TSG-RAN Working Group 1 meeting #11 *TSGR1#11(00)0212*
San Diego, USA
February 29 – March 3, 2000

Agenda item:

Source: NEC

Title: CR 25.214-062: Editorial corrections

Document for: Approval

Following is a list of editorial corrections for TS 25.214 V3.1.0:

- p.9, Section 5.1.1.2:
  2nd line: “5.1.2.4” → “5.1.2.5”

- p.14, Section 5.1.2.5.1:
  7th line: “5.1.2.4.2 and 5.1.2.4.3” → “5.1.2.5.2 and 5.1.2.5.3,”

- p.20, Section 5.2.2:
  Section title: “Power Control with DSCH” → “PDSCH”
  1st line: “DSCH” → “PDSCH”

- p.21, Section 6.1:
  13th line: “offser” → “offset”
  last 14th line: “usch” → “such”
  last 2nd line: add “(AI neq +1 nor –1)” after “acquisition indicator”

- p.26, Section 8.1:
  17th line: “FB Mode” → “Closed Loop Mode”

- pp.31 – 32, Section 8.3.2:
  Title of Table 12: “closed mode” → “closed loop mode”

- p.32, Section 8.3.3.1:
  Title of Table 13: “FB mode 2 compressed” → “closed loop mode 2 in compressed”

- p.36, Annex A:
  1st line: “FB” → “closed loop”
  1st line: “CCPCH” → “CPICH”
  two inequations: “2” in braces → “$\sqrt{2}$”
  equation: “2” in denominators → “$\sqrt{2}$”
  last 7th line: “PCCPCH” → “CPICH”
  last 5th line: “PCCPCH pilot” → “CPICH”
  last 4th line: remove, since “a_i” does not appear any more.
  last 3rd line: “interference” → “interference power”

3GPP TSG RAN WG1 Meeting #11
San Diego, USA, 29 February – 3 March 2000

Document* *R1-00-0212
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** **062** 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
list expected approval meeting # here ↑

for approval ☒
for information ☐

strategic ☐
non-strategic ☐
(for SMG use only)

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 ☒ Core Network ☐
(at least one should be marked with an X)

Source: NEC **Date:** 21 Feb 2000

Subject: Editorial corrections

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	☐
C	Functional modification of feature	☐
D	Editorial modification	☐

Release:

Phase 2	☐
Release 96	☐
Release 97	☐
Release 98	☐
Release 99	☒
Release 00	☐

Reason for change: Editorial corrections

Clauses affected: 5.1.1.2, 5.1.2.5.1, 5.2.2, 6.1, 8.1, 8.3.2, 8.3.3.1, Annex A

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:

5.1.1.2 Setting of PRACH control and data part power difference

The message part of the uplink PRACH channel shall employ gain factors to control the control/data part relative power similar to the uplink dedicated physical channels. Hence, section 5.1.2.~~4~~5 applies also for the RACH message part, with the differences that:

- b_c is the gain factor for the control part (similar to DPCCH),
- b_d is the gain factor for the data part (similar to DPDCH),
- no inner loop power control is performed.

5.1.2.5.1 General

The uplink DPCCH and DPDCH(s) are transmitted on different codes as defined in section 4.2.1 of TS 25.213. The gain factors β_c and β_d may vary for each TFC. There are two ways of controlling the gain factors of the DPCCH code and the DPDCH codes for different TFCs in normal (non-compressed) frames:

- b_c and b_d are signalled for the TFC, or
- b_c and b_d is computed for the TFC, based on the signalled settings for a reference TFC.

Combinations of the two above methods may be used to associate b_c and b_d values to all TFCs in the TFCS. The two methods are described in sections 5.1.2.~~4~~5.2 and 5.1.2.~~4~~5.3, respectively. Several reference TFCs may be signalled from higher layers.

The gain factors may vary on radio frame basis depending on the current TFC used. Further, the setting of gain factors is independent of the inner loop power control. This means that at the start of a frame, the gain factors are determined and the inner loop power control step is applied on top of that.

Appropriate scaling of the output power shall be performed by the UE, so that the output DPCCH power follows the inner loop power control with power steps of $\pm\Delta_{TPC}$ dB.

The gain factors during compressed frames are based on the gain factors defined in normal frames, as specified in 5.1.2.5.4.

5.2.2 ~~Power Control with~~ PDSCH

The PDSCH power control can be based on the following solutions, which are selectable, by the network.

- Inner-loop power control based on the power control commands sent by the UE on the uplink DPCCH.
- Slow power control.

6.1 Physical random access procedure

The physical random access procedure described in this section is initiated upon request of a PHY-Data-REQ primitive from the MAC sublayer (cf. TS 25.321).

Before the physical random-access procedure can be initiated, Layer 1 shall receive the following information from the higher layers (RRC) :

- The preamble scrambling code
- The message length in time, either 10 or 20 ms
- The AICH_Transmission_Timing parameter [0 or 1].
- The available signatures and RACH sub-channel groups for each Access Service Class (ASC), where a sub-channel group is defined as a group of some of the sub-channels defined in Section 6.1.1.
- The power-ramping factor Power_Ramp_Step [integer > 0].
- The parameter Preamble_Retrans_Max [integer > 0].
- The initial preamble power Preamble_Initial_Power.
- The set of Transport Format parameters. This includes the power offse~~r~~t $\Delta P_{p\text{-}m}$ between the preamble and the message part for each Transport Format.

Note that 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 PRACH message part.
- The ASC of the PRACH transmission.
- The data to be transmitted (Transport Block Set).

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

1 Randomly select the RACH sub-channel group from the available ones for the given ASC. The random function shall be ~~useh~~such that each of the allowed selections is chosen with equal probability.

2 Derive the available access slots in the next two frames, defined by SFN and SFN+1 in the selected RACH sub-channel group with the help of SFN and table 7. Randomly select one uplink access slot from the available access slots in the next frame, defined by SFN, if there is one available. If there is no access slot available in the next frame, defined by SFN then, randomly select one access slot from the available access slots in the following frame, defined by SFN+1. The random function shall be such that each of the allowed selections is chosen with equal probability.

3 Randomly select a signature from the available signatures for the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

4 Set the Preamble Retransmission Counter to Preamble_Retrans_Max.

5 Set the preamble transmission power to Preamble_Initial_Power.

6 Transmit a preamble using the selected uplink access slot, signature, and preamble transmission power.

7 If no positive or negative acquisition indicator (AI $\neq$ +1 nor –1) corresponding to the selected signature is detected in the downlink access slot corresponding to the selected uplink access slot:

7.1 Select a new uplink access slot as next available access slot, i.e. next access slot in the sub-channel group used, as selected in 1

7.2 Randomly selects a new signature from the available signatures within the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

7.3 Increase the preamble transmission power by ΔP_0 = Power_Ramp_Step [dB].

7.4 Decrease the Preamble Retransmission Counter by one.

7.5 If the Preamble Retransmission Counter > 0 then repeat from step 6. Otherwise pass L1 status ("No ack on AICH") to the higher layers (MAC) and exit the physical random access procedure.

8 If a negative acquisition indicator corresponding to the selected signature is detected in the downlink access slot corresponding to the selected uplink access slot, pass L1 status ("Nack on AICH received") to the higher layers (MAC) and exit the physical random access procedure.

9 Transmit the random access message three or four uplink access slots after the uplink access slot of the last transmitted preamble depending on the AICH transmission timing parameter. Transmission power of the random access message is modified from that of the last transmitted preamble with the specified offset $\Delta P_{p\text{-}m}$.

10 Pass L1 status "RACH message transmitted" to the higher layers and exit the physical random access procedure.

8.1 Determination of feedback information

The UE uses the Common PIlot CHannel (CPICH) to separately estimate the channels seen from each antenna.

Once every slot, the UE computes the phase adjustment, f, and for mode 2 the amplitude adjustment that should be applied at the UTRAN access point to maximise the UE received power. In non-soft handover case,~~-~~ that can be accomplished by e.g. solving for weight vector, $\underline{w}$,, that maximises

$$P=\underline{w}^H H^H H\underline{w} \tag{1}$$

where

$H=[\underline{h}_1\ \underline{h}_2 \ldots]$

and where the column vectors $\underline{h}_i$ and h_2 represent the estimated channel impulse responses for the transmission antennas 1 and 2, of length equal to the length of the channel impulse response. The elements of w correspond to the phase and amplitude adjustments computed by the UE.

During soft handover or SSDT power control, the antenna weight vector, $\underline{w}$ can be, for example, determined so as to maximise the criteria function,

$$P=\underline{w}^H(H_1^H H_1+ H_2^H H_2+\cdots)\underline{w} \tag{2}$$

where H_i is an estimated channel impulse response for BS#i. In regular SHO, the set of BS#i corresponds to the active set. With SSDT, the set of BS#i corresponds to the primary base station(s).

The UE feeds back to the UTRAN access point the information on which phase/power settings to use. Feedback Signalling Message (FSM) bits are transmitted in the portion of FBI field of uplink DPCCH slot(s) assigned to ~~FB~~Closed Loop Mode Transmit Diversity, the FBI D field (see 25.211). Each message is of length $N_W = N_{po}+N_{ph}$ bits and its format is shown in the figure 7. The transmission order of bits is from MSB to LSB, i.e., MSB is transmitted first. FSM_{po} and FSM_{ph} subfields are used to transmit the power and phase settings, respectively.

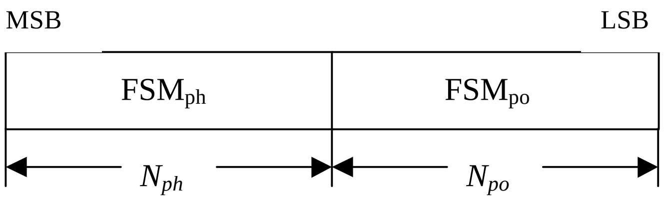

Figure 7: Format of feedback signalling message. FSM_{po} transmits the power setting and FSM_{ph} the phase setting

The adjustments are made by the UTRAN Access Point at the beginning of the downlink DPCCH pilot field. The downlink slot in which the adjustment is done is signaled to L1 of UE by higher layers. Two possibilities exist:

1. When feedback command is transmitted in uplink slot i, which is transmitted in a chip offset limited to 1024 ± 148 chips when compared to received downlink slot j, the adjustment is done at the beginning of the pilot field of the downlink slot (j+1) mod 15, or

2. When feedback command is transmitted in uplink slot i, which is transmitted in a chip offset limited to 1024 ± 148 chips when compared to received downlink slot j, the adjustment is done at the beginning of the pilot field of the downlink slot (j+2) mod 15.

8.3.2 Mode 2 normal Initialisation

For the first frame of transmission using closed loop mode 2, the operation is as follows.

The UE starts sending the FSM message in slot 0 in the normal way, refining its choice of FSM in slots 1 to 3 from the set of weights allowed given the previously transmitted bits of the FSM.

During the reception of the first three FSM bits (that is before the full four bits are received), the UTRAN Access Point initialises its transmissions as follows. The power in both antennas is set to 0.5. The phase offset applied between the antennas is updated according to the number and value of FSM_{ph} bits received as given in table 12.

Table 12: FSM_{ph} normal initialisation for closed loop mode 2

FSM_{ph}	Phase difference between antennas (degrees)
- - -	180 (normal initialisation) or held from previous setting (slotted mode recovery)
0 - -	180
1 - -	0
0 0 -	180
0 1 -	-90
1 1 -	0
1 0 -	90
0 0 0	180
0 0 1	-135
0 1 1	-90
0 1 0	-45
1 1 0	0
1 1 1	45
1 0 1	90
1 0 0	135

This operation applies in both the soft handover and non soft handover cases.

8.3.3 Mode 2 operation during compressed mode

8.3.3.1 Downlink in compressed mode and uplink in normal mode

When the downlink is in compressed mode and the uplink is in normal mode, the closed loop mode 2 functions are described below.

If UE continues to calculate the phase adjustments based on the received CPICH from antennas 1 and 2 during the idle downlink slots there is no difference in UE operation when compared to non-compressed downlink operation.

When the UE is not listening to the CPICH from antennas 1 and 2 during the idle downlink slots, the UE sends the last FSM bits calculated before entering in the compressed mode.

- For recovery after compressed mode, UTRAN Access Point sets the power in both antennas to 0.5 until a FSM_{po} bit is received. Until the first FSM_{ph} bit is received and acted upon, UTRAN uses the phase offset, which was applied before the transmission interruption (table 12).
- Normal initialisation of FSM_{ph} (table 12) occurs if the uplink signalling information resumes at the beginning of a FSM period (that is if signalling resumes in slots 0,4,8,12).
- If the uplink signalling does not resume at the beginning of a FSM period, the following operation is performed. In each of the remaining slots of the partial FSM period, and for the first slot of the next full FSM period, the UE sends the first (i.e. MSB) bit of the FSM_{ph} message, and at the UTRAN access point the phase offset applied between the antennas is updated according to the number and value of FSM_{ph} bits received as given in table 13. Initialisation then continues with the transmission by the UE of the remaining FSM_{ph} bits and the UTRAN operation according to table 12.

Table 13: FSMph subfield of ~~FB~~closed loop mode 2 in compressed~~-~~ mode recovery period

FSM_{ph}	Phase difference between antennas (degrees)
-	held from previous setting
0	180
1	0

Annex A (informative): Antenna verification

In ~~FB~~closed loop mode 1, if channel estimates are taken from the Primary ~~CCPCH~~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

~~$2\sum_{i=1}^{Npath}\frac{1}{s_i^2}\left\{2\,\mathrm{Re}(g h_{2,i}^{(d)} h_{2,i}^{(p)^*})\right\} > \ln\left(\frac{\bar{p}(f_{Rx}=p)}{\bar{p}(f_{Rx}=0)}\right)$~~

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

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

Similarly consider

~~$-2\sum_{i=1}^{Npath}\frac{1}{s_i^2}\left\{2\,\mathrm{Im}(g h_{2,i}^{(d)} h_{2,i}^{(p)^*})\right\} > \ln\left(\frac{\bar{p}(f_{Rx}=-\frac{p}{2})}{\bar{p}(f_{Rx}=\frac{p}{2})}\right)$~~

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

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:

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 as:

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

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

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 ~~PCCPCH~~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/ ~~PCCPCH Pilot~~CPICH SNIR,

~~a_i are the elements of w,~~

s_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).