

# ETSI TS 148 060 V13.0.0 (2016-01)



**Digital cellular telecommunications system (Phase 2+);  
In-band control of remote transcoders and rate adaptors  
for full rate traffic channels  
(3GPP TS 48.060 version 13.0.0 Release 13)**

PREVIEW  
iTech (China) Co., Ltd.  
https://standards.iteh.ai/standards/40751a98-5ddc-4b00-9877-c2498196110/csi-ts-48-060-v13.0.0-2016-01-01



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**Reference**RTS/TSGG-0148060vd00

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**Keywords**

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GSM

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## Foreword

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# 1 Scope

When 64 kbit/s traffic channels are used on the Abis interface, the speech shall be coded according to CCITT Recommendation G.711 and the data rate adaptation shall be as specified in 3GPP TS 44.021 and 3GPP TS 48.020.

In the case where 16 kbit/s traffic channels are used for full rate speech, enhanced full rate speech, Adaptive Multi-Rate speech, Adaptive Multi-Rate Wideband speech or full rate data service, then the present document shall apply for frame structure and for control of remote transcoders and additional rate adaptors.

For Adaptive Multi-Rate speech the present document specifies the 16 kBit/s submultiplexing, both for the full and the half rate traffic channels (TCH/AFS, TCH/AHS, TCH/WFS and O-TCH/WHS). The specification for 8 kBit/s submultiplexing is given in 3GPP TS 48.061, both for the full and the half rate traffic channels (TCH/AFS and TCH/AHS).

Additionally, the present document specifies the 32 kBit/s submultiplexing for Adaptive Multi-Rate Wideband speech. However it reuses the frame structure of the 16 kBit/s submultiplexing for Adaptive Multi-Rate speech.

The use and general aspects of the Abis interface are given in 3GPP TS 48.051.

NOTE: The present document should be considered together with the 3GPP TS 06 series of specifications, 3GPP TS 44.021 (Rate Adaptation on the MS-BSS Interface) and 3GPP TS 48.020 (Rate Adaptation on the BS/MSC 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".
- [3] 3GPP TS 44.021: "Rate adaption on the Mobile Station
- [4] Void.
- [5] 3GPP TS 46.010: "Full rate speech; Transcoding".
- [6] 3GPP TS 46.011: "Full rate speech; Substitution and muting of lost frames for full rate speech channels".
- [7] 3GPP TS 46.012: "Full rate speech; Comfort noise aspect for full rate speech traffic channels".
- [8] 3GPP TS 46.031: "Full rate speech; Discontinuous Transmission (DTX) for full rate speech traffic channels".
- [9] 3GPP TS 46.032: "Voice Activity Detector (VAD)".
- [10] 3GPP TS 48.020: "Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [11] 3GPP TS 48.051: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; General aspects".

- [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: "Network Management (NM) procedures and message on the A-bis interface".
- [15] CCITT Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".
- [16] CCITT Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces".
- [17] CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".
- [18] Void.
- [19] 3GPP TS 46.060: "Enhanced Full rate speech transcoding".
- [20] 3GPP TS 46.061: "Substitution and muting of lost frames for Enhanced Full rate speech channels".
- [21] 3GPP TS 46.062: "Comfort noise aspect for Enhanced Full rate speech traffic channels".
- [22] 3GPP TS 46.081: "Discontinuous Transmission (DTX) for Enhanced Full rate speech traffic channel".
- [23] 3GPP TS 46.082: "Voice Activity Detection (VAD)".
- [24] Void.
- [25] 3GPP TS 26.090: "Adaptive Multi-Rate speech transcoding".
- [26] 3GPP TS 26.091: "Substitution and muting of lost frames for Adaptive Multi-Rate speech traffic channels".
- [27] 3GPP TS 26.092: "Comfort noise aspect for Adaptive Multi-Rate speech traffic channels".
- [28] 3GPP TS 26.093: "Discontinuous Transmission (DTX) for Adaptive Multi-Rate speech traffic channels".
- [29] 3GPP TS 26.094: "Voice Activity Detection (VAD) for Adaptive Multi-Rate speech traffic channels".
- [30] 3GPP TS 45.009: "Link Adaptation".
- [31] 3GPP TS 48.061: "Inband control of remote transcoders and rate adaptors (half rate)".
- [32] 3GPP TS 28.062: "Inband Tandem Free Operation (TFO) of Speech Codecs".
- [33] 3G 26.171: "Digital cellular telecommunications system; Adaptive Multi-Rate Wideband speech processing functions, General Description."
- [34] 3G 26.190: "Digital cellular telecommunications system; Adaptive Multi-Rate Wideband speech transcoding".
- [35] 3G 26.191: "Digital cellular telecommunications system; Substitution and muting of lost frames for Adaptive Multi-Rate Wideband speech traffic channels".
- [36] 3G 26.192: "Digital cellular telecommunications system; Comfort noise aspect for Adaptive Multi-Rate Wideband speech traffic channels".
- [37] 3G 26.193: "Digital cellular telecommunications system; Discontinuous Transmission (DTX) for Adaptive Multi-Rate Wideband speech traffic channels".
- [38] 3G 26.194: "Digital cellular telecommunications system; Voice Activity Detection (VAD) for Adaptive Multi-Rate Wideband speech traffic channels".



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## 3 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905. Additionally:

AMR Adaptive Multi-Rate  
AMR-WB Adaptive Multi-Rate Wideband  
CMC Codec\_Mode\_Command  
CMI Codec\_Mode\_Indication  
CMR Codec\_Mode\_Request  
Onset Speech Onset Frame Classification  
PAB Phase Alignment Bit  
PAC Phase Alignment Command  
RATSCCH Robust AMR Traffic Synchronised Control CHannel  
RIF Request or Indication Flag  
TAC Time Alignment Command  
TAE Time Alignment Extension  
TFO Tandem Free Operation  
TFOE TFO Enable  
UFE Uplink Frame Error

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## 4 General Approach

When the transcoders/rate adaptors are positioned remote to the BTS, the information between the Channel Codec Unit (CCU) and the remote Transcoder/Rate Adaptor Unit (TRAU) is transferred in frames with a fixed length of 320 bits (20 ms). In the present document, these frames are denoted "TRAU frames". Within these frames, both the speech/data and the TRAU associated control signals are transferred.

The Abis interface should be the same if the transcoder is positioned 1) at the MSC site of the BSS or if it is positioned 2) at the BSC site of the BSS. In case 1), the BSC should be considered as transparent for 16 kbit/s channels.

In case of 4,8 and 9,6 kbit/s channel coding when data is adapted to the 320 bit frames, a conversion function is required in addition to the conversion/rate adaption specified in 3GPP TS 48.020. This function constitutes the RAA. In case of 14,5 kbit/s channel coding, no RAA rate adaption is required because V.110 framing is not used.

The TRAU is considered a part of the BSC, 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. The signalling between the CCU and the TRAU, using TRAU frames as specified in the present document, is mandatory when the Abis interface is applied.

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

In figure 4.1, a possible configuration of the TRAU and the CCU is shown.

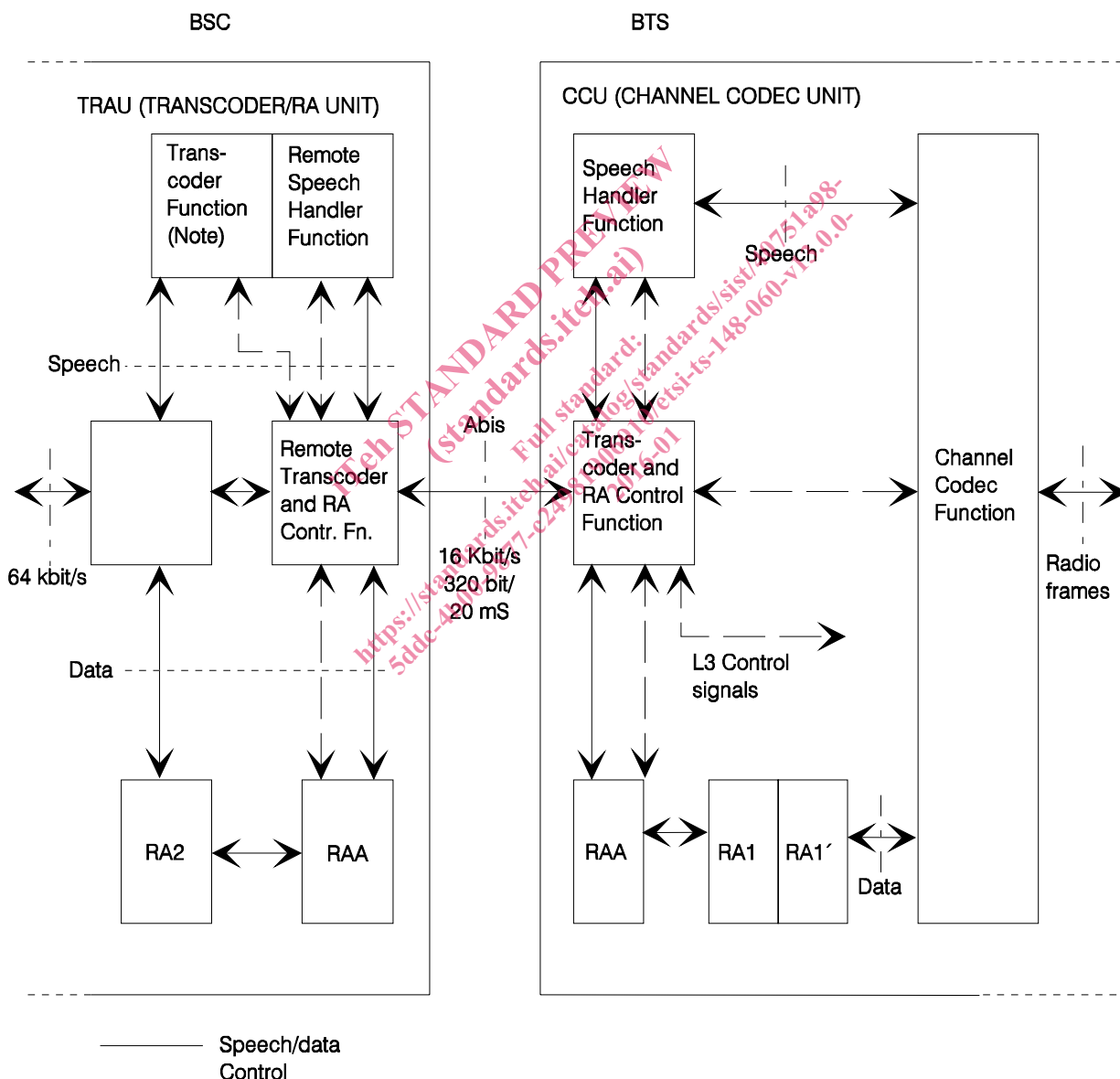
The functions inside the TRAU are:

- "Remote Transcoder and Rate Adaptor Control Function" (RTRACF);
- "Remote Speech Handler Function" (RSHF);
- The RAA function in case of 4.8 and 9.6 kbit/s channel coding;
- The RAA" function in case of 14.5 kbit/s channel coding;
- The RA2 function;
- The transcoder function.
- Optionally the TFO functions (see 3GPP TS 28.062).

The functions inside the CCU are:

- "Transcoder and Rate Adaptor Control Function" (TRACF);
- "Speech Handler Function" (SHF);
- The RAA function in case of 4.8 and 9.6 kbit/s channel coding;
- The RA1/RA1' function in case of 4.8 and 9.6 kbit/s channel coding;
- The RA1"/RAA" function in case of 14.5 kbit/s channel coding;
- The channel codec function;
- If AMR or AMR-WB is supported, the Link Adaptation (see 3GPP TS 45.009).

The present document will 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 recommendation assumes the DTX handler function to be a part of the Transcoder Function.

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

NOTE: This figure applies only for 4,8 and 9,6 kbit/s channel coding.

## 5 Frame Structure

### 5.1 Frames for Speech Services

#### 5.1.1 Frames for Full Rate and Enhanced Full Rate Speech

Octet no.	Bit number							
	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	1	C1	C2	C3	C4	C5	C6	C7
3	C8	C9	C10	C11	C12	C13	C14	C15
4	1	D1	D2	D3	D4	D5	D6	D7
5	D8	D9	D10	D11	D12	D13	D14	D15
6	1	D16	D17	D18	D19	D20	D21	D22
7	D23	D24	D25	D26	D27	D28	D29	D30
8	1	D31	D32	D33	D34	D35	D36	D37
9	D38	D39	D40	D41	D42	D43	D44	D45
10	1	D46	D47	D48	D49	D50	D51	D52
11	D53	D54	D55	D56	D57	D58	D59	D60
12	1	D61	D62	D63	D64	D65	D66	D67
13	D68	D69	D70	D71	D72	D73	D74	D75
14	1	D76	D77	D78	D79	D80	D81	D82
15	D83	D84	D85	D86	D87	D88	D89	D90
16	1	D91	D92	D93	D94	D95	D96	D97
17	D98	D99	D100	D101	D102	D103	D104	D105
18	1	D106	D107	D108	D109	D110	D111	D112
19	D113	D114	D115	D116	D117	D118	D119	D120
20	1	D121	D122	D123	D124	D125	D126	D127
21	D128	D129	D130	D131	D132	D133	D134	D135
22	1	D136	D137	D138	D139	D140	D141	D142
23	D143	D144	D145	D146	D147	D148	D149	D150
24	1	D151	D152	D153	D154	D155	D156	D157
25	D158	D159	D160	D161	D162	D163	D164	D165
26	1	D166	D167	D168	D169	D170	D171	D172
27	D173	D174	D175	D176	D177	D178	D179	D180
28	1	D181	D182	D183	D184	D185	D186	D187
29	D188	D189	D190	D191	D192	D193	D194	D195
30	1	D196	D197	D198	D199	D200	D201	D202
31	D203	D204	D205	D206	D207	D208	D209	D210
32	1	D211	D212	D213	D214	D215	D216	D217
33	D218	D219	D220	D221	D222	D223	D224	D225
34	1	D226	D227	D228	D229	D230	D231	D232
35	D233	D234	D235	D236	D237	D238	D239	D240
36	1	D241	D242	D243	D244	D245	D246	D247
37	D248	D249	D250	D251	D252	D253	D254	D255
38	1	D256	D257	D258	D259	D260	C16	C17
39	C18	C19	C20	C21	T1	T2	T3	T4

## 5.1.2 Frames for Adaptive Multi-Rate Speech (AMR-NB)

Octet no.	Bit number							
	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	1	C1	C2	C3	C4	C5	C6	C7
3	C8	C9	C10	C11	C12	C13	C14	C15
4	1	C16	C17	C18	C19	C20	C21	C22
5	C23	C24	C25	D1	D2	D3	D4	D5
6	1	D6	D7	D8	D9	D10	D11	D12
7	D13	D14	D15	D16	D17	D18	D19	D20
8	1	D21	D22	D23	D24	D25	D26	D27
9	D28	D29	D30	D31	D32	D33	D34	D35
10	1	D36	D37	D38	D39	D40	D41	D42
11	D43	D44	D45	D46	D47	D48	D49	D50
12	1	D52	D52	D53	D54	D55	D56	D57
13	D58	D59	D60	D61	D62	D63	D64	D65
14	1	D66	D67	D68	D69	D70	D71	D72
15	D73	D74	D75	D76	D77	D78	D79	D80
16	1	D81	D82	D83	D84	D85	D86	D87
17	D88	D89	D90	D91	D92	D93	D94	D95
18	1	D96	D97	D98	D99	D100	D101	D102
19	D103	D104	D105	D106	D107	D108	D109	D110
20	1	D111	D112	D113	D114	D115	D116	D117
21	D118	D119	D120	D121	D122	D123	D124	D125
22	1	D126	D127	D128	D129	D130	D131	D132
23	D133	D134	D135	D136	D137	D138	D139	D140
24	1	D141	D142	D143	D144	D145	D146	D147
25	D148	D149	D150	D151	D152	D153	D154	D155
26	1	D156	D157	D158	D159	D160	D161	D162
27	D163	D164	D165	D166	D167	D168	D169	D170
28	1	D171	D172	D173	D174	D175	D176	D177
29	D178	D179	D180	D181	D182	D183	D184	D185
30	1	D186	D187	D188	D189	D190	D191	D192
31	D193	D194	D195	D196	D197	D198	D199	D200
32	1	D201	D202	D203	D204	D205	D206	D207
33	D208	D209	D210	D211	D212	D213	D214	D215
34	1	D216	D217	D218	D219	D220	D221	D222
35	D223	D224	D225	D226	D227	D228	D229	D230
36	1	D231	D232	D233	D234	D235	D236	D237
37	D238	D239	D240	D241	D242	D243	D244	D245
38	1	D246	D247	D248	D249	D250	D251	D252
39	D253	D254	D255	D256	T1	T2	T3	T4

## 5.1.3 Frames for Adaptive Multi-Rate Wideband Speech (AMR-WB) (16 kbit/s)

The frame format for AMR-NB shall be used for all frames for AMR-WB as well, see chapters 5.1.2 and 5.5.1.3.

## 5.1.4 Frames for Adaptive Multi-Rate Wideband Speech (AMR-WB) (32 kbit/s)

The frame format for AMR-NB shall be used for all frames for AMR-WB as well, see chapters 5.1.2 and 5.5.1.3. In case of the AMR-WB modes 15.85 and 23.85 two 16kbit/s frames (channel 'a' and channel 'b') are used to compose a 32kbit/s frame.