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Digital cellular telecommunications system (Phase 2+) (GSM); In-band control of remote transcoders and rate adaptors for half rate traffic channels (GSM 08.61 version 8.0.1 Release 1999)

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European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
In-band control of remote transcoders and rate adaptors
for half rate traffic channels
(GSM 08.61 version 8.0.1 Release 1999)**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document defines the protocol between the Base Transceiver Station (BTS) and the remote Transcoder/Rate Adaption Unit (TRAU) for half rate speech, Adaptive Multi-Rate speech and half rate data, within the digital cellular telecommunications system.

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document it will be re-released with an identifying change of release date and an increase in version number as follows:

Version 8.x.y

where:

- 8 indicates Release 1999 of GSM Phase 2+
- 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 in the specification.

National transposition dates

Date of adoption of this EN:	3 November 2000
Date of latest announcement of this EN (doa):	28 February 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2001
Date of withdrawal of any conflicting National Standard (dow):	31 August 2001

1 Scope

The present document describes the protocol between the Base Transceiver Station (BTS) and the remote Transcoder/Rate Adaption Unit (TRAU) for speech and data on half rate traffic channel (TCH/H).

For Half Rate speech and half rate data the protocol is specified for 8 kbit/s and 16 kbit/s submultiplexing scheme.

For Adaptive Multi-Rate speech the present document specifies the 8 kBit/s submultiplexing, both for the full and the half rate traffic channels (TCH/AFS and TCH/AHS). The specification for 16 kBit/s submultiplexing is given in Rec GSM 08.60, both for the full and the half rate traffic channels (TCH/AFS and TCH/AHS).

The present document should be considered together with the GSM 06 series, GSM 04.21 (Rate Adaption on the MS-BSS Interface) and GSM 08.20 (Rate Adaption on the BTS/MSG Interface).

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.
- For this Release 1999 document, references to GSM documents are for Release 1999 versions (version 8.x.y).

- [1] GSM 01.02: "Digital cellular telecommunication system (Phase 2+); General description of a GSM Public Land Mobile Network (PLMN)".
- [2] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".
- [3] GSM 04.21: "Digital cellular telecommunications system (Phase 2+); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".
- [4] GSM 05.03: "Digital cellular telecommunications system (Phase 2+); Channel coding".
- [5] GSM 06.21: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Substitution and muting of lost frames for half rate speech traffic channels".
- [6] GSM 06.22: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Comfort noise aspects for half rate speech traffic channels".
- [7] GSM 06.41: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Discontinuous Transmission (DTX) for half rate speech traffic channels".
- [8] GSM 06.42: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Voice Activity Detector (VAD) for half rate speech traffic channels".
- [9] GSM 08.08: "Digital cellular telecommunication system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".
- [10] GSM 08.20: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [11] GSM 08.52: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Interface principles".

- [12] GSM 08.54: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 1 structure of physical circuits".
- [13] GSM 08.58: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 3 specification".
- [14] GSM 12.21: "Digital cellular telecommunication system (Phase 2); Network Management (NM) procedures and messages on the A-bis interface".
- [15] ITU-T Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces".
- [16] ITU-T Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".
- [24] GSM 06.71: "Digital cellular telecommunications system; Adaptive Multi-Rate speech processing functions, General Description."
- [25] GSM 06.90: "Digital cellular telecommunications system; Adaptive Multi-Rate speech transcoding".
- [26] GSM 06.91: "Digital cellular telecommunications system; Substitution and muting of lost frames for Adaptive Multi-Rate speech traffic channels".
- [27] GSM 06.92: "Digital cellular telecommunications system; Comfort noise aspect for Adaptive Multi-Rate speech traffic channels".
- [28] GSM 06.93: "Digital cellular telecommunications system; Discontinuous Transmission (DTX) for Adaptive Multi-Rate speech traffic channels".
- [29] GSM 06.94: "Digital cellular telecommunications system; Voice Activity Detection (VAD) for Adaptive Multi-Rate speech traffic channels".
- [30] GSM 05.09: "Digital cellular telecommunications system; Link Adaptation"
- [31] GSM 08.60: "Digital cellular telecommunications system; In-band control of remote transcoders and rate adaptors for full rate traffic channels".
- [32] GSM 08.62: "Digital cellular telecommunications system; Inband Tandem Free Operation (TFO) of Speech Codecs".

3 Definitions and abbreviations

3.1 Definitions

No specific definitions apply to the present document.

3.2 Abbreviations

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

ACS	Active_Codec_Set
AMR	Adaptive Multi-Rate
BSC	Base Station Controller
BTS	Base Transceiver Station
CCU	Channel Codec Unit
CMC	Codec_Mode_Command
CMI	Codec_Mode_Indication
CMR	Codec_Mode_Request
DFE	Downlink Frame Error
ICM	Initial_Codec_Mode
PAB	Phase Alignment Bit

PAC	Phase Alignment Command
RA	Rate Adaption
RIF	Request or Indication Flag
TAC	Time Alignment Command
TAE	Time Alignment Extension
TFO	Tandem Free Operation
TFOE	TFO Enable
TRAU	Transcoder and Rate Adaption Unit
UFE	Uplink Frame Error

Other abbreviations used in the present document are listed in GSM 01.04.

4 General approach

The TRAU shall be controlled by the BTS when it is positioned remote from the BTS. In this case, the speech/data information and TRAU control signals exchanged between the Channel Codec Unit (CCU) in the BTS and the TRAU shall be transferred in frames denoted "TRAU frames".

The TRAU frames may be carried by either 16 kbit/s traffic channels or 8 kbit/s channels. The choice of the traffic channel bit rate or submultiplexing scheme is operator dependent.

The TRAU frames have a fixed length of:

- 160 bits (20 ms) when 8 kbit/s submultiplexing is used;
- 320 bits (20 ms) when 16 kbit/s submultiplexing is used.

The protocol between the BTS and the TRAU should be the same if the TRAU is positioned either at the MSC site or at the BSC site. In the first case, the BSC should be considered as transparent for 16 kbit/s and 8 kbit/s channels.

The TRAU is considered a part of the BSC when the TRAU is remote from the BTS (see GSM 08.52), and the signalling between the BSC and the TRAU (e.g. detection of call release, handover and transfer of O&M information) may be performed by using BSC internal signals. However, the signalling between the CCU and the TRAU, using TRAU frames as specified in the present document, is mandatory when the TRAU is remote from the BTS.

For data transfer, a conversion function is required, in addition to the conversion/rate adaption specified in GSM 08.20, to adapt ITU-T V.110 frames to the TRAU data frames. This function constitutes the RAA.

NOTE: If standard 64 kbit/s switching is used in the BSC, multiplexing according to ITU-T Recommendation I.460 should apply at both sides of the switch.

A possible configuration of the TRAU and the CCU is shown in figure 4.1.

The functions inside the TRAU are:

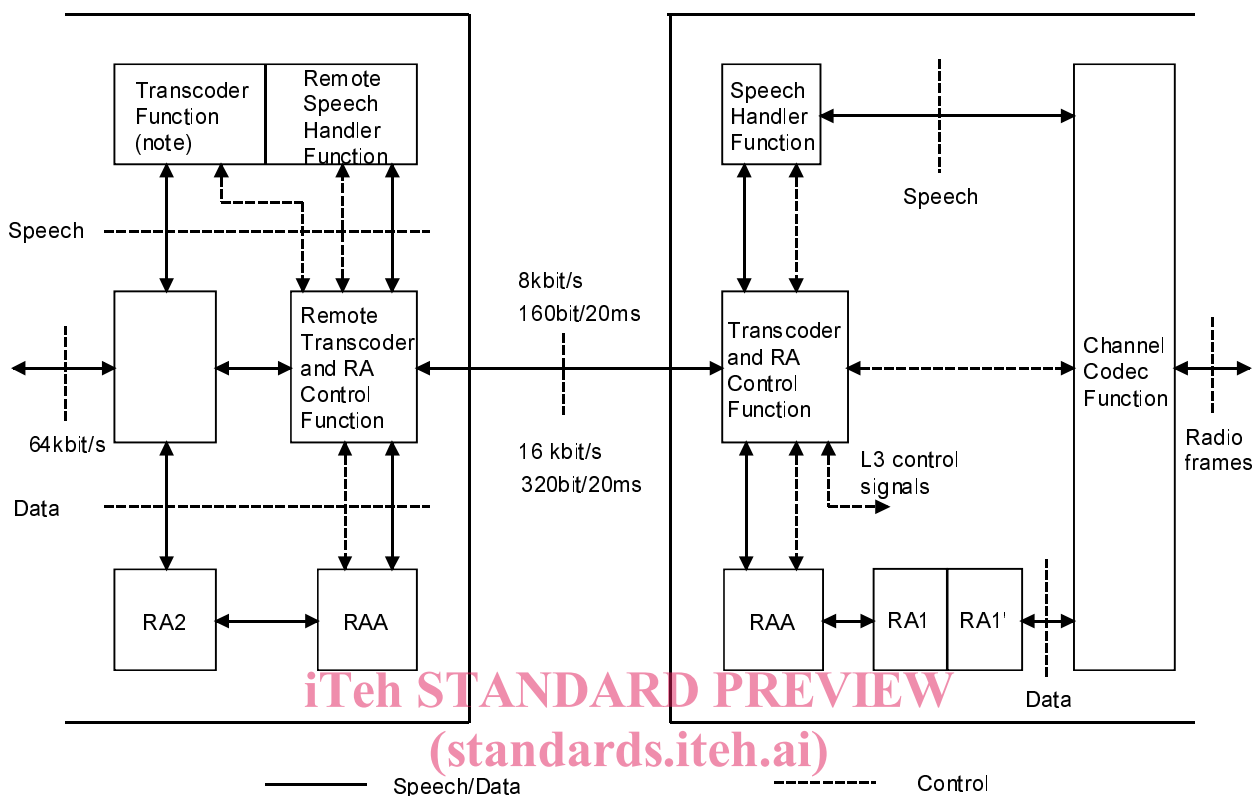
- "Remote Transcoder and Rate Adaptor Control Function" (RTRACF);
- "Remote Speech Handler Function" (RSHF);
- the RAA function;
- the RA2 function;
- the transcoder function.

The functions inside the CCU are:

- "Transcoder and Rate Adaptor Control Function" (TRACF);
- "Speech Handler Function" (SHF);
- the RAA function;
- the RA1/RA1' function;

- the channel codec function.

The present document does not describe the procedures inside the TRAU and the CCU. The layout in figure 4.1 is only intended as a reference model.



NOTE: This technical specification assumes the DTX handler function to be part of the Transcoder Function.

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Figure GSM 08.61/4.1: Functional entities for handling of control of remote transcoders and rate adaptors

5 Frame structure

5.1 16 kbit/s submultiplexing

5.1.1 Frames for Speech Services

5.1.1.1 Frame for Half Rate speech

Octet no.	Bit number							
	1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	1	C1	C2	C3	C4	C5	C6	C7
4	C8	C9	C10	C11	C12	C13	C14	C15
5	1	UFI	D1	D2	D3	D4	D5	D6
6	D7	D8	D9	D10	D11	D12	D13	D14
7	1	D15	D16	D17	D18	D19	D20	D21
8	D22	D23	D24	D25	D26	D27	D28	D29
9	1	D30	D31	D32	D33	D34	D35	D36
10	D37	D38	D39	D40	D41	D42	D43	D44
11	1	CRC2	CRC1	CRC0	D45	D46	D47	D48
12	D49	D50	D51	D52	D53	D54	D55	D56
13	1	D57	D58	D59	D60	D61	D62	D63
14	D64	D65	D66	D67	D68	D69	D70	D71
15	1	D72	D73	D74	D75	D76	D77	D78
16	D79	D80	D81	D82	D83	D84	D85	D86
17	1	D87	D88	D89	D90	D91	D92	D93
18	D94	D95	D96	D97	D98	D99	D100	D101
19	1	D102	D103	D104	D105	D106	D107	D108
20	D109	D110	D111	D112	1	1	1	1
21	1	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1	1
23	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1
26	1	1	1	1	1	1	1	1
27	1	1	1	1	1	1	1	1
28	1	1	1	1	1	1	1	1
29	1	1	1	1	1	1	1	1
30	1	1	1	1	1	1	1	1
31	1	1	1	1	1	1	1	1
32	1	1	1	1	1	1	1	1
33	1	1	1	1	1	1	1	1
34	1	1	1	1	1	1	1	1
35	1	1	1	1	1	1	1	1
36	1	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	C16	C17
40	C18	C19	C20	C21	T1	T2	T3	T4

5.1.1.2 Frames for Adaptive Multi-Rate Speech

See GSM 08.60 for 16 kBit/s submultiplexing.

5.1.2 Data frame

Octet no.	Bit number							
	1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	
3	1	C1	C2	C3	C4	C5	C6	C7
4	C8	C9	C10	C11	C12	C13	C14	C15
5	1	D1	D2	D3	D4	D5	D6	D7
6	1	D8	D9	D10	D11	D12	D13	D14
7	1	D15	D16	D17	D18	D19	D20	D21
8	1	D22	D23	D24	D25	D26	D27	D28
9	1	D29	D30	D31	D32	D33	D34	D35
10	1	D36	D37	D38	D39	D40	D41	D42
11	1	D43	D44	D45	D46	D47	D48	D49
12	1	D50	D51	D52	D53	D54	D55	D56
13	1	D57	D58	D59	D60	D61	D62	D63
14	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1	1
23	1	D'1	D'2	D'3	D'4	D'5	D'6	D'7
24	1	D'8	D'9	D'10	D'11	D'12	D'13	D'14
25	1	D'15	D'16	D'17	D'18	D'19	D'20	D'21
26	1	D'22	D'23	D'24	D'25	D'26	D'27	D'28
27	1	D'29	D'30	D'31	D'32	D'33	D'34	D'35
28	1	D'36	D'37	D'38	D'39	D'40	D'41	D'42
29	1	D'43	D'44	D'45	D'46	D'47	D'48	D'49
30	1	D'50	D'51	D'52	D'53	D'54	D'55	D'56
31	1	D'57	D'58	D'59	D'60	D'61	D'62	D'63
32	1	1	1	1	1	1	1	1
33	1	1	1	1	1	1	1	1
34	1	1	1	1	1	1	1	1
35	1	1	1	1	1	1	1	1
36	1	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1

Data frame
position 1Data frame
position 3