TSG-RAN Working Group 1 meeting #7bis **TSGR1#7bis(99)e58**
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Agenda item:

Source: Ericsson

Title: Text proposals for 25.214 V1.3.1

Document for: Decision

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1 Introduction

The text proposal below addresses some points, aiming at cleaning up 25.214. The following non-editorial changes are proposed:

- Section 4.1 "Cell search" is informative and is therefore moved to an informative annex. Further, some changes are proposed: correlation is typically done over CPICH, and there is no such thing defined in WG2 as a priority list.
- Section 4.2 has been rewritten to cover all the common physical channels, since the timing of all those are related to the P-CCPCH timing as described in 25.211.
- In the new section 4.3.3 a clarification has been made that the UE transmission timing may be adjusted also when not in soft handover. It was decided at WG1#7 that this clarification should be made.
- In section 5.1.2.2.1 the sentence that higher layers adjusts the SIR target independently for each cell in the active set has been removed. Currently in WG2 and WG3, such control cannot be done for each radio link independently, so there is a inconsistency between the groups. It is up to WG2/WG3 to define this, so the sentence is proposed to be removed.
- Sections 5.2.1 and 5.2.2 tries to specify unnecessary restrictions for the P-CCPCH and S-CCPCH. This issue was raised in an e-mail to ad hoc 9. There is no need to specify restrictions for the downlink common channels power settings, so these two sections have been removed.
- In section 5.2.3.5.5 it is clarified that with "reception level" and "pilot power" is meant CPICH RSCP.
- In sections 5.1.2.3 and 5.2.3.2 the mentioning of WG1 working assumptions have been removed.

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4 Synchronisation procedures

4.1 Cell search

During the cell search, the UE searches for a cell and determines the downlink scrambling code and <u>common channel</u> frame synchronisation of that cell. <u>How cell search is typically done is described in Annex B.</u>~~The cell search is typically carried out in three steps:~~

~~**Step 1: Slot synchronisation**~~

~~During the first step of the cell search procedure the UE uses the SCH's primary synchronisation code to acquire slot synchronisation to a cell. This is typically done with a single matched filter (or any similar device) matched to the primary synchronisation code which is common to all cells. The slot timing of the cell can be obtained by detecting peaks in the matched filter output.~~

~~**Step 2: Frame synchronisation and code-group identification**~~

~~During the second step of the cell search procedure, the UE uses the SCH's secondary synchronisation code to find frame synchronisation and identify the code group of the cell found in the first step. This is done by correlating the received signal with all possible secondary synchronisation code sequences, and identifying the maximum correlation value. Since the cyclic shifts of the sequences are unique the code group as well as the frame synchronisation is determined.~~

~~**Step 3: Scrambling-code identification**~~

~~During the third and last step of the cell search procedure, the UE determines the exact primary scrambling code used by the found cell. The primary scrambling code is typically identified through symbol-by-symbol correlation over the Primary CCPCH with all codes within the code group identified in the second step. After the primary scrambling code has been identified, the Primary CCPCH can be detected, super-frame synchronisation can be acquired and the system- and cell specific BCH information can be read.~~

~~If the UE has received a priority list with information about which scrambling codes to search for, steps 2 and 3 above can be simplified.~~

4.2 Common physical channel~~Primary CCPCH~~ synchronisation

The radio frame timing of all common physical channels can be determined after cell search. The P-CCPCH radio frame timing is found during cell search and the radio frame timing of all common physical channels are related to that timing as described in 25.211. ~~Synchronisation of the Primary CCPCHs is obtained during the cell search, see subclause 4.1 above. Frame synchronisation is obtained in step 2 of the cell search, and super-frame synchronisation is obtained by reading the SFN information on the BCH.~~

~~4.3 Secondary CCPCH synchronisation~~

~~Synchronisation of the Secondary CCPCHs can be obtained from the Primary CCPCH synchronisation and the timing offset information T_d broadcasted on the BCH. T_d is described in chapter 7 of 25.211.~~

~~4.4 PRACH synchronisation~~

~~Transmission of random access bursts on the PRACH is done aligned with access slot times. The timing of the access slots is derived from the received Primary CCPCH timing The transmit timing of access slot n starts n×10/N ms after the frame boundary of the received Primary CCPCH, where n = 0, 1, …, N-1, and N is the number of access slots per 10 ms.~~

4.3~~5~~ DPCCH/DPDCH synchronisation

4.3~~5~~.1 General

The synchronisation of the dedicated physical channels can be divided into two cases:

- when a downlink dedicated physical channel and uplink dedicated physical channel shall be set up at the same time;
- or when a downlink dedicated physical channel shall be set up and there already exist an uplink dedicated physical channel.

The two cases are described in subclauses 4~~5~~.3~~5~~.2~~1~~ and 4~~5~~.3~~5~~.3~~2~~ respectively.

4.3~~5~~.2 No existing uplink dedicated channel

The assumption for this case is that a DPCCH/DPDCH pair shall be set up in both uplink and downlink, and that there exist no uplink DPCCH/DPDCH already. This corresponds to the case when a dedicated physical channel is initially set up on a frequency.

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4.3~~5~~.3 With existing uplink dedicated channel

The assumption for this case is that there already exist DPCCH/DPDCHs in the uplink, and a corresponding dedicated physical channel shall be set up in the downlink. This corresponds to the case when a new cell has been added to the active set in soft handover and shall begin its downlink transmission.

At the start of soft handover, the uplink dedicated physical channel transmitted by the UE, and the downlink dedicated physical channel transmitted by the soft handover source cell continues transmitting as usual.

The synchronisation establishment flow upon intra/inter-cell soft handover is described in Figure 1.

a) The UE starts the chip synchronisation establishment process of downlink channels from the handover destination. The uplink channels being transmitted shall continue transmission as before.

b) UTRAN starts the transmission of the downlink DPCCH/DPDCH at a frame timing such that the frame timing received at the UE will be within $T_0 \pm [148]$ chips prior to the frame timing of the uplink DPCCH/DPDCH at the UE. UTRAN then starts the synchronization establishment process of the uplink DPCCH/DPDCH transmitted by the UE. Frame synchronization can be confirmed using the Frame Synchronization Word. Successful frame synchronization is confirmed and reported to the higher layers when S_R successive frames have been confirmed to be frame synchronized. Otherwise, frame synchronization failure is reported to the higher layers.

c) Based on the handover destination CPICH reception timing, the UE establishes chip synchronisation of downlink channels from handover destination cell. Frame synchronization can be confirmed using the Frame Synchronization Word. Successful frame synchronization is confirmed and reported to the higher layers when S_R successive frames have been confirmed to be frame synchronized. Otherwise, frame synchronization failure is reported to the higher layers.

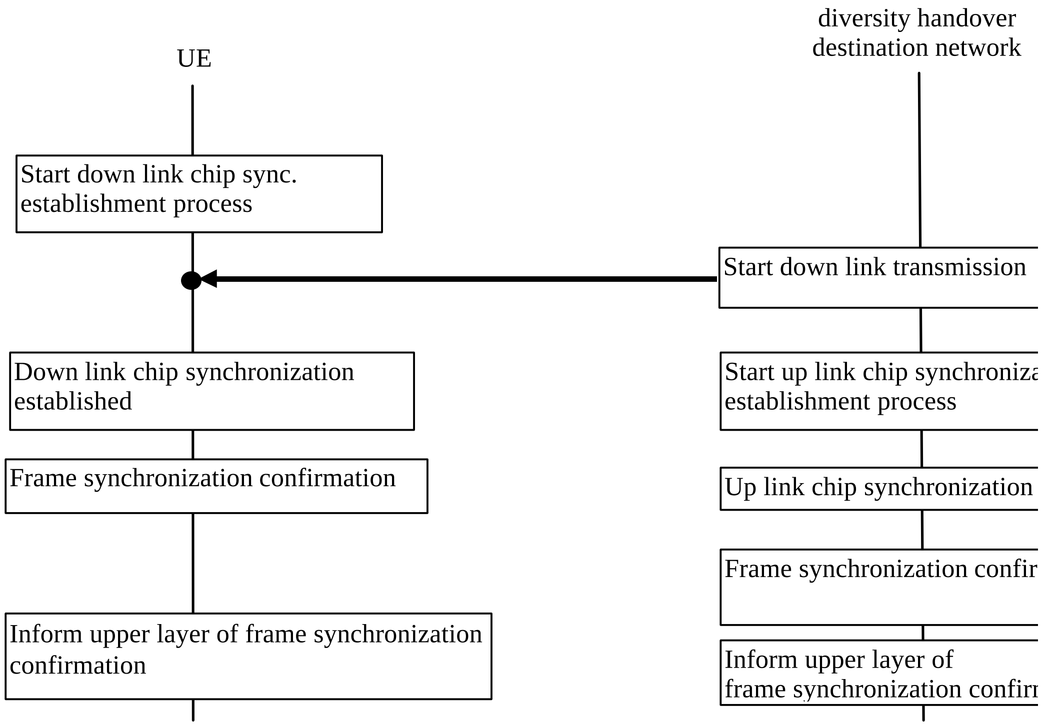

Figure 1: Synchronization establishment flow upon intra/inter-cell soft~~diversity~~ handover

During a connection, in some cases the UE is allowed to change its transmission timing. When the UE is not in soft handover or in soft handover with cells that all are known to have the same timing reference, the UE may adjust its DPDCH/DPCCH transmission time instant. <Note: maximum rate of the adjustment should be specified in R4> Otherwise, the UE may not adjust its DPDCH/DPCCH transmission time instant.

~~4.6 PCPCH Synchronisation~~

~~Transmission of random access bursts on the PCPCH is aligned with access slot times. The timing of the access slots is derived from the received Primary CCPCH timing The transmit timing of access slot n starts n×10/N ms after the frame boundary of the received Primary CCPCH, where n = 0, 1, N-1, and N is the number of access slots per 10 ms.~~

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5.1.2.2.1 General

The initial uplink transmit power to use is decided using an open-loop power estimate, similar to the random access procedure. < *Editor's note: This needs to be elaborated, how is the estimate derived?* >

The maximum transmission power at the maximum rate of DPDCH is designated for uplink and control must be performed within this range. < *Editor's note: The necessity of this range needs to be confirmed.* > The maximum transmit power value of the inner-loop TPC is set by the network using higher layer signalling.

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}. ~~An higher layer outer loop adjusts SIR_{target} independently for each cell in the active set.~~

The serving cells (cells in the active set) should estimate signal-to-interference ratio SIR_{est} of the received uplink DPCH . The serving cells then generates TPC commands and transmits the commands once per~~ ms~~ 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".

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5.1.2.3 Transmit power control in compressed mode

~~*< Note: The following is a working assumption of WG1. >*~~

The aim of uplink power control in downlink or/and uplink compressed mode is to recover as fast as possible a signal-to-interference ratio (SIR) close to the target SIR after each transmission gap.

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~~5.2.1 Primary CCPCH~~

~~''The Primary CCPCH transmit power can vary on a slow basis, i.e. the power is constant over many frames. The transmit power is determined by the network and signalled on the BCH.~~

~~5.2.2 Secondary CCPCH~~

~~'The Secondary CCPCH transmit power is set by the network, and may vary.~~

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5.2.3.2 Ordinary transmit power control

The downlink inner-loop power control adjusts the network transmit power in order to keep the received downlink SIR at a given SIR target, SIR_{target}. An higher layer outer loop adjusts SIR_{target} independently for each connection.

The UE should estimate the received downlink DPCCH/DPDCH power of the connection to be power controlled. Simultaneously, the UE should estimate the received interference. The obtained SIR estimate SIR_{est} is then used by the UE to generate TPC commands according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", requesting a transmit power decrease, while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1", requesting a transmit power increase.

When the UE is not in soft handover the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH.

When the UE is in soft handover it should check the downlink power control mode (DPC_MODE) before generating the TPC command

- if DPC_MODE = 0 : the UE sends a unique TPC command in each slot and the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH
- if DPC_MODE = 1 : the UE repeats the same TPC command over 3 slots and the new TPC command is transmitted such that there is a new command at the beginning of the frame.

The DPC_MODE parameter is a UE specific parameter controlled by the UTRAN.

~~<Note : the introduction of the DPC_MODE parameter and its use are working assumptions>~~

As a response to the received TPC commands, UTRAN may adjust the downlink DPCCH/DPDCH power. The transmitted DPCCH/DPDCH power may not exceed Maximum_DL_Power, nor may it be below Minimum_DL_Power.

< Note: It should be clarified with WG3 if Maximum_DL_Power and Minimum_DL_Power are given as absolute values or relative. >

< Note: It is not clear to what extent the UTRAN response to the received TPC commands should be specified. Until this has been clarified, the text in the paragraph below should be seen as an example of UTRAN behaviour. >

Changes of power shall be a multiple of the minimum step size $\Delta_{TPC,min}$ dB. It is mandatory for UTRAN to support $\Delta_{TPC,min}$ of 1 dB, while support of 0.5 dB is optional.

< Note: It needs to be clarified if an upper limit on the downlink power step should be specified. >

-'When SIR measurements cannot be performed due to downlink out-of-synchronisation, the TPC command transmitted shall be set as "1" during the period of out-of-synchronisation.

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5.2.3.5.5 Selection of primary cell

The UE selects a primary cell periodically by measuring the RSCP of ~~reception levels of~~ CPICHs~~common pilots~~ transmitted by the active cells. The cell with the highest CPICH RSCP~~pilot power~~ is detected as a primary cell.

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Annex~~ppendix~~ A: Power c~~C~~ontrol t~~T~~iming (Informative)

~~<Editors note:~~ The p~~P~~ower control timing described in this anne~~ppendi~~x should be seen as an example on how the control bits have to be placed in order to permit a short TPC delay. ~~It seems appropriate to move this part later.>~~

In order to maximize the BTS-UE distance within which one-slot control delay is achieved, the frame timing of an uplink DPCH is delayed by 1024 chips from that of the corresponding downlink DPCH measured at the UE antenna.

Responding to a downlink TPC command, the UE -shall change its uplink DPCH output power at the beginning of the first uplink pilot field after the TPC command reception. -Responding to an uplink TPC command, BTS shall change its

DPCH output power at the beginning of the next downlink pilot field after the reception of the whole TPC command. Note that in soft handover, the TPC command is sent over one slot when DPC_MODE is 0 and over three slots when DPC_MODE is 1. Note also that the delay from the uplink TPC command reception to the power change timing is not specified for BTS. The UE shall decide and send TPC commands on the uplink based on the downlink SIR measurement. The TPC command field on the uplink starts, when measured at the UE antenna, 512 chips after the end of the downlink pilot field. The BTS shall decide and send TPC commands based on the uplink SIR measurement. However, the SIR measurement periods are not specified either for UE nor BTS.

Fig. A-1 illustrates an example of transmitter power control timings.

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Annex B: Cell search procedure (Informative)

[NOTE: THE TEXT IN THIS SECTION HAS BEEN COPIED FROM SECTION 4.1 WITHOUT REVISION MARKS, AND THEN REVISIONS HAVE BEEN MADE TO SHOW DIFFERENCES IN THE TEXT.]

During the cell search, the UE searches for a cell and determines the downlink scrambling code and frame synchronisation of that cell. The cell search is typically carried out in three steps:

Step 1: Slot synchronisation

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During the third and last step of the cell search procedure, the UE determines the exact primary scrambling code used by the found cell. The primary scrambling code is typically identified through symbol-by-symbol correlation over the CPICH~~Primary CCPCH~~ with all codes within the code group identified in the second step. After the primary scrambling code has been identified, the Primary CCPCH can be detected~~, super-frame synchronisation can be acquired~~ and the system- and cell specific BCH information can be read.

If the UE has received~~ a priority list with~~ information about which scrambling codes to search for, steps 2 and 3 above can be simplified.