3GPP TSG RAN Meeting #19 **RP-030136**
Birmingham, United Kingdom, 11 - 14 March 2003

Title: **CRs (Rel-5) to TS 25.214**

Source: **TSG-RAN WG1**

Agenda item: **8.1.5**

TS 25.214 **(RP-030136)**

Doc-1st-	Doc-2nd-	Spec	CR	Rev	Subject	Phase	Ca	Versio	Versio	Workitem
RP-030136	R1-030255	25.214	299	5	CQI reporting with TxD	Rel-5	F	5.3.0	5.4.0	HSDPA-Phys
RP-030136	R1-030355	25.214	313	1	On closed loop transmit diversity mode 1	Rel-5	F	5.3.0	5.4.0	TEI-5
RP-030136	R1-030371	25.214	315	2	Clarification of SSDT and HSDPA	Rel-5	F	5.3.0	5.4.0	HSDPA-Phys

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CHANGE REQUEST

⌘	**25.214**	**CR**	**299**	⌘ **rev**	**5**	⌘	Current version: **5.3.0**	⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	CQI reporting with TxD		
Source:	⌘	TSG RAN WG1		
Work item code:	⌘	HSDPA-Phys	***Date:*** ⌘	14/02/2003
Category:	⌘	**F**	***Release:*** ⌘	REL-5
		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)* *Rel-6 (Release 6)*

Reason for change:	⌘	Clarify CQI report calculation for TxD.
Summary of change:	⌘	Clarify misleading expression when determining CQI during TxD.
Consequences if not approved:	⌘	Lack of precision in specification will lead to an incomplete implementation of CQI reporting when using TxD transmission.

Clauses affected:	⌘	6A.2				
		Y	**N**			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
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.

6A .2 Channel quality indicator (CQI) definition

Based on an unrestricted observation interval, the UE shall report the highest tabulated CQI value for which a single HS-DSCH sub-frame formatted with the transport block size, number of HS-PDSCH codes and modulation corresponding to the reported or lower CQI value could be received in a 3-slot reference period ending 1 slot before the start of the first slot in which the reported CQI value is transmitted and for which the transport block error probability would not exceed 0.1. Depending on the UE category as defined in [10], either Table 7A, 7B, 7C, 7D, or 7E should be used.

For the purpose of CQI reporting, the UE shall assume a total received HS-PDSCH power of

$P_{HSPDSCH} = P_{CPICH} + \Gamma + \Delta$ in dB,

where the total received power is evenly distributed among the HS-PDSCH codes of the reported CQI value, the measurement power offset Γ is signaled by higher layers and the reference power adjustment Δ is given by Table 7A, 7B, 7C, 7D, or 7E depending on the UE category.

Further, UE shall assume the number of soft bits available in the virtual IR buffer (N_{IR}), and redundancy and constellation version parameter (X_{RV}) as given by Table 7A, 7B, 7C, 7D, or 7E depending on the UE category. If higher layer signaling informs the UE that for the radio link from the serving HS-DSCH cell it may use a S-CPICH as a phase reference and the P-CPICH is not a valid phase reference, P_{CPICH} is the received power of the S-CPICH used by the UE, otherwise P_{CPICH} is the received power of the P-CPICH. If closed loop transmit diversity is used for the radio link from the serving HS-DSCH cell, P_{CPICH} denotes the power of the combined received CPICH ~~received power of the combined CPICH~~ from both ~~diversity~~ transmit antennas, determined as if error-free transmitter weights had been applied to the CPICH, where those weights are determined as described in sub-clause 7.2. If STTD is used, P_{CPICH} denotes the combined CPICH power received from each transmit antenna and if no transmit diversity is used P_{CPICH} ~~otherwise it~~ denotes the power received from the non~~-~~ diversity antenna.

3GPP TSG-RAN WG1 Meeting #31 *Tdoc R1-030355*
Tokyo, Japan, February 18 – 21, 2003

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CHANGE REQUEST

⌘	**25.214**	**CR**	**313**	⌘ **rev**	**1**	⌘	Current version:	**5.3.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	On closed loop transmit diversity mode 1 verification algorithm		
Source:	⌘	TSG RAN WG1		
Work item code:	⌘	TEI5	***Date:*** ⌘	20/02/2003
Category:	⌘	**F**	***Release:*** ⌘	Rel-5
		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)* *Rel-6 (Release 6)*

Reason for change:	⌘	Corrects some typographical errors in the specification.
Summary of change:	⌘	The legibility of TxAA Mode 1 antenna verification algorithm is improved
Consequences if not approved:	⌘	

Clauses affected:	⌘	A.1				
		Y	**N**			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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Annex A (informative):

A.1 Antenna verification

In closed loop mode 1, if channel estimates are taken from the Primary CPICH, the performance will also suffer if the UE can-not detect errors since the channel estimates will be taken for the incorrect phase settings. To mitigate this problem, antenna verification can be done, which can make use of antenna specific pilot patterns of the dedicated physical channel. The antenna verification can be implemented with several different algorithms. A straightforward algorithm can use a 4-hypothesis test per slot. Alternatively, a simplified beam former verification (SBV) requiring only a 2-hypothesis test per slot can be used. If we have orthogonal pilot patterns on the downlink DPCCH we can apply the SBV as follows:

Consider::

$$2\sum_{i=1}^{Npath}\frac{1}{\sigma_i^2}\left\{\sqrt{2}\,\mathrm{Re}(\gamma h_{2,i}^{(d)} h_{2,i}^{(p)^*})\right\} > \ln\left(\frac{\bar{p}(\phi_{Rx}=\pi)}{\bar{p}(\phi_{Rx}=0)}\right)$$

Tthen define the variable x_0 as, x_0 = 0 if the above inequality holds good and $x_0 = \pi$ otherwise.

Similarly consider::

$$-2\sum_{i=1}^{Npath}\frac{1}{\sigma_i^2}\left\{\sqrt{2}\,\mathrm{Im}(\gamma h_{2,i}^{(d)} h_{2,i}^{(p)^*})\right\} > \ln\left(\frac{\bar{p}(\phi_{Rx}=-\pi/2)}{\bar{p}(\phi_{Rx}=\pi/2)}\right)$$

then define the variable x_1 as, x_1 = $-\pi/2$ if the above inequality holds good and $x_1 = \pi/2$ oherwise.

Whether x_0 or x_1 is to be calculated for each slot is given by the following table:, where the first row contains the UL slot index of the feedback bit to be verified.

UL Slot	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	x_0	x_1	x_0	x_1	x_0	x_1	x_0	x_1	x_0	x_1	x_0	x_1	x_0	x_1	x_0

The estimate for the transmitted phase is now obtained fromas:

$$\sin(\phi_{Tx}) + j\cos(\phi_{Tx}) = \frac{\sum_{i=0}^{1}\sin(x_i)}{\sqrt{2}} + j\frac{\sum_{i=0}^{1}\cos(x_i)}{\sqrt{2}}$$

where:

- the x_i values are used corresponding to the current slot and the next slot, except in the case of slot 14 wherein the slot 14 and slot 1 of the next frame values are used;
- $h_{2,i}^{(p)}$ is the *i*'th estimated channel tap of antenna 2 using the CPICH;
- $h_{2,i}^{(d)}$ is the *i*'th estimated channel tap of antenna 2 using the DPCCH;
- γ^2 is the DPCH Pilot SNIR/ CPICH SNIR;
- σ_i^2 is the noise plus interference power on the *i*'th path.

In normal operation the *a priori* probability for selected pilot pattern is assumed to be 96% (assuming there are 4% of errors in the feedback channel for power control and antenna selection).

For closed loop mode 2, if channel estimates are taken from the Primary CPICH, antenna verification can also be performed, for example using a 16-hypothesis test per slot. For closed loop mode 2, the same pilot sequence is transmitted on both antennas for DPCCH. Therefore, we obtain channel estimates from the DPCCH that correspond to the combined channel from both transmitting antennas:

$$\vec{h}^{(d)} = \gamma(\beta_1\vec{h}_1 + \beta_2\vec{h}_2) + \vec{b}^{(d)}$$

where β_1, β_2 are the applied coefficients on the antennas at the UTRAN, γ is as defined above for mode 1 verification, $\vec{h}_i$ is the actual channel vector from the *i-th* antenna, and $\vec{b}^{(d)}$ is the noise vector for the DPCCH channel estimate. Furthermore we have channel estimates made on the CPICH Pilots for each antenna:

$$\vec{h}_1^{(p)} = \vec{h}_1 + \vec{b}_1^{p}$$

$$\vec{h}_2^{(p)} = \vec{h}_2 + \vec{b}_2^{p}$$

where $\vec{h}_i^{(p)}$ is the estimated channel vector using the CPICH, and $\vec{b}_i^{p}$ is the noise vector for the CPICH channel estimate, from the *i-th* antenna.

At the receiver, verification consists in choosing a pair of applied coefficients, $(\hat{\beta}_1, \hat{\beta}_2)$, which results in a combined channel estimate from CPICH which best fits the channel estimate obtained from the DPCCH, taking into account the *a priori* probability of error on the FBI bits.

One possible way of implementing verification for mode 2 is by choosing $(\hat{\beta}_1, \hat{\beta}_2)$ from the whole set of possibilities $T = \{\alpha_1, \alpha_2\}$, using the logarithmic form of the following decision rule:

$$(\hat{\beta}_1, \hat{\beta}_2) = \arg\left\langle \max_{\alpha_1,\alpha_2 \in T} \left\{ \ln(\hat{p}(\alpha_1,\alpha_2)) + \ln(\overline{p}(\alpha_1,\alpha_2)) \right\} \right\rangle$$

where the *a priori* probability $\overline{p}(\alpha_1,\alpha_2)$ for each candidate antenna coefficient pair is determined from the antenna coefficient pair asked for by the mobile, combined with the *a priori* probability of each FSM bit used to represent the antenna coefficient pair. The *a priori* probability of each FSM bit is assumed to be 96% (assuming there are 4% of errors in the feedback channel). Also

$$\ln(\hat{p}(\alpha_1,\alpha_2)) = -\left(\sum_{i=1}^{Npath} \frac{\left| h_i^{(d)} - \gamma\left(\alpha_1 h_{1,i}^{(p)} + \alpha_2 h_{2,i}^{(p)}\right) \right|^2}{\sigma_i^2 \left(1 + \gamma^2 \left(|\alpha_1|^2 + |\alpha_2|^2 \right)\right)} \right)$$

where σ_i^2 is as defined above for mode 1 verification.

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Tokyo, Japan, 18 – 21 February 2003

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CHANGE REQUEST

⌘	**25.214**	**CR 315**	⌘ **rev**	**2** ⌘	Current version:	**5.3.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘ Clarification of SSDT and HSDPA			
Source:	⌘ TSG RAN WG1			
Work item code:	⌘ HSDPA-Phys		***Date:*** ⌘	21 Feb, 2003
Category:	⌘ **F**		***Release:*** ⌘	Rel-5
	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)* *Rel-6 (Release 6)*

Reason for change: ⌘	The combination of HSDPA with SSDT is not clear.
Summary of change: ⌘	It is clarified that the combination of HSDPA with SSDT is not allowed.
Consequences if not approved: ⌘	The combination of HSDPA with SSDT is allowed is ambiguous.

Clauses affected: ⌘	5.2.1.4.1			
	Y	**N**		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	
Other comments: ⌘				

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5.2.1.4.1 General

Site selection diversity transmit power control (SSDT) is another macro diversity method in soft handover mode. This method is optional in UTRAN.

Operation is summarised as follows. The UE selects one of the cells from its active set to be 'primary', all other cells are classed as 'non primary'. The main objective is to transmit on the downlink from the primary cell, thus reducing the interference caused by multiple transmissions in a soft handover mode. A second objective is to achieve fast site selection without network intervention, thus maintaining the advantage of the soft handover. In order to select a primary cell, each cell is assigned a temporary identification (ID) and UE periodically informs a primary cell ID to the connecting cells. The non-primary cells selected by UE switch off the transmission power. The primary cell ID is delivered by UE to the active cells via uplink FBI field. SSDT activation, SSDT termination and ID assignment are all carried out by higher layer signalling.

SSDT is only supported when the P-CPICH is used as the downlink phase reference and closed loop mode transmit diversity is not used simultaneously. Simultaneous operation of SSDT and HS-SCCH reception is not supported.

UTRAN may also command UE to use SSDT signalling in the uplink although cells would transmit the downlink as without SSDT active. In case SSDT is used in the uplink direction only, the processing in the UE for the radio links received in the downlink is as with macro diversity in non-SSDT case. The downlink operation mode for SSDT is set by higher layers. UTRAN may use the SSDT information for the PDSCH power control as specified in section 5.2.2 and for the TFCI power control in hard split mode. Simultaneous operation of SSDT signalling in the uplink and HS-SCCH reception is not supported.

NOTE: This feature of SSDT limited to uplink only applies to terminals that are DSCH capable.