Technical Specification Group Services and System Aspects ***TSGS#15(02)0090***
Meeting #15, Cheju Island, Korea, 11-14 March 2002

Source: **TSG-SA WG4**

Title: CRs to TS 28.062 on " Corrections to "In-band Tandem Free Operation (TFO) of Speech Codecs; Stage 3 - Service Description " (Release 4)

Document for: **Approval**

Agenda Item: **7.4.3**

The following CRs, agreed at the TSG-SA WG4 meeting #20, are presented to TSG SA #15 for approval.

Spec	CR	Rev	Phase	Subject	Cat	Vers	WG	Meeting	S4 doc
28.062	004		REL-4	Correction of OM & OD bits mapping in TFO 16k frames	F	4.2.0	S4	TSG-SA WG4#20	S4-020026
28.062	005	1	REL-4	Inclusion of the Non_Speech TFO frames in conditions for TFO_Frame	F	4.2.0	S4	TSG-SA WG4#20	S4-020176
28.062	007	2	REL-4	Corrections in TFO Protocol Tables	F	4.2.0	S4	TSG-SA WG4#20	S4-020180
28.062	013		REL-4	Corrected C-Code for AMR TFO decision rules	F	4.2.0	S4	TSG-SA WG4#20	S4-020142
28.062	016		REL-4	Corrections	F	4.2.0	S4	TSG-SA WG4#20	S4-020141

3GPP TSG-SA4 Meeting #20
Lulea, Sweden, 18th – 22nd February 2002

Tdoc S4-020026
Agenda item 8

CR-Form-v4

CHANGE REQUEST

⌘ **28.062** **CR** **004** ⌘ ev ⌘ Current version: **4.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network [X] Core Network [X]

Title:	⌘	Correction of OM & OD bits mapping in TFO 16k frames
Source:	⌘	TSG SA WG4
Work item code:	⌘	TFO+AMR NB
Date:	⌘	2002-03-11
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The mapping of OD and OM bits in 16 kbit/s AMR TFO frames is different depending on the frame type (No Speech, Speech ≤ 7.95 kbit/s, Speech = 10.2 kbit/s)
Summary of change:	⌘	OD shall always be mapped on D3. OM shall always be mapped on D4.
Consequences if not approved:	⌘	Possible misunderstanding leading to TFO interworking problems.

Clauses affected:	⌘	C6.1.5
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

C.6.1.5 Mapping of the Configuration Parameters on 16 and 8 kbit/s TRAU/TFO frames

Table C.6.1.5-1 gives the mapping of the configuration fields for each frame (TRAU/TFO) format:

Table C.6.1.5-1: Mapping of the configuration parameters in the TRAU/TFO frames

Sub-multiplexing		**8 kbit/s**	**8 kbit/s**	**8 kbit/s**		**16 kbit/s**	**16 kbit/s**	**16 kbit/s**
Codec Modes **Time Align. Field**	**#bits** 6	**No_Data** D1..D6	**SID** D1..D6	**Speech ≤5,9 kbit/s** # (= TFO_On)		**No_Speech** C6..C11	**Speech ≤7,95 kbit/s** C6..C11	**Speech 10,2kbit/s** C6..C11
Config_Prot	3	D55..D57	D55..D57	D55..D57		C14..C16	C14..C16	C14..C16
Message_No	2	D58..D59	D58..D59	D58..D59		C17..C18	C17..C18	C17..C18
TFO_Enable	1	D64	D64	# (= 1)		C20	C20	C20
Par_Type[5]	2	D65..D66	D65..D66	# (= 0.0)		D1..D2	D1..D2	D1..D2
OD	1	D67	D67	#		D3	~~D4~~D3	~~D4~~D3
OM[3]	1	D68	D68	#		D4	~~D3~~D4	~~D3~~D4
ACS[3] **(Optimal ACS)**[5]	8	D69..D76	D69..D76	#		D5..D12	D5..D12	D5..D12
SCS[3]	8	D77..D84	D77..D84	#		D13..D20	D13..D20	D13..D20
ATVN[3], **short**[6]	1	D85	D85	#		D21	D21	# (= 0)
Sys_ID, short[6]	4	D86..D89	D86..D89	#		D22..D25	D22..D25	# (= 0..0)
spare (= 0)	3	D90..D92	D90..D92	#		D26..D28	D26..D28	# (= 0)
CRC_A **(of 28 bits:)**	3	D93..D95 (D65..92)	D93..D95 (D65..92)	#		D29..D31 (D1..D28)	D29..D31 (D1..D28)	#[1]
ACT[3] **(Optimal ACT)**[5]	4	D96..D99	D96..D99	#		D234..D237	D234..D237	D234..D237
MACS[3]	3	D100..D102	D100..D102	#		D238..D240	D238..D240	D238..D240
Codec List	13	D103..D115	D103..D115	#		D241..D253	D241..D253	D241..D253
CRC_B **(of 20 bits:)**	3	D116..D118 (D96..115)	D116..D118 (D96..115)	#		D254..D256 (D234..253)	D254..D256 (D234..253)	#[2]
SCS_2[4]	8	D17..D24	# (= 1..1) [7]	#		D203..D210	D203..D210	# (= 1..1) [7]
OM_2[4]	1	D25	# (= 0)	#		D211	D211	# (= 0)
MACS_2[4]	3	D26..D28	# (= 1.0.0)	#		D212..D214	D212..D214	# (= 1.0.0)
ATVN_2[4][6]	1	D29	# (= 0)	#		D215	D215	# (= 0)
SCS_3[4]	8	D30..D37	# (= 1..1) [7]	#		D216..D223	D216..D223	# (= 1..1) [7]
OM_3[4]	1	D38	# (= 0)	#		D224	D224	# (= 0)
MACS_3[4]	3	D39..D41	# (= 1.0.0)	#		D225..D227	D225..D227	# (= 1.0.0)
ATVN_3[4][6]	1	D42	# (= 0)	#		D228	D228	# (= 0)
spare (=0)	2	D43..D44	#	#		D229..D230	D229..D230	#
CRC_C **(of 28 bits:)**	3	D45..D47 (D17..44)	#	#		D231..D233 (D203..230)	D231..D233 (D203..230)	#
8k_spare	7	D48..D54	#	#				
8k_spare	7	D119..D125	D119..D125	#				
16k_spare	14					D44..D57	#	#

The bit positions refer to the positions reserved in 3GPP TS 48.060 [3] and 3GPP TS 48.061 [4] : D bits are data bits, C bits are control bits. The parameters are mapped into the field with MSB first, example:
Par_Type: MSB => D65, LSB => D66 in 8k frames.

# denotes not existing fields; the entries in brackets () denote the default values of the missing parameters, see Note[7]. Only if the missing parameters are set to these default values, these frames may be used. Otherwise No_Data frames shall be used.

NOTE 1: In Mode 10,2 the bits D93..D95 are already used for the CRC1 of the first sub-frame. The bits otherwise protected by CRC_A shall be protected in Mode 10,2 by CRC1 (see 3GPP TS 48.060 [3]).

NOTE 2: In Mode 10,2 the bits D254..D256 are already used for the CRC4 of the fourth sub-frame. The bits otherwise protected by CRC_B shall be protected in Mode 10,2 by CRC4 (see 3GPP TS 48.060 [3]).

NOTE 3: The fields ACS, SCS,MACS, OM and ATVN shall always be used for the Active Codec Type, if from the AMR family.

NOTE 4: The fields SCS_2 ... ATVN_3 are reserved for the other AMR Codec Types, when flagged in the Codec_List, according to the following mapping:

Active Codec Type	ACS, SCS, OM, MACS, ATVN	SCS_2, OM_2, MACS_2, ATVN_2	SCS_3, OM_3, MACS_3, ATVN_3
none of AMR	FR_AMR	HR_AMR	UMTS_AMR(_2)
FR_AMR	FR_AMR	HR_AMR	UMTS_AMR(_2)
HR_AMR	HR_AMR	FR_AMR	UMTS_AMR(_2)
UMTS_AMR(_2) [8]	UMTS_AMR(_2)	FR_AMR	HR_AMR

If a Codec Type is not within the Codec_List, then the corresponding fields are undefined and shall be set to "0".

NOTE 5: If Par_Type is set to "Optimal Configuration", then ACT and ACS shall carry the optimal configuration. All other configuration parameters shall carry the Codec List and the relevant configuration parameters.

NOTE 6: For Sys_ID and ATVN a short form is used: only lower 4 bits for Sys_ID, only LSB for AVTN. The missing bits are defined to be "0".

NOTE 7: The default setting for the SCS fields shall be "1111.1111" for FR_AMR and UMTS_AMR and "0001.1111" for HR_AMR.

NOTE 8: Either UMTS_AMR or UMTS_AMR_2 shall be indicated, but not both together, with preference to UMTS_AMR_2.

Note for the AMR_TFO_8+8k frames: Only the "No_Data" frames convey all configuration parameters. Thus, a speech frame has to be stolen when this configuration information has to be sent. The frames with a rate lower or equal to 5,9 kbit/s can convey only the Config_Prot and Mess_No without stealing a speech frame. Par_Type in these speech frames is assumed to be "0.0".

Note for the AMR_TFO_16k frames: All the configuration parameters are included in the rates below the 10,2 kbit/s. The 12,2 kbit/s conveys TFO enable and the Config_Prot only. Par_Type in 12,2 kbit/s speech frames is assumed to be "0.0". Thus a speech frame has to be stolen to send configuration parameters.

3GPP TSG-S4 TFO ad hoc#X
Lulea, Sweden, 18-22 Feb 2002

S4-020180

CR-Form-v6.1

CHANGE REQUEST

⌘	TS 28.062	CR	CR 007	⌘ rev	2	⌘	Current version:	4.2.0	⌘
	Spec Title:	Inband Tandem Free Operation (TFO) of speech codecs							⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network [X] Core Network ☐

Title:	⌘	Corrections in TFO Protocol Tables
Source:	⌘	TSG SA WG4
Work item code:	⌘	TFO
Date:	⌘	2002-03-11
Category:	⌘	**F**
Release:	⌘	**REL-4**

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Errors in TFO protocol
Summary of change:	⌘	Clarify conditions for events 6, 7, 8, 24, and 25. Change actions in KON when event 17 is received. Change actions in MIS when event 15 or 16 is received. Change actions in WRC when events 46 and 47 are received.
Consequences if not approved:	⌘	TFO establishment may fail

Clauses affected:	⌘	10
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	⌘	
Other comments:	⌘	

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Table 10.4-1: Events of the State Machine Description

#	Event	Description
1	TFO_Enable	The event TFO_Enable occurs when all TFO parameters get available in the transcoder and the controlling entity enables TFO. In GSM, it means that the TFOE bit of AMR TRAU Frames toggles from '0' to '1'. Enabling TFO might involve a proprietary process not further addressed in the present document.
2	New_Speech_Call	This event occurs when a new speech call is set-up or the TRAU/TC is re-initialised (e.g. after a handover failure). In GSM, this means that the transcoder is initialised by the BTS by two consecutive TRAU frames with identical codec types (GSM_FR, GSM_HR, GSM_EFR) or by a config frame (AMR codec types). In 3G, this means that the Iu User Plan is initialised.
3	TFO_Disable	The event TFO_Disable occurs when TFO is disabled by the controlling entity. In GSM, the TFO_Disable event is also controlled by the TFOE bit of AMR TRAU Frames.
4	TRAU_Idle	This event occurs when the transcoder is set into idle mode.
5	PCM_Non_Idle	The event PCM_Non_Idle occurs if more than one PCM samples are received that are different to PCM_Idle.
12	TFO_Frame and Match_1	This event means that a valid TFO Frame was received by the transcoder and the condition Match_1 is fulfilled.
17	TFO_Frame and Match_2	This event means that a valid TFO Frame was received by the transcoder and the condition Match_2 is fulfilled.
38	TFO_Frame and Mismatch_1	This event means that a valid TFO Frame was received by the transcoder and the condition Mismatch_1 is fulfilled.
39	TFO_Frame and Mismatch_2	This event means that a valid TFO Frame was received by the transcoder and the condition Mismatch_2 is fulfilled.
13	New_Local_Codec and (NA_TP | A_TP)	This event occurs when the local used codec type changes and either the condition NA_TP or the condition A_TP is fulfilled.
15	New_Local_Codec and TM	This event occurs when the local used codec type changes and the condition TM is fulfilled.
14	New_Local_Config and (NA_TP | A_TP)	This event occurs when an AMR codec type is used and the local codec configuration changes and the condition A_TP is fulfilled.
16	New_Local_Config and TM	This event occurs when an AMR codec type is used and the local codec configuration changes and the condition TM is fulfilled.
32	RC_ack	This event (rate control acknowledgement) occurs when an acknowledgement to the RCi action is received from the BTS/RNC indicating that the rate control command was understood (TFO_Soon acknowledgement in GSM, Rate_Ack in UMTS).
40	New_Local_Codec_List	This event occurs when the local codec list changes.
41	Data_Call	This event is only relevant for GSM systems. It occurs when the transcoder is informed that a Data Call is set-up.
44	Runout	The event Runout occurs when the last TFO message has been taken from the Transmit Queue and the last 10 bits are going to be sent. So there is still some time for TFO_Protocol to react and place a further TFO Message in the Transmit Queue, which then shall be transmitted without gap to the messages before.
45	T==0	This event occurs when a time-out has been reached.
46	Frame_Sync_Lost and n<3	This event occurs when the TFO frame synchronisation is lost for the first or the second time. For further details see Annex C.
47	Frame_Sync_Lost and n>2	This event occurs when the TFO frame synchronisation is lost for more than two times. For further details see Annex C.
48	Mes_Sync_Lost	This event corresponds to a loss of TFO message synchronisation. For further details see Annex C.
35	Handover_Soon and (NA_TP | A_TP)	This event occurs when the TRAU/TC is informed that a local hand-over will soon take place and either the condition NA_TP or the condition A_TP is fulfilled.
36	Handover_Soon and TM	This event occurs when the TRAU/TC is informed that a local hand-over will soon take place and the condition TM is fulfilled.
6	TFO_REQ and (NA_TP | A_TP) and Dsig==Lsig and Dsig!=Old_Sig	This event occurs when a TFO_REQ message is received, either the condition NA_TP or the condition A_TP is fulfilled and the distant signature is equal to the local signature but different from the old (local) signature.

#	Event	Description
7	TFO_REQ and (NA_TP | A_TP) and Dsig==Old_Sig	This event occurs when a TFO_REQ message is received, the condition NA_TP or A_TP is fulfilled, and the distant signature is equal to the old signature.
8	TFO_REQ and (NA_TP | A_TP) and Dsig!=Lsig and Dsig!=Old_Sig	This event occurs when a TFO_REQ message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the distant signature is different from the local signature and old (local) signature.
24	TFO_REQ and TM and Dsig==Lsig	This event occurs when a TFO_REQ message is received, the condition TM is fulfilled, and the distant and the local signatures are equal.
25	TFO_REQ and TM and Dsig!=Lsig	This event occurs when a TFO_REQ message is received, the condition TM is fulfilled, and the distant signature is different from the local signature.
9	TFO_ACK and NA_TP and Dsig==Lsig	This event occurs when a TFO_ACK message is received, the condition NA_TP is fulfilled, and the local and distant signatures are equal.
10	TFO_ACK and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_ACK message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the distant signature is different from the local signature.
26	TFO_ACK and TM and Dsig==?	This event occurs when a TFO_ACK message is received and the condition TM is fulfilled. The distant signature is ignored for this event.
31	TFO_ACK and A_TP and Dsig==Lsig	This event occurs when a TFO_ACK message is received, the condition A_TP is fulfilled, and the distant signature is equal to the local signature.
11	TFO_TRANS and Luc != AMR and DCh==LCh	This event occurs when a TFO_TRANS message is received when a non-AMR codec type is used on the local side and the distant and local channel types do match.
30	TFO_TRANS and Luc == AMR and DCh==LCh	This event occurs when a TFO_TRANS message is received while a AMR codec type is used and the distant and local channel types do match.
37	TFO_TRANS and DCh!=LCh	This event occurs when a TFO_TRANS message is received and a channel mismatch occurs.
18	TFO_SYL	This event occurs when a TFO_SYL message is received.
19	TFO_DUP	This event occurs when a TFO_DUP message is received.
20	TFO_REQ_L and (NA_TP | A_TP) and Dsig==Lsig	This event occurs when a TFO_REQ_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local signature is equal to the distant signature.
21	TFO_REQ_L and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_REQ_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local and distant signatures are different.
27	TFO_REQ_L and TM and Dsig==Lsig	This event occurs when a TFO_REQ_L message is received, the condition TM is fulfilled, and the local and distant signatures are equal.
28	TFO_REQ_L and TM and Dsig!=Lsig	This event occurs when a TFO_REQ_L message is received, the condition TM is fulfilled and the local and distant signatures are different.
22	TFO_ACK_L and (NA_TP | A_TP) and Dsig==Lsig	This event occurs when a TFO_ACK_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local signature is equal to the distant signature.
23	TFO_ACK_L and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_ACK_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local and distant signatures are different.
29	TFO_ACK_L and TM and Dsig==?	This event occurs when a TFO_ACK_L message is received and the condition TM is fulfilled. The distant signature is not relevant for this event.
42	TFO_FILL	This event occurs when a TFO_FILL message is received.
43	TFO_NORMAL	This event occurs when a TFO_NORMAL message is received.
49	Distant_Config and (NA_TP | A_TP) and Con_Req & TC	This event occurs when a 3G system (TC) receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame are compatible with the local parameters so that TFO is possible.
50	Distant_Config and TM and Con_Req & TC	This event occurs when 3G system (TC) receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible.
51	Distant_Config and (NA_TP | A_TP) and	This event occurs when a 3G system (TC) receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this

#	Event	Description
	Con_Ack & TC	config frame are compatible with the local parameters so that TFO is possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
52	Distant_Config and TM and Con_Ack & TC	This event occurs when 3G system (TC) receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
53	Distant_Config and (NA_TP | A_TP) and TRAU	This event occurs when a 2G system (TRAU) receives a config frame (config request or config acknowledgement) from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame are compatible with the local parameters so that TFO is possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
54	Distant_Config and TM and Con_Req & TRAU	This event occurs when a 2G system receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible.
55	Distant_Config and TM and Con_Ack & TRAU	This event occurs when a 2G system receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
56	Distant_Disable	This event occurs when a config frame (config request) with a TFO_Enable bit set to zero is received from the distant TRAU/TC, i.e. when the distant side is going to disable TFO.

Table 10.6-2: PCM_Non_Idle and Loopback Handling

Event:	PCM_Non_Idle	TFO_REQ	TFO_REQ
Number:	5	6	7
Condition: & &		(NA_TP | A_TP) Dsig==Lsig Dsig!=Old_Sig	(NA_TP | A_TP) Dsig==Old_Sig
Comment: **State:**	Occurs only at the beginning	Loopback (LB) or distant handover (HO)? wrong Sig	Loopback (LB) or distant handover (HO)?
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	C;F;REQ; FIT; **Typ 2nd Event**	---------- ----------	---------- ----------
FIT: First_Try	---------- ----------	C;SO;REQ; FIT; **LB!**	NoAc; FIT; **Ignore LB**
COR: Continuous Retry	---------- ----------	C;SO;REQ; COR; LB!?	NoAc; COR; **Ignore LB**
PER: Periodic Retry	---------- ----------	C;F;S;ACK; CON; Dist HO!	---------- ----------
MON: Monitor	---------- ----------	C;F;S;REQ; FIT; Dist HO!	---------- ----------
MIS: Mismatch	---------- ----------	C;F;S;ACK; CON; Dist HO!	---------- ----------
CON: Contact	---------- ----------	C;SO;REQ; COR; Safe way	---------- ----------
FAT: Fast Try	---------- ----------	C;SO;REQ;RCm; COR; Safe way	---------- ----------
FAC: Fast Contact	---------- ----------	C;SO;REQ;RCm; COR; Safe way	---------- ----------
WRC Wait_RC	---------- ----------	C;SO;RCm;REQ; COR;	---------- ----------
KON: Konnect	---------- ----------	C;DT;SO;RCm,REQ;T1; COR; IPEs transparent!	---------- ----------
REK: Re_Konnect	---------- ----------	C;DT;SO;RCm;REQ;IT;B;T1; COR; IPEs transparent!	---------- ----------
SOS: Sync_Lost	---------- ----------	C;IT;S;RCm;REQ;B;T1; COR; Contact is back	---------- ----------
OPE: Operation	---------- ----------	---------- ----------	---------- ----------
FAI: Failure	---------- ----------	NoAc; FAI;	---------- ----------

Table 10.6-3: Most Important Cases, Especially at Call Set-up

Event:	TFO_REQ	TFO_ACK	TFO_ACK	TFO_TRANS	TFO_Frame
Number:	8	9	10	11	12
Condition: & &	(NA_TP | A_TP) Dsig!=Lsig Dsig!=Old_Sig	NA_TP Dsig==Lsig	(NA_TP | A_TP) Dsig!=Lsig	Luc != AMR DCh==LCh	Match_1
Comment: **State:**	Distant REQ Good Signature	Distant ACK Good Signature	Wrong Response Handover?	similar to ACK As response to loc ACK_?	First or second TFO Frame
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;U;ACK; CON; **Typical**	C;U;T;BT;T;T1; KON; **Typical; IPEs!**	C;REQ; FIT;	NoAc; FIT; Wait for Frame	C;U;DUP;RCi; FAT; **1: HO**
COR: Continuous Retry	C;U;ACK; CON; Typical	C;U;T;BT;T;T1; KON; **Typical; IPEs!**	C;REQ; COR;	NoAc; COR; Wait for Frames	C;U;DUP; FAT; 1: Call is back?
PER: Periodic Retry	C;F;ACK; CON; OK, Contact is back	C;F;S;REQ; COR; Rare case, test	C;F;REQ; COR;	NoAc; PER; Wait for Frames	C;DUP; FAT; 1: Call is back?
MON: Monitor	C;F;REQ; FIT; IPEs?	C;F;S;REQ; FIT; Rare case, test	C;F;REQ; FIT;	NoAc; MON Wait for Frames	C;DUP; FAT; 1: Call is back?
MIS: Mismatch	C;F;ACK; CON; Mismatch resolved	C;F;S;REQ; COR; Rare case, test	C;F;REQ; COR;	NoAc; MIS; Wait for Frames	C;DUP; FAT; 1: Call is back?
CON: Contact	C;ACK; CON; **Typical: wait**	C;T;BT;T;T1; KON; **Typical: yes!**	C;REQ; COR;	C;T;BT;T;T1; KON; **yes! Fast way**	C;T;BT;T;T1; KON; Missed TRANS?
FAT: Fast Try	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	NoAc; FAC; Wait for Frames	NoAc; FAT; **2: Typ. Loc HO**
FAC: Fast Contact	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	NoAc; FAC; Wait for Frames	C;BT;T;L;T2;AT;B; OPE; **5: Typ. Loc HO**
WRC Wait_RC	C;RCm;REQ;T1; COR;	---------- ----------	C;RCm;REQ; COR;	---------- ----------	AT WRC;
KON: Konnect	C;RCm;DT;REQ;T1; COR; IPEs transparent!	NoAc; KON; **Typical: wait**	NoAc; KON;	NoAc; KON; **Typical: wait**	RCs;AT;L;T2;B; OPE; **Typ: call set-up**
REK: Re_Konnect	C;RCm;DT;REQ;IT;B;T1; COR; IPEs transparent!	C;DT;REQ;IT;B;T1; COR;	C;DT;RCm;REQ;IT;B; T1 COR;	NoAc; REK; Wait for Frames	AT;L;T2;B; OPE; **5: Typ. Dis HO**
SOS: Sync_Lost	C;RCm;IT;REQ;B;T1; COR; Contact is back	C;IT;REQ;B;T1; COR; Contact is back	C;IT;RCm;REQ;B;T1; COR; Contact is back	NoAc; SOS; Wait for Frames	C;BT;T;L;T2;B; OPE; short Interrupt?
OPE: Operation	---------- ----------	---------- ----------	---------- ----------	NoAc; OPE; Typical in HO	NoAc; OPE; **Main! TFO!**
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;

Table 10.6-4: In Call Modification and Handover

Event: or	**New_Local_Codec New_Local_Config**	**New_Local_Codec New_Local_Config**	**TFO_Frame**	**TFO_SYL**	**TFO_DUP**
Number:	13, 14	15, 16	17	18	19
Condition: &	(NA_TP | A_TP)	TM	Match_2		
Comment: **State:**	In Call Modif. Mismatch resolv	In Call Modif. Mismatch occurs	Three or more TFO Frames	The dist TC lost sync in OPE	The dist TC recognised HO Identical #17
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	NoAc; WAK;	NoAc; WAK;	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;REQ; FIT; Restart	C;REQ; FIT; Restart	---------- ----------	NoAc; FIT; HO? Ignore	NoAc; FIT; HO? Ignore
COR: Continuous Retry	C;REQ; COR;	C;REQ; COR;	---------- ----------	NoAc; COR; Ignore	NoAc; COR; Ignore
PER: Periodic Retry	L1;T5; PER;	L1;T5; PER;	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
MON: Monitor	NoAc; MON	NoAc; MON	---------- ----------	C;F;REQ; FIT; Rare case, test	C;F;REQ; FIT; Rare case, test
MIS: Mismatch	C;F;REQ; COR; **Mismatch Res.**	C;L;T2;B; MIS; **Direct info**	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
CON: Contact	C;REQ; COR;	C;L;T2;B; MIS;	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
FAT: Fast Try	NoAc; FAT;	C;L;T2;B;RCm; MIS;	NoAc; FAC;	NoAc; FAC; **3: Typ. Loc HO**	C;F;REQ;RCm; COR; Rare case, test
FAC: Fast Contact	NoAc; FAC;	C;L;T2;B;RCm; MIS;	C;BT;T;L;T2;AT;B;RCs; OPE; assume matching ACS	NoAc; FAC; **4: Typ Loc HO**	C;F;REQ;RCm; COR; rare case, test
WRC Wait_RC	C;RCm;REQ; COR;	C;RCm;L;T2;B; MIS;	NoAc; WRC;	NoAc; WRC;	NoAc; WRC;
KON: Konnect	C;RCm;DT;REQ; COR;	C;RCm;DT;L;T2;B; MIS;	RCs;AT;L;T2;B; OPE;	NoAc; KON; Wait, short int?	NoAc; KON; Other TC?
REK: Re_Konnect	C;RCm;DT;IT;REQ; COR;	C;RCm;DT;IT;L;T2;B; MIS;	---------- ----------	C;DT;SYL; SOS; IPEs not transp?	NoAc; REK; **4: Typ. Dist HO**
SOS: Sync_Lost	C;RCm;IT;REQ; COR;	C;RCm;IT;L;T2;B; MIS;	---------- ----------	NoAc; SOS; Short Interrupt.?	C;BT;T;T1; REK; **3: typ Dis HO**
OPE: Operation	RCs;L;T2; OPE;	C;RCm;DT;IT;L;T2;B; MIS;	NoAc; OPE; Main! TFO!	NoAc; OPE; Short interrupt?	NoAc; OPE; Typical
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;

Table 10.6-11: Special Events, Timeouts

Event:	**Runout**	**T==0**	**Frame_Sync_Lost**	**Frame_Sync_Lost**	**Mes_Sync_Lost**
Number:	44	45	46	47	48
Condition: &			n<3	n>2	
Comment: **State:**	IPEs may become unsynchronised	Time-Out	start to send SYL already	Stop TFO Frames if 3 Frames missing	
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	U;N; MON; **PSTN Call**	---------- ----------	---------- ----------	---------- ----------	NoAc; FIT;
COR: Continuous Retry	U;L1;T5; PER; **at end of COR**	C;N;REQ; COR; Reset IPEs	---------- ----------	---------- ----------	NoAc; COR;
PER: Periodic Retry	NoAc; PER;	L1;T5; PER; **Periodic Test**	---------- ----------	---------- ----------	NoAc; PER;
MON: Monitor	---------- ----------	C;N; MON;	---------- ----------	---------- ----------	---------- ----------
MIS: Mismatch	NoAc; MIS; **typ Final state**	N;B; MIS; List not Ack_ed!	NoAc; MIS;	NoAc; MIS;	NoAc; MIS;
CON: Contact	REQ; COR; can this occur?	---------- ----------	---------- ----------	---------- ----------	C;REQ; COR;
FAT: Fast Try	REQ;RCm; COR; fast HO failed	---------- ----------	NoAc; FAT; typical in HO	NoAc; FAT; typical in HO	C;REQ;RCm; COR; fast HO failed
FAC: Fast Contact	REQ;RCm; COR; fast HO failed	---------- ----------	NoAc; FAC; typical in HO	NoAc; FAC; typical in HO	C;REQ;RCm; COR; fast HO failed
WRC Wait_RC	C; T;BT;T;T1; KON; Missing RC_Ack	C; T;BT;T;T1; KON; Missing RC_Ack	NoAc; WRC;	IT; WRC;	C;RCm;REQ; COR;
KON: Konnect	NoAc; KON; may happen	C;RCm;DT;N; FAI; Misbehaviour!	---------- ----------	---------- ----------	C;RCm;DT;REQ;T1; COR; after Timeout: N
REK: Re_Konnect	NoAc; REK; may happen	C;RCm;DT;N;IT;B; FAI; Misbehaviour!	---------- ----------	---------- ----------	C;RCm;DT;REQ;IT;B;T1; COR; after Timeout: N
SOS: Sync_Lost	RCm;REQ;IT;B;T1; COR; after Timeout: N	---------- ----------	---------- ----------	NoAc; SOS; wait for Runout	C;RCm;REQ;IT;B;T1; COR; after Timeout: N
OPE: Operation	NoAc; OPE; **typ Final event**	B; OPE; List not Ack_ed!	SYL1; OPE; **1: Alarm, go on**	C;DT;SYL; SOS; **2: Alarm, stop!**	NoAc; OPE; **Typ Final event**
FAI: Failure	NoAc; FAI; typical	---------- ----------	---------- ----------	---------- ----------	NoAc; FAI; don´t trust!

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Lulea, Sweden, February 18-22, 2002

CR-Form-v5

CHANGE REQUEST

⌘ **28.062** **CR** **005** ⌘ rev **1-** ⌘ Current version: **4.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network **X**

Title:	⌘	Inclusion of the Non_Speech TFO frames in conditions for TFO_Frame
Source:	⌘	TSG SA WG4
Work item code:	⌘	TFO-AMR
Date:	⌘	11-Mar-2002
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	If Non_Speech frames are received while being in Konnect State it is not possible to go to Operation state (Tandem Free). WRC state actions when time runs out were incorrect.
Summary of change:	⌘	The Match_1 and Match_2 conditions are extended to Non_Speech Frames in case of AMR.
Consequences if not approved:	⌘	TFO cannot be established if the distant TC/TRAU sends Non_Speech frames due to a speech pause

Clauses affected:	⌘	Section. 10.2.2.
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification, which are not relevant to the change request.

10.2.2 Conditions for TFO_Frame

In the context of a TFO_Frame event the conditions Match_1, Match_2, Mismatch_1, and Mismatch_2 are used. N represents the number of consecutive TFO frames received, corresponding to the conditions.

Match_1
Match_1 is fulfilled if one of the following conditions is true:

- A non-AMR codec type is used and
  the distant used codec type is equal to the local used codec type (Duc==Luc) and
  n<3.

- An AMR codec type is used and
  the local used codec type and the distant used codec type are compatible and
  the distant used codec mode is contained in the local ACS and
  n<3

- ~~or~~An AMR codec type is used and
  the local used codec type and the distant used codec type are compatible and
  a Non_Speech TFO frame (i.e.~~e.g.~~ Sid_First, Sid-Update, Sid_Bad, No_Data~~, etc.~~ and Onset) is received and
  n<3.

Match_2
Match_2 is fulfilled if one of the following conditions is true:

- A non-AMR codec type is used and
  the distant used codec type is equal to the local used codec type (Duc==Luc) and
  n>2.

- An AMR codec type is used and
  the local used codec type and the distant used codec type are compatible and
  the distant used codec mode is contained in the local ACS and
  n>2~~ or~~

- An AMR codec type is used and
  the local used codec type and the distant used codec type are compatible and
  a Non_Speech TFO frame (i.e. Sid_First, Sid-Update, Sid_Bad, No_Data and Onset) is received and
  n>2.

Mismatch_1
Mismatch_1 is fulfilled if one of the two following conditions is true:

- A non-AMR codec type is used and
  the distant used codec type is different from the local used codec type (Duc!=Luc) and
  n==1.

- An AMR codec type is used and
  the TFO frame doesn't match because of incompatible codec types or a used codec mode that is not in the ACS and
  n<3.

Mismatch_2
Mismatch_2 is fulfilled if one of the following conditions is true:

- A non-AMR codec type is used and
  the distant used codec type is different from the local used codec type (Duc!=Luc) and
  n>1.

- An AMR codec type is used and
  the TFO frame doesn't match because of incompatible codec types or a used codec mode that is not in the ACS and
  n>2.

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CR-Form-v3

CHANGE REQUEST

⌘ **28.062** **CR** **013** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Corrected C-Code for AMR TFO decision rules
Source:	⌘	TSG SA WG4
Work item code:	⌘	TFO-AMR
Date:	⌘	11-Mar-2002
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The reference implementation of the AMR TFO decision rules gives confusing results for some special cases.
Summary of change:	⌘	Confusing output for non AMR codec types corrected. Input of modes 10,2 and 12,2 for HR_AMR is answered with an input error message. IACS, CSCS and OACS removed from output for incompatible AMR codec types. Codec Mismatch Resolution is not given as result, if it is not possible. Input interface made more user friendly.
Consequences if not approved:	⌘	TFO decision rule results are not unambiguous.

Clauses affected:	⌘	C-Code files tfo_decision.c and tfo_main.c (oacs.h, tfo_decision_h and oacs.c remain as they are)
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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Tdoc S4-(02)0141

CR-Form-v3

CHANGE REQUEST

⌘ **28.062** **CR** **016** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Corrections
Source:	⌘	TSG SA WG4
Work item code:	⌘	TFO-AMR
Date:	⌘	11-Mar-2002
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Errors in the TFO_Protocol
Summary of change:	⌘	Introduction of the TFO_Terminating State in the TFO protocol. Correction of the actions for the WRC state when the timer elapses.
Consequences if not approved:	⌘	An Error case is introduced in the protocol for the BTS

Clauses affected:	⌘	Sections. 9.7, 10.4, 10.6, G.3.1, G.3.2.
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.7 Distant Handover, TFO Interruption

9.7.1 Sync_Lost State

If the TC was in Operation State and suddenly the TFO Frame synchronisation is lost, then the TC enters the Sync_Lost State for a short while, before it transits to Continuous_Retry.

If synchronisation was lost due to a distant handover, then a fast TFO establishment might be possible and the TC enters Operation State soon again. In Sync_Lost it expects TFO_DUP Message as confirmation of the distant handover. Then it transits to Re_Konnect.

9.7.2 Re_Konnect State

This State is entered from Operation via Sync_Lost, if TFO_DUP Messages are received. The TC starts immediately to send TFO Frames again, with a TFO_TRANS embedded into the first TFO Frames. The TC transits back to Operation State, as soon as TFO Frames are received, again.

9.7.3 TFO_Term

This State is entered when TFO is disabled by the TRAU/TC. The TRAU/TC stops then sending TFO frames but still accepts receiving TFO frames and messages sent by the distant TRAU/TC. The TRAU/TC transits through this state before entering to Not_Active state after the TFO termination has been acknowledged by the distant side.

10.4 Detailed Description of the Events

Table 10.4-1 lists all events of the Protocol Tables.

Table 10.4-1: Events of the State Machine Description

#	Event	Description
1	TFO_Enable	The event TFO_Enable occurs when all TFO parameters get available in the transcoder and the controlling entity enables TFO. In GSM, it means that the TFOE bit of AMR TRAU Frames toggles from '0' to '1'. Enabling TFO might involve a proprietary process not further addressed in the present document.
2	New_Speech_Call	This event occurs when a new speech call is set-up or the TRAU/TC is re-initialised (e.g. after a handover failure). In GSM, this means that the transcoder is initialised by the BTS by two consecutive TRAU frames with identical codec types (GSM_FR, GSM_HR, GSM_EFR) or by a config frame (AMR codec types). In 3G, this means that the Iu User Plan is initialised.
3	TFO_Disable	The event TFO_Disable occurs when TFO is disabled by the controlling entity. In GSM, the TFO_Disable event is also controlled by the TFOE bit of AMR TRAU Frames.
4	TRAU_Idle	This event occurs when the transcoder is set into idle mode.
5	PCM_Non_Idle	The event PCM_Non_Idle occurs if more than one PCM samples are received that are different to PCM_Idle.
12	TFO_Frame and Match_1	This event means that a valid TFO Frame was received by the transcoder and the condition Match_1 is fulfilled.
17	TFO_Frame and Match_2	This event means that a valid TFO Frame was received by the transcoder and the condition Match_2 is fulfilled.
38	TFO_Frame and Mismatch_1	This event means that a valid TFO Frame was received by the transcoder and the condition Mismatch_1 is fulfilled.
39	TFO_Frame and Mismatch_2	This event means that a valid TFO Frame was received by the transcoder and the condition Mismatch_2 is fulfilled.
13	New_Local_Codec and (NA_TP | A_TP)	This event occurs when the local used codec type changes and either the condition NA_TP or the condition A_TP is fulfilled.
15	New_Local_Codec and TM	This event occurs when the local used codec type changes and the condition TM is fulfilled.
14	New_Local_Config and (NA_TP | A_TP)	This event occurs when an AMR codec type is used and the local codec configuration changes and the condition A_TP is fulfilled.
16	New_Local_Config and TM	This event occurs when an AMR codec type is used and the local codec configuration changes and the condition TM is fulfilled.
32	RC_ack	This event (rate control acknowledgement) occurs when an acknowledgement to the RCi action is received from the BTS/RNC indicating that the rate control command was understood (TFO_Soon acknowledgement in GSM, Rate_Ack in UMTS).
40	New_Local_Codec_List	This event occurs when the local codec list changes.
41	Data_Call	This event is only relevant for GSM systems. It occurs when the transcoder is informed that a Data Call is set-up.
44	Runout	The event Runout occurs when the last TFO message has been taken from the Transmit Queue and the last 10 bits are going to be sent. So there is still some time for TFO_Protocol to react and place a further TFO Message in the Transmit Queue, which then shall be transmitted without gap to the messages before.
45	T==0	This event occurs when a time-out has been reached.
46	Frame_Sync_Lost and n<3	This event occurs when the TFO frame synchronisation is lost for the first or the second time. For further details see Annex C.
47	Frame_Sync_Lost and n>2 and TFO_Disabled	This event occurs when the TFO frame synchronisation is lost for more than two times and TFO has been disabled. For further details see Annex C.
57	Frame_Sync_Lost and n>2 and TFO_Enabled	This event occurs when the TFO frame synchronisation is lost for more than two times and TFO is still enabled. For further details see Annex C.
48	Mes_Sync_Lost	This event corresponds to a loss of TFO message synchronisation. For further details see Annex C.
35	Handover_Soon and (NA_TP | A_TP)	This event occurs when the TRAU/TC is informed that a local hand-over will soon take place and either the condition NA_TP or the condition A_TP is fulfilled.
36	Handover_Soon and TM	This event occurs when the TRAU/TC is informed that a local hand-over will soon take place and the condition TM is fulfilled.
6	TFO_REQ and	This event occurs when a TFO_REQ message is received, either the condition

#	Event	Description
	(NA_TP | A_TP) Dsig==Lsig	NA_TP or the condition A_TP is fulfilled and the distant signature is equal to the local signature.

#	Event	Description
7	TFO_REQ and NA_TP and Dsig==Old_Sig	This event occurs when a TFO_REQ message is received, the condition NA_TP is fulfilled, and the distant signature is equal to the old signature.
8	TFO_REQ and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_REQ message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the distant signature is different from the local signature.
24	TFO_REQ and TM and Dsig==Lsig	This event occurs when a TFO_REQ message is received, the condition TM is fulfilled, and the distant and the local signatures are equal.
25	TFO_REQ and TM and Dsig!=Lsig	This event occurs when a TFO_REQ message is received, the condition TM is fulfilled, and the distant signature is different from the local signature.
9	TFO_ACK and NA_TP and Dsig==Lsig	This event occurs when a TFO_ACK message is received, the condition NA_TP is fulfilled, and the local and distant signatures are equal.
10	TFO_ACK and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_ACK message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the distant signature is different from the local signature.
26	TFO_ACK and TM and Dsig==?	This event occurs when a TFO_ACK message is received and the condition TM is fulfilled. The distant signature is ignored for this event.
31	TFO_ACK and A_TP and Dsig==Lsig	This event occurs when a TFO_ACK message is received, the condition A_TP is fulfilled, and the distant signature is equal to the local signature.
11	TFO_TRANS and Luc != AMR and DCh==LCh	This event occurs when a TFO_TRANS message is received when a non-AMR codec type is used on the local side and the distant and local channel types do match.
30	TFO_TRANS and Luc == AMR and DCh==LCh	This event occurs when a TFO_TRANS message is received while a AMR codec type is used and the distant and local channel types do match.
37	TFO_TRANS and DCh!=LCh	This event occurs when a TFO_TRANS message is received and a channel mismatch occurs.
18	TFO_SYL	This event occurs when a TFO_SYL message is received.
19	TFO_DUP	This event occurs when a TFO_DUP message is received.
20	TFO_REQ_L and (NA_TP | A_TP) and Dsig==Lsig	This event occurs when a TFO_REQ_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local signature is equal to the distant signature.
21	TFO_REQ_L and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_REQ_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local and distant signatures are different.
27	TFO_REQ_L and TM and Dsig==Lsig	This event occurs when a TFO_REQ_L message is received, the condition TM is fulfilled, and the local and distant signatures are equal.
28	TFO_REQ_L and TM and Dsig!=Lsig	This event occurs when a TFO_REQ_L message is received, the condition TM is fulfilled and the local and distant signatures are different.
22	TFO_ACK_L and (NA_TP | A_TP) and Dsig==Lsig	This event occurs when a TFO_ACK_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local signature is equal to the distant signature.
23	TFO_ACK_L and (NA_TP | A_TP) and Dsig!=Lsig	This event occurs when a TFO_ACK_L message is received, either the condition NA_TP or the condition A_TP is fulfilled, and the local and distant signatures are different.
29	TFO_ACK_L and TM and Dsig==?	This event occurs when a TFO_ACK_L message is received and the condition TM is fulfilled. The distant signature is not relevant for this event.
42	TFO_FILL	This event occurs when a TFO_FILL message is received.
43	TFO_NORMAL	This event occurs when a TFO_NORMAL message is received.
49	Distant_Config and (NA_TP | A_TP) and Con_Req & TC	This event occurs when a 3G system (TC) receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame are compatible with the local parameters so that TFO is possible.
50	Distant_Config and TM and Con_Req & TC	This event occurs when 3G system (TC) receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible.
51	Distant_Config and (NA_TP | A_TP) and Con_Ack & TC	This event occurs when a 3G system (TC) receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame are compatible with the local parameters so that TFO is possible.

#	Event	Description
		This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
52	Distant_Config and TM and Con_Ack & TC	This event occurs when 3G system (TC) receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
53	Distant_Config and (NA_TP | A_TP) and TRAU	This event occurs when a 2G system (TRAU) receives a config frame (config request or config acknowledgement) from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame are compatible with the local parameters so that TFO is possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
54	Distant_Config and TM and Con_Req & TRAU	This event occurs when a 2G system receives a config request from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible.
55	Distant_Config and TM and Con_Ack & TRAU	This event occurs when a 2G system receives a config acknowledgement from the distant TRAU/TC, the TFO_enable bit is set, and the parameters of this config frame do not match with the local parameters so that TFO is not possible. This event does not occur when an acknowledgement for a config request indicating Handover_Soon is received.
56	Distant_Disable	This event occurs when a config frame (config request) with a TFO_Enable bit set to zero is received from the distant TRAU/TC, i.e. when the distant side is going to disable TFO.

10.6 Protocol Tables

Table 10.6-1: Enabling/Disabling/New_Speech_Call/TRAU_Idle

Event: or	**TFO_Enable New_Speech_Call**	**TFO_Disable TRAU_Idle**
Number:	1, 2	3, 4
Condition: &		
Comment:	TFO gets active.	Local disable.
State:		
NAC: Not_Active	C;S;IT;RCm; WAK	NoAc; NAC;
WAK: Wakeup	NoAc WAK;	NoAc; NAC;
FIT: First_Try	---------- ----------	C;N; NAC;
COR: Continuous Retry	---------- ----------	C;N; NAC;
PER: Periodic Retry	---------- ----------	C;N; NAC;
MON: Monitor	---------- ----------	C;N; NAC;
MIS: Mismatch	---------- ----------	C;N; NAC;
CON: Contact	---------- ----------	C;N; NAC;
FAT: Fast Try	---------- ----------	C;N;RCm; NAC;
FAC: Fast Contact	---------- ----------	C;N;RCm; NAC;
WRC: Wait_RC		C;N;RCm; NAC;
KON: Konnect	---------- ----------	C;RCm;CR;DT;N;~~CR~~T1; ~~NAC;~~TT;
REK: Re_Konnect	---------- ----------	C;RCm;CR;DT;~~IT;~~N; ~~CR~~T1; ~~NAC;~~TT;
SOS: Sync_Lost	---------- ----------	C;RCm;IT;N; NAC;
OPE: Operation	---------- ----------	C;RCm;CR;DT;~~IT~~;N;~~CR~~T 1; ~~NAC;~~TT;
FAI: Failure	---------- ----------	C; NAC; **Exit from FAI**

Event: or	TFO_Enable New_Speech_Call	TFO_Disable TRAU_Idle
TT: TFO_Term	---------- ----------	NoAC; TT;

Table 10.6-2: PCM_Non_Idle and Loopback Handling

Event:	PCM_Non_Idle	TFO_REQ	TFO_REQ
Number:	5	6	7
Condition: &		(NA_TP | A_TP) Dsig==Lsig	NA_TP Dsig==Old_Sig
Comment: **State:**	Occurs only at the beginning	Loopback (LB) or distant handover (HO)? wrong Sig	Loopback (LB) or distant handover (HO)?
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	C;F;REQ; FIT; **Typ 2nd Event**	---------- ----------	---------- ----------
FIT: First_Try	---------- ----------	C;SO;REQ; FIT; **LB!**	NoAc; FIT; **Ignore LB**
COR: Continuous Retry	---------- ----------	C;SO;REQ; COR; LB!?	NoAc; COR; **Ignore LB**
PER: Periodic Retry	---------- ----------	C;F;S;ACK; CON; Dist HO!	---------- ----------
MON: Monitor	---------- ----------	C;F;S;REQ; FIT; Dist HO!	---------- ----------
MIS: Mismatch	---------- ----------	C;F;S;ACK; CON; Dist HO!	---------- ----------
CON: Contact	---------- ----------	C;SO;REQ; COR; Safe way	---------- ----------
FAT: Fast Try	---------- ----------	C;SO;REQ;RCm; COR; Safe way	---------- ----------
FAC: Fast Contact	---------- ----------	C;SO;REQ;RCm; COR; Safe way	---------- ----------
WRC: Wait_RC	---------- ----------	C;SO;RCm;REQ; COR;	---------- ----------
KON: Konnect	---------- ----------	C;DT;SO;RCm,REQ;T1; COR; IPEs transparent!	---------- ----------
REK: Re_Konnect	---------- ----------	C;DT;SO;RCm;REQ;IT;B;T1; COR; IPEs transparent!	---------- ----------
SOS: Sync_Lost	---------- ----------	C;IT;S;RCm;REQ;B;T1; COR; Contact is back	---------- ----------
OPE: Operation	---------- ----------	---------- ----------	---------- ----------
FAI: Failure	---------- ----------	NoAc; FAI;	---------- ----------
TT: TFO_Term	---------- ----------	---------- ----------	---------- ----------

Table 10.6-3: Most Important Cases, Especially at Call Set-up

Event:	TFO_REQ	TFO_ACK	TFO_ACK	TFO_TRANS	TFO_Frame
Number:	8	9	10	11	12
Condition: &	(NA_TP | A_TP) Dsig!=Lsig	NA_TP Dsig==Lsig	(NA_TP | A_TP) Dsig!=Lsig	Luc != AMR DCh==LCh	Match_1
Comment: **State:**	Distant REQ Good Signature	Distant ACK Good Signature	Wrong Response Handover?	similar to ACK As response to loc ACK_?	First or second TFO Frame
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;U;ACK; CON; **Typical**	C;U;T;BT;T;T1; KON; **Typical; IPEs!**	C;REQ; FIT;	NoAc; FIT; Wait for Frame	C;U;DUP;RCi; FAT; **1: HO**
COR: Continuous Retry	C;U;ACK; CON; Typical	C;U;T;BT;T;T1; KON; **Typical; IPEs!**	C;REQ; COR;	NoAc; COR; Wait for Frames	C;U;DUP; FAT; 1: Call is back?
PER: Periodic Retry	C;F;ACK; CON; OK, Contact is back	C;F;S;REQ; COR; Rare case, test	C;F;REQ; COR;	NoAc; PER; Wait for Frames	C;DUP; FAT; 1: Call is back?
MON: Monitor	C;F;REQ; FIT; IPEs?	C;F;S;REQ; FIT; Rare case, test	C;F;REQ; FIT;	NoAc; MON Wait for Frames	C;DUP; FAT; 1: Call is back?
MIS: Mismatch	C;F;ACK; CON; Mismatch resolved	C;F;S;REQ; COR; Rare case, test	C;F;REQ; COR;	NoAc; MIS; Wait for Frames	C;DUP; FAT; 1: Call is back?
CON: Contact	C;ACK; CON; **Typical: wait**	C;T;BT;T;T1; KON; **Typical: yes!**	C;REQ; COR;	C;T;BT;T;T1; KON; **yes! Fast way**	C;T;BT;T;T1; KON; Missed TRANS?
FAT: Fast Try	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	NoAc; FAC; Wait for Frames	NoAc; FAT; **2: Typ. Loc HO**
FAC: Fast Contact	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	C;REQ;RCm; COR; Safe way	NoAc; FAC; Wait for Frames	C;BT;T;L;T2;AT;B; OPE; **5: Typ. Loc HO**
WRC: Wait_RC	C;RCm;REQ;T1; COR;	---------- ----------	C;RCm;REQ; COR;	---------- ----------	AT WRC;
KON: Konnect	C;RCm;DT;REQ;T1; COR; IPEs transparent!	NoAc; KON; **Typical: wait**	NoAc; KON;	NoAc; KON; **Typical: wait**	RCs;AT;L;T2;B; OPE; **Typ: call set-up**
REK: Re_Konnect	C;RCm;DT;REQ;IT;B;T1; COR; IPEs transparent!	C;DT;REQ;IT;B;T1; COR;	C;DT;RCm;REQ;IT;B; T1 COR;	NoAc; REK; Wait for Frames	AT;L;T2;B; OPE; **5: Typ. Dis HO**
SOS: Sync_Lost	C;RCm;IT;REQ;B;T1; COR; Contact is back	C;IT;REQ;B;T1; COR; Contact is back	C;IT;RCm;REQ;B;T1; COR; Contact is back	NoAc; SOS; Wait for Frames	C;BT;T;L;T2;B; OPE; short Interrupt?
OPE: Operation	---------- ----------	---------- ----------	---------- ----------	NoAc; OPE; Typical in HO	NoAc; OPE; **Main! TFO!**
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------

Table 10.6-4: In Call Modification and Handover

Event: or	**New_Local_Codec New_Local_Config**	**New_Local_Codec New_Local_Config**	**TFO_Frame**	**TFO_SYL**	**TFO_DUP**
Number:	13, 14	15, 16	17	18	19
Condition: &	(NA_TP | A_TP)	TM	Match_2		
Comment: **State:**	In Call Modif. Mismatch resolv	In Call Modif. Mismatch occurs	Three or more TFO Frames	The dist TC lost sync in OPE	The dist TC recognised HO Identical #17
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	NoAc; WAK;	NoAc; WAK;	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;REQ; FIT; Restart	C;REQ; FIT; Restart	---------- ----------	NoAc; FIT; HO? Ignore	NoAc; FIT; HO? Ignore
COR: Continuous Retry	C;REQ; COR;	C;REQ; COR;	---------- ----------	NoAc; COR; Ignore	NoAc; COR; Ignore
PER: Periodic Retry	L1;T5; PER;	L1;T5; PER;	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
MON: Monitor	NoAc; MON	NoAc; MON	---------- ----------	C;F;REQ; FIT; Rare case, test	C;F;REQ; FIT; Rare case, test
MIS: Mismatch	C;F;REQ; COR; **Mismatch Res.**	L;T2;B; MIS; **Direct info**	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
CON: Contact	C;REQ; COR;	C;L;T2;B; MIS;	---------- ----------	C;F;REQ; COR; Rare case, test	C;F;REQ; COR; Rare case, test
FAT: Fast Try	NoAc; FAT;	C;L;T2;B;RCm; MIS;	NoAc; FAC;	NoAc; FAC; **3: Typ. Loc HO**	C;F;REQ;RCm; COR; Rare case, test
FAC: Fast Contact	NoAc; FAC;	C;L;T2;B;RCm; MIS;	C;BT;T;L;T2;AT;B;RCs; OPE; assume matching ACS	NoAc; FAC; **4: Typ Loc HO**	C;F;REQ;RCm; COR; rare case, test
WRC: Wait_RC	C;RCm;REQ; COR;	C;RCm;L;T2;B; MIS;	NoAc; WRC;	NoAc; WRC;	NoAc; WRC;
KON: Konnect	C;RCm;DT;REQ; COR;	C;RCm;DT;L;T2;B; MIS;	---------- ----------	NoAc; KON; Wait, short int?	NoAc; KON; Other TC?
REK: Re_Konnect	C;RCm;DT;IT;REQ; COR;	C;RCm;DT;IT;L;T2;B; MIS;	---------- ----------	C;DT;SYL; SOS; IPEs not transp?	NoAc; REK; **4: Typ. Dist HO**
SOS: Sync_Lost	C;RCm;IT;REQ; COR;	C;RCm;IT;L;T2;B; MIS;	---------- ----------	NoAc; SOS; Short Interrupt.?	C;BT;T;T1; REK; **3: typ Dis HO**
OPE: Operation	RCs;L;T2; OPE;	C;RCm;DT;IT;L;T2;B; MIS;	NoAc; OPE; Main! TFO!	NoAc; OPE; Short interrupt?	NoAc; OPE; Typical
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	C;F;REQ; COR;	NoAc; TT;	NoAc; TT;	IT;N; NAC;	NoAc; TT;

Table 10.6-5: Special Matching TFO Messages

Event:	**TFO_REQ_L**	**TFO_REQ_L**	**TFO_ACK_L**	**TFO_ACK_L**
Number:	20	21	22	23
Condition: &	(NA_TP | A_TP) Dsig==Lsig	(NA_TP | A_TP) Dsig!=Lsig	(NA_TP | A_TP) Dsig==Lsig	(NA_TP | A_TP) Dsig!=Lsig
Comment: **State:**	Only sent in MIS/OPE/PER HO? Loop?	Only sent in MIS/OPE/PER Codec_List	Only sent in MIS; HO?	HO?
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	NoAc; FIT; Ignore	NoAc; FIT; Ignore	NoAc; FIT; Ignore	NoAc; FIT; Ignore
COR: Continuous Retry	NoAc; COR; Ignore	NoAc; COR; Ignore	NoAc; COR; Ignore	NoAc; COR; Ignore
PER: Periodic Retry	C;F;S;REQ; COR; Start again	C;F;REQ; COR; Start again	C;F;S;REQ; COR; Test	C;F;REQ; COR; Test
MON: Monitor	C;F;S;REQ; FIT; Test	C;F;REQ; FIT; Test	C;F;S;REQ; FIT; Test	C;F;REQ; FIT; Test
MIS: Mismatch	C;F;S;REQ; COR; Test	C;F;REQ; COR; Test	C;F;S;REQ; COR; Test	C;F;REQ; COR; Test
CON: Contact	C;S;REQ; COR; Safe way!	C;REQ; COR; Safe way!	C;S;REQ; COR; Safe way!	C;REQ; COR; Safe way!
FAT: Fast Try	C;S;REQ;RCm; COR; Safe way!	C;REQ;RCm; COR; Safe way!	C;S;REQ;RCm; COR; Safe way!	C;REQ;RCm; COR; Safe way!
FAC: Fast Contact	C;S;REQ;RCm; COR; Safe way!	C;REQ;RCm; COR; Safe way!	C;S;REQ;RCm; COR; Safe way!	C;REQ;RCm; COR; Safe way!
WRC: Wait_RC	C;S;RCm;REQ; COR;	C;RCm;REQ; COR;	C;S;RCm;REQ; COR;	C;RCm;REQ; COR;
KON: Konnect	C;RCm;DT;S;REQ;T1; COR; Safe way!	C;RCm;DT;REQ;T1; COR; Safe way!	C;RCm;DT;S;REQ;T1; COR; Safe way!	C;RCm;DT;REQ;T1; COR; Safe way!
REK: Re_Konnect	C;RCm;DT;IT;S;REQ;T1; COR; Safe way!	C;RCm;DT;IT;REQ;T1; COR; Safe way!	C;RCm;DT;IT;S;REQ;T1; COR; Safe way!	C;RCm;DT;IT;REQ;T1; COR; Safe way!
SOS: Sync_Lost	C;RCm;IT;S;REQ;B;T1; COR; Safe way!	C;RCm;IT;REQ;B;T1; COR; Safe way!	C;RCm;IT;S;REQ;B;T1; COR; Safe way!	C;RCm;IT;REQ;B;T1; COR; Safe way!
OPE: Operation	S;L;T2;B; OPE; Tx Codec_List	C;RCs;LA;B; OPE; Ack List, stop	C;RCs;B; OPE; Ack ok, stop	S;L;T2;B; OPE; Exchange list
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	---------- ----------	C;B; TT;	C;B; TT;	---------- ----------

Table 10.6-6: TFO Messages with mismatching Codec Type / Configuration

Event:	**TFO_REQ**	**TFO_REQ**	**TFO_ACK**	**TFO_REQ_L**	**TFO_REQ_L**	**TFO_ACK_L**
Number:	24	25	26	27	28	29
Condition: &	TM Dsig==Lsig	TM Dsig!=Lsig	TM Dsig==? Dsig=-=?	TM Dsig==Lsig	TM Dsig!=Lsig	TM Dsig==?
Comment: **State:**	Mismatch Wrong Sig, HO?	Mismatch Good Sig	Mismatch w/wo HO identical #8	Mismatch Codec_List Wrong Sig, HO?	Mismatch Codec_List Identical #20	Mismatch Codec_List Identical #19
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;S;L;T2;B; MIS; Rare	C;U;L;T2;B; MIS; **Typical: Setup**	C;U;L;T2;B; MIS; HO?	C;S;LA;B; MIS; rare	C;U;LA;B; MIS; **Typical: Setup**	C;U;LA;B; MIS; HO?
COR: Continuous Retry	C;S;L;T2;B; MIS;	C;U;L;T2;B; MIS;	C;U;L;T2;B; MIS;	C;S;LA;B; MIS;	C;U;LA;B; MIS;	C;U;LA;B; MIS;
PER: Periodic Retry	C;F;S;L;T2;B; MIS;	C;F;L;T2;B; MIS;	C;F;L;T2;B; MIS;	C;F;S;LA;B; MIS;	C;F;LA;B; MIS;	C;F;LA;B; MIS;
MON: Monitor	C;F;S;L;T2;B; MIS;	C;F;L;T2;B; MIS;	C;F;L;T2;B; MIS;	C;F;S;LA;B; MIS;	C;F;LA;B; MIS;	C;F;LA;B; MIS;
MIS: Mismatch	C;S;L;T2;B; MIS;	C;L;T2;B; MIS;	C;L;T2;B; MIS;	C;S;LA;B; MIS;	C;LA;B; MIS; **Terminate Prot.**	C;LA;B; MIS; **Terminate Prot.**
CON: Contact	C;S;L;T2;B; MIS;	C;L;T2;B; MIS;	C;L;T2;B; MIS;	C;S;LA;B; MIS;	C;LA;B; MIS;	C;LA;B; MIS;
FAT: Fast Try	C;S;L;T2;B;RCm; MIS;	C;L;T2;B;RCm; MIS;	C;L;T2;B;RCm; MIS;	C;S;LA;B;RCm; MIS;	C;LA;B;RCm; MIS;	C;LA;B;RCm; MIS;
FAC: Fast Contact	C;S;L;T2;B;RCm; MIS;	C;L;T2;B;RCm; MIS;	C;L;T2;B;RCm; MIS;	C;S;LA;B;RCm; MIS;	C;LA;B;RCm; MIS;	C;LA;B;RCm; MIS;
WRC: Wait_RC	C;S;RCm;L;T2;B; MIS;	C; RCm;L;T2;B; MIS;	C; RCm;L;T2;B; MIS;	C;S; RCm;LA;B; MIS;	C; RCm;LA;B; MIS;	C; RCm;LA;B; MIS;
KON: Konnect	C;RCm;DT;S;L;T2; B; MIS;	C;RCm;DT;L;T2; B; MIS;	C;RCm;DT;L;T2; B; MIS;	C;RCm;DT;S;LA; B; MIS;	C;RCm;DT;LA;B; MIS;	C;RCm;DT;LA;B; MIS;
REK: Re_Konnect	C;RCm;DT;S;L;T2; IT;B; MIS;	C;RCm;DT;L;T2; IT;B; MIS;	C;RCm;DT;L;T2; IT;B; MIS;	C;RCm;DT;S;LA; IT;B; MIS;	C;RCm;DT;LA;IT ;B; MIS;	C;RCm;DT;LA;IT; B; MIS;
SOS: Sync_Lost	C;RCm;S;L;T2;IT; B; MIS;	C;RCm;L;T2;IT; B; MIS;	C;RCm;L;T2;IT; B; MIS;	C;RCm;S;LA;IT; B; MIS;	C;RCm;LA;IT;B; MIS; **In_Call_Mod**	C;RCm;LA;IT;B; MIS;
OPE: Operation	---------- ----------	---------- ----------	---------- ----------	NoAc; OPE; Trans Error?	NoAc; OPE; Trans Error?	---------- ----------
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	---------- ----------	---------- ----------	---------- ----------	---------- ----------	C;B; TT;	C;B; TT;

Table 10.6-7 AMR Case: TFO_TRANS, TFO_ACK, RC_ack

Event:	**TFO_TRANS**	**TFO_ACK**	**RC_ack**
Number:	30	31	32
Condition: &	Luc == AMR DCh==LCh	A_TP Dsig==Lsig	
Comment: **State:**		Good Sig Immediate TFO possible	BTS has steered the mode.
NAC: Not_Active	---------- ----------	---------- ----------	NoAc; NAC;
WAK: Wakeup	---------- ----------	---------- ----------	NoAc; WAK;
FIT: First_Try	NoAc; FIT; Wait for Frame	C;U;RCi;ACK;T1; WRC; **Typical;**	NoAc; FIT;
COR: Continuous Retry	NoAc; COR; Wait for Frames	C;U;RCi;ACK;T1; WRC; **Typical**	NoAc; COR;
PER: Periodic Retry	NoAc; PER; Wait for Frames	C;F;S;REQ; COR; Rare case, test	NoAc; PER;
MON: Monitor	NoAc; MON Wait for Frames	C;F;S;REQ; FIT; Rare case, test	NoAc; MON;
MIS: Mismatch	NoAc; MIS; Wait for Frames	C;F;S;REQ; COR; Rare case, test	NoAc; MIS;
CON: Contact	C;RCi;ACK;T1; WRC; Missed Ack	C;RCi;ACK;T1; WRC; **Typical**	NoAc; CON;
FAT: Fast Try	NoAc; FAC; Wait for Frames	C;REQ;RCm; COR; Safe way	NoAc; FAT;
FAC: Fast Contact	NoAc; FAC; Wait for Frames	C;REQ;RCm; COR; Safe way	NoAc; FAC;
WRC: Wait_RC	NoAc; WRC;	NoAc; WRC;	C; T;BT;T;T1; KON; **Typical**
KON: Konnect	NoAc; KON; **Typical: wait**	NoAc; KON; **Typical: wait**	NoAc; KON;
REK: Re_Konnect	NoAc; REK; Wait for Frames	C;DT;REQ;IT;B;T1 COR;	NoAc; REK;
SOS: Sync_Lost	NoAc; SOS; Wait for Frames	C;IT;REQ;B;T1 COR; Contact is back	NoAc; SOS;
OPE: Operation	NoAc; OPE; Typical in HO	---------- ----------	NoAc; OPE;
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	---------- ----------	---------- ----------	NoAc; TT;

Table 10.6-8 ~~and~~ Handover_Soon

Event:	**Handover_Soon**	**Handover_Soon**
Number:	35	36
Condition: &	(NA_TP | A_TP)	TM
Comment: **State:**	Local hand-over future parameters	Local hand-over future parameters
NAC: Not_Active	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------
FIT: First_Try	C; NAC;	C; NAC;
COR: Continuous Retry	C; NAC;	C; NAC;
PER: Periodic Retry	C; NAC;	C; NAC;
MON: Monitor	C; NAC;	C; NAC;
MIS: Mismatch	C; NAC;	C; NAC;
CON: Contact	C; NAC;	C; NAC;
FAT: Fast Try	C;RCm; NAC;	C;RCm; NAC;
FAC: Fast Contact	C;RCm; NAC;	C;RCm; NAC;
WRC: Wait_RC	C;RCm; NAC;	C;RCm; NAC;
KON: Konnect	RCh; KON;	C;RCm;DT; NAC;
REK: Re_Konnect	RCh; REK;	C;RCm;DT;IT; NAC;
SOS: Sync_Lost	RCh; SOS;	C;RCm;IT; NAC;
OPE: Operation	RCh; OPE;	C;RCm;DT;~~IT~~;T1; ~~NAC~~TT;
FAI: Failure	---------- ----------	---------- ----------
TT: TFO_Term	NoAc; TT;	NoAc; TT;

Table 10.6-9: Mismatching TFO_TRANS and TFO Frames

Event:	**TFO_TRANS**	**TFO_Frame**	**TFO_Frame**
Number:	37	38	39
Condition: &	DCh!=LCh	Mismatch_1	Mismatch_2
Comment: **State:**	Mismatch of channel type	Mismatch for one or two TFO Frames	Continued Mismatch
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;U;L;T2;B; MIS; HO?	NoAc; FIT; HO? be tolerant	C;U;L;T2;B; MIS; **Typical in HO**
COR: Continuous Retry	C;U;L;T2;B; MIS;	NoAc; COR; Call Forw?	C;U;L;T2;B; MIS;
PER: Periodic Retry	C;F;L;T2;B; MIS;	NoAc; PER; Call Forw?	C;F;L;T2;B; MIS;
MON: Monitor	C;F;L;T2;B; MIS;	NoAc; MON Call Forw?	C;F;L;T2;B; MIS;
MIS: Mismatch	C;L;T2;B; MIS;	NoAc; MIS; Call Forw?	C;L;T2;B; MIS;
CON: Contact	C;L;T2;B; MIS;	NoAc; CON;	C;L;T2;B; MIS;
FAT: Fast Try	C;L;T2;B;RCm; MIS;	NoAc; FAT;	C;L;T2;B;RCm; MIS;
FAC: Fast Contact	C;L;T2;B;RCm; MIS;	NoAc; FAC;	C;L;T2;B;RCm; MIS;
WRC: Wait_RC	C;RCm;L;T2;B; MIS;	NoAc; WRC;	C; RCm;L;T2;B; MIS;
KON: Konnect	C;RCm;DT;L;T2;B; MIS;	NoAc; KON;	C;RCm;DT;L;T2;B; MIS;
REK: Re_Konnect	C;RCm;DT;L;T2;IT;B; MIS;	NoAc; REK;	C;RCm;DT;L;T2;IT;B; MIS;
SOS Sync_Lost	C;RCm;L;T2;IT;B; MIS;	NoAc; SOS;	C;RCm;L;T2;IT;B; MIS;
OPE: Operation	NoAc; OPE; Ignore?	NoAc; OPE; Hard HO?	C;RCm;DT;L;T2;IT;B; MIS; Hard HO into TFO
FAI: Failure	NoAc; FAI;	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	---------- ----------	---------- ----------	---------- ----------

Table 10.6-10: Local Events, TFO_FILL, TFO_NORMAL

Event:	**New_Local_Codec_List**	**Data_Call**	**TFO_FILL**	**TFO_NORMAL**
Number:	40	41	42	43
Condition: &				
Comment: **State:**	From RAN	In Call Modif. Stop TFO (see TFO_Disable)	Ignore is just Filler	Ignore alternative: Soft Reset
NAC: Not_Active	NoAc; NAC;	NoAc; NAC;	---------- ----------	---------- ----------
WAK: Wakeup	NoAc; WAK;	NoAc; NAC;	---------- ----------	---------- ----------
FIT: First_Try	NoAc; FIT; Update loc. Par.	C;N; NAC;	NoAc; FIT;	NoAc; FIT;
COR: Continuous Retry	NoAc; COR;	C;N; NAC;	NoAc; COR;	NoAc; COR;
PER: Periodic Retry	NoAc; PER;	C;N; NAC;	NoAc; PER;	NoAc; PER;
MON: Monitor	NoAc; MON	C;N; NAC;	NoAc; MON	NoAc; MON
MIS: Mismatch	C;L;T2; MIS; **direct info**	C;N; NAC;	NoAc; MIS;	NoAc; MIS;
CON: Contact	NoAc; CON;	C;N; NAC;	NoAc; CON;	NoAc; CON;
FAT: Fast Try	NoAc; FAT;	C;N;RCm; NAC;	NoAc; FAT;	NoAc; FAT;
FAC: Fast Contact	NoAc; FAC;	C;N;RCm; NAC;	NoAc; FAC;	NoAc; FAC;
WRC: Wait_RC	NoAc; WRC;	C;N; NAC;	NoAc; WRC;	NoAc; WRC;
KON: Konnect	NoAc; KON;	C;DT;N; NAC;	NoAc; KON;	NoAc; KON;
REK: Re_Konnect	NoAc; REK;	C;DT;IT;N; NAC;	NoAc; REK;	NoAc; REK;
SOS: Sync_Lost	NoAc; SOS;	C;IT;N; NAC;	NoAc; SOS;	NoAc; SOS;
OPE: Operation	L;T2; OPE; **direct info**	C;DT;IT;N; NAC;	NoAc; OPE;	NoAc; OPE;
FAI: Failure	NoAc; FAI;	C; NAC; **exit from FAI**	NoAc; FAI;	NoAc; FAI;
TT: TFO_Term	NoAc; TT;	IT;N; NAC;	---------- ----------	---------- ----------

Table 10.6-11: Special Events, Timeouts

Event:	**Runout**	**T==0**	**Frame_Sync_Lost**	**Frame_Sync_Lost**	**Mes_Sync_Lost**
Number:	44	45	46	47	48
Condition: &			n<3	n>2 TFO_Disabled	
Comment: **State:**	IPEs may become unsynchronised	Time-Out	start to send SYL already	Stop TFO Frames if 3 Frames missing	
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	U;N; MON; **PSTN Call**	---------- ----------	---------- ----------	---------- ----------	NoAc; FIT;
COR: Continuous Retry	U;L1;T5; PER; **at end of COR**	C;N;REQ; COR; Reset IPEs	---------- ----------	---------- ----------	NoAc; COR;
PER: Periodic Retry	NoAc; PER;	L1;T5; PER; **Periodic Test**	---------- ----------	---------- ----------	NoAc; PER;
MON: Monitor	---------- ----------	C;N; MON;	---------- ----------	---------- ----------	---------- ----------
MIS: Mismatch	NoAc; MIS; **typ Final state**	N;B; MIS; List not Ack_ed!	NoAc; MIS;	NoAc; MIS;	NoAc; MIS;
CON: Contact	REQ; COR; can this occur?	---------- ----------	---------- ----------	---------- ----------	C;REQ; COR;
FAT: Fast Try	REQ;RCm; COR; fast HO failed	---------- ----------	NoAc; FAT; typical in HO	NoAc; FAT; typical in HO	C;REQ;RCm; COR; fast HO failed
FAC: Fast Contact	REQ;RCm; COR; fast HO failed	---------- ----------	NoAc; FAC; typical in HO	NoAc; FAC; typical in HO	C;REQ;RCm; COR; fast HO failed
WRC; Wait_RC	C;RCm; FAI;~~C; T;BT;T;T1;~~ ~~KON;~~ Missing RC_Ack	C;RCm; FAI;~~C; T;BT;T;T1;~~ ~~KON;~~ Missing RC_Ack	---------- ----------	---------- ----------	C;RCm;REQ; COR;
KON: Konnect	NoAc; KON; may happen	C;RCm;DT;N; FAI; Misbehaviour!	---------- ----------	---------- ----------	C;RCm;DT;REQ;T1; COR; after Timeout: N
REK: Re_Konnect	NoAc; REK; may happen	C;RCm;DT;N;IT;B; FAI; Misbehaviour!	---------- ----------	---------- ----------	C;RCm;DT;REQ;IT;B;T1; COR; after Timeout: N
SOS: Sync_Lost	RCm;REQ;IT;B;T1; COR; after Timeout: N	---------- ----------	---------- ----------	NoAc; SOS; wait for Runout	C;RCm;REQ;IT;B;T1; COR; after Timeout: N
OPE: Operation	NoAc; OPE; **typ Final event**	B; OPE; List not Ack_ed!	SYL1; OPE; **1: Alarm, go on**	C;DT;SYL; SOS; **2: Alarm, stop!**	NoAc; OPE; **Typ Final event**
FAI: Failure	NoAc; FAI; typical	---------- ----------	---------- ----------	---------- ----------	NoAc; FAI; don´t trust!
TT: TFO_Term	NoAc; TT;	IT;N: NAC;	NoAc; TT;	IT;N; NAC;	NoAc; TT;

Table 10.6-11b: Special Events, Timeouts (continuation)

Event:	**Frame_Sync_Lost**
Number:	57
Condition: &	n>2 TFO_Enabled
Comment: **State:**	Stop TFO Frames if 3 Frames missing
NAC: Not_Active	---------- ----------
WAK: Wakeup	---------- ----------
FIT: First_Try	---------- ----------
COR: Continuous Retry	---------- ----------
PER: Periodic Retry	---------- ----------
MON: Monitor	---------- ----------
MIS: Mismatch	NoAc; MIS;
CON: Contact	---------- ----------
FAT: Fast Try	NoAc; FAT; typical in HO
FAC: Fast Contact	NoAc; FAC; typical in HO
WRC: Wait_RC	IT; WRC;
KON: Konnect	---------- ----------
REK: Re_Konnect	---------- ----------
SOS: Sync_Lost	NoAc; SOS; wait for Runout
OPE: Operation	C;DT;SYL; SOS; **2: Alarm, stop!**
FAI: Failure	---------- ----------
TT: TFO_Term	C;RCm;B; MON;

Table 10.6-12 Distant Config Frame for 3G systems (TC)

Event:	**Distant_Config**	**Distant_Config**	**Distant_Config**	**Distant_Config**
Number:	49	50	51	52
Condition: &	(NA_TP | A_TP) Con_Req & TC	TM Con_Req & TC	(NA_TP | A_TP) Con_Ack & TC	TM Con_Ack & TC
Comment: **State:**	Config request Matching parameters	Config request TFO Mismatch	Config acknowledgement Matching parameters	Config acknowledgement TFO Mismatch
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;U;DUP;RCi; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;U;DUP;RCi; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
COR: Continuous Retry	C;U;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;U;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
PER: Periodic Retry	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
MON: Monitor	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
MIS: Mismatch	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
CON: Contact	C;T;BT;T;T1; KON; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;T;BT;T;T1; KON; Same as 1. TFO_Frame	C;RCm;B; MIS;
FAT: Fast Try	NoAc; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	NoAc; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;
FAC: Fast Contact	C;BT;T;L;T2;AT;B; OPE; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;BT;T;L;T2;AT;B; OPE; Same as 1. TFO_Frame	C;RCm;B; MIS;
WRC: Wait_RC	NoAc; WRC;	C;RCm;B; MIS;	NoAc; WRC;	C;RCm;B; MIS;
KON: Konnect	RCs;CA1;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;B;T1; MIS;	RCs;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;DT;B;T1; MIS;
REK: Re_Konnect	RCs;CA1;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B;T1; MIS;	RCs;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;DT;IT;B;T1; MIS;
SOS: Sync_Lost	C;RCs;CA1;BT;T;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B;T1; MIS;	C;RCs;BT;T;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;DT;IT;B;T1; MIS;
OPE: Operation	RCs;CA1; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B;T1; MIS;	RCs; OPE; Same as 1. TFO_Frame	C;RCm;DT;IT;B;T1; MIS;
FAI: Failure	---------- ----------	---------- ----------	---------- ----------	---------- ----------
TT: TFO_Term	B; TT;	B; TT;	B: TT;	B; TT;

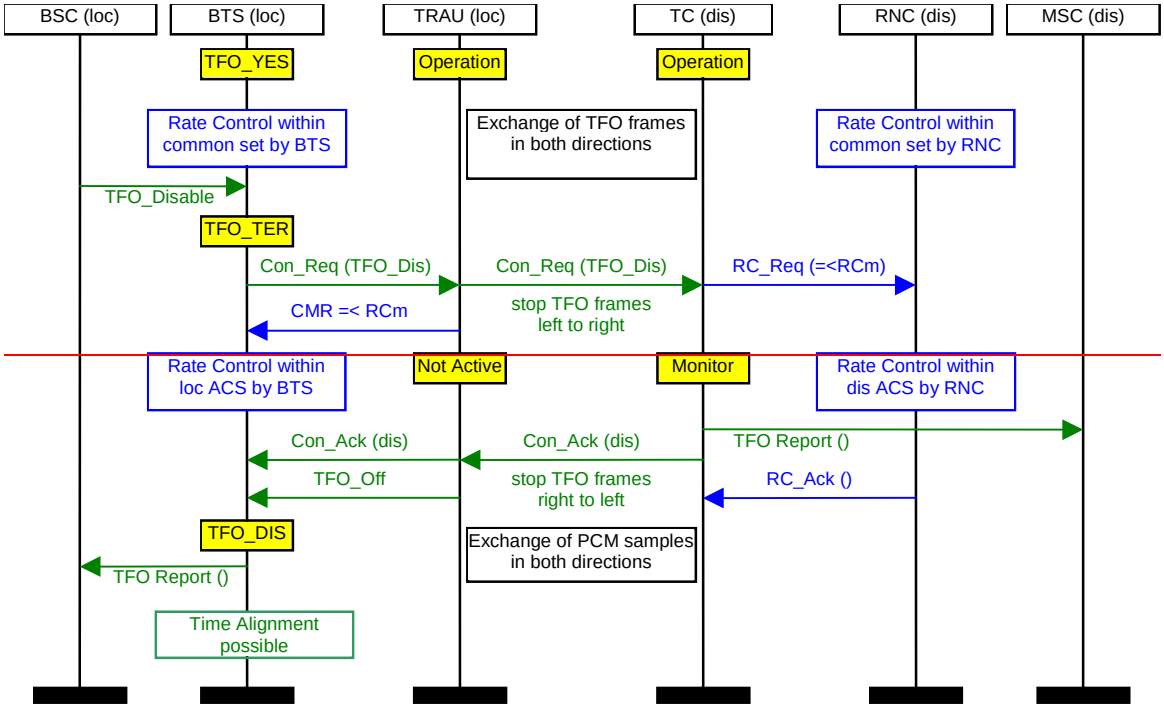
Table 10.6-13 Distant Config Frame for GSM systems (TRAU) and Distant_Disable

Event:	**Distant_Config**	**Distant_Config**	**Distant_Config**	**Distant_Disable**
Number:	53	54	55	56
Condition: &	(NA_TP | A_TP) TRAU	TM Con_req & TRAU	TM Con_Ack & TRAU	
Comment: **State:**	Config req or Config ack Matching parameters	Config request TFO Mismatch	Config acknowledgement TFO Mismatch	Distant side has disabled TFO
NAC: Not_Active	---------- ----------	---------- ----------	---------- ----------	---------- ----------
WAK: Wakeup	---------- ----------	---------- ----------	---------- ----------	---------- ----------
FIT: First_Try	C;U;DUP;RCi; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
COR: Continuous Retry	C;U;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
PER: Periodic Retry	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
MON: Monitor	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
MIS: Mismatch	C;DUP; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
CON: Contact	C;T;BT;T;T1; KON; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
FAT: Fast Try	NoAc; FAT; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
FAC: Fast Contact	C;BT;T;L;T2;AT;B; OPE; Same as 1. TFO_Frame	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
WRC: Wait_RC	NoAc; WRC;	C;RCm;B; MIS;	C;RCm;B; MIS;	C;RCm;B; MON;
KON: Konnect	RCs;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;B;T1; MIS;	C;RCm;DT;B;T1; MIS;	C;RCm;CA;DT;B;T1; MON;
REK: Re_Konnect	RCs;AT;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B; T1; MIS;	C;RCm;DT;IT;B;T1; MIS;	C;RCm;CA;DT;IT;B;T1; MON;
SOS: Sync_Lost	C;RCs;BT;T;L;T2;B; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B; T1; MIS;	C;RCm;DT;IT;B;T1; MIS;	C;RCm;IT;B;T1; MON;
OPE: Operation	RCs; OPE; Same as 1. TFO_Frame	C;RCm;CA;DT;IT;B; T1; MIS;	C;RCm;DT;IT;B;T1; MIS;	C;RCm;CA;DT;IT;B;T1; MON;
FAI: Failure	---------- ----------	---------- ----------	---------- ----------	---------- ----------
TT: TFO_Term	B; TT;	B; TT;	B;IT;N; NAC;	B;IT;N; NAC;

G.3 TFO_Disable during Operation

G.3.1 TFO_Disable – passive partner: UMTS

The following protocol flow shows TFO_Disable, where UMTS is the passive partner.



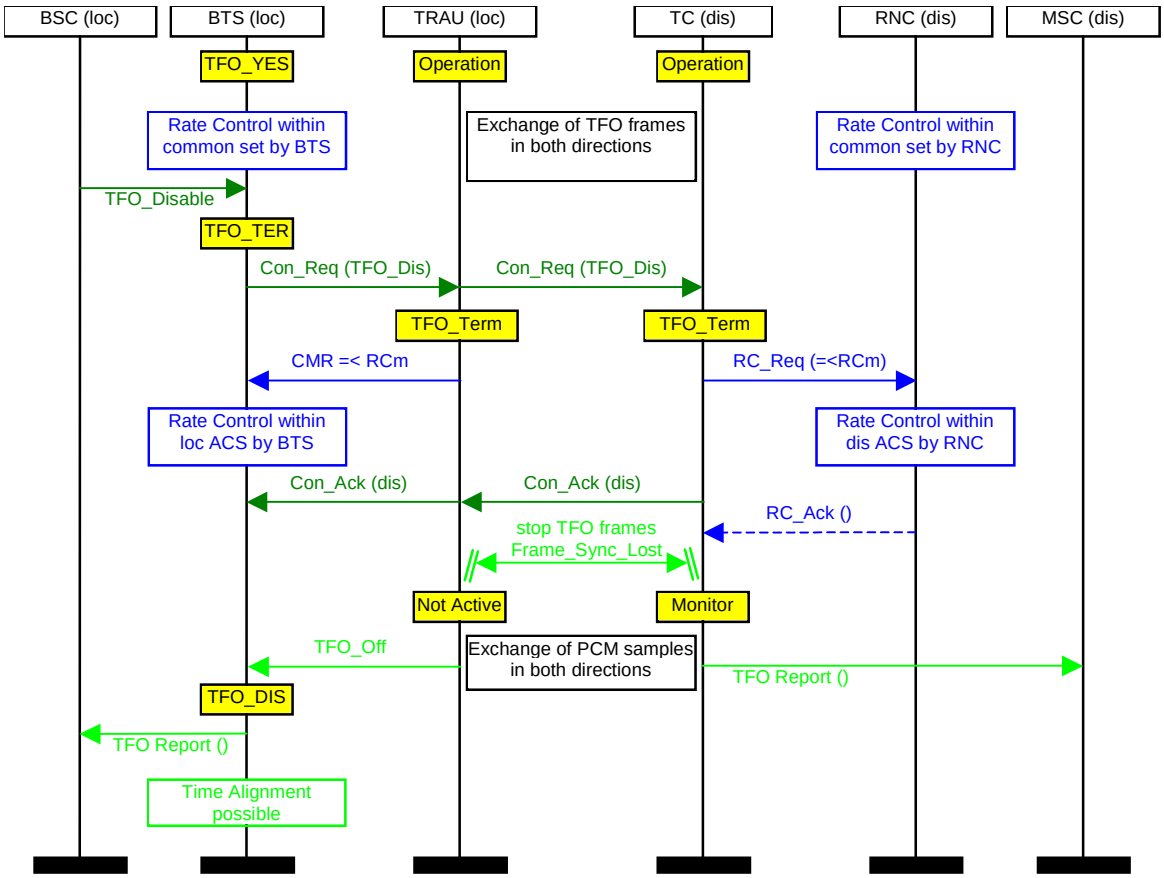
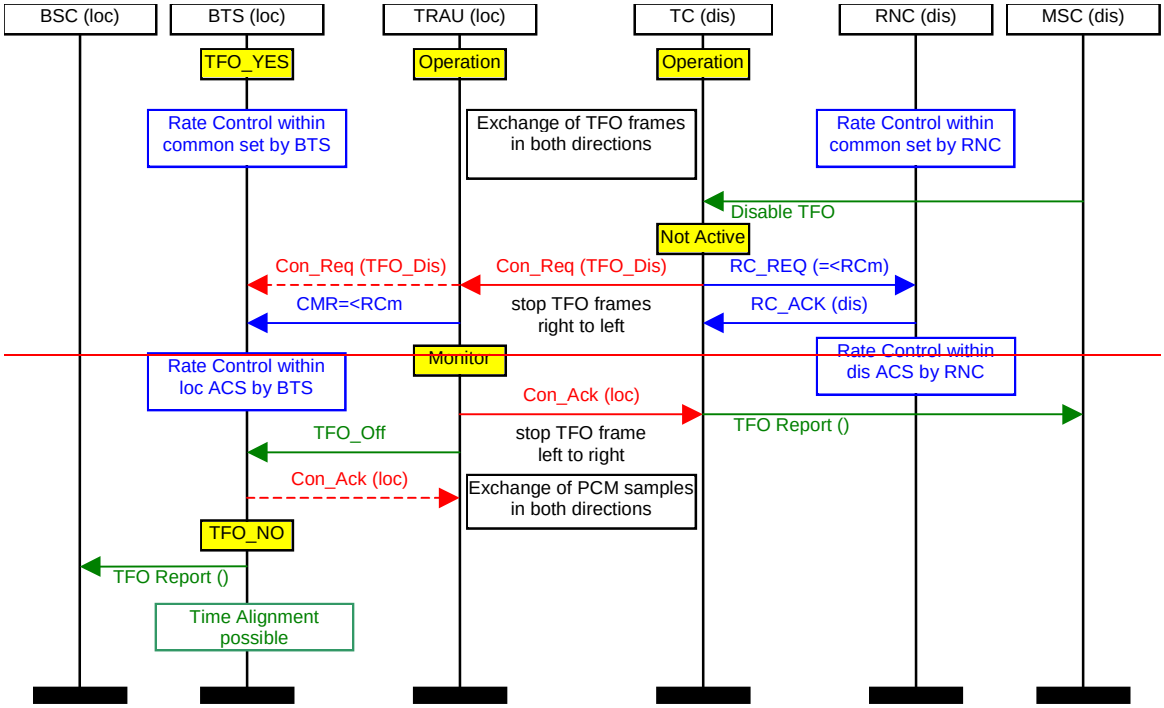


Figure G.3.1-1: TFO_Disable during operation – passive partner: UMTS

G.3.2 TFO_Disable – passive partner: GSM

The following protocol flow shows TFO Disable, where GSM is the passive partner.



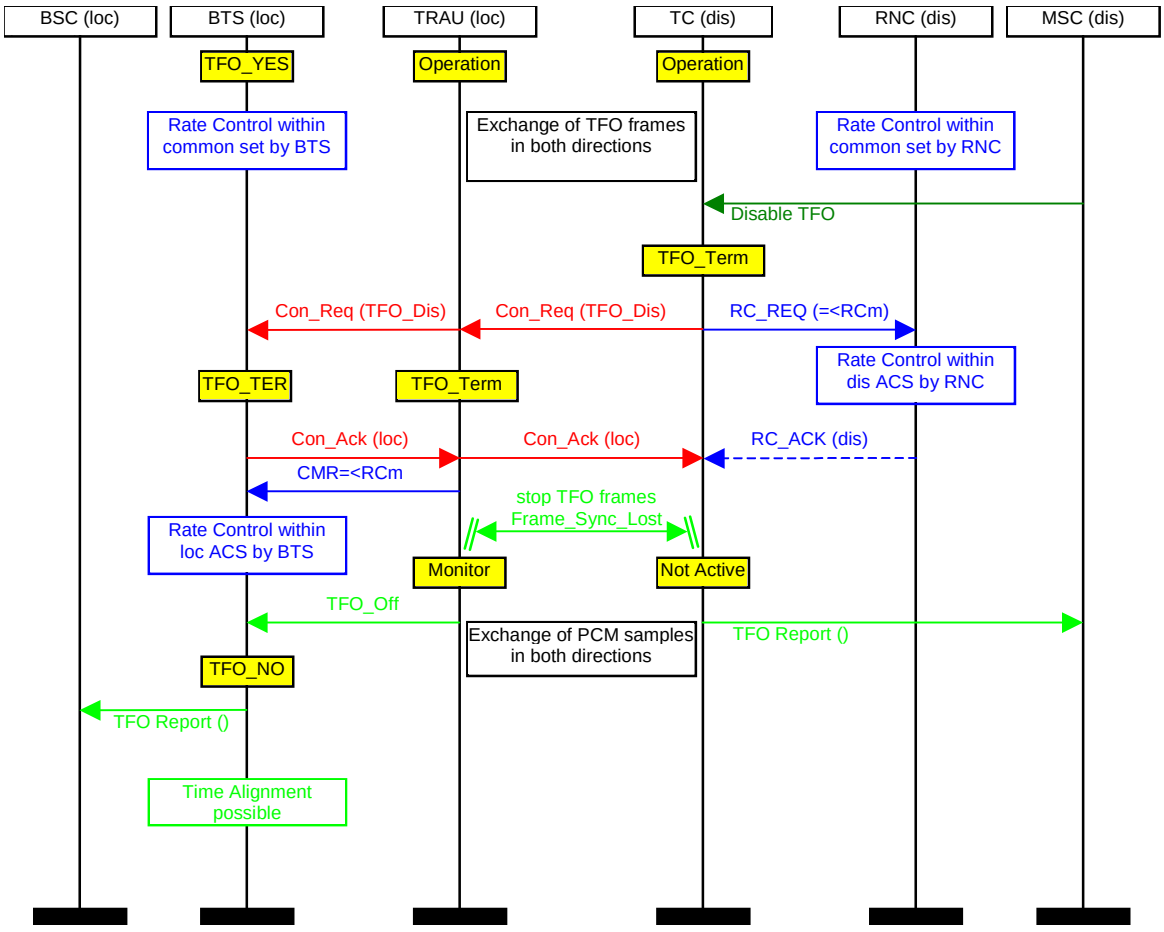


Figure G.3.2-1: TFO_Disable during operation – passive partner: GSM

~~Note that the TRAU answers the Con_Req (TFO_Disable) directly and stops sending TFO Frames immediately after Con_Ack (loc). The Con_Ack (loc) from the BTS is terminated within the TRAU.~~