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CR-Form-v3

CHANGE REQUEST

✍ **25.224**	**CR 044** ✍	rev **-** ✍	Current version: **3.5.0** ✍		

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 [X] Core Network [ ]

Title: ✍	Layer 1 procedure for Node B synchronisation
Source: ✍	Siemens
Work item code: ✍	RANimp-NBsync
Date: ✍	10.01.2001
Category: ✍	**B**
Release: ✍	REL-4

Use one 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)*
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: ✍	Introduction of L1 procedure necessary for work item
Summary of change: ✍	A new chapter is added with the L1 procedure for Node B synchronisation, an indication is given, that some frames are blocked for PRACH transmissions.
Consequences if not approved: ✍	Work item Node B synchronisation is not feasible

Clauses affected: ✍	4.7, 4.9	
Other specs affected: ✍	[X] Other core specifications ✍ [ ] Test specifications [ ] O&M Specifications	25.402, 25.433, 25.435
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.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest 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.

4.7 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. Retransmission on the RACH in case of failed transmission (e.g. due to a collision) is controlled by higher layers. Thus, the backoff algorithm and associated handling of timers is not described here. The definition of the RACH in terms of PRACH sub-channels and associated Access Service Classes is broadcast on the BCH in each cell. Parameters for common physical channel uplink outer loop power control are also broadcast on the BCH in each cell. The UE needs to decode this information prior to transmission on the RACH. Higher layer signalling may indicate, that in some frames the PRACH shall not be used for uplink transmission.

4.7.1 Physical random access procedure

The physical random access procedure described in this subclause is initiated upon request of a PHY-Data-REQ primitive from the MAC sublayer (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 available PRACH sub-channels for each Access Service Class (ASC);
- the timeslot, spreading factor, channelisation code, midamble, repetition period and offset for each PRACH sub-channel. (There is a 1:1 mapping between spreading code and midamble as defined by RRC);
- the set of Transport Format parameters;
- the set of parameters for common physical channel uplink outer loop power control.

NOTE: 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;
- the ASC of the PRACH transmission;
- the data to be transmitted (Transport Block Set).

In addition, Layer 1 may receive information from higher layers, that certain frames shall be blocked for PRACH uplink transmission.

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

1 Randomly select the PRACH 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.

2 Derive the acess slots that are available and not blocked~~available access slots~~ in the next N frames, defined by SFN, SFN+1, ..., SFN+N-1 for the selected PRACH sub-channel with the help of SFN (where N is the repetition period of the selected PRACH sub-channel). Randomly select an 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. This search is performed for all frames in increasing order, defined by SFN, SFN+1, ..., SFN+N-1, until an available access slot is found. The random function shall be such that each of the allowed selections is chosen with equal probability.

3 Randomly select a spreading code 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. The midamble is derived from the selected spreading code.

4 Set the PRACH message transmission power level according to the specification for common physical channels in uplink (see subclause 4.2.2.2).

5 Transmit the random access message with no timing advance.

4.8 DSCH procedure

The physical downlink shared channel procedure described below shall be applied by the UE when the physical layer signalling either with the midamble based signalling or TFCI based signalling is used to indicate for the UE the need for PDSCH detection. There is also a third alternative to indicate to the UE the need for the PDSCH detection and this is done by means of higher layer signalling, already described in [8].

4.8.1 DSCH procedure with TFCI indication

When the UE has been allocated by higher layers to receive data on DSCH using the TFCI, the UE shall decode the PDSCH in the following cases:

- In case of a standalone PDSCH the TFCI is located on the PDSCH itself, then the UE shall decode the TFCI and based on which data rate was indicated by the TFCI, the decoding shall be performed. The UE shall decode PDSCH only if the TFCI word decode corresponds to the TFC part of the TFCS given to the UE by higher layers.

- In case that the TFCI is located on the DCH, the UE shall decode the PDSCH frame or frames if the TFCI on the DCH indicates the need for PDSCH reception. Upon reception of the DCH time slot or time slots, the PDSCH slot (or first PDSCH slot) shall start *SFN n+2* after the DCH frame containing the TFCI, where n indicates the SFN on which the DCH is received. In the case that the TFCI is repeated over several frames, the PDSCH slot shall start *SFN n+2* after the frame having the DCH slot which contains the last part of the repeated TFCI.

4.8.2 DSCH procedure with midamble indication

When the UE has been allocated by higher layers to receive PDSCH based on the midamble used on the PDSCH (midamble based signalling described in [8]), the UE shall operate as follows:

- The UE shall test the midamble it received and if the midamble received was the same as indicated by higher layers to correspond to PDSCH reception, the UE shall detect the PDSCH data according to the TF given by the higher layers for the UE.

- In case of multiple time slot allocation for the DSCH indicated to be part of the TF for the UE, the UE shall receive all timeslots if the midamble of the first timeslot of PDSCH was the midamble indicated to the UE by higher layers.

- In case the standalone PDSCH (no associated DCH) contains the TFCI the UE shall detect the TF indicated by the TFCI on PDSCH.

4.9 Node B Synchronisation Procedure

The Node B synchronisation procedure is based on transmissions of cell synchronisation bursts [10] in predetermined PRACH time slots according to an RNC schedule. Such soundings between neighbouring cells facilitate timing offset measurements by the cells. The timing offset measurements are reported back to the RNC for processing. The RNC generates cell timing updates that are transmitted to the Node Bs and cells for implementation.

The synchronisation procedure has two phases, the initial phase and the steady-state phase. The procedure for late entrant cells is slightly different and is described separately.

4.9.1 Initial Synchronisation

The procedure for initial synchronisation is used to bring cells of an RNS area into synchronisation at network start up. No traffic is supported during this phase:

1. The cells with reference timing shall initialise their SFN counter so that the frame with SFN=0 starts on January 6, 1980 at 00:00:00. The time stated begins the first second of January 6th based on GPS time.

2. On request by higher layers, the cells with a reference clock shall send their SFN to the RNC at the beginning of the frame following the request.

3. The RNC sends an SFN update over the Iub to all the cells, apart from the one containing the reference clock. The cells shall adjust SFN and frame timing accordingly. The start of a frame shall be aligned with the reception of the higher layer update signal.

4. Each cell shall transmit cell sync bursts acc. to the higher layer command. The same cell sync burst code and code offset is used by all cells.

5. Each cell shall listen for transmissions from other cells. Each cell shall report the timing and received SIR of successfully detected cell sync bursts to the RNC.

6. Upon reception of a Synchronisation Adjustment command from higher layers the cell shall adjust its timing accordingly. The timing adjustment shall be completed at the end of the frame following the frame where the command was received. It shall be implemented by adjusting the timing and/or tuning the clock frequency.

Steps 3 to 5 are repeated as often as necessary in order to reach the minimum synchronisation accuracy defined in [17].

4.9.2 Steady-State Phase

The steady-state phase allows to reach and/or maintain the required synchronisation accuracy. With the start of the steady-state phase, also traffic is supported in a cell. The steady-state phase starts with a Cell Synchronisation Reconfiguration Request from higher layers. The information contained in this command includes the transmit schedule, i. e. when to transmit which code and code offset, and which transmit power to use. It contains as well the information which codes and code offsets to measure in a certain timeslot, i. e. a receive schedule.

1. The cell shall transmit a cell sync burst acc. to the information given in the Cell Synchronisation Reconfiguration Request. The cell shall report the reception times for all relevant codes and code offsets back to the RNC.

2. Upon reception of a Synchronisation Adjustment command a cell shall adjust its timing accordingly. The timing adjustment shall be started at the beginning of the frame with the SFN given in the command. It shall be completed by the next cell sync slot. It shall be implemented by adjusting the timing and optionally by tuning the clock frequency. Timing adjustments shall be implemented via gradual steps at the beginning of a frame. The whole adjustment shall be implemented with maximum stepsize of one sample or per frame.

Steps 1 and 2 continue indefinitely.

4.9.3 Late entrant cells

The scheme for introducing new cells into an already synchronised RNS is as follows:

1. The RNC sends measurement information and an SFN update over Iub to the late entrant cell. The late entrant cell shall adjust its SFN accordingly. The nominal start of a frame shall be aligned with the reception of the higher layer update signal.

2. Upon reception of a Cell Synchronisation Initiation Request with type Late Entrant Cell from higher layers, a cell shall transmit a single cell sync burst as specified in the request. The cells involved are preferrably the ones surrounding the late entrant one.

3. The late entrant cell shall correlate against the cell sync burst acc. to the measurement information. The reception window shall be +/- 3 frames around the SFN frame given in the measurement information . The late entrant cell shall take the earliest reception as the timing of the system and adjusts its own timing and SFN number accordingly.

4. The late entrant cell shall start regular measurements after the reception of a Cell Synchronisation Reconfiguration Request and it shall report these to the RNC. In turn, the late entrant cell receives its own schedules for sync transmissions and receptions and enters the steady-state phase.