

**Source:** TSG-SA WG4

**Title:** CRs TS 28.062 on Operator guidelines for UMTS\_AMR  
(Releases 4, 5 and 6)

**Document for:** Approval

**Agenda Item:** 7.4.3

The following CRs, agreed at the TSG-SA WG4 meeting #33, are presented to TSG SA #26 for approval.

Spec	CR	Rev	Phase	Subject	Cat	Vers	WG	Meeting	S4 doc
28.062	045		Rel-4		F	4.5.0	S4	TSG-SA WG4#33	S4-040628
28.062	046		Rel-5		A	5.4.0	S4	TSG-SA WG4#33	S4-040629
28.062	047		Rel-6		F	6.0.0	S4	TSG-SA WG4#33	S4-040630

## CHANGE REQUEST

28.062 CR 045 rev - Current version: 4.5.0

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

Proposed change affects:  UICC apps  ME  Radio Access Network  Core Network

<b>Title:</b>	Operator Guidelines for UMTS_AMR	
<b>Source:</b>	TSG-SA WG4	
<b>Work item code:</b>	TrFO-OoBTC	<b>Date:</b> 2004-12-14
<b>Category:</b>	<b>F</b>	<b>Release:</b> Rel-4
Use <i>one</i> of the following categories: <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		Use <i>one</i> of the following releases: <b>Ph2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>Rel-4</b> (Release 4) <b>Rel-5</b> (Release 5) <b>Rel-6</b> (Release 6) <b>Rel-7</b> (Release 7)

**Reason for change:** Essential correction

**TS 26.103** (4.3.0, 5.5.0, 6.0.0) states:

For the UMTS AMR2 this Codec Mode Adaptation can be performed every 20ms for the downlink traffic channel, but only every 40ms for the uplink radio channel. By this definition the UMTS AMR2 Codec Type is TFO and TrFO compatible to the FR AMR, HR AMR, UMTS AMR and UMTS AMR2 Codec Types.

**TS 28.062** (4.5.0, 5.4.0, 6.0.0) states:

**Table 11-1: Compatibility of AMR Codec Types**

distant → ↓ local	UMTS_AMR_2	UMTS_AMR	FR_AMR	HR_AMR	OHR_AMR
UMTS_AMR_2	compatible	compatible	compatible	compatible	compatible
UMTS_AMR	compatible	compatible	-	-	-
FR_AMR	compatible	-	compatible	compatible	compatible
HR_AMR	compatible	-	compatible	compatible	compatible
OHR_AMR	compatible	-	compatible	compatible	compatible

The UMTS\_AMR\_2 is the preferred Codec Type for 3G systems.

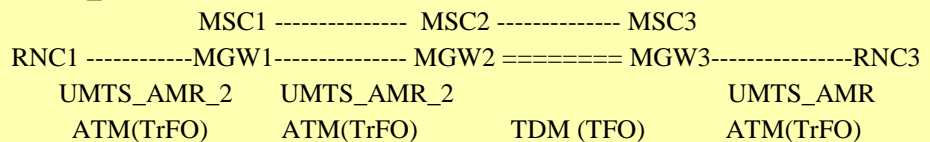
**TS 23.153** (4.10.0 and 5.8.0) states:

"The UMTS\_AMR\_2 is a superset of the UMTS\_AMR. It behaves as a FR\_AMR codec in the UL and as a UMTS\_AMR codec in the DL. This allows UMTS terminals to operate in TFO with GSM terminals. **The UMTS\_AMR\_2 is fully compatible with UMTS\_AMR in TFO and TrFO** and fully compatible with R99 CN nodes (TC in MGW)."

In other words: UMTS\_AMR\_2 is TFO/TrFO compatible to UMTS\_AMR and FR\_AMR; but **UMTS\_AMR and FR\_AMR** (indeed all GERAN versions) are **not** compatible.

These statements are true for end-to-end TFO scenarios and end-to-end TrFO scenarios with these two Codec Types. **But this may cause problems in a more complex networks supporting TFO/TrFO interworking, as explained in the following:**

Let us assume that a call is set up from an UE1 served by RNC1 towards an UE3 served by RNC3. UE1 supports UMTS\_AMR\_2, UE3 only UMTS\_AMR. For the first part of the connection, UMTS\_AMR\_2 is negotiated via BICC OoBTC. MSC2/MGW2 and MSC3/MGW3 are connected via a TDM link and may belong to different PLMNs. Nevertheless, all the MSCs are configured so that the same active codec mode set (ACS) is selected both for UMTS\_AMR\_2 and UMTS\_AMR.



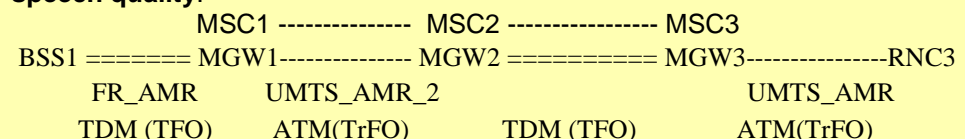
When the TFO peer entities in MGW2 and MGW3 exchange the locally used codec types and codec configurations via TFO in-band signalling, they will come to the conclusion that immediate TFO operation is possible, since UMTS\_AMR and UMTS\_AMR\_2 are termed "TFO compatible". The result will be an concatenation of tandem free and transcoder free links: it will be end-to-end transcoding free.

(Note that according to TS 29.232, MSC2 and MSC3 will not be informed that TFO operation was actually successfully established. Furthermore, MSC2 will not be informed that MGW3 is actually using UMTS\_AMR, unless MSC2 explicitly asked MGW2 for a list of all distant codecs.)

**So far so good.**

**But now:**

Subsequently, UE1 performs an inter-system handover to GERAN. The new codec assigned by BSS1 is FR\_AMR, again with the same ACS. Now, the TFO peer entities in BSS1 and MGW1 start TFO in-band signalling and go to immediate TFO operation, since FR\_AMR and UMTS\_AMR\_2 are TFO compatible. So we end up with a **concatenation of links using FR\_AMR, UMTS\_AMR\_2 and UMTS\_AMR**. With the information locally available at MSC1/MGW1 and MSC2/MGW2, both nodes come to the conclusion that TFO/TrFO is possible, but **end-to-end, FR\_AMR and UMTS\_AMR are not compatible**. Since the UMTS\_AMR codec does not comply with the rate control rules of the FR\_AMR codec, the result will be a higher frequency of bad speech frames in downlink direction towards UE1. This can seriously **deteriorate the speech quality**.



For a solution to avoid this kind of path configuration it should be taken into account that

a) apart from R99 'UMTS only' UEs, all other UTRAN capable UEs support the UMTS\_AMR\_2. And it can be expected that R99 'UMTS only' UEs will soon become a small minority. Therefore, calls without involvement of an UMTS\_AMR codec should be affected by the solution as little as possible.

For this reason we do not want to require MSC1 to perform a codec modification or mid-call codec negotiation on the link between MGW1 and MGW2 after each inter-system handover of UE1, since such a requirement would apply to any call using AMR codecs. But codec changes in the core network should be avoided, if possible, since each re-initialization of the user plane will cause a short interruption of the speech transmission. Furthermore, such a requirement would create an unnecessarily high signalling load between MSC1 and MSC2 and their associated MGWs. And, most important to note: a transcoder would have to be inserted somewhere in the path.

b) Nowadays, many operating UMTS networks use the UMTS\_AMR codec only in 12.2 kbit/s single mode configuration. For AMR codecs in single mode configuration, the difference in the rate control becomes meaningless.

c) Since MSC3/MGW3 can be located in a different PLMN, anywhere in the world, it cannot be excluded that in this foreign PLMN the UMTS\_AMR codec is used in a multi-mode configuration with TFO.

For these reasons we propose the following solution:

**i) UMTS\_AMR and UMTS\_AMR\_2 shall only be considered as TFO- and TrFO- compatible, when used in a single mode configuration.**

In the scenario above, this would mean that for an UMTS\_AMR in multimode configuration immediate TFO between MGW2 and MGW3 would not be possible. MGW2 (using the new compatibility rule, for example) would terminate the TFO-negotiation. Provided that MSC2 asked MGW2 for a list of all distant codecs, MSC2 would be informed by MGW2 that UMTS\_AMR was the codec used by the distant TFO partner. It would then be up to MSC2 to take appropriate measures. (Note that a codec modification from UMTS\_AMR\_2 to UMTS\_AMR on the link between MGW1 and MGW2 would not improve this situation, because then the FR\_AMR in BSS1 and the UMTS\_AMR in MGW1 are not TFO-compatible. Only the point, where the transcoder is inserted, would be shifted from MGW2 to MGW1.)

**ii) Since UMTS\_AMR and UMTS\_AMR\_2 are no longer considered as TFO/TrFO-compatible in all cases, it shall be possible to discriminate clearly between the two codecs in the BICC OoBTC signalling. I.e. the UMTS\_AMR\_2 codec in the Supported Codecs List or Available Codecs List shall not include also the UMTS\_AMR codec.**

E.g. the originating MSC might want to offer in the Supported Codecs List the preferred (multimode) configuration 1 only for UMTS\_AMR\_2, but not for UMTS\_AMR. Then the terminating MSC should not be allowed to reply with UMTS\_AMR in preferred configuration 1 (which would currently be allowed according to subclause TS 23.153, 5.6).

(Note: in order to allow TrFO connections with R99 UMTS only UEs, the originating MSC can additionally include UMTS\_AMR in preferred (single) mode configuration 7 to the Supported Codecs List. Or it can include UMTS\_AMR in configuration 1, then the terminating MSC may select between all offers.)

**iii) The Operator Guidelines shall discriminate UMTS\_AMR from all other AMR Codec Types. Since UMTS\_AMR is not compatible to these in multi-mode configurations, a single-mode configuration is recommended: 12.20.**

**Summary of change:** ⓘ iii) The Operator Guidelines recommend UMTS\_AMR in a single mode configuration with 12.20 as only codec mode.

**Consequences if not approved:** ⓘ Without the change (i), the network may set up a connection consisting of links using different codecs (FR\_AMR, UMTS\_AMR\_2, and UMTS\_AMR) that cannot be combined in TFO/TrFO end-to-end (FR\_AMR and UMTS\_AMR), although locally, at each node, the used codecs (FR\_AMR and UMTS\_AMR\_2, or UMTS\_AMR\_2 and UMTS\_AMR, respectively) are TFO/TrFO compatible.

Since the UMTS\_AMR codec does not comply with the rate control rules of the FR\_AMR codec, the result will be a higher frequency of bad speech frames in downlink direction towards the UE using the FR\_AMR codec. This can **seriously deteriorate the speech quality**.

Without the change (ii), it is not possible for the originating MSC to restrict the use of UMTS\_AMR to single mode configurations: if the originating MSC offers UMTS\_AMR\_2 in a multi mode configuration the terminating MSC could select the UMTS\_AMR in the same multi mode configuration as Selected Codec.

Without change iii) the coordination between operators is missing and TFO/TrFO between PLMNs is not guaranteed.

**Clauses affected:** ⓘ Annex F in TS 28.062

**Other specs affected:** ⓘ

Y	N
ⓘ	X
	X
	X

Other core specifications ⓘ (TS 23.153?)  
Test specifications  
O&M Specifications

**Other comments:** ⓘ

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- 1) Fill out the above form. The symbols above marked ⓘ contain pop-up help information about the field that they are closest to.
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## First Change

### F.2.1 Avoidance of Codec Mode Optimisation

#### **Guideline 2:**

If the operator wants to avoid Codec Mode Optimisation after TFO establishment with AMR, then he shall set the "Optimisation Mode" to "No\_Change".

#### **Guideline 3:**

The operator should configure AMR so that MACS = 4 and the ACS e.g. corresponds to the default sets (10,20, 6,70, 5,90, 4,75 for FR\_AMR, ~~UMTS\_AMR~~ and UMTS\_AMR\_2 and 7,40, 6,70, 5,90, 4,75 for HR\_AMR). [For UMTS\\_AMR the ACS should include only mode 12,20 kbps.](#) By this the chance for Inter-PLMN TFO is enhanced.

Other ACSs for FR\_AMR, ~~UMTS\_AMR~~, UMTS\_AMR\_2 and HR\_AMR are possible. They should include as many as possible common Codec Modes in the lower, contiguous subsets. [Also for UMTS\\_AMR other ACSs are possible.](#) In that case Inter-PLMN TFO is not as obvious and may need [other](#) inter-operator agreements.

NOTE: The default sets correspond to the ACSs determined by the TFO Decision algorithm, when all Codec Modes of the ACSs are included in the corresponding SCS.

#### **Guideline 4:**

The operator should configure AMR so that the ACSs are homogeneous within the whole PLMN (same ACS used in all BSS of a given PLMN for a given Codec Type: ~~UMTS\_AMR~~, UMTS\_AMR\_2, FR\_AMR, HR\_AMR). The ACSs of different Codec Types of the AMR Family should contain as many as possible Codec Modes within the common, lower, contiguous subset. [Also UMTS\\_AMR should be configured homogeneous within the whole PLMN, but since it is not compatible to the other AMR codec types, another configuration is possible \(see Guideline 3\).](#)

# CHANGE REQUEST

28.062 CR 046 rev - Current version: 5.4.0

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Proposed change affects:  UICC apps  ME  Radio Access Network  Core Network

**Title:** Operator Guidelines for UMTS\_AMR

**Source:** TSG-SA WG4

**Work item code:** TrFO-OoBTC **Date:** 2004-12-14

**Category:** **A** **Release:** Rel-5

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:

- Ph2 (GSM Phase 2)
- R96 (Release 1996)
- R97 (Release 1997)
- R98 (Release 1998)
- R99 (Release 1999)
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- Rel-6 (Release 6)
- Rel-7 (Release 7)

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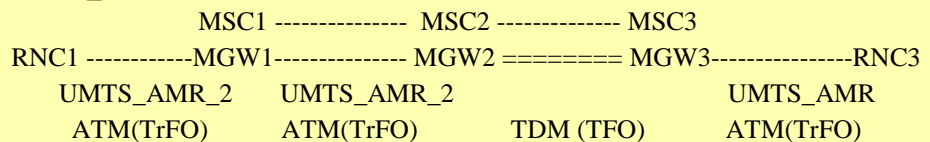
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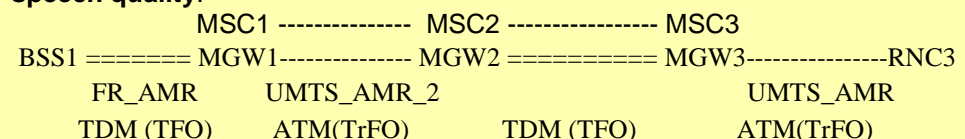
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For a solution to avoid this kind of path configuration it should be taken into account that

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**i) UMTS\_AMR and UMTS\_AMR\_2 shall only be considered as TFO- and TrFO- compatible, when used in a single mode configuration.**

In the scenario above, this would mean that for an UMTS\_AMR in multimode configuration immediate TFO between MGW2 and MGW3 would not be possible. MGW2 (using the new compatibility rule, for example) would terminate the TFO-negotiation. Provided that MSC2 asked MGW2 for a list of all distant codecs, MSC2 would be informed by MGW2 that UMTS\_AMR was the codec used by the distant TFO partner. It would then be up to MSC2 to take appropriate measures. (Note that a codec modification from UMTS\_AMR\_2 to UMTS\_AMR on the link between MGW1 and MGW2 would not improve this situation, because then the FR\_AMR in BSS1 and the UMTS\_AMR in MGW1 are not TFO-compatible. Only the point, where the transcoder is inserted, would be shifted from MGW2 to MGW1.)

**ii) Since UMTS\_AMR and UMTS\_AMR\_2 are no longer considered as TFO/TrFO-compatible in all cases, it shall be possible to discriminate clearly between the two codecs in the BICC OoBTC signalling. I.e. the UMTS\_AMR\_2 codec in the Supported Codecs List or Available Codecs List shall not include also the UMTS\_AMR codec.**

E.g. the originating MSC might want to offer in the Supported Codecs List the preferred (multimode) configuration 1 only for UMTS\_AMR\_2, but not for UMTS\_AMR. Then the terminating MSC should not be allowed to reply with UMTS\_AMR in preferred configuration 1 (which would currently be allowed according to subclause TS 23.153, 5.6).

(Note: in order to allow TrFO connections with R99 UMTS only UEs, the originating MSC can additionally include UMTS\_AMR in preferred (single) mode configuration 7 to the Supported Codecs List. Or it can include UMTS\_AMR in configuration 1, then the terminating MSC may select between all offers.)

**iii) The Operator Guidelines shall discriminate UMTS\_AMR from all other AMR Codec Types. Since UMTS\_AMR is not compatible to these in multi-mode configurations, a single-mode configuration is recommended: 12.20.**

**Summary of change:** ⓘ iii) The Operator Guidelines recommend UMTS\_AMR in a single mode configuration with 12.20 as only codec mode.

**Consequences if not approved:** ⓘ Without the change (i), the network may set up a connection consisting of links using different codecs (FR\_AMR, UMTS\_AMR\_2, and UMTS\_AMR) that cannot be combined in TFO/TrFO end-to-end (FR\_AMR and UMTS\_AMR), although locally, at each node, the used codecs (FR\_AMR and UMTS\_AMR\_2, or UMTS\_AMR\_2 and UMTS\_AMR, respectively) are TFO/TrFO compatible.

Since the UMTS\_AMR codec does not comply with the rate control rules of the FR\_AMR codec, the result will be a higher frequency of bad speech frames in downlink direction towards the UE using the FR\_AMR codec. This can **seriously deteriorate the speech quality**.

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Without change iii) the coordination between operators is missing and TFO/TrFO between PLMNs is not guaranteed.

**Clauses affected:** ⓘ Annex F in TS 28.062

**Other specs affected:** ⓘ

Y	N
ⓘ	X
	X
	X

Other core specifications ⓘ (TS 23.153?)  
Test specifications  
O&M Specifications

**Other comments:** ⓘ

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#### **Guideline 3:**

The operator should configure AMR so that MACS = 4 and the ACS e.g. corresponds to the default sets (10,20, 6,70, 5,90, 4,75 for FR\_AMR, ~~UMTS\_AMR~~, UMTS\_AMR\_2 and OHR\_AMR and 7,40, 6,70, 5,90, 4,75 for HR\_AMR). For UMTS\_AMR the ACS should include only mode 12,20 kbps. By this the chance for Inter-PLMN TFO is enhanced.

Other ACSs for FR\_AMR, ~~UMTS\_AMR~~, UMTS\_AMR\_2, OHR\_AMR and HR\_AMR are possible. They should include as many as possible common Codec Modes in the lower, contiguous subsets. Also for UMTS\_AMR other ACSs are possible. In that case Inter-PLMN TFO is not as obvious and may need other inter-operator agreements.

NOTE: The default sets correspond to the ACSs determined by the TFO Decision algorithm, when all Codec Modes of the ACSs are included in the corresponding SCS.

#### **Guideline 4:**

The operator should configure AMR so that the ACSs are homogeneous within the whole PLMN (same ACS used in all BSS of a given PLMN for a given Codec Type: ~~UMTS\_AMR~~, UMTS\_AMR\_2, FR\_AMR, OHR\_AMR, HR\_AMR). The ACSs of different Codec Types of the AMR Family should contain as many as possible Codec Modes within the common, lower, contiguous subset. Also UMTS\_AMR should be configured homogeneous within the whole PLMN, but since it is not compatible to the other AMR codec types, another configuration is possible (see Guideline 3).

Helsinki, Finland. 22<sup>th</sup> to 26<sup>th</sup> November 2004.

CR-Form-v7.1

**CHANGE REQUEST**

⌘ 28.062 CR 047 ⌘ rev - ⌘ Current version: 6.0.0 ⌘

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

**Proposed change affects:** | UICC apps  ME  Radio Access Network  Core Network

<b>Title:</b>	⌘ Operator Guidelines for UMTS_AMR and AMR Harmonisation		
<b>Source:</b>	⌘ TSG-SA WG4		
<b>Work item code:</b>	⌘ TFO / TrFO-OoBTC	<b>Date:</b>	⌘ 2004-12-14
<b>Category:</b>	⌘ <b>F</b>	<b>Release:</b>	⌘ Rel-6
	<p>Use <i>one</i> of the following categories:</p> <p><b>F</b> (correction)  <b>A</b> (corresponds to a correction in an earlier release)  <b>B</b> (addition of feature),  <b>C</b> (functional modification of feature)  <b>D</b> (editorial modification)</p> <p>Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a>.</p>		<p>Use <i>one</i> of the following releases:</p> <p>Ph2 (GSM Phase 2)  R96 (Release 1996)  R97 (Release 1997)  R98 (Release 1998)  R99 (Release 1999)  Rel-4 (Release 4)  Rel-5 (Release 5)  Rel-6 (Release 6)  Rel-7 (Release 7)</p>

<b>Reason for change:</b>	⌘ <b>Essential correction</b>
	<p>In their recent meeting SA approved the new AMR <a href="#">Configuration 1</a> for AMR Harmonisation (12.2 ñ 7.4 ñ 5.9 ñ 4.75). This new Configurations is especially recommended for TFO/TrFO between UMTS and GSM. Annex F (Operatoris guide) in TS 28.062 should now also reflect this decision.</p> <p>Further: in CR 28.062 042 a clear separation between UMTS_AMR and all other codec types was introduced to avoid problems in TFO-TrFO-TFO interworking scenarios. In that context it is recommended in CR 045 that UMTS_AMR should be used in single mode with mode 12,20. This change is incorporated here, because the same clauses are affected.</p>
<b>Summary of change:</b>	⌘ Change the Operator Guidelines to recommend UMTS_AMR with 12.20. Change the Operator Guidelines to recommend the new Configuration 1.
<b>Consequences if not approved:</b>	⌘ This new important Configuration 1 does not have the correct visibility. UMTS_AMR has no clearly recommended configuration. Inter-Operator TFO/TrFO is then less likely to establish.

<b>Clauses affected:</b>	⌘ Annex F												
<b>Other specs affected:</b>	<table border="1"> <tr> <td>Y</td> <td>N</td> <td></td> </tr> <tr> <td></td> <td>X</td> <td>Other core specifications</td> </tr> <tr> <td></td> <td>X</td> <td>Test specifications</td> </tr> <tr> <td></td> <td>X</td> <td>O&amp;M Specifications</td> </tr> </table>	Y	N			X	Other core specifications		X	Test specifications		X	O&M Specifications
Y	N												
	X	Other core specifications											
	X	Test specifications											
	X	O&M Specifications											
	⌘ (TS 23.153?)												

**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/specs/CR.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.

## First Change

### F.2.1 Avoidance of Codec Mode Optimisation

#### **Guideline 2:**

If the operator wants to avoid Codec Mode Optimisation after TFO establishment with AMR, then he shall set the "Optimisation Mode" to "No\_Change".

#### **Guideline 3:**

~~The operator should configure AMR so that MACS = 4 and the ACS e.g. corresponds to the default sets (10,20,6,70,5,90,4,75 for FR\_AMR, UMTS\_AMR, UMTS\_AMR\_2 and OHR\_AMR and 7,40,6,70,5,90,4,75 for HR\_AMR). By this the chance for Inter-PLMN TFO is enhanced.~~

All operators should configure all AMR Codec Types, except UMTS\_AMR, in their networks with preferred configuration 1 (see Table 7.11.3.1.3-2, Config-NB-code 1). For UMTS\_AMR the ACS should include only mode 12,20 kbps. By these configurations the chances for TFO/TrFO between systems (GSM-UMTS) and between different PLNMs are substantially enhanced.

This configuration 1 fulfils automatically also Guidelines 2, 4 and 5.

Other ACSs for FR\_AMR, UMTS\_AMR, UMTS\_AMR\_2, OHR\_AMR and HR\_AMR are possible. They should include as many as possible common Codec Modes in the lower, contiguous subsets. Also for UMTS\_AMR other ACSs are possible. In that case Inter-PLMN TFO is not as obvious and may need other inter-operator agreements.

~~NOTE:—The default sets correspond to the ACSs determined by the TFO Decision algorithm, when all Codec Modes of the ACSs are included in the corresponding SCS.~~

#### **Guideline 4:**

The operator should configure AMR so that the ACSs are homogeneous within the whole PLMN (same ACS used in all BSS of a given PLMN for a given Codec Type: ~~UMTS\_AMR~~, UMTS\_AMR\_2, FR\_AMR, OHR\_AMR, HR\_AMR). The ACSs of different Codec Types of the AMR Family should contain as many as possible Codec Modes within the common, lower, contiguous subset. Also UMTS\_AMR should be configured homogeneous within the whole PLMN, but since it is not compatible to the other AMR codec types, another configuration is possible (see Guideline 3).