

**TSG-RAN Meeting #14  
Kyoto, Japan, 11 - 14, December, 2001**

**TSGRP#14(01) 0869**

**Title:** Agreed CRs to TS 25.402

**Source:** TSG-RAN WG3

**Agenda item:** 8.3.3/8.3.4/9.4.3

RP Tdoc	R3 Tdoc	Spec	CR_Num	Rev	Release	CR_Subject	Cat	Cur_Ver	New_Ver	Workitem
RP-010869	R3-013164	25.402	028		Rel-4	Text amendments for TDD Node B synchronisation	F	4.2.0	4.3.0	RANimp-Nbsync

## CHANGE REQUEST

⌘ **25.402 CR 028** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

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  Core Network

<b>Title:</b>	⌘ Text amendments for TDD Node B synchronisation		
<b>Source:</b>	⌘ R-WG3		
<b>Work item code:</b>	⌘ RANimp-Nbsync	<b>Date:</b>	⌘ November 2001
<b>Category:</b>	⌘ <b>F</b>	<b>Release:</b>	⌘ REL-4
	<i>Use one of the following categories:</i> <b>F</b> (essential correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (Addition of feature), <b>C</b> (Functional modification of feature) <b>D</b> (Editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900.		<i>Use one of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

<b>Reason for change:</b>	⌘ Textual amendments required in support of TDD Node B synchronisation.		
<b>Summary of change:</b>	⌘ Clarifications in the chapter TDD Inter Node B Node Synchronisation procedure Clause Initial Synchronisation is renamed by Initial Phase		
<b>Consequences if not approved:</b>	⌘ If this CR is not approved, the TDD Inter Node B Node Synchronisation procedures used for the Initial Phase and Steady-State Phase are missing.  Impact Analysis: This CR has isolated impact to the previous version because it affects the REL-4 procedure "Node B synchronisation for 3.84Mcps TDD" only.		

<b>Clauses affected:</b>	⌘ 6.1.2.2.1, 6.1.2.2.1B, 6.1.2.2.2		
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications	⌘	
<b>Other comments:</b>	⌘ This CR was in principle agreed at R3#24 meeting (R3-012928). In addition the Node Synchronisation procedure is added in the preliminary phase.		

### 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](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.

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## 6 Node Synchronisation

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### 6.1.2.2 TDD Inter Node B Node Synchronisation procedure

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

The synchronisation procedure has four phases to bring a network into a synchronised operation, the preliminary phase, the frequency acquisition phase, the initial phase and the steady-state phase. The procedure for late entrant cells is slightly different and is described separately.

For synchronisation via the air interface it has to be considered that as long as a cell is not synchronised the cell may interfere the neighbouring cells. This applies especially in case of late entrant cells where first the new cell has to be setup before the synchronisation procedure starts. By this Cell Setup procedure the SCH is already transmitting. The RNC shall therefore disable the downlink time slots on Cell Setup procedure by means of the *Time slot Status* IE. When the cell synchronisation has been performed the downlink time slots shall be enabled by means of the Cell Reconfiguration procedure.

#### 6.1.2.2.1 Preliminary Phase

- 1) There should be at least one cell in each RNC area (i.e. in the RNS) which is synchronised by an external reference (e.g. GPS receiver). 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 [GMT](#).
- 2) The RNC has to be informed at which of the cells the external reference clock is connected. Therefore, a 'Reference Clock availability' indicator is added within the RESOURCE STATUS INDICATION message that is sent from the Node B to the RNC when a Local Cell becomes existing at the Node B.
- 3) At Cell Setup a 'Reference SFN offset' may be given to the cells where the reference clock is connected in order to separate the synchronisation bursts from different RNC areas.
- 4) The RNC has to retrieve the reference time from the cells with the reference clock. For the reference time retrieval the DL Transport Channels Synchronisation procedure [or the Node Synchronisation procedure](#) on the PCH frame protocol (see [4]) shall be used. The Node B shall consider the SFN derived from the synchronisation port and the Reference SFN offset given by the RNC.
- 5) Now the RNC proceeds by updating the timing of all the remaining cells in the RNS, instructing them to adjust their clocks. Therefore, first the DL Transport Channels Synchronisation procedure on the PCH frame protocol shall be performed in order to determine the deviation from the reference SFN. The RNC then sends a **CELL SYNCHRONISATION ADJUSTMENT REQUEST** message to all the cells for SFN update, apart from the one(s) containing the reference clock. The cells shall adjust [their](#) SFN and frame timing accordingly.

#### 6.1.2.2.1A Frequency Acquisition Phase

The frequency acquisition phase is used to bring cells of an RNS area to within frequency limits prior to initial synchronisation. No traffic is supported during this phase.

- 1) The cell(s) identified as reference cell, i.e. external reference clock is connected to, shall transmit continuously cell sync bursts in every time slot where possible according to the information's given in the CELL SYNCHRONISATION INITIATION REQUEST message.
- 2) All other cells are considered as unlocked (i.e. not in frequency lock) shall listen for transmission from other cells and perform frequency locking to any transmission received. For setting the parameters within the Node B to listen for transmission from other cells, the CELL SYNCHRONISATION INITIATION REQUEST message is used.

- 3) A cell shall signal completion of frequency acquisition to the RNC, as soon as it has locked its frequency to the received signal, fulfilling the Frequency Stability requirement set in [17].
- 4) If the cell(s) have received transmission request on instructing the frequency acquisition and the cell(s) have performed frequency locking, the cell(s) shall begin transmitting the specified code for frequency locking of other cells.
- 5) When the RNC has received completion of frequency acquisition signals from all cells the frequency acquisition phase is completed.

#### 6.1.2.2.1B Initial **Synchronisation**Phase

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) For the sync procedure it is useful to know which cells can “hear” each other. Therefore, all cells are instructed to transmit their cell sync bursts in turn one after the other. The same cell sync burst code and code offset is used by all cells.
- 2) 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.
- 3) Upon reception of a CELL SYNCHRONISATION ADJUSTMENT message the cell shall adjust its timing accordingly. The timing adjustment shall be completed before the CELL SYNCHRONISATION ADJUSTMENT RESPONSE message is sent. It shall be implemented by adjusting the timing and/or tuning the clock frequency.
- 4) Steps 1 to 3 are repeated as often as necessary in order to reach the minimum synchronisation accuracy defined in [16]. This serves the purpose to bring the network into tight synchronisation. The SIR value within the cell sync burst reports is used by the RNC to define the schedule for the steady-state phase. I.e. to define when which cells transmit a cell sync burst and when which cell sync bursts shall be received. Cells which are sufficiently separated can be allowed to send the same cell sync burst at the same time. Cells which are not sufficiently separated have to use different cell sync codes and code offsets for distinctions.

#### 6.1.2.2.2 Steady-State Phase

The steady-state phase allows [cells](#) to reach and/or maintain the required synchronisation accuracy. With the start of the steady-state phase traffic is supported in a cell. The steady-state phase starts with the Cell Synchronisation Reconfiguration procedure (see [3]) which defines the synchronisation schedule. I.e. each cell gets the information when to transmit a cell sync burst and when the individual cell sync bursts from the neighbouring cells shall be measured.

For definition of the SFN when the cell shall transmit or receive cell sync bursts, the SFN period is divided into cycles that have the same schedule. Within each cycle the Frame numbers for the cell sync bursts are calculated by the number of repetitions per cycle and by an offset. Code and code offset are used to identify the individual cell sync bursts.

- 1) The cell shall transmit a cell sync burst and measure cell sync bursts from neighbouring cells according to the information's given in the CELL SYNCHRONISATION RECONFIGURATION REQUEST message. Reception times for all relevant codes and code offsets shall be reported to the RNC with the CELL SYNCHRONISATION REPORT message.
- 2) Upon determination of an error in timing, the RNC adjusts the cell timing by means of the CELL SYNCHRONISATION ADJUSTMENT message. 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. 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 per frame.
- 3) Step 1 and 2 continue indefinitely

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