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**Digital cellular telecommunications system (Phase 2+);
In-band control of remote transcoders and rate adaptors
for half rate traffic channels
(3GPP TS 48.061 version 13.0.0 Release 13)**



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Foreword

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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 3GPP TS 48.060, both for the full and the half rate traffic channels (TCH/AFS and TCH/AHS).

The present document should be considered together with the 3GPP TS 46 series, 3GPP TS 44.021 (Rate Adaption on the MS-BSS Interface) and 3GPP TS 48.020 (Rate Adaption on the BTS/MS 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.
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- [1] 3GPP TS 01.02: "Digital cellular telecommunication system (Phase 2+); General description of a GSM Public Land Mobile Network (PLMN)".
- [2] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".
- [3] 3GPP TS 44.021: "Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".
- [4] 3GPP TS 45.003: "Channel coding".
- [5] 3GPP TS 46.021: "Half rate speech; Substitution and muting of lost frames for half rate speech traffic channels".
- [6] 3GPP TS 46.022: "Half rate speech; Comfort noise aspects for half rate speech traffic channels".
- [7] 3GPP TS 46.041: "Half rate speech; Discontinuous Transmission (DTX) for half rate speech traffic channels".
- [8] 3GPP TS 46.042: "Half rate speech; Voice Activity Detector (VAD) for half rate speech traffic channels".
- [9] 3GPP TS 48.008: "Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification".
- [10] 3GPP TS 48.020: "Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [11] 3GPP TS 48.052: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Interface principles".
- [12] 3GPP TS 48.054: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 1 structure of physical circuits".
- [13] 3GPP TS 48.058: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

- [14] 3GPP TS 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] 3GPP TS 26.071: "Adaptive Multi-Rate speech processing functions, General Description."
- [25] 3GPP TS 26.090: "Adaptive Multi-Rate speech transcoding".
- [26] Void.
- [27] 3GPP TS 26.092: "Comfort noise aspect for Adaptive Multi-Rate speech traffic channels".
- [28] Void.
- [29] Void.
- [30] Void.
- [31] 3GPP TS 48.060: "Inband control of remote transcoders and rate adaptors".
- [32] 3GPP TS 48.062: "Inband Tandem Free Operation (TFO) of Speech Codecs".
- [33] 3GPP TS 46.020: "Half Rate Speech Transcoding".

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 3GPP TS 21.905.

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 3GPP TS 48.052), 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 3GPP TS 48.020, 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.

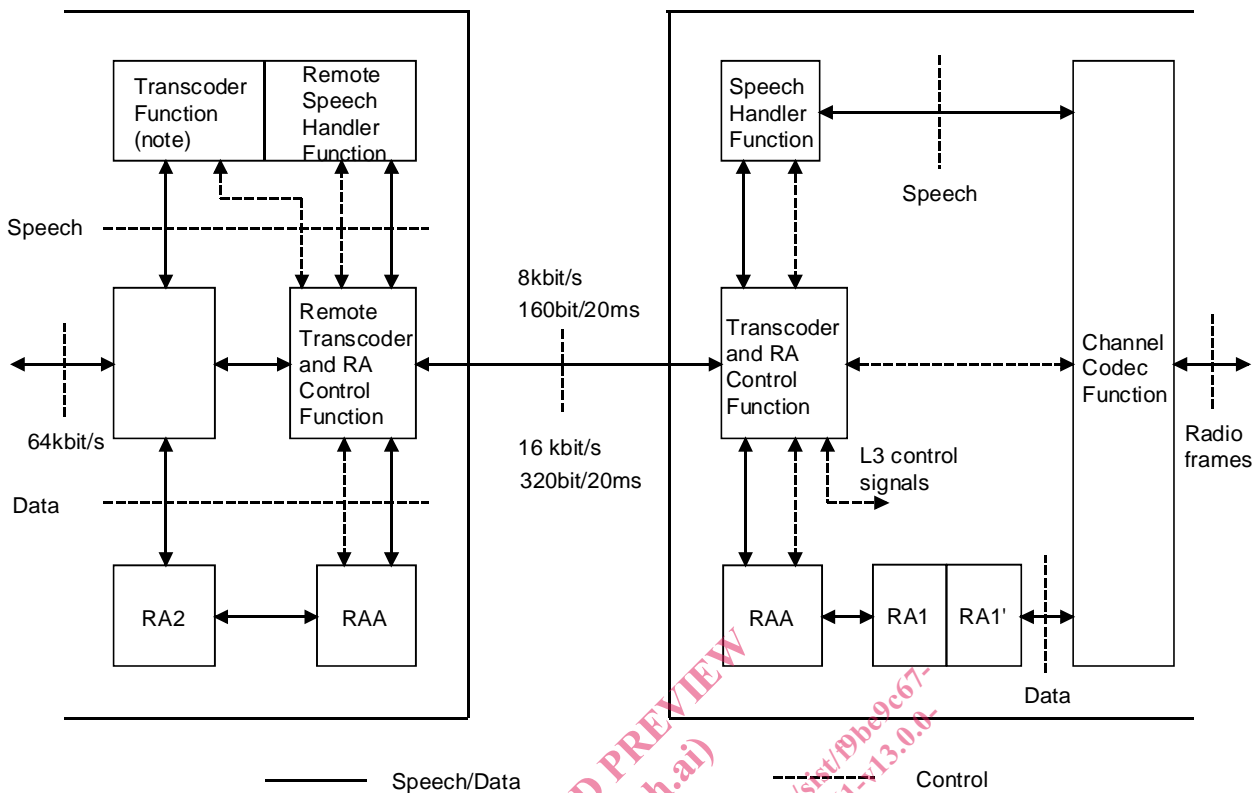
The functions inside the TRAU are:

- "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.

Figure 3GPP TS 48.061/4.1: Functional entities for handling of control of remote transcoders and rate adaptors

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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 3GPP TS 48.060 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	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 1

Data frame position 3