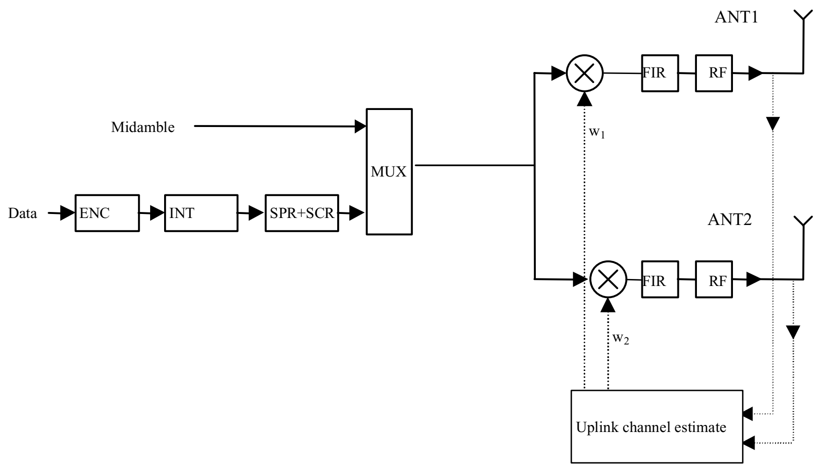

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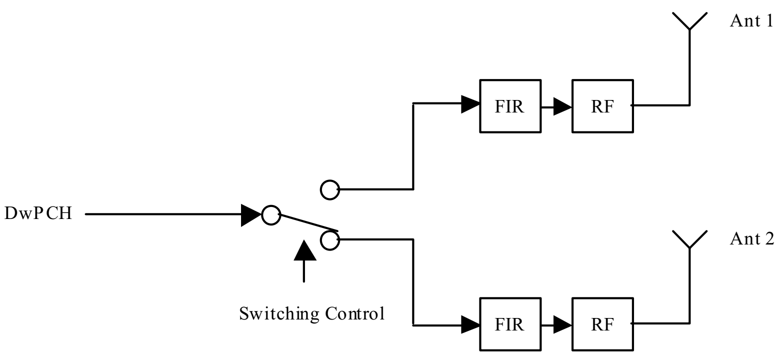

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