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Technical Specification

3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) RAN; UTRAN I_{ur} Interface User Plane Protocols for Common Transport Channel Data Streams [UMTS <spec>]

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Contents

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of this TS are subject to continuing work within 3GPP TSG RAN and may change following formal TSG RAN approval. Should the TSG modify the contents of this TS, 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

This document shall provide a description of the UTRAN RNS-RNS (Iur) interface user plane protocols for Common Transport Channel data streams as agreed within the TSG-RAN working group 3.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply;

b) all versions up to and including the identified version (identified by "up to and including" before the version identity);

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case 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] ITU-T Recommendation I.361 B-ISDN ATM Layer Specification (11/95)

[2] ITU-T Recommendation I.363.2 B-ISDN ATM Adaptation Layer type 2 (9/97)

[3] ITU-T Recommendation I.366.1 Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL type 2 (6/98)

[4] 3GPP TS 25.427 Iub/Iur User Plane Protocols for DCH Data Streams

[5] TS 25.401 UTRAN architecture description

3 Definitions, symbols and abbreviations

3.1 Definitions

. *[Editor´s note: For list of definitions, see [1]. Only definitions specific to this document are listed below, in order to avoid inconsistency between documents. When list is stable, definitions relevant for this document should be extracted.]*

For the purpose of the present document, the following terms and definition apply:

Common Transport Channel:~~s~~ ~~are~~ it is defined as a transport channel~~s~~ that is~~are~~ shared by several users i.e. RACH, FACH and DSCH.

Transport Connection: Service provided by the transport layer and used by Frame Protocol for the delivery of FP PDU.

For other definitions, please refer to [5]

3.2 Symbols

3.3 Abbreviations

AAL2	ATM Adaptation Layer type 2
ATM	Asynchronous Transfer Mode
CFN	Connection Frame Number
CmCH	CoMmon transport CHannel
CPS	Common Part Sublayer
C-RNC	Controlling Radio Network Controller
CRC	Cyclic Redundancy Checksum
CRCI	CRC Indicator
DCH	Dedicated Transport Channel
DL	Downlink
DSCH	Downlink Shared CHannel
D-RNTI	Drift RNTI
FACH	Forward Access CHannel
FP	Frame Protocol
FT	Frame Type
PC	Power Control
RACH	Random Access CHannel
RNC	Radio Network Controller
RNTI	Radio Network Temporary Identity
SRNC	Serving Radio Network Controller
S-RNTI	Serving RNTI
SSCS	Service Specific Convergence Sublayer

SSSAR	Service Specific Segmentation and Reassembly sublayer
TB	Transport Block
TBS	Transport Block Set
TFI	Transport Format Indicator
ToA	Time of arrival
TTI	Transmission Time Interval
UE	User Equipment
UL	Uplink

4 General aspects

4.1 Common Transport Channel Data Streams User Plane Protocol Services

This chapter describes the services that the User Plane Protocols provide such as data transfer, flow control.

4.1.1 RACH/FACH Data Streams User Plane Protocol Services

RACH/FACH frame protocol provides the following services:

- Transport of MAC-c SDUs between the SRNC and the CRNC for FACH common transport channel
- Flow Control between MAC-d and MAC-c

4.1.2 DSCH Data Streams User Plane Protocol Services

DSCH frame protocol provides the following services:

- Transport of MAC-sh SDUs between the SRNC and the CRNC for DSCH common transport channel
- Flow Control between MAC-d and MAC-sh

4.2 Services expected from data transport

The following services are expected from the transport layer:

- In sequence delivery of Frame Protocol PDUs

5 Common Transport Channel Data Streams User Plane Procedures

This chapter specifies the user plane procedures for Common Transport Channels data streams. Typical related scenarios at Iur interface should be described.

For the user plane of the radio network layer there are three Common Transport Channel frame handling protocols:

- Random Access Channel Frame Protocol (RACH FP) for transport of Iur data streams carried on RACH on the Uu-interface.
- Forward Access Channel Frame Protocol (FACH FP) for transport of Iur data streams carried on FACH on the Uu-interface.

- Downlink Shared Channel Frame Protocol (DSCH FP) for transport of Iur data streams carried on DSCH on the Uu-interface.

5.1 Data Transfer

5.1.1 RACH/FACH Channels

5.1.2 DSCH Channels

5.2 Flow Control

5.2.1 RACH/FACH Channels

The FACH flow control frame is used by the DRNC to acknowledge transmission of FACH data frames and control the user data flow.

[Editor's note: Flow Control procedure is FFS].

5.2.2 DSCH Channels

6 Frame Structure and Coding

6.1 General

The general structure of a Common Transport Channel frame consists of a header and a payload. This structure is depicted in the table below:

Header	Payload: Data or Control Information

Figure 1: General Frame Structure

The header shall contain the frame type field and information related to the frame type.

There are two types of frames (indicated by the Frame Type field).

- Data frame
- Control frame

In this specification the structure of frames will be specified by using pictures similar to the following figure:

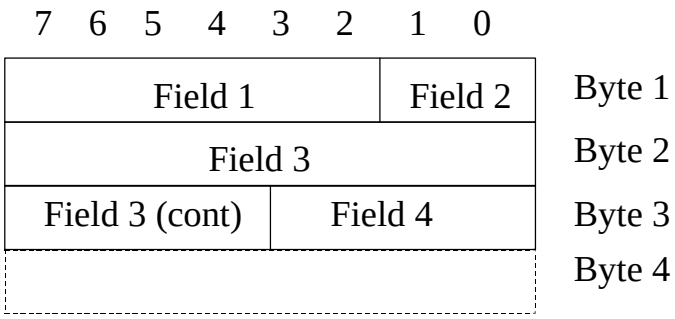

Figure 2: Example frame structure

Unless otherwise indicated, fields which consist of multiple bits within a byte will have the more significant bit located at the higher bit position (indicated above frame in picture 1). In addition, if a field spans several bytes, more significant bits will be located in lower numbered bytes (right of frame in picture 1).

On the Iur interface, the frame will be transmitted starting from the lowest numbered byte. Within each byte, the bits are sent according decreasing bit position (bit position 7 first).

The parameters are specified giving the value range and the step (if not 1). The coding is done as follows (unless otherwise specified):

- Lower value (in the range) coded as a sequence of 0's
- Higher value in the range coded as a sequence of 1's

~~6.1~~6.2 Data frame structure

~~6.1.1~~6.2.1 RACH~~/FACH~~ Channels

RACH~~/FACH~~ Iur data stream corresponds to the data stream of one specific UE. The used transport bearer for the transport of FACH/RACH is bi-directional.

		Information element	Description	Present on	
				RACH UL	FACH DL
Header		Frame Type	RACH/FACH data frame	X	X
		DRNTI/SRNTI	Used to identify the UE context in the CRNC/SRNC	SRNTI	DRNTI
		FACH Indicator	Indicates if the data in the payload should be sent on the FACH coupled to the RACH (i.e. the payload contains the Cell Update Confirm message), or if it can be sent on a different FACH decided by the CRNC (subsequent user data).		X
		Common Transport Channel Priority Indicator	Indicates the priority of the FACH data frame. Used by the DRNC when scheduling FACH traffic.		X
		Frame Sequence Number	Used for sequential numbering of FACH data frames.		X
		User Buffer Size	Indicates the users' buffer size (i.e. the amount of data in the buffer) per Common Transport Channel Priority class,		X
		Length	Length of the data field	X	X
Payload		Checksum indicator	See ref. [4] TS 25.427	X	
		Data	Contains the MAC-c SDU to be sent over the radio interface.	X	X
Tail		Data frame checksum	See ref. [4] TS 25.427	X	X

Table 1: FACH/RACH data frame structure, FDD mode

Note that the RACH/FACH FP does not facilitate multiplexing of data streams from different UEs onto the same data frame, but does allow multiple UEs to share the same transport bearer.

The RACH Data frame structure is different for FDD and TDD.

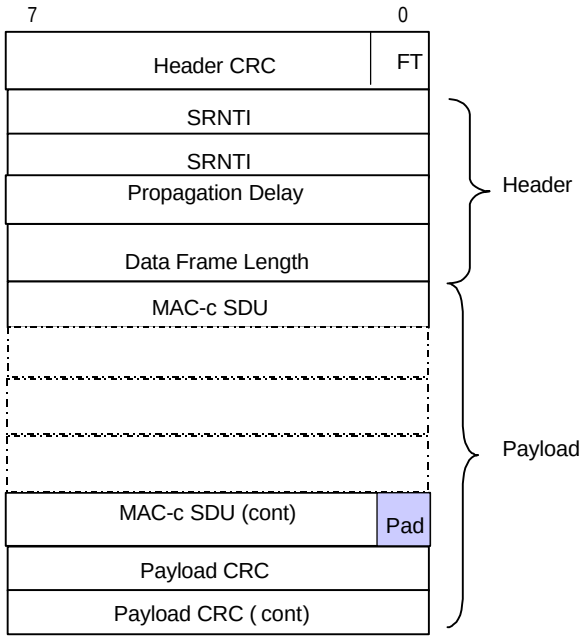

Figure 3. FDD RACH Data Frame structure

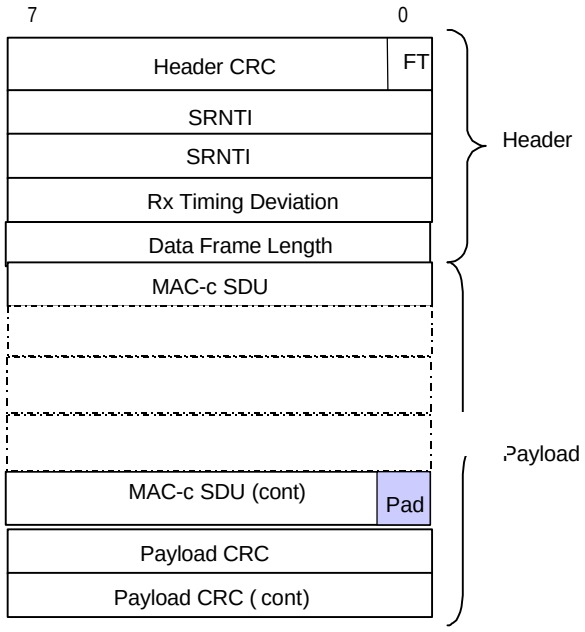

Figure 4.TDD RACH Data Frame structure

	Information element	Description	Present on	
			RACH UL	FACH DL
Header	Frame Type	RACH/FACH data frame	X	X
	DRNTI/SRNTI	Used to identify the UE context in the CRNC/SRNC	SRNTI	DRNTI
	FACH Indicator	Indicates if the data in the payload should be sent on the FACH coupled to the RACH (i.e. the payload contains the Cell Update Confirm message), or if it can be sent on a different FACH decided by the CRNC (subsequent user data).		X
	Priority Indicator	Priority indicator corresponding to logical channel type. Used by the CRNC to place the payload in the correct transmit buffer.		X
	Rx Timing Deviation (TDDl)	*Measured RACH burst receive timing deviation*	X	
	Length	Length of the data field	X	X
Payload	Checksum indicator	See ref. [4] TS 25.427	X	
	Data	Contains the MAC-c SDU to be sent or received over the radio interface.	X	X
Tail	Data frame checksum	See ref. [4] TS 25.427	X	X

Table 2: FACH/RACH data frame structure, TDD mode

6.2.2 FACH Channels

FACH Iur data stream corresponds to the data stream of one specific UE. The used transport bearer for the transport of FACH/RACH is bi-directional.

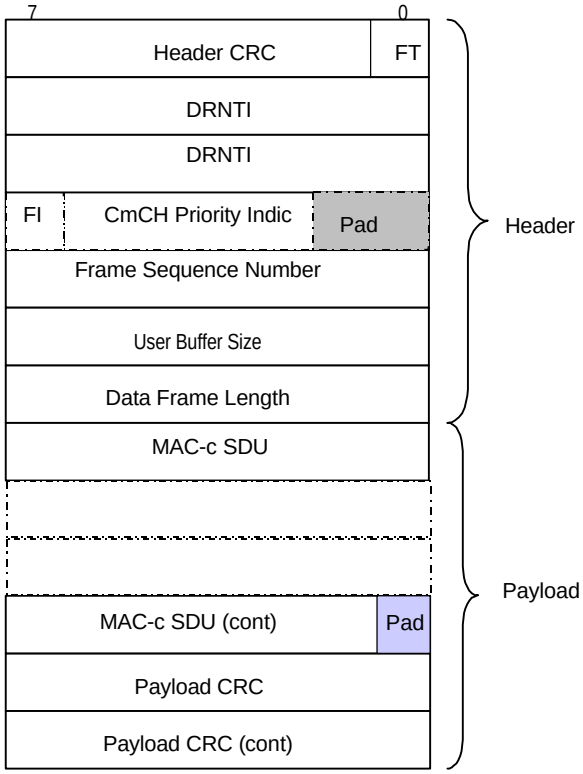

Figure 5. FDD FACH Data Frame structure

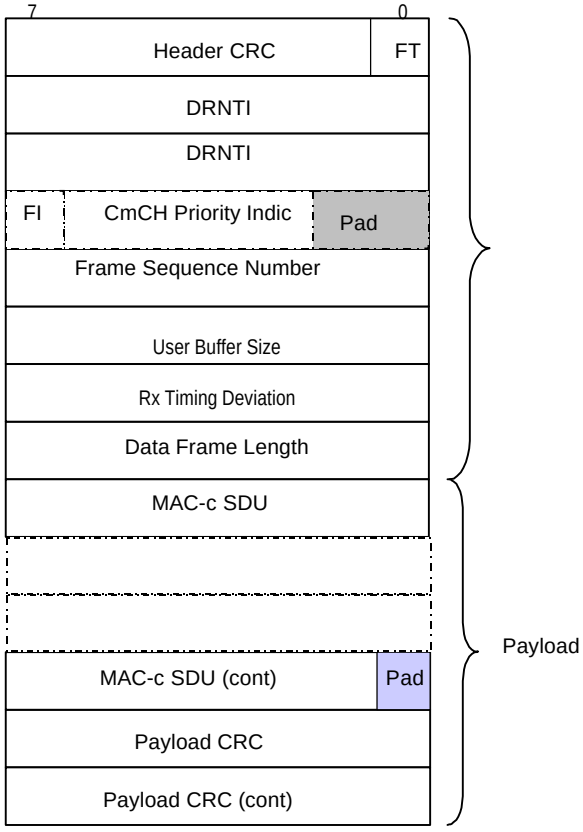

Figure 6. TDD FACH Data Frame structure

~~6.1.2~~6.2.3 DSCH Channels

6.2.4 Coding of information elements in data frames

6.2.4.1 Header CRC

Description: Cyclic Redundancy Polynomial calculated on the header of a data frame with polynom X^7+X^6+X^2+1. The CRC calculation shall cover all bits in the header, starting from bit 0 in the first byte (FT field) up to the end of the header.

Value range: {0-127}

Field length: 7 bits

~~1.1.1.2~~6.2.4.2 Frame Type (FT)

Description: describes if it is a control frame or a data frame.

Value range: {0=data, 1=control}.

Field Length: 1 bit

6.2.4.3 FACH Indicator (FI)

Description: Indicates if the data in the payload should be sent on the FACH coupled to the RACH (i.e. the payload contains the Cell Update Confirm message), or if it can be sent on a different FACH decided by the CRNC (subsequent user data).

Value range: {0=FACH/RACH coupled, 1=FACH/RACH not coupled}.

Field Length: 1 bit

~~1.1.1.4~~6.2.4.4 Frame Sequence Number (FSN)

[Editor's note: This paragraph is an editor's proposal]

Description: Used for sequential numbering of FACH data frames.

Value range: {0-255}

Field length : 8 bits

~~1.1.1.5~~6.2.4.5 Common Transport Channel Priority Indicator (CmCH-PI)

[Editor's note: This paragraph is an editor's proposal]

Description: CmCH-PI is the relative priority of the data frame.

Value range: {0-16}

Field length: 4 bits

~~1.1.1.6~~6.2.4.6 [FDD — Propagation delay]

Description: One-way air interface delay as measured during RACH access

Value range: {0 – 765 chips}

Granularity: 3 chips

Field length: 8 bits

~~1.1.1.7~~6.2.4.7 [TDD — Rx Timing Deviation]

Description: Measured Rx Timing Deviation as a basis for timing advance

Value range: {0-1020 chips}

Granularity: 4 chips

Field length: 8 bits

6.2.4.8 User Buffer Size

Description: Indicates the users' buffer size (i.e. the amount of data in the buffer) for a given Common Transport Channel Priority.

Value range: to be defined

Field length : to be defined

~~1.1.1.9~~6.2.4.9 MAC-c SDU

[Editor's note: This paragraph is an editor's proposal]

Description: It corresponds to the Transport Block to be transmitted to the Node B.

Field length : to be defined

~~1.1.1.10~~6.2.4.10 CRC indicator

Description: Shows if the transport block has a correct CRC. The UL Outer Loop Power Control may use the CRC indication.

Value range: {0=Correct, 1=Not Correct}

Field length: 1 bit

~~1.1.1.11~~6.2.4.11 Payload CRC

Description: Cyclic Redundancy Polynomial calculated on the payload of a data frame with polynom X^16+X^15+X^2+1. The CRC calculation shall cover all bits in the data frame payload, starting from bit 7 in the first byte up to bit 0 in the byte before the payload CRC.

Field length: 16 bits

~~6.2~~6.3 Control frame structure

Control Frames are used to transport control information between SRNC and CRNC.

~~Table 3 below summarises the data sent in a control frame, the two last columns shows in which direction the data is valid:~~The figure below defines the Control Frame structure for common transport channels.

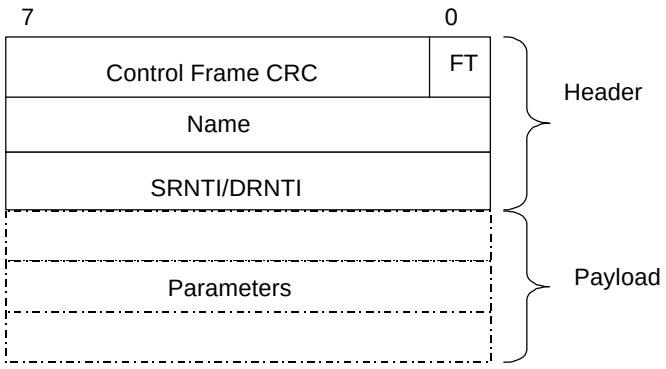

Figure 7. Iur Common Transport Channel Control Frame Format

'NAME' defines the type of the control frames.

The length of the payload is variable accordingly to the control frame type.

The structure of the header and the payload of the control frames is defined in the following sections:

6.3.1 Coding of information elements of the Control frame header.

6.3.1.1 Control frame CRC

Description: Cyclic Redundancy Polynomial calculated on a control frame with polynom X^7+X^6+X^2+1. The CRC calculation shall cover all bits in the control frame, starting from bit 0 in the first byte (FT field) up to the end of the control frame.

Value range: {0-127}

Field length: 7 bits

6.3.1.2 Frame type (FT)

Refer to section 6.2.4.2.

6.3.1.3 NAME

Description: Indicates the type of the control information (information elements and length) contained in the payload (=type of control frame).

Value: values of the NAME parameter are defined in the following table:

Type of control frame	Value
FACH Flow Control	0000 0010
DSCH Flow Control	0000 0011

6.3.1.4 S-RNTI/D-RNTI

Description: S-RNTI and D-RNTI are defined in [5]. S-RNTI is used in UL control frames to identify the UE context in the SRNC. D-RNTI is used in DL control frames to identify the UE context in the CRNC.

Value range:

Field length:

	Information element	**Description**	**Valid On**	
			UL	**DL**
Header	Frame Type	FAC/RACH Control Frame, or DSCH Control Frame	X	X
	DRNTI/SRNTI	Used to identify the UE context in the CRNC/SRNC	SRNTI	DRNTI
Payload	NAME	Name of command or measurement report	X	X
	Parameters	Parameters of the command or measurement report	X	X
Tail	FACH/RACH control frame checksum	Checksum of the header and payload data	X	X

Table 3: Control Frame structure

Following Control information are identified.

6.3.2 Payload structure and information elements

6.2.1RACH/FACH Channels

6.1.2.16.3.2.1 FACH Flow Control

The FACH flow control frame is used by the DRNC to acknowledge transmission of FACH data frames and control the user data flow. The figuretable below shows the payload structure when the control frame is used for the above mentioned purpose. This control information is sent in the UL only.

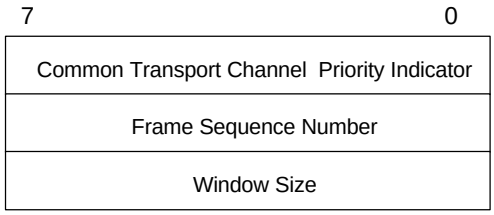

Figure 8: FACH Flow Control Payload structure

6.3.2.1.1 Common Transport Channel Priority Indicator

Description: Indicates the priority of the acknowledged FACH data frame(s). A user may simultaneously have multiple FACH data streams with different priorities. The Common Transport Channel Priority Indicator correlates the acknowledgement to the correct FACH data stream. Refer to section 6.2.4.5.

Value range:

Field length:

6.3.2.1.2 Frame Sequence Number

Description: Sequence number of acknowledged FACH data frame. Refer to section 6.2.4.4.

[Editor's note: Value range and field length are an editor's proposal]

Value range: {0-255}

Field length : 8 bits

6.3.2.1.3 Window Size

Description: Indicates the maximum number of FACH data frames that may be transmitted without an acknowledgement. The window size can be set to 0 to prevent a user from transmitting FACH data frames, or to 'unlimited' implying that an unlimited number of data frames can be transmitted without acknowledgement. The coding of the 'unlimited' value is FFS.

Value range:

Field length:

	Information element	Description	Present on	
			UL	DL
Header	Frame Type	FACH/RACH Control Frame	X	
Payload	Name	FACH Flow Control	X	
	Common Transport Channel Priority Indicator	Indicates the priority of the acknowledged FACH data frame(s). A user may simultaneously have multiple FACH data streams with different priorities. The Common Transport Channel Priority Indicator correlates the acknowledgement to the correct FACH data stream.	X	
	Sequence Number	Sequence number of acknowledged FACH data frame.	X	
	Window Size	Indicates the maximum number of FACH data frames that may be transmitted without an acknowledgement. The window size can be set to 0 to prevent a user from transmitting FACH data frames, or to 'unlimited' implying that an unlimited number of data frames can be transmitted without acknowledgement. The coding of the 'unlimited' value is FFS.	X	
Tail	Control frame checksum	See ref. [4] TS 25.427	X	

Table 4: FACH flow control frame structure

6.2.26.3.3 DSCH Flow ControlChannels

6.3Coding

7 Annex A (Infnormative):Annex A Document Stability Assessment Table

Section	Content missing	Incomplete	Restructuring needed	Checking needed	Editorial work required	Finalisation needed	Almost stable	Stable
1				√				
2				√				
3				√				
4	√							
5	√	√						
6	√	√						

7.1 List of open issues

The open issues identified by the editor are the following:

- Error handling
- Extension mechanisms – compatibility principles
- The exact coding length and value range of the IEs
- The replacement of data frame length by a TFI-like IE in RACH/FACH data frames
- FACH power control
- DSCH flow control

- Coding principles for user plane protocols

- Flow control between MAC-d and MAC-c/MAC-sh

- FACH flow control procedure text
- Mapping between transport bearers and DSCH/USCHFACH/RACH
- DSCH and USCH data frame structure
- FACH/RACH and DSCH flow control frame structure
- RACH/FACH and DSCH data transfer procedures
- Format of user data blocks and indication of format over Iur

8 History

Document history		
0.0.1	February 1999	Document structure proposal
0.0.2	February 1999	Introduction of the related content of Merged description of Iur interface.
0.0.3	March 1999	Revision bars removed. Modifications of the title. CCH have been changed into "Common Transport Channel". Addition of a definition of Common Transport Channels.
0.0.4	April 1999	Removal of temporary reference to Merged Iur specification
0.1.0	April 1999	Removal of revision bars
0.1.1	April 1999	Changes after the 1st review in TSG RAN WG3 #3 meeting.
0.2.0	June 1999	Version approved at TSG RAN WG3#4 meeting. No change.
0.2.1	August 1999	Addition of text on Data Frame structure coming from tdoc R3-99734 section 5.1 agreed with modifications at RAN WG3#5 meeting.
0.2.2	September 99	Version approved at RAN3#6 with modifications: - FACH/RACH frame structure: Move of data frame checksum to the tail; Replacing CRNTI by DRNTI.
0.2.3	September 99	- Addition of section 7: stability assessment table and open points.
0.2.4	September 99	- Addition of FACH/RACH data frame structure for TDD mode. - Modification of FACH data frame structure and addition of FACH control frame structures for flow control.
0.2.5	September 99	Restructuring of the specification in order to get aligned with TS 25.427 and TS 25.435 presentation. Corrections of errors.

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