TSG-RAN Meeting #12 *TSGRP#12(01) 0390*
Stockholm, Sweden, 12 - 15 June 2001

Title: **Agreed CRs to TS 25.402**

Source: **TSG-RAN WG3**

Agenda item: **8.3.3/8.3.4**

Tdoc_Num	Specification	CR_Num	Revision_Num	CR_Subject	CR_Category	WG_Status	Cur_Ver_Num	New_Ver_Num	Workitem
R3-011412	25.402	021		Frequency Acquisition phase for Cell Synchronisation for TDD	F	agreed	4.0.0	4.1.0	RANimp-Nbsync
R3-011413	25.402	022		Correction on TDD Radio Interface Synchronistion	F	agreed	4.0.0	4.1.0	LCRTDD-IubIur

3GPP TSG-RAN3 Meeting #21 **_Tdoc R3-011412_**
Busan, Korea, 21st – 25th May 2001

CR-Form-v3

CHANGE REQUEST

⌘	**25.402**	**CR**	**021**	⌘ rev		⌘ Current version:	**4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM [ ] ME/UE [ ] Radio Access Network [X] Core Network [ ]

Title:	⌘	Introduction of Frequency Acquisition phase for Cell Synchronisation for TDD		
Source:	⌘	R-WG3		
Work item code:	⌘	RANimp-Nbsync	***Date:*** ⌘	May 2001
Category:	⌘	**F**	***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:	⌘	For cell synchronisation via the radio interface, cells to be synchronised must be able to adjust their receiver oscillator frequency to the chip rate of the synchronisation bursts to receive. A radio interface mechanism has therefore been specified by WG1, whereby Node Bs can acquire the frequency from the synch bursts sent out by the cells containing the reference clock. This CR introduces the frequency acquisition phase in 25.402.
Summary of change:	⌘	New phase is added describing the frequency acquisition phase for cell synchronisation procedure via air interface. In addition the impact to the procedure for late entrant cells is described.
Consequences if not approved:	⌘	Node B synchronisation not completely defined in WG3 specs. Inconsistency between WG1 and WG3 specs Backward compatibility: This CR is backward compatible to R99.

Clauses affected:	⌘	6.1.2.2		
Other specs affected:	⌘	[X] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	25.433 CR416 Rel 4
Other comments:	⌘	This CR is the updated version of R3-011156 from RAN#20. This CR was agreed with following comments: Clarify that it is backward compatible to R99 since it is not backward compatible to 4.0.0.		

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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 ~~two~~ 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 ~~Initial Synchronisation~~Preliminary 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) 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.

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 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 an CELL SYNCHRONISATION ADJUSTMENT message to all the cells for SFN update, apart from the one(s) containing the reference clock. The cells shall adjust SFN and frame timing accordingly.

6.1.2.2.2 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 continously cell sync bursts in every time slot where possible according to the informations 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) When a cell has detected that it has locked its frequency to within 50 ppm of the received signal, it shall signal completion of frequency acquisition to the RNC.

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.

6.1.2.2.3 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~~6~~) 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~~7~~) 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~~8~~) 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~~9~~) Steps ~~6~~ 1 to ~~8~~ 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~~4 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 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 informations 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

6.1.2.2.35 Late-Entrant Cells

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

1. Late entrant cells (new cells being added without referene clock) or cells recovering from unavailability shall first be roughly synchronised. 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 an CELL SYNCHRONISATION ADJUSTMENT message to the late-entrant cells for SFN update.

2. Frequency acquisition of the late entrant cell is started by instructing the late entrant cell first to listen to the regular schedule of cell sync bursts of the surrounding cells. The transmission schedule of the surrounding cells shall be signalled to the late entrant cell within the CELL SYNCHRONISATION INITIATION REQUEST message. Frequency locking is reported using the CELL SYNCHRONISATION REPORT message.

2.3. In addition or instead of a regular schedule a single common cell sync burst is transmitted in parallel by cells which are synchronised in the system and which are preferrably the ones surrounding the late-entrant cell. The single cell sync burst is initiated by means of the CELL SYNCHRONISATION INITIATION REQUEST message to the surrounding cells.

3.4. The late entrant cell shall correlate against the cell sync burst according to the measurement information within the CELL SYNCHRONISATION INITIATION REQUEST message. 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.

4.5. Thereafter, the late entrant cell shall start regular measurements after the reception of a CELL SYNCHRONISATION RECONFIGURATION REQUESTmessage and it shall report the timing of the measured cell sync bursts to the RNC. In turn, the late entrant cell receives its own schedules for sync transmissions and receptions and enters the steady-state phase.

3GPP TSG-RAN3 Meeting #21
Busan, South Korea, 21 - 25 May 2001
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CHANGE REQUEST

⌘ **25.402**	**CR**	**022**	⌘ rev	**-**	⌘ Current version:	**4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM [ ] ME/UE [ ] Radio Access Network [X] Core Network [ ]

Title: ⌘	Correction on TDD Radio Interface Synchronistion general aspects		
Source: ⌘	R-WG3		
Work item code: ⌘	LCRTDD-IubIur	***Date:*** ⌘	May 2001
Category: ⌘	**F**	***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: ⌘	On TDD Radio Interface Synchronisation Aspects,Timing advance function is used in 3.84Mcps TDD and Uplink Synchronisation fuction is used in 1.28Mcps TDD .
Summary of change: ⌘	In section 8.3.1, the sentence 'Timing Advance' is changed to 'Timing Advance for 3.84Mcps TDD and Uplink Synchronisation for 1.28Mcps TDD'
Consequences if not approved: ⌘	The discription of TDD Radio Interface Synchronistion general aspects is not fully correct. Backward compatibility: These descriptive additions are backward compatible with the previous version of the TS.

Clauses affected: ⌘	8.3.1	
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘
Other comments: ⌘		

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8.3 TDD Radio Interface Synchronisation

8.3.1 General

The TDD Radio Interface Synchronisation relates to the following two aspects:

- Intercell Synchronisation;
- Timing Advance for 3.84Mcps TDD and Uplink Synchronisation for 1.28Mcps TDD.

In TDD mode Intercell Synchronisation may be achieved by means of:

- Inter Node B Node Synchronisation that allows to achieve a common timing reference among Node B's.

The Radio Interface Synchronisation between UE and UTRAN is achieved by means of the Timing Advance mechanism.

8.3.2 Intercell Synchronisation

Intercell Synchronisation ensures that the frame boundaries are positioned at the same time instant in adjacent cells (see Figure 16).

This requirement is necessary to minimise the interference between UEs in neighbouring cell.

In addition it automatically ensures that the slots of different cells are synchronised, i.e. they do not overlap at the UE.

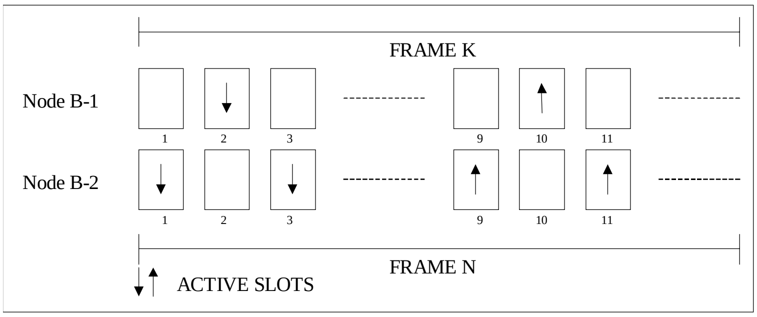

Figure 16: Intercell Synchronisation

Furthermore, Intercell Synchronisation assures the synchronisation of the last 8 bits of the SFN, that is required if frame wise hopping mechanisms among cells are used. It also can be used to keep more efficient and faster all procedures involving a switch from one cell to another, such as searching for new cells, locking to new cells or handover.

8.3.3 Multi Frame Synchronisation

Void.

8.3.4 Timing Advance for 3.84Mcps TDD

Timing Advance is used in uplink to align the uplink radio signals from the UE to the UTRAN both in case of uplink Dedicated Physical Channels (DPCH) and of Physical Uplink Shared Channels (PUSCH).

The handling of timing advance can be divided in four main categories: measurement, initial assignment, updates during operation, and setting on handover. For each category, a number of different cases can be distinguished.

1. Measurement of the timing deviation on the physical channels:
    - On PRACH transmissions;

- On DPCH transmissions;
- On PUSCH transmissions.

2. Assignment of correct timing advance value when establishing new channels:
   - At transition to CELL_DCH state;
   - When establishing an USCH in CELL_FACH state.
3. Update of timing advance value for channels in operation:
   - UE in CELL_DCH state;
   - UE with USCH in CELL_FACH state.
4. Setting of timing advance value for target cell at handover:
   - Handover from TDD to TDD with synchronised cells;
   - Handover from TDD to TDD with unsynchronised cells;
   - Handover from FDD to TDD;
   - Handover from other systems to TDD.

8.3.4.1 Measurement of the timing deviation on the physical channels

Timing deviation measurements are always performed in the physical layer in Node B. These measurements have to be reported to the higher layers, where timing advance values are calculated and signalled to the UE. For this reporting, a number of different ways are foreseen, depending on the used physical channels.

PRACH: The Node B physical layer measures the timing deviation of the received PRACH signal (RX Timing Deviation) and passes this together with the transport block to the CRNC (by means of the Iub RACH Frame Protocol). In case the RACH carries a DDCH or DTCH, the measured timing deviation may be passed from DRNC to the SRNC over Iur interface (by means of the Iur RACH Frame Protocol). Note: PRACH transmissions themselves are transmitted with a large guard period so they do not require timing advance.

PUSCH: The Node B physical layer measures the timing deviation of the received PUSCH signal (RX Timing Deviation) and passes this together with the transport block to the CRNC (by means of the Iub USCH Frame Protocol).

DPCH: The Node B physical layer measures the timing deviation of the received DPCH signal (RX Timing Deviation) and passes this value, if the conditions for reporting the measurement are met, to the SRNC (by means of the Iub & Iur DCH Frame Protocols).

8.3.4.2 Assignment of correct timing advance value when establishing new channels

8.3.4.2.1 Transition to CELL_DCH State

The transition to CELL_DCH state from CELL_FACH state or Idle Mode operates in the following manner:

- The SRNC checks whether an up to date timing deviation measurement is available. Such a measurement can be available from a recent RACH access (e.g. from initial access) or from a recent USCH transmission. If no up to date timing deviation measurement is available, e.g. because of lack of uplink transmissions, or during USCH over Iur, the SRNC is not informed about RX Timing Deviations, and has to trigger an uplink transmission from the UE before it can assign a DCH (for example, a RRC procedure requiring a response from the UE). The SRNC calculates the required timing advance value and saves it in the UE context in the SRNC for later use in dedicated or shared channel activation.
- The SRNC attaches the timing advance value to the channel allocation message that it signals to the UE via FACH (RRC CONNECTION SETUP or RADIO BEARER SETUP).

- When the UE receives the channel allocation message it configures its physical layer with the given absolute timing advance value. When a timing advance command is signalled to the UE, the CFN that the new timing advance is to be applied is always signalled.

8.3.4.2.2 When establishing an USCH in CELL_FACH state

For uplink traffic using the USCH, short time allocations are sent to the UE regularly. Therefore establishing an USCH in CELL_FACH state is very similar to handling of timing advance updates during USCH operation. The UTRAN shall use a recent timing deviation measurement. Such a measurement shall be available from a recent USCH burst or a recent RACH access (e.g. from a PUSCH_CAPACITY_REQUEST).

8.3.4.3 Update of timing advance value for channels in operation

8.3.4.3.1 UE in CELL_DCH state

An UE that is operating a dedicated channel (CELL_DCH state), has to update the timing advance from time to time to keep the received signal at the Node B within the required time window. Under reasonable assumptions the worst case update frequency is in the order of 8 seconds.

The timing advance update procedure operates in the following manner:

1. The SRNC determines whether a new timing advance value has to be transmitted to the UE taking into account the timing deviation measurements. The new timing advance value is calculated taking into account the UE's current timing advance value.

2. The new timing advance value and the CFN in which it is to take effect are signalled to the UE via RRC signalling on FACH or DCH (PHYSICAL CHANNEL RECONFIGURATION, TRANSPORT CHANNEL RECONFIGURATION, RADIO BEARER RECONFIGURATION or UPLINK PHYSICAL CHANNEL CONTROL are examples of possible messages on the DCCH).

3. The SRNC shall also send the updated timing advance value and the CFN in which it is to take effect to the Node B, using a user plan control message. The Node B may adjust its physical layer to take the change in uplink transmission into account.

4. When the UE receives a new timing advance value, it shall configure its physical layer so that the updated timing advance value takes effect on the given CFN specified within the RRC message. The timing advance value shall be applied to all DPCHs and, if present, to all PUSCHs.

There is no need for the UE to acknowledge the timing advance update: the Node B continually measures and reports the UE timing deviation and the UE reports the received timing advance value as part of its measurement reporting. The SRNC is thus able to detect if a timing advance update has not been received and needs to be resent.

8.3.4.3.2 UE with USCH Traffic in CELL_FACH state

If the UE uses an USCH in CELL_FACH state (no DCH), the timing advance update procedure operates in the following manner:

1. The CRNC determines whether a new timing advance value has to be transmitted to the UE taking into account when the last timing advance update was signalled. Two cases are possible:

   - If the data transfer is uplink after a longer idle period then the UE has to transmit a capacity request on the RACH. The CRNC is therefore informed of any timing deviation on this RACH.

   - If a new allocation follows an USCH transmission, the timing deviation is already known to the CRNC from measurements of the last uplink transmission.

2. If a Timing Advance update is needed, the CRNC includes a new timing advance value and the CFN in which it will take effect in the next USCH allocation message to the UE (PHYSICAL SHARED CHANNEL ALLOCATION).

3. The CRNC shall also send a user plane control message indicating the CFN and the updated timing advance value to the Node B so the Node B can adjust its physical layer averaging to take the change in uplink transmission into account.
4. When the UE receives a new timing advance value, the UE shall configure its physical layer, so that the updated timing advance value takes effect on the given CFN specified within the PHYSICAL SHARED CHANNEL ALLOCATION message. The timing advance value shall be applied to all present PUSCHs.

8.3.4.4 Setting of timing advance value for target cell at handover

8.3.4.4.1 General

Since the uplink radio signals need to be adjusted only because of large enough distances between the UE and the cell transmission, certain cells will have a small enough radius that timing advance needs to not be used. In those cells the timing advance value in the UE is set to zero and UE autonomous adjustment of timing advance upon handover is disabled in the handover messages to the UE.

In these cells, where TA is not applied, the “RX Timing Deviation” measurement can be omitted if no other procedure (e.g. LCS) requires it.

8.3.4.4.2 Handover from TDD to TDD with synchronised cells

When two TDD cells are involved in handover and the two cells are sufficiently synchronised, a UE is able to measure the time offset between P-CCPCH reception of the two cells and, consequently, is able to autonomously correct its timing on handover without UTRAN assistance. However to improve the accuracy for the UE calculated timing advance, the SRNC can include an updated timing advance based on the timing deviation measured by the old cell in the messages triggering the handover in the UE. Note that this update shall apply in the old cell at the specified CFN if handover is performed on a later CFN or if the handover fails and falls back to the old cell. The UE shall use this new value as the basis for the UE autonomous update.

After a successful handover, a response message is transmitted in the new cell. In this message, if the UE automonomously updated its timing advance it shall report the calculated timing advance value, which it is using for access to the new cell. By this way, the SRNC is informed as fast as possible about the absolute timing advance value in the UE, and it can correct the timing advance immediately or in the future based on this value, if necessary.

8.3.4.4.3 Handover from FDD to TDD, Handover from other systems to TDD, or Handover from TDD to TDD with unsynchronised cells

In these cases, since synchronisation between the handover cells is not possible, the new TDD cell must use a burst type with a large enough transmission window to allow the immediate transmission of data without the need of timing advance adjustment in the new cell, since timing adjustment can only be performed in these cells after the first uplink transmission.

8.3.5 UL Synchronisation for 1.28Mcps TDD

This section describes the details of the UL synchronisation including the establishment of UL synchronisation and maintenance of the UL synchronisation.

8.3.5.1 The establishment of uplink synchronisation

8.3.5.1.1 Preparation of uplink synchronisation by downlink synchronisation

When a UE is powered on, it first needs to establish the downlink synchronisation with the cell. Only after the UE can establish and maintain the downlink synchronisation, it can start the uplink synchronisation procedure.

8.3.5.1.2 Establishment of uplink synchronisation

Although the UE can receive the downlink synchronisation signal from the Node B, the distance to Node B is still uncertain which would lead to unsynchronised uplink transmission. Therefore, the first transmission in uplink direction is performed in Uplink Pilot Channel (UpPCH), to avoid interference in traffic time-slots.

The timing used for the SYNC_UL burst are set e.g. according to the received power level of DwPCH and/or P-CCPCH.

At the detection of the SYNC_UL sequence in the searching window, the Node B will evaluate the received power levels and timing, and reply by sending the adjustment information to UE to modify its timing and power level for next transmission and for establishment of the uplink synchronisation procedure. Within the next 4 sub-frames, the Node B will send the adjustment information to the UE (in a single subframe message in the FPACH). The uplink synchronisation procedure, normally used for a random access to the system, can also be used for the re-establishment of the uplink synchronisation when uplink is out of synchronisation.

8.3.5.2. Maintenance of uplink synchronisation

For the maintenance of the uplink synchronisation, the midamble field of each uplink burst can be used.

In each uplink time slot the midamble in each UE is different. The Node B can estimate the power level and timing shift by measuring the midamble field of each UE in the same time slot. Then, in the next available downlink time slot, the Node B will signal the Synchronisation Shift (SS) and the Power Control (PC) commands to enable the UE to properly adjust respectively its Tx timing and Tx power level.

These procedures guarantee the reliability of the uplink synchronisation. The uplink synchronisation can be checked once per 1.28Mcps TDD sub-frame. The step size in uplink synchronisation is configurable and re-configurable and can be adapted from 1/8 chip to 1 chip duration. The following updates for UL synchronisation are possible: 1 step up; 1 step down; no update.

For 3.84Mcps TDD option, uplink synchronisation is mentioned in 4.3 of [16]. But the implementation method is a little different with the 1.28Mcps TDD option. For 1.28Mcps TDD option, the establishment of the UL synchronisation is done by using the UpPCH and the FPACH.

UE will select one of the set of SYNC_UL codes which can be used in the cell to establish uplink synchronisation in the access procedure. The benefit of this method is when the UE wants to do random access, the PRACH will have minimum interference to other traffic channel. Vice versa, it will also reduce the interference from traffic channels to PRACH.