TR 25.937 V0.3.~~1~~ 2 (2000-11)

Technical Specification

3rd Generation Partnership Project (3GPP);
Technical Specification Group (TSG) RAN;

Low chip rate TDD Iub/Iur protocol aspects
(Release 2000)

UMTS <spec>

Reference

<Workitem> (<Shortfilename>.PDF)

Keywords

<keyword[, keyword]>

3GPP

Postal address

Office address

Internet

secretariat@3gpp.org

Individual copies of this deliverable
can be downloaded from
http://www.3gpp.org

Contents

Intellectual Property Rights

Foreword

This Technical Report (TR) has been produced by the 3rd Generation Partnership Project (3GPP), Technical Specification Group RAN.

The contents of this TR are subject to continuing work within 3GPP and may change following formal TSG approval. Should the TSG modify the contents of this TR, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version m.t.e

where:

m indicates [major version number]

x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

y the third digit is incremented when editorial only changes have been incorporated into the specification.

1 Scope

The work item "Low chip rate TDD Iub/Iur protocol aspects" is a Building Block which has been agreed at TSG RAN#8 as described in contribution [1]. Its parent feature is "Low chip rate TDD" which has been agreed at TSG-RAN#6 and updated at RAN#7. The purpose of the work item "Low chip rate TDD Iub/Iur protocol aspects" is to update the Iub/Iur interface protocol specifications and related overview specifications in RAN WG3 in support of the several aspects of the feature "Low chip rate TDD".

The purpose of the present document is to help the TSG RAN WG3 group to specify the changes to existing specifications, needed for the introduction of the low chip rate TDD option in the UTRAN for Release 2000. It is intended to gather all information in order to trace the history and the status of the Work Task in RAN WG3. It is not intended to replace contributions and Change Requests, but only to list conclusions and make reference to agreed contributions and CRs. When solutions are sufficiently stable, the CRs can be issued.

It describes agreed requirements related to the Work Task, and split the Work Task into "Study Areas" in order to group contributions in a consistent way.

It identifies the affected specifications with related Change Requests.

It also describes the schedule of the Work Task.

This document is a 'living' document, i.e. it is permanently updated and presented to all TSG-RAN meetings.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] RP-(00)0316rev, Low chip rate TDD Iub/Iur protocol aspects, Work Item Description

[2] R3(#15)-002003: LS from R1 to R2, R3, R4: Progress report of the Work Item "Low chip rate TDD, physical layer" and request for support.

[3] TR 25.928 (by RAN WG1), 1.28 Mcps functionality for UTRA TDD Physical Layer

[4] TR 25.834 (by RAN WG2), UTRA TDD Low Chip Rate Option Radio Protocol Aspects

[5] TS 25.302, Services provided by the Physical Layer

[6] TS 25.420, UTRAN I_{ur} Interface: General Aspects and Principles

[7] TS 25.430, UTRAN I_{ub} Interface: General Aspects and Principles

[8] TS 25.401: UTRAN Overall Description

[9] TS 25.423, UTRAN Iur interface RNSAP signalling

[10] TS 25.425, UTRAN Iur interface user plane protocols for CCH data streams

[11] TS 25.427, UTRAN Iur and Iub interface user plane protocols for DCH data streams

[12] TS 25.433, UTRAN Iub interface NBAP signalling

[13] TS 25.435, UTRAN Iub interface user plane protocols for CCH data streams

[14] TR 25.990: Vocabulary for the UTRAN

[15] TS 25.402, Synchronisation in UTRAN

[16] TS 25.224, Physical Layer Procedures (TDD)

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [14] apply.

3.2 Symbols

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASC	Access Service Class
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
BMC	Broadcast/Multicast Control
C-	Control-
CCCH	Common Control Channel
CCH	Control Channel
CCTrCH	Coded Composite Transport Channel
CN	Core Network
CRC	Cyclic Redundancy Check
CTCH	Common Traffic Channel
DC	Dedicated Control (SAP)
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DL	Downlink
DRNC	Drift Radio Network Controller
DSCH	Downlink Shared Channel
DTCH	Dedicated Traffic Channel
DwPTS	Downlink Pilot Timeslot
FACH	Forward Link Access Channel
FDD	Frequency Division Duplex
FPACH	Fast Physical Access Channel
GC	General Control (SAP)
GP	Guard Period
HO	Handover
ITU	International Telecommunication Union
kbps	kilo-bits per second
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
MAC	Medium Access Control
Nt	Notification (SAP)
PCCH	Paging Control Channel
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging Channel
PDCP	Packet Data Convergence Protocol
PDSCH	Physical Downlink Shared Channel
PDU	Protocol Data Unit
PHY	Physical layer
PhyCH	Physical Channels
P-RACH	Physical Random Access Channel
PU	Payload Unit
PUSCH	Physical Uplink Shared Channel
RAB	Radio Access Bearer
RACH	Random Access Channel
RB	Radio Bearer
RLC	Radio Link Control
RNC	Radio Network Controller
RNS	Radio Network Subsystem

RNTI	Radio Network Temporary Identity
RRC	Radio Resource Control
Rx	Receive
SAP	Service Access Point
SCH	Synchronization Channel
SDU	Service Data Unit
SHCCH	Shared Channel Control Channel
SIR	Signal to Interference Ratio
SRNC	Serving Radio Network Controller
SRNS	Serving Radio Network Subsystem
TCH	Traffic Channel
TDD	Time Division Duplex
TFCI	Transport Format Combination Indicator
TFI	Transport Format Indicator
TPC	Transmit Power Control
Ts	Timeslot
Tx	Transmit
U-	User-
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
UpPTS	Uplink Pilot Timeslot
URA	UTRAN Registration Area
USCH	Uplink Shared Channel
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

4 Overview of the TDD low chip rate option

4.1 Physical layer

4.1.1 General

This section contains some basic information about frame and burst structure of physical layer of TDD low chip rate option. More information on physical layer characteristics of TDD low chip rate option can be found in [3] .

4.1.2 Frame structure

For low chip rate option, the frame length is 10ms and the 10ms frame is divided into 2 sub-frames of 5ms. The frame structure for each sub-frame in the 10ms frame length is the same. The frame structure for each sub-frame is shown in Figure 1.

Figure 1 Structure of the sub-frame for TDD low chip rate option

Tsn (n from 0 to 6): the nth normal time slot, 864 chips duration;
DwPTS: downlink pilot time slot, 96 chips duration;
UpPTS: uplink pilot time slot, 160 chips duration;
GP: main guard period for TDD operation, 96 chips duration;

In Figure 1, the total number of normal traffic time slots for uplink and downlink is 7, and the length for each normal time slot is 864 chips duration. Among the 7 normal traffic time slots, Ts0 is always allocated as downlink while Ts1 is always allocated as uplink. The time slots for the uplink and the downlink are separated by a switching point. Between the downlink time slots and uplink time slots, the special period is the switching point to separate the uplink and downlink. In each sub-frame of 5ms for low chip rate option, there are two switching points (uplink to downlink and vice versa). The proposed frame structure has taken some new technologies into consideration, both the smart antenna (beam forming) technology and the uplink synchronisation will be well supported.

4.1.3 Burst Types

In correspondence to the frame structure described above, the burst structures for Tsn, DwPTS and UpPTS are proposed. The burst structure for normal time slot (Tsn) is described in Figure 2.

Figure 2 Burst structure for normal traffic time slot

The structure for DwPTS and UpPTS is described in Figure 3 and Figure 4.

Figure 3 Structure for DwPTS

Figure 4 Structure for UpPTS

In Figure 2, the data symbols in each side of the midamble are 352 chips. The TPC bits for power control, the TFCI bits and the additional uplink synchronization bits (synchronization shift) are included in the Data symbols fields of the burst if they are needed. The amount of TFCI bits used is depending on the service and the details for TFCI, synchronization shift and TPC bits should be provided later with service mapping. For the power control symbols, the uplink synchronization control symbols and the TFCI the symbols around the midamble are used.

The GP field in Figure 2 for each time slot is used for protection between time slots to avoid the long delay multi-path interference. It should be noted that the GP of the TS0 together with the guard period in DwPTS is 48 chips long which is different with other normal guard period of 16 chips between time slots. This ‘super long’ guard period can be used to avoid the interference between the last normal downlink time slot and the downlink synchronization pilot burst. Otherwise, the interference to the last downlink time slot from the strong powered pilot will be serious to the traffic; and vice versa, the interference to the downlink pilot burst from the last downlink time slot will decrease the performance on downlink synchronization and cell search. Note that if the UEs serving Node B is far away and the UE makes handover measurements it will receive the beginning of the DwPTS of a close by Node B inside these 48 chip. 48 chip corresponds to 11 km difference in distance to the Node B. If the other Node B is more distant to the serving Node B, big guard period can be used for receiving the DwPTS of the handover candidate Node B.

In DwPTS and UpPTS, the content of SYNC and SYNC1 field are used for downlink and uplink pilot. The GP fields are used to separate the downlink (uplink) pilot from the normal downlink (uplink) time slot.

It should be pointed out that the uplink synchronization burst (SYNC1) is not followed by a RACH immediately. First the UL synchronization burst UpPTS is sent by the UE. This UpPTS is used for Node B to determine the received power level and the received timing. Second, the Node B transmits timing and power control information to the UE using the FPACH (one burst message) within the next 4 frames. Then the P-RACH is transmitted. Both FPACH and P-RACH are carrying single burst messages transmitted on a normal traffic time slot (see Fig. 2).

4.2 Transport Channel and higher layer differences compared to TDD-high

For details on the higher layers of the radio protocol of the low-chip-rate TDD option see [4].
For example there are differences with the RACH access procedure, compared to TDD-high.
DSCH and USCH details may be different.

4.3 Other key features of low-chip-rate TDD

Uplink synchronisation.
Smart antenna, and baton handover.

5 Iub/Iur aspects of Low chip rate TDD radio frame structure

5.1 Introduction

This chapter includes several properties of the radio frames used in low chip rate TDD. On the Iub and Iur interface, this will imply new parameters and information elements in the radio related control plane protocols.
The following impacts have been identified in a Liaison Statement from RAN1 to RAN3 [2].

- Different frame structure than for high chiprate TDD option.
- Different basic midamble sequences, maximum channel impulse response is scalable (W=8, 9, 12, 16, 21, 32, 64), depending on number of users and environment, including the association between midambles and channelisation codes
- Use of only one burst type for physical channels except special bursts in DwPTS/UpPTS. Because there is only one burst type in low chip rate TDD option, "burst type" defined as a parameter for physical channel is not necessary.
- Support of different timeslot formats due to different number of bits and L1 control signals and midamble length
- Support of use of 8PSK for special timeslots/all timeslots per cell
- Beacon function is provided by DwPTS and P-CCPCH.

5.2 Requirements

5.3 Study areas

5.4 Agreements and associated contributions

5.5 Specification impact and associated Change Requests

It is expected that these Iub/Iur protocol aspects have impacts on the following Specifications:
[12] (NBAP), [9] (RNSAP).

5.6 Open issues

6 Iub/Iur aspects of physical channel types

6.1 Introduction

6.1.1 General

In addition to the physical channels defined for UTRA TDD, three physical channels are added to support low chip rate TDD option, they are: DwPTS (Downlink Pilot Time Slot), UpPTS (Uplink Pilot Time Slot) and FPACH (Fast Physical Access CHannel). Besides, two physical channels, Primary SCH and Secondary SCH, are not needed in low chip rate TDD option.
Because there is only one burst type in low chip rate TDD option, "burst type" defined as a parameter for physical channel is not necessary.
Due to the different RACH procedure of low chip rate TDD option, the Access Service Class selection needs further study.

Shared channels, PUSCH and PDSCH, will be supported by TDD low chip rate option, but details are ffs.
The added physical channels and the modifications for PRACH are described in the following:

6.1.2 DwPTS

- Tx diversity mode.
- SYNC code ID

6.1.3 UpPTS

- SYNC1 code ID

6.1.4 FPACH

- Scrambling code.
- Channelisation code.
- Timeslot
- Midamble shift
- Tx diversity mode.

6.1.5 PRACH

- Spreading factor for data part
- Power control info:
  - UL target SIR
  - Primary CCPCH DL TX power
  - UL interference
- Access Service Class Selection
- Timeslots
- Spreading Codes
- Midamble Shift

6.2 Requirements

6.3 Study areas

6.4 Agreements and associated contributions

6.5 Specification impact and associated Change Requests

It is expected that this Iub/Iur protocol aspects has effects on the following Specifications:
[7],[9],[12],[13] .

6.5.1 Impact on NBAP

In [12],the special features of low chip rate TDD physical channels, as described in ch. 6.1 will require some adaptation of the procedural descriptions in NBAP as well as updates of the Information Elements in the messages.

The following examples show how the CELL SETUP REQUEST message for TDD cells could be changed for Release 4, to include the Information Elements of the low-chip-rate TDD option in a backward compatible way.

Example: CELL SETUP REQUEST (TDD Message, [12]) with extensions for the low chip rate TDD option

9.1.24.2 TDD Message

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message discriminator	M		9.2.1.45		–	
Message Type	M		9.2.1.46		YES	reject
Transaction ID	M		9.2.1.62		–	
Local Cell Id	M		9.2.1.38		YES	reject
C-Id	M		9.2.1.9		YES	reject
Configuration Generation Id	M		9.2.1.16		YES	reject
UARFCN	O		9.2.1.65	Corresponds to Nt [15]	YES	reject
Cell Parameter ID	M		9.2.3.4		YES	reject
Maximum Transmission Power	M		9.2.1.40		YES	reject
Transmission Diversity Applied	M		9.2.3.26	On DCHs	YES	reject
Sync Case	O		9.2.3.18		YES	reject
Synchronisation Configuration		1			YES	reject
>N_INSYNC_IND	M				–	
>N_OUTSYNC_IND	M				–	
>T_RLFAILURE	M				–	
DPCH Constant Value	M		Constant Value		YES	reject
PUSCH Constant Value	M		Constant Value		YES	reject
PRACH Constant Value	M		Constant Value		YES	reject
SCH Information		0 .. 1		For wideband TDD	YES	reject
>Common physical channel ID	M		9.2.1.13		–	
>CHOICE *Sync Case*						
>>Case 1					YES	reject
>>>Time Slot	M		9.2.3.23		–	
>>Case 2					YES	reject
>>>SCH Time Slot	M		9.2.3.17		–	
>SCH Power	M		DL Power 9.2.1.21		–	
>TSTD Indicator	M		9.2.1.64		–	
PCCPCH Information		1			YES	reject
>Common physical channel ID	M		9.2.1.13		–	
>TDD Physical Channel Offset	M		9.2.3.20		–	
>Repetition Period	M		9.2.3.16		–	
>Repetition Length	M		9.2.3.15		–	
>PCCPCH Power	M		9.2.3.9		–	
>Block STTD Indicator	M		9.2.3.1		–	
Time Slot Configuration		0 .. 15		For wideband TDD	GLOBAL	reject
>Time Slot	M		9.2.3.23		–	
>Time Slot Status	M		9.2.3.25		–	
>Time Slot Direction	M		9.2.3.24		–	
Time Slot Configuration 1.28TDD		0 .. 6		For low chip rate TDD	GLOBAL	reject
>Time Slot	M		9.2.3.x		–	
>Time Slot Status	M		9.2.3.25		–	
>Time Slot Direction	M		9.2.3.24		–	

Figure x2: Example for a Release 4 message with backward compatible additions for 1.28 Mcps TDD

6.5.2 Impact on “Node B logical Model over Iub”

In chapter 6 “Node B logical Model over Iub” of [7], in the section 6.2.4.1 “common resources”, the common resources in Node B are described in Figure 3, and it only includes FDD mode and the 3.84Mcps TDD option. So it is suggested to modify the figure to include the 1.28Mcps TDD option also.
The following figure is recommended:

Figure X: Common resources in a Node B that are managed by the CRNC

6.6 Open issues

7 Iub/Iur aspects of transport channel features

7.1 Introduction

7.1.1 General

The transport channel concept for UTRA TDD low chip rate option is the same as for UTRA TDD 3.84 Mcps as defined in [5]. Some differences exist with respect to the features of some of the transport channels.

7.1.2 Types of Transport Channels

A general classification of transport channels is into two groups:

- common channels; and
- dedicated channels (where the UEs can be unambiguously identified by the physical channel, i.e. code, frequency and time slot).

Common transport channel types are the same as for UTRA TDD 3.84 Mcps. Details of operation on RACH and FACH are ffs, e.g. power control. RACH and FACH are characterized as follows:

1. Random Access Channel(s) (RACH) characterised by:
   - existence in uplink only;
   - limited data field;
   - collision risk;
   - power control.
2. Forward Access Channel(s) (FACH) characterised by:
   - existence in downlink only;
   - possibility to use beam forming;
   - power control;
   - possibility to change rate fast (each 10ms).

The details of shared channels USCH and DSCH are ffs.

Dedicated transport channel types are the same as for UTRA TDD 3.84 Mcps. For TDD low chip rate option, DCH has the possibility to use Uplink Synchronisation to maintain timing advance :

1. Dedicated Channel (DCH) characterised by:
   - existing in uplink or downlink;
   - possibility to use beam forming;
   - possibility to change rate fast (each 10ms);
   - fast power control;
   - Possibility to use Uplink Synchronisation

7.1.3 System information broadcast

For the low chip rate TDD a predefined PCCPCH that carries system information transmitted on BCH is proposed. The PCCPCH uses two codes of spreading factor 16 in a predefined timeslot (TS0). Two codes of spreading factor 16 provide a data rate of all in all 35.2 kbit/s, which is certainly sufficient to allow the same transport format as in FDD and high chip rate TDD. It might be possible to use a bigger transport block size or apply stronger coding. However, this does not prevent low chip rate TDD from using exactly the same principles for system information broadcast.
In principle the same kind of information needs to be broadcast. Modifications are only required to support the physical layer of low chip rate TDD.
As a conclusion only some new information elements need to be broadcast but no changes to the principles of system information broadcast are foreseen.

7.1.4 Usage of RACH

The proposed RACH procedure in low chip rate TDD provides large flexibility. The PRACH basically allows the same configuration possibilities as a DPCH. Thus the allowed transport formats can be adjusted according to the actual needs. The configuration to be used for the PRACH transmissions is broadcast on BCH. This assures that the required signaling e.g. for initial access can be realized with the same messages as currently defined. Only differences of detail of the messages requiring the RACH are foreseen. However, the details of the realization of a similar concept for Access Service Classes are currently under further study.

As a conclusion there are no major problems identified that will result in problems of the usage of the principles of the current NBAP/RNSAP protocol.

7.1.5 Common downlink channels

The common channels can also be configured to provide sufficient capacity for the messages that need to be transmitted on common downlink channels. The exact configuration is as in FDD and high chip rate TDD broadcasted on BCH.

- PCH; PICH and FACH can be time multiplexed with the BCH:
  BCH is mapped on the P-CCPCH while PCH, PICH and FACH can be time multiplexed on the S-CCPCH, i.e. the S-CCPCH can be time multiplexed with P-CCPCH or not. These physical channels are using channelisation codes of SF 16.
- P-CCPCH and S-CCPCH require two channelisation codes which can be the same or different; FPACH is a new physical channel which always uses one channelisation code at SF 16.

7.2 Requirements

7.3 Study areas

7.4 Agreements and associated contributions

7.5 Specification impact and associated Change Requests

It is expected that this Iub/Iur protocol aspects has impacts on the following Specifications:
[7] ,[9],[10],[11],[12],[13].

7.6 Open issues

8 Iub/Iur aspects of Uplink synchronisation

8.1 Introduction

This aspect includes the following bullets listed in [2]:

- Special Layer1-Synchronisation Shift (SS) symbols
- Number of used SS symbols can take 3 values
- SS-symbols are transmitted once per subframe

In principle, this feature replaces or complements the “Timing advance” function which is performed by higher layer interaction in TDD-high.

8.1.1 The establishment of uplink synchronization

8.1.1.1 Preparation of uplink synchronization (downlink synchronization)

When a UE is powered on, it first needs to establish the downlink synchronisation with the cell as describe in [3] about cell search procedure. Only after the UE can establish and maintain the downlink synchronisation, it can start the uplink synchronisation procedure.

8.1.1.2 Establishment uplink synchronization

Although the UE can receive the downlink synchronization signal from the Node B, the distance to Node B is still uncertain which would lead unsynchronised uplink transmission. Therefore, the first transmission in uplink direction is performed in a special time-slot UpPTS to reduce interference in traffic time-slots.

The timing used for the SYNC1 burst are set e.g. according to the received power level of DwPTS and/or P-CCPCH.

At the detection of the SYNC1 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.

8.1.2. Maintenance of uplink synchronisation

For the maintenance of the uplink synchronization, 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 synchronization can be checked once per TDD sub-frame. The step size in uplink synchronization is configurable and re-configurable and can be adapted from 1/8 chip to 1 chip duration. The following updates for UL synchronization are possible: 1 step up; 1 step down; no update.
[Explanation difference:]

For high chip rate option , uplink synchronisation is mentioned in 4.3 of ~~TS25.224~~[16]. But the implementation method is a little different with the low chip rate option. For low chip rate option, the establishment of the UL synchronization is done by using the UpPTS and the FPACH.

It allocates a unique time slot UpPTS for UE to establish uplink synchronisation in the access procedure. The benefit of this method is when the UE wants to do random access, the P-RACH will have minimum interference to other traffic channel. Vice versa, it will also reduce the interference from traffic channels to P-RACH.

8.2 Requirements

8.3 Study areas

8.4 Agreements and associated contributions

8.5 Specification impact and associated Change Requests

It is expected that this Iub/Iur protocol aspects has impacts on the following Specifications:
[8] ,[9],[10],[11],[12],[13],[15].

8.5.1 Impact on UTRAN Overall Description

In chapter 6 “UTRAN Architecture” of [8],some details might be added to the third paragraph:
“A Node B can support FDD mode, TDD mode or dual-mode operation. There are two options in TDD mode,1.28Mcps TDD option and 3.84Mcps TDD option.”

In chapter 7 “UTRAN functions description” of [8]:
In the section 7.2.4.14 “[TDD - Timing Advance]”, some details might be added because the function implementation is quite different between 1.28Mcps TDD option and 3.84Mcps:
“This function is used in uplink to align the uplink radio signals from the UE to the UTRAN. In 3.84Mcps TDD option,Timing advance is based on uplink burst timing measurements performed by the Node B L1, and on

Timing Advance commands sent downlink to the UE. In 1.28Mcps TDD option,the *Timing Advance* function can be achieved by uplink synchronization procedure .”

In addition, in chapter 9 “Synchronisation” of [8], the "uplink synchronisation" function might be added to the list of UTRAN functions related to synchronisation.

8.5.2 Impact on UTRAN Synchronisation

In,chapter 4 “Synchronisation Issues” of [15], the issue “uplink synchronization” for 1.28Mcps TDD might be included in the section 4.1 “general” of [15]:

“Different synchronisation issues are identified within UTRAN, i.e.:
- Network Synchronisation;
- Node Synchronisation;
- Transport Channel synchronisation;
- Radio Interface Synchronisation;
- Time Alignment handling.
- uplink synchronization”

So the Synchronisation Issues Model of Figure 1 might be changed for including uplink synchronisation. The details are FFS.

It is suggested that add the summary of Uplink synchronization into new section 4.X and the details into a new chapter X.

Since the *Timing Advance* function implementation is quite different between 1.28Mcps TDD option and 3.84Mcps, it is suggested for section 8.3 “TDD Radio interface Synchronisation”, to change the title of section 8.3.4 “Timing Advance” to “Timing Advance for 3.84Mcps” and add a new section 8.3.X “Timing Advance for 1.28Mcps”.

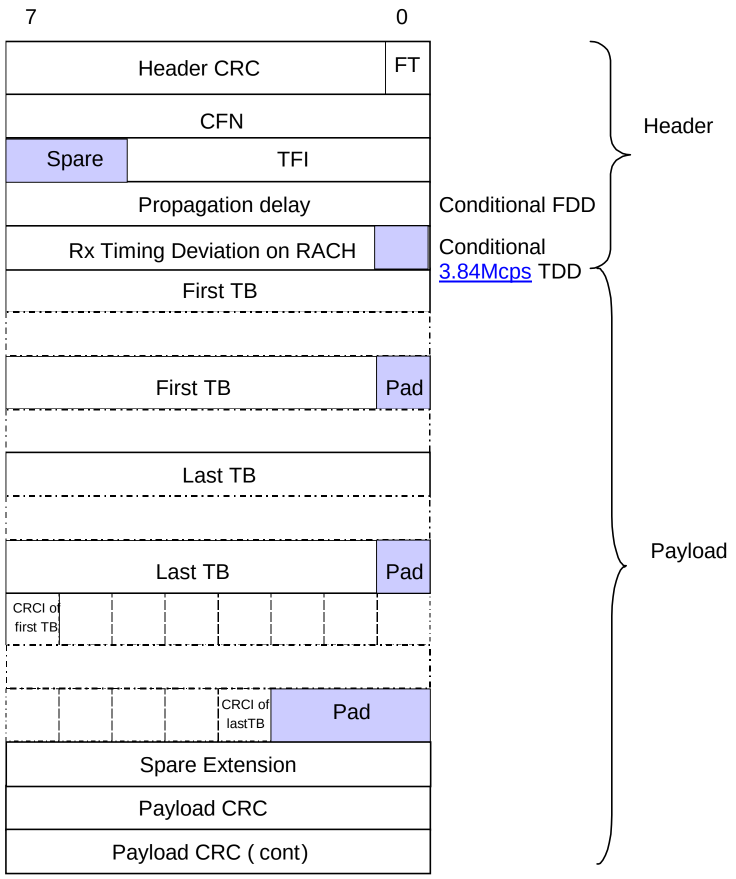
8.5.3 Impact on the DCH user plane protocols

In principle, the “uplink synchronisation” feature in 1.28Mcps TDD replaces or complements the “timing advance”function which is performed by higher layer interaction in 3.84Mcps.
The title of chapter 5.6 “Rx timing deviation measurement[TDD]” shall be changed to “Rx timing deviation measurement[3.84Mcps TDD]”,because the procedure is applicable in 3.84Mcps TDD option only.

8.5.4 Impact on the Iub common transport channel user plane protocols

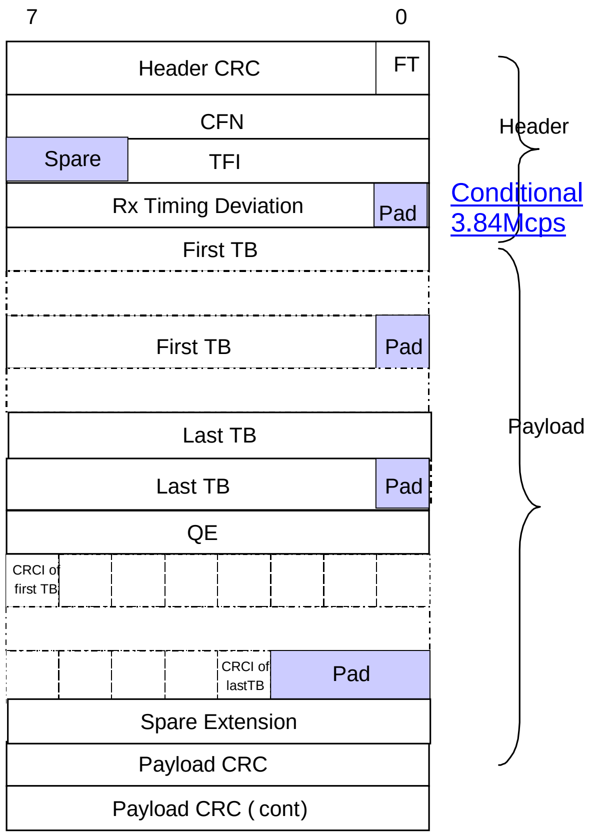
The same reason as above, in [13], The title of chapter 5.7 “Timing Advance [TDD]” shall be changed to “Timing Advance [3.84 Mcps TDD]”.

the chapter 6.2.1 “RACH channels”,the RACH Data Frame structure showed in Figure 13 shall be changed as follows:



And the discription shall be changed as follows: "Rx Timing Deviation is a conditional Information Element which is only present when the Cell supporting the RACH Transport Channel is a 3.84Mcps TDD Cell."

the chapter 6.2.6 "Uplink Shared Channels[TDD]",the USCH Data Frame structure showed in Figure 21 shall be changed as follows:



8.5.5 Impact on other WG3 Specifications and TRs

It is expected that the Iub/Iur aspects of uplink synchonisation have an impact also on the Specifications [9], [10], and [12] because it may influence the physical channel handling procedures. In this TR, these aspects will be covered implicitely in chapter 6 where the physical channel types are addressed.

8.6 Open issues

9 Iub/Iur aspects of Measurements

9.1 Introduction

This aspect includes the following bullets listed in [2]

- Ranges and accuracy have to be adapted for the low chip rate option.

In principle, this issue relates to

- measurements to be performed by Node B and to be reported to DRNC/SRNC, and
- measurements performed by UE, reported to SRNC or CRNC, and used by SRNC, DRNC or Node B.

Due to the different power control and uplink synchronisation concept, different measurements are expected.

9.2 Requirements

9.3 Study areas

9.4 Agreements and associated contributions

9.5 Specification impact and associated Change Requests

It is expected that this Iub/Iur protocol aspects has impacts on the following Specifications: [9],[10],[11],[12],[13].

9.6 Open issues

10 Information elements for 1.28Mcps TDD

10.1 Discussion on physical channel parameter for 1.28Mcps

1.28Mcps TDD and 3.84Mcps TDD are both based on CDMA with an additional TDMA component. The most obvious difference is of course the different bandwidth that is used in the both modes. In contrast to 3.84Mcps TDD it is foreseen to be the normal case for 1.28Mcps TDD that several frequency bands are used within one cell. For example if a frequency band of 5 MHz is available it is divided into three frequency bands of 1.6 MHz to be used for 1.28Mcps TDD.
Timing handling is due to the high accuracy requirements in 1.28Mcps TDD a layer1 functionality. Thus It's no need to transfer timing advance information over Iub interface .
Apart from these differences there is a high potential to reuse descriptions of the description of physical channel information for the 3.84Mcps TDD for 1.28Mcps TDD mode.

Parameters required to define physical channels in 1.28Mcps TDD:

- **Timeslot:** The frame structure defines seven timeslots per subframe. The timeslots of the two subframes in a timeslot are always associated to each other (except for the FPACH; this will be described later). The first timeslot (TS0) in a subframe is always dedicated to the downlink and the second timeslot (TS1) is always dedicated to the uplink. Thus at most six timeslots may be allocated in one direction in contrast to fourteen in 3.84Mcps TDD.

- **Channelisation code:** The handling of channelisation codes is exactly the same as in 3.84Mcps TDD.

- **Midamble shift:** The handling of midambles (basic midamble code and applied midamble shift) is basically the same as in 3.84Mcps TDD. The basic midamble code is also acquired during synchronisation process and the midamble shift is either explicitly signalled for a particular physical channel or a predefined association between channelisation codes and midamble shifts is used. This association is defined in WG1 specifications.

- **Frame allocation:** The same optional multiframe structure (defined by an offset, repetition period and repetition length) as used in 3.84Mcps TDD can be adopted for 1.28Mcps TDD.

- **Burst type:** Only one burst type exists for 1.28Mcps TDD for traffic channels. Therefore no signalling of the used burst type is required.

- **Modulation:** The basic modulation scheme is the same as in 3.84Mcps TDD. However, in case of usage of spreading factor 1 optionally 8 PSK can be used in contrast to 3.84Mcps TDD.

10.2 Information elements for low chip rate TDD

The following describes the IEs for 1.28Mcps TDD, based on the tabular format representation in the NBAP specification [12]. It is expected that the description is also valid for RNSAP [9].

10.2.1 Time Slot

The Time Slot represents the minimum time interval inside a Radio Frame that can be assigned to a Physical Channel.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Time slot	MP		Integer(0..6)	

10.2.2 Midamble shift and burst type

This information element indicates burst type and midamble allocation.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Midamble Allocation Mode	MP		Enumerated (Default midamble, Common midamble, UE specific midamble)	
Midamble Shift	CV UE		Integer(0..15)	

Condition	Explanation
UE	This information element is only sent when the value of the "Midamble Allocation Mode" IE is "UE-specific midamble".

10.2.3 Channelisation Code

The Channelisation Code Number indicates which Channelisation Code is used for a given Physical Channel. In TDD the Channelisation Code is an Orthogonal Variable Spreading Factor code, that can have a spreading factor of 1, 2, 4, 8 or 16.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE SF				
>SF=1			Enumerated(QPSK,8PSK)	Modulation options in contrast to 3.84Mcps TDD mode
>Otherwise				
>>TDD Channelisation Code			ENUMERATED ((1/1), (2/1), (2/2), (4/1),…(4/4), (8/1), (8/8), (16/1)… (16/16) ,…)	

CHOICE SF	Condition under which the given SF is chosen
SF =1	“spreading factor” is set to 1
otherwise	“spreading factor” is set to a value distinct from 1

10.2.4 special physical channels IE for 1.28Mcps TDD

FPACH info

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Timeslot number	MP		Integer(1..6)	
Midamble Shift	MP		Integer(0..15)	
Channelisation Codes	MP		Integer((16/1)..(16/16))	

Sync1 transmission parameters

There are major similarities to the RACH transmission parameters in FDD.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Power Increment	MP		Integer(0,1,2,3)	in dB
M	MP		Integer(1,2,4,8)	Max re-transmissions of UpPTS

11 Project Plan

11.1 General

It is intended to focus on the basic features of low-chip-rate TDD first, and then on the advanced features.

Basic features includes:

L1 interface
primitives to MAC, RRC
uplink synchronisation
support of RACH, FACH, PCH, BCH, DCH
cell selection/reselection

handover (set of measurements)
incorporation of basic features of the smart antenna concept
Advanced features include:
Support of USCH/DSCH
Support of Iur
baton handover
extended functionality and completion of smart antenna concept
alignment with UTRA LCS concept

11.2 Schedule

Date	Meeting	Scope	[expected] Input	[expected]Output

11.3 Work Task Status

	Planned Date	Milestone	Status
1.			
2.			

12 History

Document history		
Date	**Version**	**Comment**
August 2000	0.0.1	First proposal
August 2000	0.1.0	Approved by WG3 #15
August 2000	0.1.1	Includes some input chapters approved by WG3 #15
October 2000	0.2.0	Approved by WG3 #16
November 2000	0.2.1	Includes some input chapters approved by WG3 #16
November 2000	0.3.0	Approved by WG3 #17
November 2000	0.3.1	Includes some input chapters approved by WG3 #17
November 2000	0.3.2	Includes some information of specification impact for 1.28Mcps TDD
Editor for 3G TR 25.937 is: Mr. Bing Xu , CWTS/CATT		
Tel. : +86 10 62304422 ext 201 Fax : +86 10 62303127 Email : xub@catt.ac.cn		
This document is written in Microsoft Word version.		