Source: **TSG-S4 Chairman**[1]

Title: **TSG-S4 Status Report at TSG-SA#10**

Document for: **Information**

Agenda Item: **7.4.1**

Executive Summary

Since TSG-SA#9, TSG-S4 (Codec Working Group) has held two plenary meetings: S4#13 (October 23rd – 27th, 2000) and S4#14 (27th November - 1st December, 2000). In addition one Ad Hoc meeting on TFO has been held (October 16th – 17th, 2000).

The key activity during this period has been the AMR Wideband (AMR-WB) codec Selection Phase. The Selection Phase has now been completed in time, and the results are brought for approval. Five codec candidates were tested in listening tests during September-October. The test results and technical details of the codec proposals were reviewed at S4#13, and a recommendation of the codec to be chosen as the AMR-WB codec was made. This recommendation is brought for approval to TSG-SA#10. A set of draft specifications for the AMR-WB codec has been prepared and these are brought for information.

The 3G Characterization tests for AMR have been completed. The technical report on AMR 3G Performance Characterisation (TR 26.975) is under preparation and is expected for approval at TSG-SA#11.

The AMR TFO definition has been further progressed. The TFO specification (TS 28.062) is brought for information at TSG-SA#10 and is expected for approval at TSG-SA#11.

Agreements / working assumptions for most of the media codecs have been made in the Packet Switched Multimedia work items (Transparent End-to-End Packet Switched Mobile Streaming Applications, and Multimedia Codecs and Protocols for Conversational Packet-Switched Services). A sub working group (Packet Switched Multimedia, PSM) has been established within S4. Three draft specifications are brought for information.

Two specifications of Cellular Text Telephony Modem (CTM) are brought for approval: General Description (TS 26.226) and Transmitter Bit Exact C-code (TS 26.230). Minimum Performance Specification (TS 26.231) is brought for information.

Presentation for approval for some specifications (TFO, AMR-WB, PSM) is delayed from TSG-SA#10 to TSG-SA#11 to allow more time to finalise the specifications for Release 4.

Several CRs are brought for approval (to TSs 06.51, 06.54, 06.93/26.093, 26.102, 26.103, 26.104, 26.111, and 26.911).

Note: Annex A of this report contains a copy of the slides presentation to TSG-SA#10.

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1. Introduction

Since TSG-SA#9, TSG-S4 (Codec Working Group) has held two plenary meetings: S4#13 (October 23rd – 27th, 2000) and S4#14 (27th November - 1st December, 2000). In addition one Ad Hoc meeting on TFO (October 16th – 17th, 2000) has been held.

Meetings held:

TFO drafting session:	Oct 16-17, 2000	hosted by Motorola in Slough, UK
TSG-S4#13:	Oct 23-27, 2000	hosted by NTT DoCoMo in Osaka, Japan
TSG-S4#14:	Nov 27 - Dec 1, 2000	hosted by British Telecom in Bath, UK

Next S4 Plenary Meetings calendar:

TSG-S4#15:	Jan 22-26, 2001	to be hosted by Siemens in Munich
TSG-S4#16:	Feb 26 – Mar 02, 2001	
TSG-S4#17:	Jun 04-08, 2001	
TSG-S4#18:	Sep 10-14, 2001	
TSG-S4#19:	Dec 03-07, 2001	

2. Progress in Work items

2.1 Mandatory Speech Codec – AMR (Release 1999)

TR on 3G AMR Performances Characterisation (TR 26.975) is the only pending Release 99 specification.

AMR Characterisation Tests in 3G channels were carried out during October - November. These tests complement earlier AMR characterisation results obtained from the GSM AMR codec characterisation phase. The 3G AMR tests consisted of 2 main experiments divided into altogether 4 sub-experiments. Three of these test clean speech performance under static error conditions and one is used for testing the effect of car background noise in static error conditions:

Experiment 1: Influence of Errors in Static C/I and Clean Speech Conditions
- 1a: Set A of error patterns in *{English language}*
- 1b: Set B of error patterns in *{Korean language}*
- 1c: Set C of error patterns in *{Japanese language}*

Experiment 2: Influence of Car Background Noise (15 dB SNR) in Static C/I Conditions in *{English language}*

Four listening test laboratories participated in the testing: ARCON (Exp. 2a in North American English), Dynastat (Exp. 1a North American English), Lockheed-Martin Global Telecommunications (Exp. 1b in Korean), and NTT-AT (Exp. 1c in Japanese). ARCON furthermore acted as host laboratory for processing of the speech samples through the AMR narrowband codec and reference conditions. ARCON also acted as a global analysis laboratory. The error patterns were provided by Nortel Networks and NTT DoCoMo. The error conditions in the tests cover various combinations of link direction (uplink, downling), path and speed profiles (vehicular 50 km/h, pedestrian 3 km/h, indoor 3 km/h) and QoS values (FER target values of 0.1%, 0.5% and 3%). The configurations correspond to parameter settings defined by GSMA ISG [RP-000447, Typical Radio Parameter Sets, version 1.3, GSMA ISG].

First analysis of the results was carried out during S4#14.The results show how the AMR codec performs in the different error conditions and configurations in 3G channels. Preparation of TR on 3G AMR Performances Characterisation (TR 26.975) is under way and is expected to be presented for approval at TSG-SA#11. The 3G characterisation results will be presented in detail at TSG-SA#11 when TR 26.975 is finalised and presented for approval. The test results from the test laboratories are brought for information in Tdoc SP-000580. In order to authorise ETSI to pay the involved laboratories S4 asks TSG-SA#10 to approve the results of the AMR narrowband Characterisation Phase of testing.

Deliverable	Title	Latest version	Comment/Status	Approval expected
TR 26.975	AMR Speech Codec Performances Characterization	1.1.0	Funding approved by PCG (60 kEURO). Characterisation Tests carried out October-November 2000. Preparation of TR 26.975 in progress. (Version 1.1.0 based on GSM 06.75 was presented for information to TSG-SA#6 in SP-000021)	Approval expected at TSG-SA#11 (March 2001)

Table 2.1: Status List of remaining AMR specifications

2.2 Codec(s) for Wideband Telephony service (Release 4)

TSG-S4 has carried out development and standardisation of Adaptive Multi-Rate Wideband (AMR-WB) codec since 1999. The work item on wideband coding was approved at TSG-SA#2 (March 1999) and a common WI description harmonising the work with ETSI SMG11 was approved later at TSG-SA#5 (October 1999). After more than one year, the AMR-WB codec development and selection have now been completed in time, and the results are brought for approval at TSG-SA#10.

The AMR-WB codec selection was carried out as a competitive selection process consisting of two phases: a Qualification (Pre-Selection) Phase and a Selection Phase. Seven AMR-WB candidate codecs were submitted for the Qualification Phase. One candidate was later withdrawn and the remaining six were accepted at TSG-SA#8 in June 2000 to proceed into the Selection Phase. Since then two proponents have joined their codec development reducing the number of codec candidates to five for the Selection Phase. The codecs that participated into the Selection Phase came from Ericsson, FDNS consortium (consisting of France Télécom, Deutsche Telekom, Nortel Networks and Siemens), Motorola, Nokia and Texas Instruments.

The codec candidates for the Selection Phase were tested in listening tests during September and October. Six laboratories participated in the testing: ARCON, AT&T, Dynastat, France Télécom, Lockheed-Martin Global Communications, and NTT-AT. Testing was carried out in several languages: Japanese, North American English, French, Mandarin Chinese, and Spanish. The tests consisted of 6 main experiments divided altogether into 19 sub-experiments. Testing covered clean speech, channel errors for the different applications, background noise (car noise and street noise), dynamic conditions in GSM FR channel, and performance of VAD and source controlled operation.

The test results and technical details of the codec proposals were revieved at S4#13 (October). Taking into account all the factors including the analysis of the subjective test results and the technical descriptions of the AMR-WB candidate algorithms, S4 recommends that the codec candidate from Nokia should be chosen as the AMR-WB codec. This recommendation is brought for approval to TSG-SA#10.

The AMR-WB Selection Phase results are described in detail in Tdoc SP-000555. This document also explains in detail the testing and the selection procedures. S4 asks TSG-SA#10 to formally approve the results of the AMR-WB Selection Phase of testing (as explained in Tdoc SP-000555) to authorise ETSI to pay the involved laboratories. It is the intention of S4 to prepare a TR on the AMR-WB Selection Phase results based on Tdoc SP-000555.

A set of AMR-WB draft specifications for 26-series have been prepared and these are brought for information to TSG-SA#10 in Tdocs SP-000556 to SP-000564:

1. “3G TS 26.171 AMR Wideband Speech Codec; General description v.0.0.1”, 3GPP TSG-SA Tdoc SP-000556
2. “3G TS 26.173 AMR Wideband Speech Codec; C-source code v.0.0.1”, 3GPP TSG-SA Tdoc SP-000557
3. “3G TS 26.190 AMR Wideband Speech Codec; Transcoding Functions v.0.0.3”, 3GPP TSG-SA Tdoc SP-000558
4. “3G TS 26.191 AMR Wideband Speech Codec; Error concealment of erroneous or lost frames v.0.0.1”, 3GPP TSG-SA Tdoc SP-000559
5. “3G TS 26.192 AMR Wideband Speech Codec; CN for AMR Speech Traffic Channels v.0.0.2”, 3GPP TSG-SA Tdoc SP-000560
6. “3G TS 26.193 AMR Wideband Speech Codec; Source Controlled Rate operation v.0.0.1”, 3GPP TSG-SA Tdoc SP-000561
7. “3G TS 26.194 AMR Wideband Speech Codec; VAD for AMR Speech Traffic Channels v.0.0.2”, 3GPP TSG-SA Tdoc SP-000562
8. “3G TS 26.201 AMR Wideband Speech Codec; Speech Codec Frame Structure v.0.0.1”, 3GPP TSG-SA Tdoc SP-000563
9. “3G TS 26.202 AMR-WB speech codec; interface to Iu and Uu v.0.0.1”, 3GPP TSG-SA Tdoc SP-000564

Also, draft specifications of GSM channel coding and link adaptation have been presented for information within S4 and will be presented within TSG-GERAN for finalisation.

First verification results were presented at S4#14. Further results are expected in the forthcoming meetings. Characterisation tests for the AMR-WB codec are planned for the first half or 2001. A budget of 250 kEURO is available for the characterisation tests (funding from codec proponents participating in the Selection Phase). The results of the characterisation and verification phases will be contained in TR on AMR-WB Codec Performances Characterization. This can be expected for approval at TSG-SA#12 at the earliest.

Deliverable	Title	Latest version	Comment/Status	Approval expected
TS 26.171	AMR Wideband Speech Codec; General description	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 in Tdoc SP-000556.	TSG-SA#11
TS 26.173	AMR Wideband Speech Codec; C-source code	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 in Tdoc SP-000557	TSG-SA#11
TS 26.190	AMR Wideband Speech Codec; Transcoding Functions	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 Tdoc SP-000558.	TSG-SA#11
TS 26.191	AMR Wideband Speech Codec; Error concealment of erroneous or lost frames	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 Tdoc SP-000559.	TSG-SA#11
TS 26.192	AMR Wideband Speech Codec; CN for AMR Speech Traffic Channels	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 Tdoc SP-000560.	TSG-SA#11
TS 26.193	AMR Wideband Speech Codec; Source Controlled Rate operation	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 Tdoc SP-000561.	TSG-SA#11
TS 26.194	AMR Wideband Speech Codec; VAD for AMR Speech Traffic Channels	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 in Tdoc SP-000562.	TSG-SA#11
TS 26.201	AMR Wideband Speech Codec; Speech Codec Frame Structure	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 Tdoc SP-000563.	TSG-SA#11
TS 26.202	AMR-WB speech codec; interface to Iu and Uu	1.0.0	Draft reviewed at S4#14. Presented for information at TSG-SA#10 in Tdoc SP-000564.	TSG-SA#11
TS 26.xyz	AMR-WB speech codec; test sequences	-	Work is ongoing to produce the test sequences.	TSG-SA#11
TR 26.xyz	Wideband Speech Codec Performances Characterization	-	Characterisation tests planned for 1H01	t.b.d

Table 2.2: Status List of AMR Wideband codec specifications

As reported earlier to TSG-SA, wideband codec standardisation is carried out parallel in ITU-T Study Group 16 and in S4 with rather similar quality targets and bit-rates. ITU-T SG 16 and S4 have along their wideband codec standardisation processes considered harmonisation of requirements and design constraints. Some harmonisation has been done. ITU-T SG 16 has proposed a further possibility for harmonisation by offering to include the AMR-WB codec (to be chosen at TSG-SA#10 meeting) as one candidate codec in the ITU-T wideband codec selection process, provided that sufficiently good performance can be demonstrated by the codec. The ITU-T selection process will be carried out sometime during early 2001. To enable ITU-T to analyse the performance of the best AMR-WB codec candidate, some AMR-WB Selection Test results were sent for information to ITU-T on request at their November 2000 meeting by Nokia (endorsed by TSG-S4). From the response of ITU-T, it is understood by S4 that the AMR-WB codec algorithm to be selected by 3GPP will be allowed as a candidate codec in the ITU-T selection process. S4 has agreed with the principle that the selected AMR-WB codec should participate into the ITU-T selection process. This could lead into one harmonised wideband codec for both 3GPP and ITU-T.

2.3. Tandem Free aspects for 3G and between 2G and 3G systems (Release 4)

The AMR TFO specification is now almost finalised. Version 1.0.0 of TS on In-band Tandem Free Operation of Speech Codecs (TS 28.062) is presented for information in Tdoc SP-000568.

The key decisions/achievements of the period include an agreement on AMR TFO decision algorithm to determine whether the TFO configuration is acceptable or not and an agreement on the algorithm to compute the optimized Active Codec Set. Reference C-code of TFO decision algorithm and guidelines (for operators) for AMR TFO configuration have been included in the specification. Interoperability of GSM-3G TFO (or TrFO) requires that the 3G UE supports the GSM version of the AMR codec (FR_AMR Codec Type). This codec type has been introduced in 3G with codec mode change rate restricted to 40 ms as in GSM (instead of 20 ms as in 3G).

Deliverable	Title	Latest Version	Comment/Status	Approval expected

Deliverable	Title	Latest Version	Comment/Status	Approval expected
TR 26.920	Architectural Model for the 3G Transcoders	0.1.1	Initial draft sent to TSG-S2 for comments. It was reported earlier to TSG-SA that the necessity of this report is still tbd. S4 now sees that TS 28.062 is sufficient and there is no need for other specifications.	t.b.d.
TS 28.062	In-band Tandem Free Operation (TFO) of Speech Codecs	1.0.0	Presented for information at TSG-SA#10 in Tdoc SP-000568.	TSG-SA#11

Table 2.3: Status List of TFO Specifications

On the support of the RATSCCH (Robust AMR Traffic Synchronized Control Channel) S4 could not find a consensus to recommend to TSG-GERAN to either keep it or remove it.

2.4. Transparent End-to-End Packet Switched Mobile Streaming Applications (Release 4)

Streaming refers to the ability of an application to play synchronised media streams like audio and video streams in a continuous way while those streams are being transmitted to the client over a data network. The objectives of this Work Item, are to standardise the components of a mobile streaming service, including especially multimedia codecs, but also relating streaming and media transport protocols.

S4 has agreed to complete the work item in two phases where the first phase will already include a complete basic streaming service, and is referred to as basic streaming. The second phase builds on the first phase and includes additional compatible functionality. The first phase will be completed for Release 4 and the second phase for Release 5. The present S4 work on streaming is limited to downlink streaming (with a terminal as a streaming client).

The exact scope of basic streaming for Release 4 has not yet been fully defined, but Release 4 will at least include support for streaming session control protocols (based on a subset of RTSP), transport protocols (based on RTP/UDP or HTTP/TCP), presentation control, and support for basic media types. Default codecs and RTP payload formats will be defined for speech, video, audio, still images, bitmap and vector graphics, and text. In the simple streaming case, there is neither explicit capability exchange nor encryption or digital rights management.

An important working assumption has been to minimise the number of different codecs (for each media type) that the terminal needs to support for different services. Hence, the media codec choices for PSS will be made taking into consideration the codec choices already made for defined services (speech, circuit-switched multimedia telephony 3G-324M) as well as the on-going work on packet-switched conversational service.

For video coding, ITU-T H.263 Baseline Profile (Profile 0) Level 10 is the mandatory codec. Optional codecs are: ITU-T H.263 Profile 3 level 10, and ISO MPEG-4 Visual Simple Profile Level 0. For speech coding the working assumption is the AMR (Adaptive Multi-Rate) codec. For audio, the working assumption is to have support for MPEG-4 AAC (Advanced Audio Coding) codec. ISO/IEC JPEG is the working assumption for static images, and GIF for bitmaps.

The two specifications (General Description, Protocols and Codecs) have been progressed and are presented for information to TSG-SA#10 in Tdocs SP-000565 and SP-000566. Both draft specifications have also been sent from S4#14 to T1 and T2 (Cc: CN1, CN2) for information and comments. S4 and T2 are considering collaboration in order to align codecs and protocols for PSS and MSS (Multimedia Messaging Service).

Deliverable	Title	Latest Version	Comment/Status	Approval expected
TS 26.233	Packet-switched Streaming Services (PSS); General Description	1.0.0	Version 1.0.0 presented for information at TSG-SA#10 in Tdoc SP-000565.	TSG-SA#11
TS 26.234	Packet-switched Streaming Services (PSS); Protocols and Codecs	1.0.0	Version 1.0.0 presented for information at TSG-SA#10 in Tdoc SP-000566.	TSG-SA#11

Table 2.4: Status List of specifications for "Transparent End-to-End Packet Switched Mobile Streaming Applications" WI

2.5. Multimedia Codecs and Protocols for Conversational Packet-Switched Services (Release 5)

AMR narrowband codec has been chosen to be the mandatory speech codec. AMR Wideband (AMR-WB) codec will be an optional speech codec.

For video coding, the same codecs as for PSS have been chosen: ITU-T H.263 Baseline Profile (Profile 0) Level 10 is the mandatory codec. Optional codecs are: ITU-T H.263 Profile 3 level 10, and ISO MPEG-4 Visual Simple Profile Level 0.

A draft of Default Codecs specification is presented for information at TSG-SA#10 in Tdoc SP-000567.

Deliverable	Title	Latest Version	Comment/Status	Approval expected
TS 26.235	Packet Switched Conversational Multimedia Applications; Default Codecs	1.0.0	Version 1.0.0 presented for information at TSG-SA#10 in Tdoc SP-000567.	TSG-SA#11
TR 26.xyz	Performance characterization of default codecs for PS conversational multimedia applications	-	-	TSG-SA#14
TS 26.xyz	Protocols for PS conversational multimedia applications	-	-	TSG-SA#14

Table 2.5: Status List of specifications for "Multimedia Codecs and Protocols for Conversational Packet-Switched Services " WI

2.6 Global Text Telephony (GTT) (Release 5)

For this WI, the following specifications are under the responsibility of S4: Cellular Text Telephone Modem (CTM); General Description (TS 26.226), Transmitter Bit Exact C-code (TS 26.230), and Minimum Performance Specification (TS 26.231).

Text Telephone devices (TTY) perform well in fixed networks. However, in digital cellular systems the modulation developed for fixed network may not provide satisfactory character error rate. This is because of the impact of transmission errors and also because the compression and error concealment are optimised for speech-like signals. CTM enables traditional TTY equipments to be used also in mobile networks: CTM transforms the TTY characters into a signal that can be transmitted robustly via the speech codec and the radio transmission path.

General Description and Transmitter Bit Exact C-code TSs are brought for approval at TSG-SA#10 in Tdocs SP-000569 and SP-000570. Minimum performance specification is brought for information in Tdoc SP-000571. (The long test sequence data files associated with Tdoc SP-000571 are contained in Tdoc SP-000582.) These 3GPP draft specifications are based on T1P1 CTM specifications.

Deliverable	Title	Latest Version	Comment/Status	Approval expected
TS 26.226	GTT Cellular Text Telephone Modem; General Description	2.0.0	Presented for approval at TSG-SA#10 in Tdoc SP-000569.	TSG-SA#10
TS 26.230	GTT Cellular Text Telephone Modem; Transmitter C-code Description	2.0.0	Presented for approval at TSG-SA#10 in Tdoc SP-000570.	TSG-SA#10
TS 26.231	GTT Cellular Text Telephone Modem; Minimum Performance Specification	1.0.0	Presented for information at TSG-SA#10 in Tdoc SP-000571 and SP-000582.	TSG-SA#11

Table 2.6: Status List for GTT Specifications (under the responsibility of S4)

During the approval discussion in S4, some concern was expressed that it may be necessary to specify the location where the CTM functionality is located in GSM, i.e., whether it is located in the BSS (Base Station Sub-System) or in the NSS (Network Sub-System). Otherwise, in a situation where other vendor's BSS is connected to other vendor's NSS, the operator may not have the CTM function in its network. (As an architectural issue, the location of CTM is outside the scope of S4 and may need to be dealt with at S2.)

3. Maintenance of previous releases (Phase 2, Release '96 - '99, and Release 4)

The CRs brought for approval to TSG-SA#10 are listed below (with a brief description of the proposed changes):

Tdoc SP-000572: CRs to TS 06.51 (GSM EFR speech processing functions; General Description):

- **Definition of decoder homing frame for the alternative EFR implementation** (as AMR 12.2) is brought into the specification. The codec homing (resetting) frame from the EFR codec is defined to be used. Presently, it is not clear which homing frame should be used. (Category F: essential correction)

Tdoc SP-000573: CRs to TS 06.54 (Test vectors for the GSM EFR speech codec). Test sequence files in SP-000581:

- **Corrections to test vectors of the alternative EFR version** (as AMR 12.2): Correct input test sequences are brought for VAD option 2 and their byte format is set correctly. Presently, the coverage of VAD option 2 test sequences is not guaranteed, and their byte format is not correct. (Category F: essential correction)

Tdoc SP-000574: CRs to TS 06.93/26.093 (DTX for AMR speech traffic channels / AMR Source Controlled Rate operation):

- **Clarifications on re-scheduling of stolen SID-UPDATE frames or SID_FIRST frames for AMR, Clarification of Hangover period after handover**. The CR brings editorial clarifications for the text of AMR DTX/SCR specifications. (Category D: editorial modification)
- **Re-scheduling of stolen SID-UPDATE frames for AMR (Part 2)** to handle re-scheduling the same way for FACCH signalling purposes as for RATSCCH**.** This CR has the same reason as an earlier CR (A008). In the earlier CR only section 5.1.2.2 was changed, while section 5.1.2.1 was forgotten to change. (Category F: essential correction)

Tdoc SP-000575: CRs to TS 26.102 (AMR speeh codec; Interface to Iu):

- **AMR interface to Iu specification** is clarified with some editorial improvements for the text. (Category D: editorial modification)

Tdoc SP-000576: CRs to TS 26.103 (Speech codec List for GSM and UMTS):

- **Introduction of codec type bit-map for codec negotiation.** Introduction of PDC EFR and TDMA EFR as codec type alternatives for UMTS to support TFO/TrFO. Addition of Optimisation Mode field for TFO purposes. Removal of Initial Codec Mode from AMR parameters, as decided earlier. Addition of Codec Type bit map for codec negotiation at call set-up (Section 6) (Category B: addition of a feature)
- **Introduction of a Selected Codec Type for Codec negotiation.** The coding of Selected Codec Type is included (from TS 28.062) also in this specification as requested by CN1. (Category B: addition of a feature)
- **Clarification for the use of the codec list information element**. This is a correction explaining that Supported Codec List Information Element is defined for the UE cabapilities in UMTS only (and not in GSM). (Category F: essential correction)

Tdoc: SP-000577: CRs to TS 26.104 (ANSI-C code for the floating-point AMR speech codec):

- **AMR core frame bit ordering (AMR speech codec; floating point code).** One table in the C-code is corrected. (Category F: essential correction)

Tdoc SP-000578: CRs to TS 26.111 (Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324):

- **Clarification to 3G-H.324M.** TS 26.111 recommends the mandatory usage of ITU H.263 video codec but also allows the optional usage of ISO MPEG-4 video codec using visual simple profile level 1. However, due to very limited resources of mobile handsets and terminals only a subset of the ISO MPEG-4 visual simple profile level 1 capabilities are used in 3G. ISO MPEG has introduced, on request of S4, a new level (level 0) to the visual simple profile suit for a restricted use of level 1 as defined for 3G use in TS 26.111. This CR presents a correction to TS 26.111 making reference to the level 0 now specified in ISO MPEG-4. (Category F: essential correction)

Tdoc SP-000579: CRs to TS 26.911 (Codec for Circuit Switched Multimedia Telephony Service; Terminal Implementor's Guide):

- **Annex K submodes of H.263 video codec for 3G-H324 specification.** The correction defines more precisely what submodes of Annex K of H.263 video codec should be used. (Category F: essential correction)
- **Editorial changes due to correction of TS 26.111** (in SP-000578) (Category D: editorial modification)

For more detailed description on the CRs and the releases they impact, see the above mentioned documents.

4. Miscellaneous

- A new S4 sub working group was established on Packet Switched Multimedia (to work on the two PS work items: Transparent End-to-End Packet Switched Mobile Streaming Applications, and Codecs and Protocols for Conversational PS Services). The subgroup met for the first time during the S4#14 meeting.
- The AMR Noise Suppression Test Plan (to compare performance against the Minimum Performance

Requirements) was progressed. This will be included into TS 06.77 (Minimum Performance Requirements for Noise Suppresser; Application to the AMR Speech Encoder). Three out of four Experiments are now finalised. The complete test plan is expected to be finalised in time for TSG-SA#11.

- It has been noted in S4, that there is a divergence in views on how many modes AMR compliant TRAU shall support: some companies see that it is necessary to support all the AMR modes, while some companies view is that to support at least one AMR mode is sufficient.
- Communication to ITU-T Q. 24/16 on "Parameters for variable bit rate voice codec operation and information on channel models" was endorsed by S4 and was sent to ITU-T Q. 24/16 November meeting by Ericsson. This communication provides requested information of the AMR narrowband codec (and the AMR Wideband codec recommended for selection) as a response to earlier communication from ITU-T Q. 24/16.
- Liaison statement has been sent to ISO MPEG4 regarding MPEG-4 visual simple profile level 0, thanking them for defining level 0 as requested by S4.

5. Approval requested

TSG-S4 requests TSG-SA#10 to:

1. Approve that Nokia AMR-WB candidate codec is chosen as the AMR-WB codec (as recommended by S4 in Tdoc SP-000555).
2. Approve the results of the AMR-WB Selection Phase of testing (as described in Tdoc SP-000555) to authorise ETSI to pay the involved laboratories.
3. Approve the Cellular Text Telephone Modem (CTM) specifications: TS 26.226 "General Description" (Tdoc SP-000569) and TS 26.230 "Transmitter Bit Exact C-code" (Tdoc SP-000570).
4. Approve the results of the 3G AMR narrowband Characterisation Phase of testing (as described in Tdoc SP-000580) to authorise ETSI to pay the involved laboratories.
5. Approve the CRs in Tdocs SP-000572 to SP-000579 (including the test sequence files in SP-000581).

6. List of input documents

Number	Title	Source	Agenda item	Comment
SP-000554	TSG S4 Status Report at TSG-SA#10	SA WG4 Chairman	7.4.1	Information
SP-000555	Results of AMR Wideband (AMR-WB) Codec Selection Phase	SA WG4	7.4.3	Approval
SP-000556	AMR Wideband Speech Codec; General Description (3G TS 26.171 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000557	ANSI-C code for the Adaptive Multi Rate Wideband speech codec (3G TS 26.173 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000558	AMR Wideband speech codec; Transcoding functions (3G TS 26.190 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000559	AMR Wideband Speech Codec; Error concealment of erroneous or lost frames (3G TS 26.191 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000560	AMR Wideband Speech Codec; Comfort noise aspects (3G TS 26.192 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000561	AMR Wideband Speech Codec; Source Controlled Rate operation (3G TS 26.193, version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000562	AMR Wideband speech codec; Voice Activity Detector (VAD) (3G TS 26.194 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000563	AMR Wideband Speech Codec; Frame Structure (3G TS 26.201 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000564	AMR wideband speech codec; Interface to Iu and Uu (3G TS 26.202 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000565	Packet-switched Streaming Services (PSS); General Description (3G TS 26.233 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000566	Packet-switched Streaming Services (PSS); Protocols and Codecs (3G TS 26.234 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000567	Packet Switched Conversational Multimedia Applications; Default Codecs (3G TS 26.235 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000568	In-band Tandem Free Operation (TFO) of Speech Codecs; Stage 3 - Service Description; (3G TS 28.062 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000569	Cellular Text Telephone Modem; General Description (3G TS 26.226 version 2.0.0 Release 5)	SA WG4	7.4.3	Approval
SP-000570	Cellular Text Telephone Modem; Transmitter Bit Exact C-Code (3G TS 26.230 version 2.0.0 Release 5)	SA WG4	7.4.3	Approval
SP-000571	Cellular Text Telephone Modem; Minimum Performance Requirements (3G TS 26.231 version 1.0.0 Release 5)	SA WG4	7.4.3	Information
SP-000572	CRs 06.51 - A009 to A 013 on Definition of the homing frame for the alternative EFR implementation (Phase 2 until R99)	SA WG4	7.4.3	Approval
SP-000573	CRs 06.54 - A007 to A011 on Correction to the test vectors of the alternative EFR version (Phase 2 until R99)	SA WG4	7.4.3	Approval
SP-000574	CRs TS 06.93 & TS 26.093 on Re-scheduling of stolen SID_UPDATE frames for AMR and clarification of Hangover period after Handover (R98 until Release 4)	SA WG4	7.4.3	Approval
SP-000575	CR TS 26.102 - 005 on AMR interface to Iu (R99)	SA WG4	7.4.3	Approval
SP-000576	CRs TS 26.103 004 to 006 (all Release 4)	SA WG4	7.4.3	Approval
SP-000577	CRs TS 26.104 - 001-002 on "AMR speech Codec; Floating point C-Code" (R99 and Release 4)	SA WG4	7.4.3	Approval
SP-000578	CR TS 26.111 - 005 rev1 on MPEG4 visual simple profile @ level 0 (R99)	SA WG4	7.4.3	Approval
SP-000579	CRs TS 26.911 - 006 to 008 on Annex K submodes of H.263 video codec for 3G-H324 specification + correction (R99 and Release 4)	SA WG4	7.4.3	Approval
SP-000580	Deliverables from the 3G AMR-NB testing laboratories	SA WG4	7.4.1, 7.4.3	Information / Approval
SP-000581	Test vectors associated to 06.54 (SP-000573)	SA WG4	7.4.3	Approval
SP-000582	Test sequences associated to TS 26.231 (SP-000571)	SA WG4	7.4.3	Information

Table 6: List of documents to TSG-SA#10 from TSG-S4

Source: TSG-S4 Chairman *TSGS#10(00)0554 Annex A*

TSG-S4 (CODEC) Working Group

Status Report

TSG-SA#10
December 11-14, 2000
Bangkok, Thailand

Kari Järvinen
TSG-S4 Chairman
Nokia

3GPP TSG-S4

Content of presentation

- **1) General part**
  - TSG-S4 input documents, Meeting shedule
  - Progress in Work items:
    - AMR Narrowband codec: -> 3G Characterisation Test results
    - AMR Wideband: -> Selection Phase results
    - Tandem Free Operation
    - Transparent End-to-End Packet Switched Mobile Streaming Applications
    - Multimedia Codecs and Protocols for Conversational Packet-Switched Services
    - Global Text Telephony: -> Cellular Text Telephone Modem (CTM) specifications for approval

- **2) Decision points**
  - Approval of AMR-WB codec Selection Phase results
  - Approval of two Cellular Text Telephone Modem (CTM) specifications
  - Approval of CRs
  - Approval of AMR-WB Selection Phase and AMR 3G Characterisation Phase of testing to authorise payment for the laboratories

1) General part

TSG-S4 Documents

Input documents in SP-000554 to SP-000582

Number	Title	Source	Agenda item	Comment
SP-000554	TSG S4 Status Report at TSG-SA#10	SA WG4 Chairman	7.4.1	Information
SP-000555	Results of AMR Wideband (AMR-WB) Codec Selection Phase	SA WG4	7.4.3	Approval
SP-000556	AMR Wideband Speech Codec; General Description (3G TS 26.171 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000557	ANSI-C code for the Adaptive Multi Rate Wideband speech codec (3G TS 26.173 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
SP-000558	AMR Wideband speech codec; Transcoding functions (3G TS 26.190 version 1.0.0 Release 4)	SA WG4	7.4.1	Information
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SP-000573	CRs 06.54 - A007 to A011 on Correction to the test vectors of the alternative EFR version (Phase 2 until R99)	SA WG4	7.4.3	Approval
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SP-000582	Test sequences associated to TS 26.231 (SP-000571)	SA WG4	7.4.3	Information

Meetings Schedule

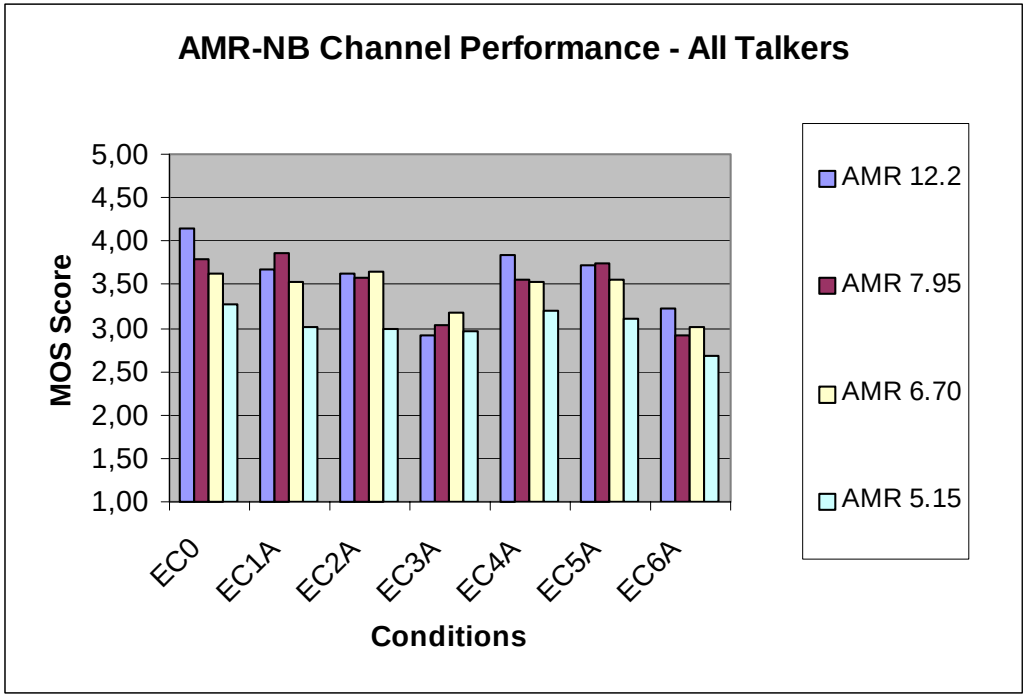
- **Two S4 Plenaries and 1 TFO Ad Hoc since TSG-SA#9**
  - TFO drafting session: Oct 16-17, 2000; hosted by Motorola in Slough, UK
  - TSG-S4#13: Oct 23-27, 2000; hosted by NTT DoCoMo in Osaka, Japan
  - TSG-S4#14: Nov 27 - Dec 1, 2000; hosted by British Telecom in Bath, UK
- **Future meeting schedule**
  - TSG-S4#15: Jan 22-26, 2001; to be hosted by Siemens in Munich, Germany
  - TSG-S4#16: Feb 26 – Mar 02, 2001
  - TSG-S4#17: Jun 04-08, 2001
  - TSG-S4#18: Sep 10-14, 2001
  - TSG-S4#19: Dec 03-07, 2001
- **Meeting statistics**
  - ~70-80 Participants, 1 week, >100 Documents

Release 1999: AMR Speech Codec

- **The only pending Release 1999 issue is the AMR 3G Performance Characterization Report (TR 26.975)**
  - Listening Tests in 3G channel carried out during October - November. Complement earlier AMR characterisation results obtained during the GSM AMR codec characterisation phase.
  - Two main experiments divided into altogether 4 sub-experiments.
    Experiment 1: Influence of Errors in Static C/I and Clean Speech Conditions (3 sub experiments)
    Experiment 2: Influence of Car Background Noise (15 dB SNR) in Static C/I Conditions in
  - Laboratories: ARCON (Exp. 2a in North American English), Lockheed-Martin Global Telecommunications (Exp. 1b in Korean), Dynastat (Exp. 1a North American English), and NTT-AT (Exp. 1c in Japanese). ARCON also host laboratory and global analysis laboratory.
  - First analysis of the results was carried out during S4#14.The results show how the AMR codec performs in the different error conditions and configurations in 3G channels.
  - Preparation of TR on 3G AMR Performances Characterisation (TR 26.975) is under way and is expected to be presented for approval at TSG-SA#11. The 3G characterisation results will be presented in detail at TSG-SA#11 when TR 26.975 is finalised and presented for approval.
  - The test results from the test laboratories are brought for information in Tdoc SP-000580. In order to authorise ETSI to pay the involved laboratories S4 asks TSG-SA#10 to approve the results of the AMR narrowband Characterisation Phase of testing.

Release 1999: AMR Speech Codec

- **Example from Experiment 1a (Set A of EPs, North American English)**



EC	Direction	Path Profile	Speed	Target
EC1A	Uplink	Vehicular-B	50 km/h	0.5% FER
EC2A	Uplink	Vehicular-B	50 km/h	1% FER
EC3A	Uplink	Vehicular-B	50 km/h	3% FER
EC4A	Downlink	Vehicular-B	120 km/h	0.5% FER
EC5A	Downlink	Vehicular-B	120 km/h	3% FER
EC6A	Downlink	Vehicular-B	120 km/h	1% FER

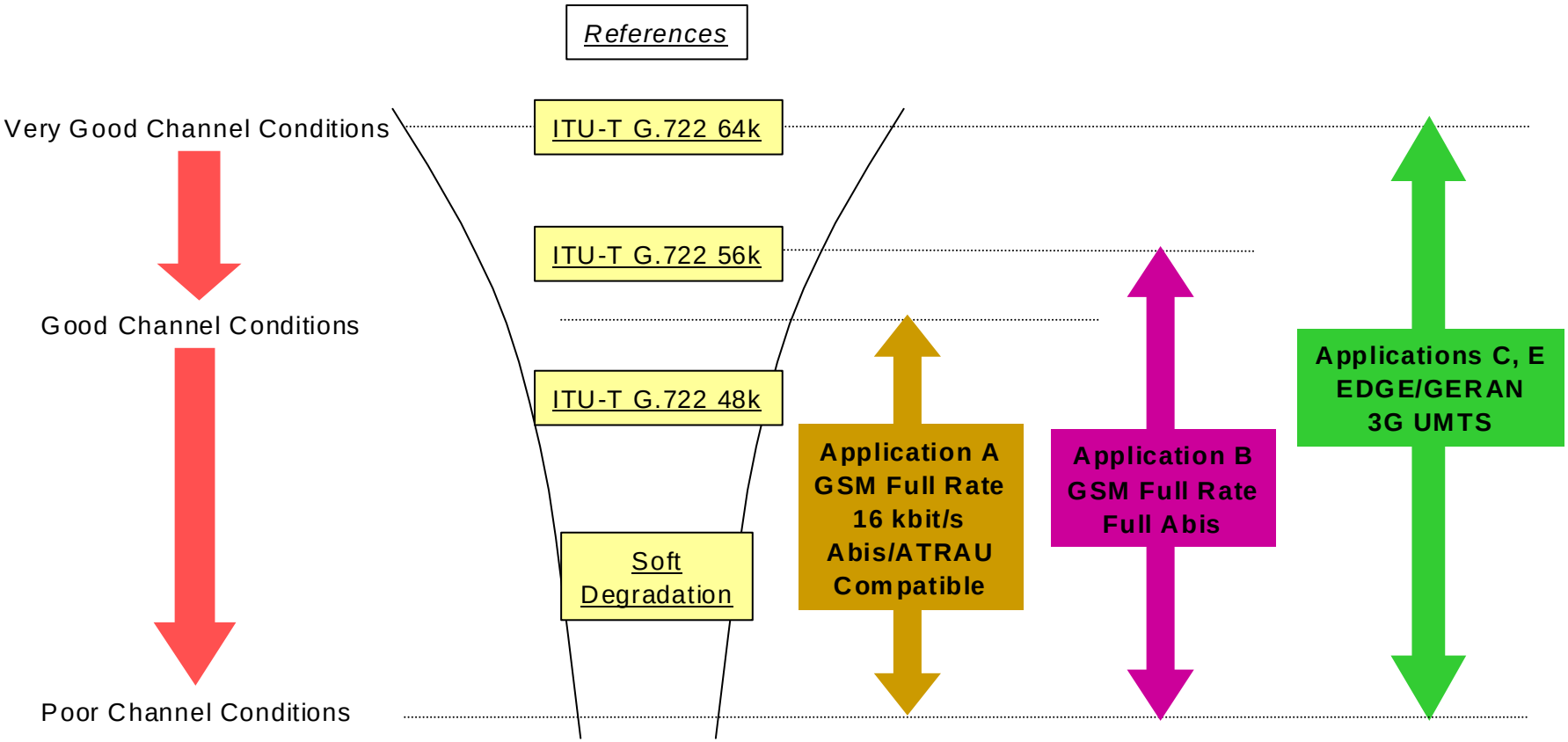
Release 4 : AMR Wideband Speech Codec

- AMR-WB codec Selection Phase has been carried out and the results are brought to TSG-SA#10 for approval.
- The work item on wideband coding was approved at TSG-SA#2 (March 1999). Harmonised WID with ETSI SMG11 approved at TSG-SA#5 (October 1999). After 21 months (from the approval of the WID at TSG-SA#2), the AMR-WB codec development and selection have now been completed in time. The results are brought for approval at TSG-SA#10.
- Qualification Phase results were presented at TSG-SA#8 (June 2000) where 6 codecs were approved to proceed in the Selection Phase. Since then two codec proponents started joined development reducing the number of candidates to 5 for the selection phase.
- Selection Phase listening testing of the codec algorithms was carried out from mid-September until late October. Listening test results were analysed at S4#13 (October) and recommendation of the codec to be selected was made. This is brought for approval to TSG-SA#10.
- The AMR-WB Selection Phase results are described in detail in Tdoc SP-000555.
- Draft AMR-WB codec specifications were prepared and reviewed at S4#14 (November). The draft specifications are brought for information to TSG-SA#10 in Tdocs SP-000556 to SP-000564
- Verification Phase is ongoing. Characterisation phase is planned for 1H01.

AMR-WB Selection Phase: Project Objectives

- **Development and Selection of a Multi-Rate Wideband Speech Codec with extended Acoustic Bandwidth (50Hz-7kHz) for the support of Wideband Speech Telephony in multiple radio environments:**
  - Application A: GSM FR traffic channel with 16 kbit/s A-ter sub-multiplexing
  - Application B: GSM FR traffic channel
  - Application C: Circuit Switched EDGE/GERAN 8-PSK Phase II radio channels
  - Application E: 3G UTRAN WCDMA radio channel
- **Why AMR-WB:**
  - The AMR-WB codec brings quality improvement over the existing narrowband telephony (bandwidth limited to 3.4 kHz) through the use of extended audio bandwidth (bandwidth limited to 7 kHz).
  - The introduction of a wideband speech service brings improved voice quality especially in terms of increased voice naturalness.
  - Wideband coding brings speech quality exceeding that of (narrowband) wireline quality to 3G and GSM systems.
- **Key Project Milestones:**
  - Feasibility Study (ETSI SMG11): Spring 1999
  - Qualification Phase: by June 2000 (TSG-SA#8)
  - Selection Phase: by October 2000
  - **Approval of Selection Phase results: December 2000 (TSG-SA#10)**
  - Approval of AMR-WB codec specifications: March 2000 (TSG-SA#11 & Rel-4)

AMR-WB Selection Phase: Performance requirements



Results of AMR-WB Selection Phase: Selection Process

- **5 codec candidates**
  - Codec 1 = Ericsson
  - Codec 2 = FDNS consortium (consisting of France Télécom, Deutsche Telekom, Nortel Networks and Siemens)
  - Codec 3 = Nokia
  - Codec 4 = Motorola
  - Codec 5 = Texas Instruments
- **Listening tests carried out in mid-September to late October:**
  - 6 independent laboratories (ARCON, AT&T, Dynastat, France Télécom, LMGT, NTT-AT)
  - 5 languages: Japanese, English (North American), French, Mandarin Chinese, and Spanish
  - 6 experiments, divided altogether into 19 sub-experiments
  - Tests cover: clean speech, channel errors for the different applications, background noise (car noise and street noise), dynamic conditions in GSM FR channel, and performance of VAD and source controlled operation.
  - 3G error patterns with FER=0.5% / RBER= 0% and FER=1.0% / RBER= 0.1%
- **Listening test results and technical details of the algorithms analysed at S4#13 (October)**
- **Codec selection based on pre-defined rules and procedure**
- **Codec 4 was withdrawn (development not completed by the deadline)**

Results of AMR-WB Selection Phase: Selection Process

- **Rule 1: The codec must comply with a set of mandatory design constraints (speech and channel coding complexity, transmission delay etc.)**
  - ☞ **All candidates passed Rule 1**

- **Rule 2: Eliminating Rules related to the number of failures (2a) and the failures' severity (2b).**

Rule 2a: Any candidate failing 50% or more of the test conditions contained in any defined subsets of tests will be excluded.

Rule 2A	Candidate Failures in Set#1					Candidate Failures in Set#2					Candidate Failures in Set #3				
Codec #	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Number of failures	17	29	0	13	11	6	5	0	3	3	11	24	0	10	8
Failure-%	10,6	18,1	0,0	8,1	6,9	8,1	6,8	0,0	4,1	4,1	12,8	27,9	0,0	11,6	9,3
Pass / Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Rule 2A	Candidate Failures in Set#4					Candidate Failures in Set#5					Candidate Failures in Set#6				
Codec #	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Number of failures	4	8	0	5	3	2	3	0	4	4	11	18	0	4	4
Failure-%	9,1	18,2	0,0	11,4	6,8	4,5	6,8	0,0	9,1	9,1	16,7	27,3	0,0	6,1	6,1
Pass / Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

☞ **All candidates passed Rule 2a (see table above). Codec 3 is the only codec that has no failures at all.**

Results of AMR-WB Selection Phase: Selection Process

Rule 2b: Any candidate severely failing more than 10% of the test conditions contained in any defined subsets of tests will be excluded.

☞ All candidates passed Rule 2b. None of the candidate codecs had severe failures in any of the sets.

- **Rule 3**: Comparison of Performances according to multiple Figures of Merit

Rule 3 FOM	Weighted ΔMOS					Weighted ΔdBQ					Unweighted %ΔPOW				
Codec #	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Total	19.0	6.8	**60.4**	19.6	32.0	146.9	47.6	**787.6**	217.7	353.4	36,5%	68,8%	**10,4%**	49,0%	19,8%

Rule 3 FOM	Number of systematic failures				
Codec #	1	2	3	4	5
Total	3	7	**0**	4	3

Rule 3 FOM restricted to failures	Weighted ΔMOS					Weighted ΔdBQ				
Codec #	1	2	3	4	5	1	2	3	4	5
Total	-2.1	-5.6	**0,0**	-1,4	-1.3	-30.4	-65.7	**0,0**	-13,9	-17.0

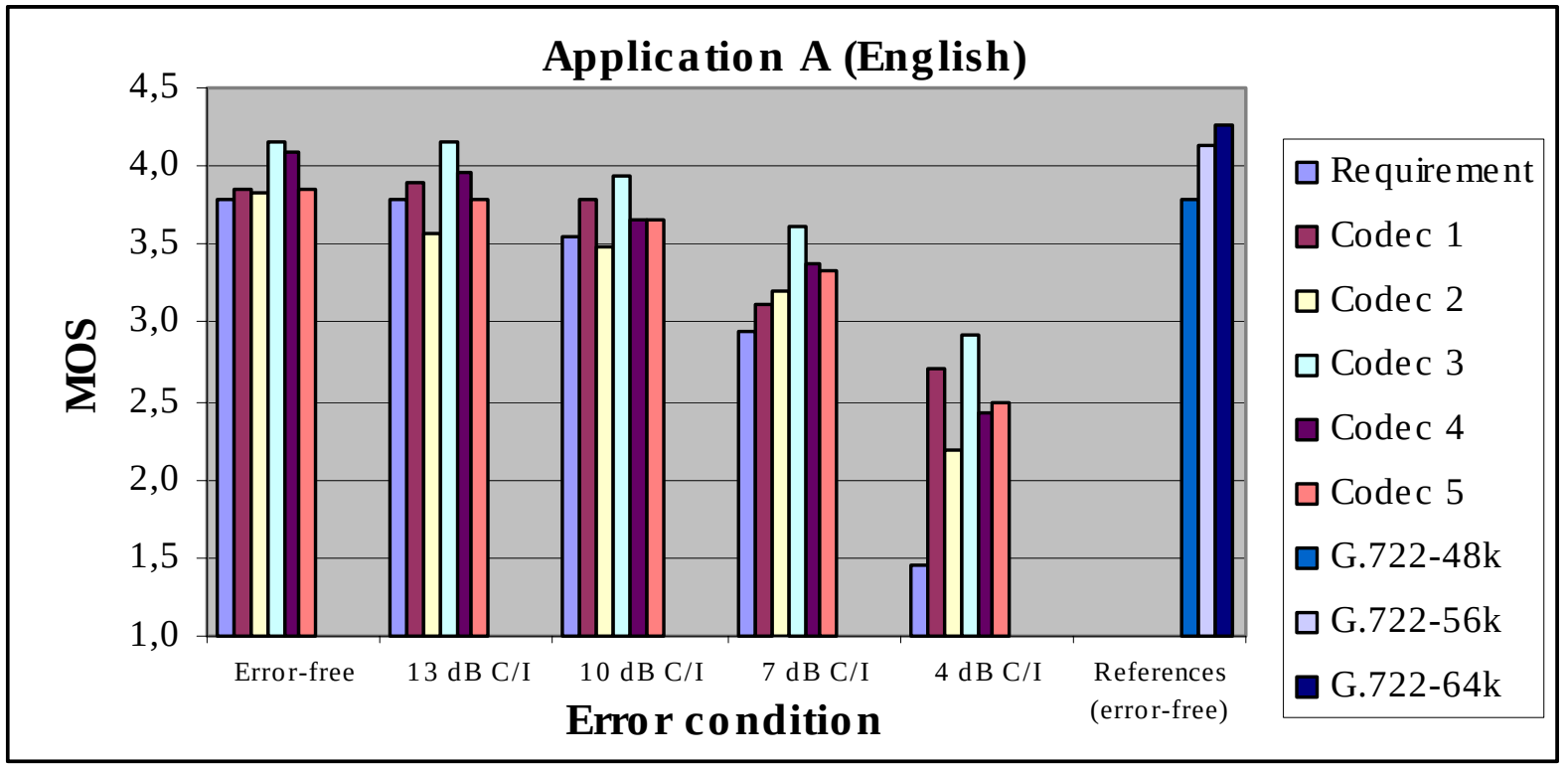
☞ Codec 3 is the best quality codec in all the FOMs.

Results of AMR-WB Selection Phase: Conclusions

- **Conclusions on the AMR-WB Codec Candidates:**
  - All candidate algorithms fulfil the mandatory design constraints.
  - All candidate algorithms meet the Rule 2 requirements for the amount of failures and severe failures.
    - Codec 3 is the only codec candidate that meets all the performance requirements in the selection tests. It has no failures at all.
  - The Figures of Merit show that Codec 3 has the best quality of the candidates.
    - Codec 3 is ranked as the best codec in all the Figures of Merit.
    - Quality ranking for the remaining codecs was not performed.

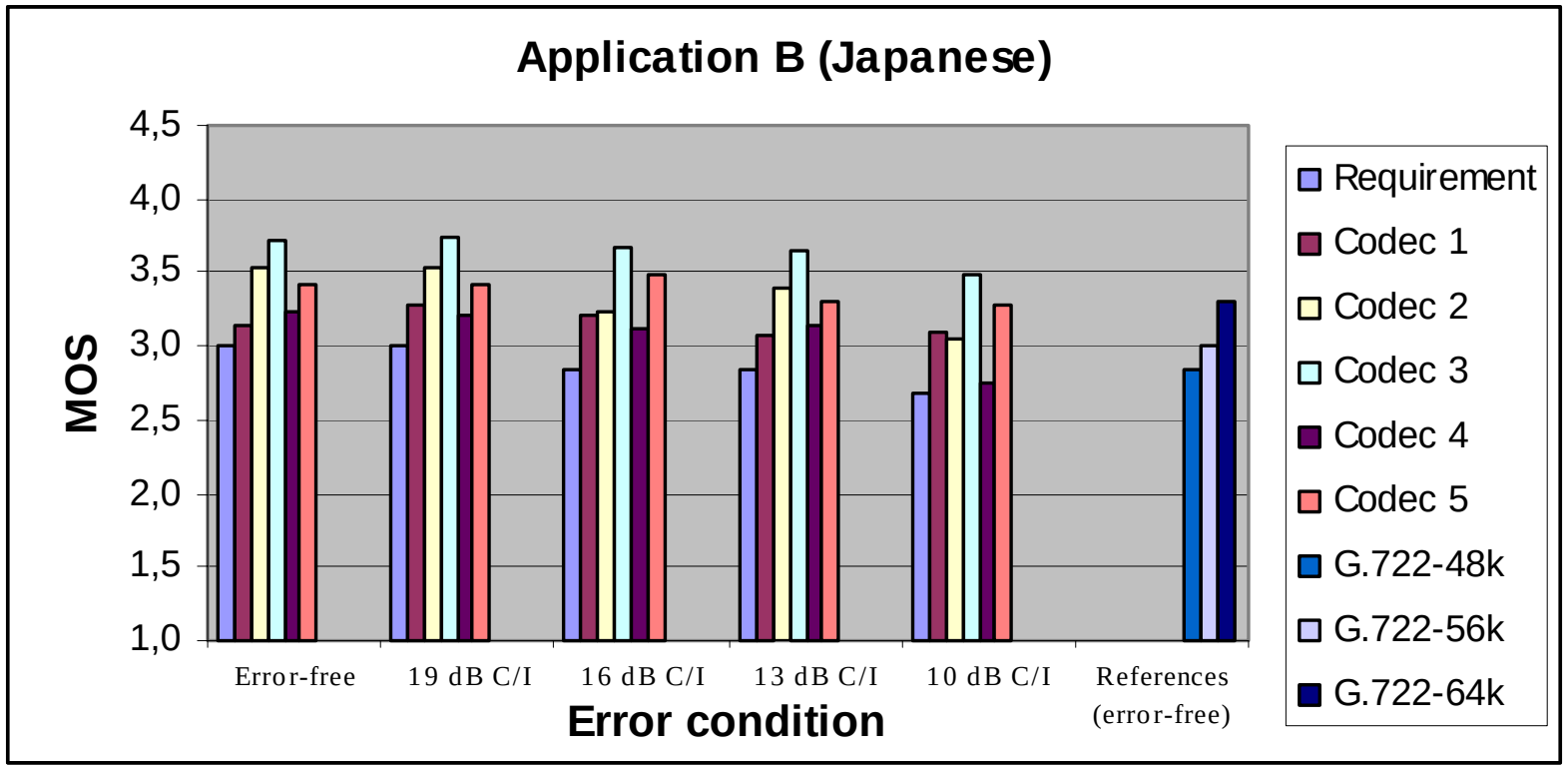
- **Recommendation:**
  - Candidate Codec 3 (Nokia) should be chosen as the AMR-WB codec

Results of AMR-WB Selection Phase: Examples of codec performance



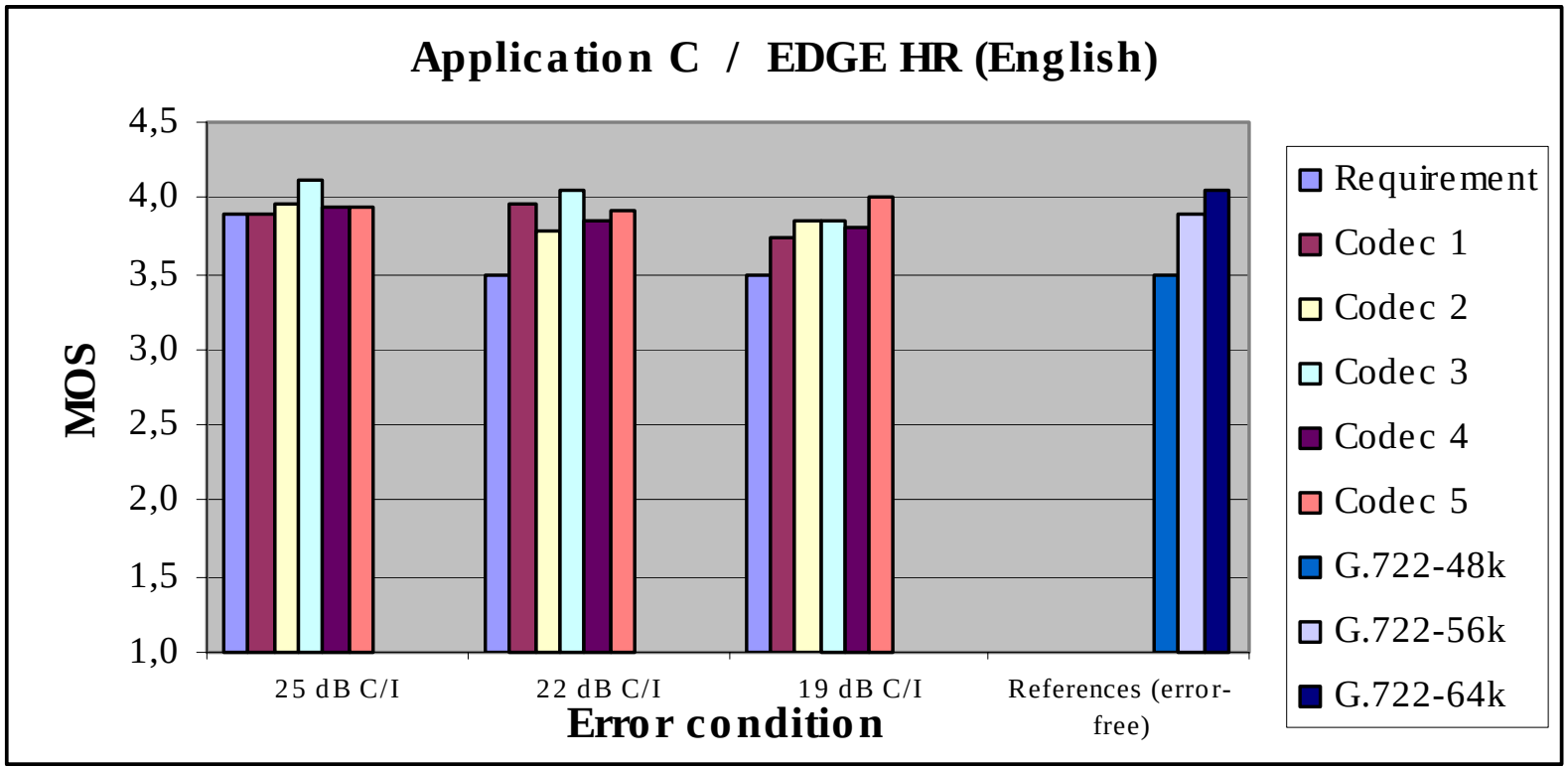
GSM FR channel with an additional constraint of 16 kbit/s A-ter sub-multiplexing (source codec < 14.4 kbit/s)

Results of AMR-WB Selection Phase: Examples of codec performance



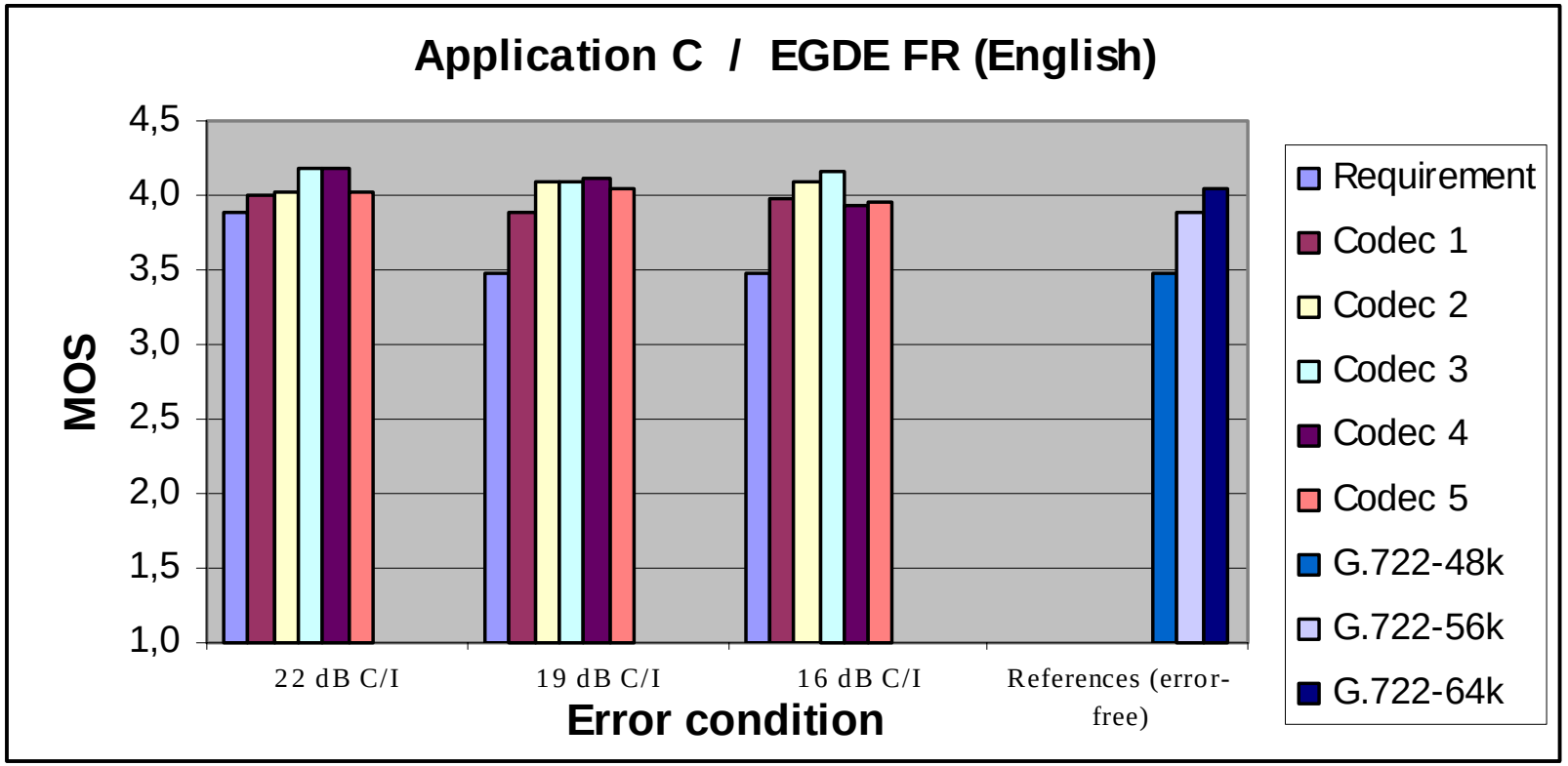
GSM FR channel

Results of AMR-WB Selection Phase: Examples of codec performance



Circuit Switched EDGE/GERAN 8-PSK Phase II HR channel

Results of AMR-WB Selection Phase: Examples of codec performance



Circuit Switched EDGE/GERAN 8-PSK Phase II FR channel

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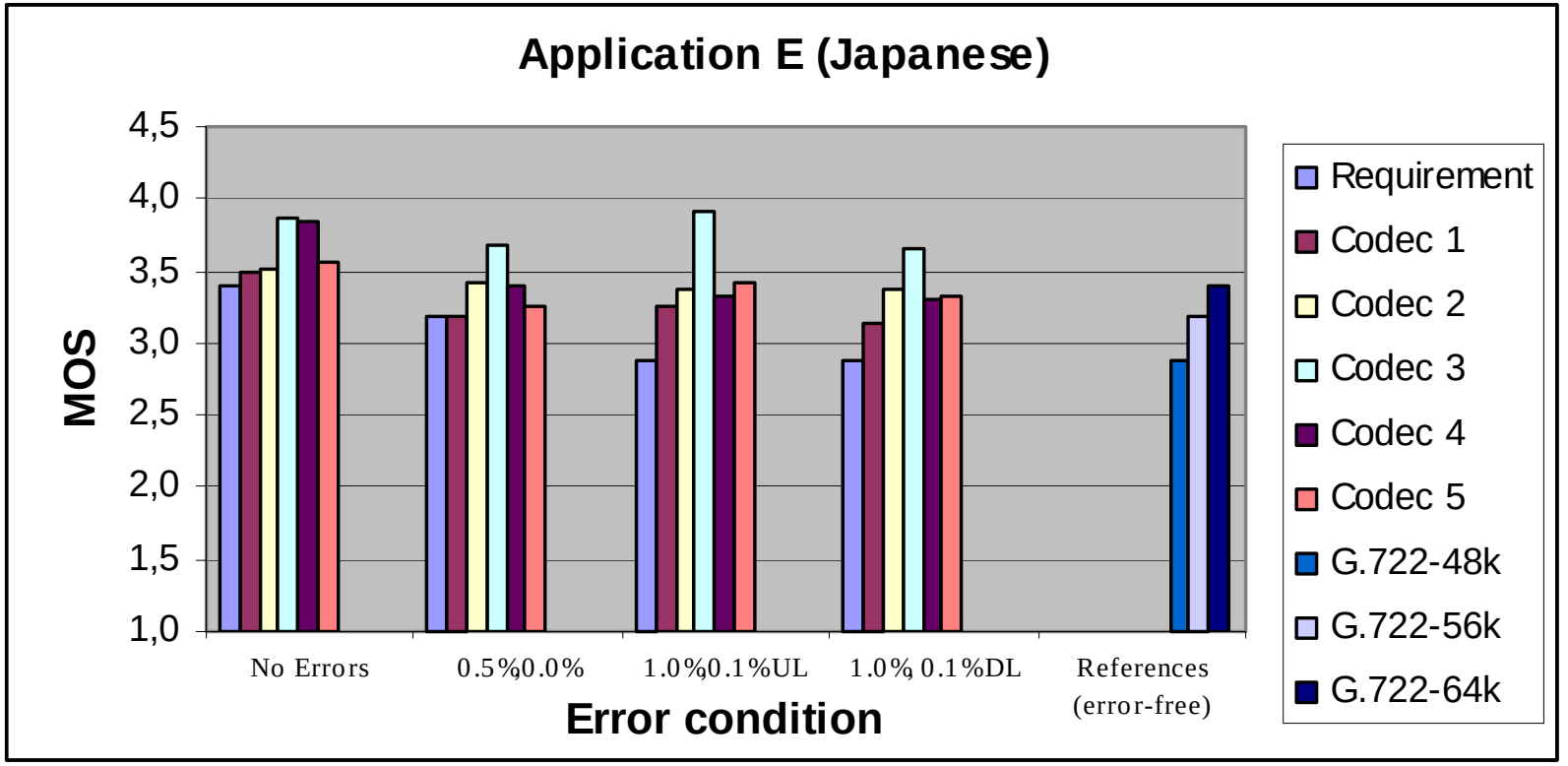
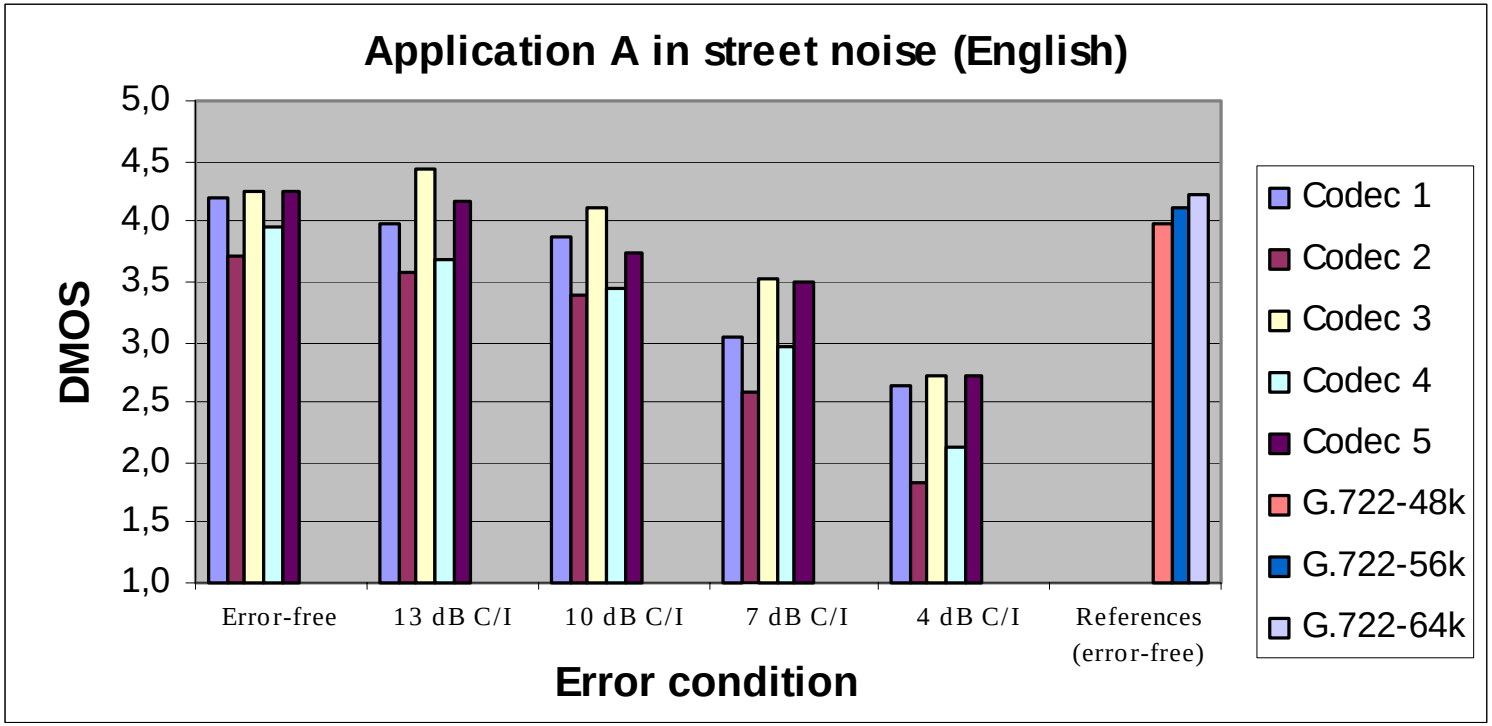


3G UTRAN WCDMA radio channel

Results of AMR-WB Selection Phase: Examples of codec performance



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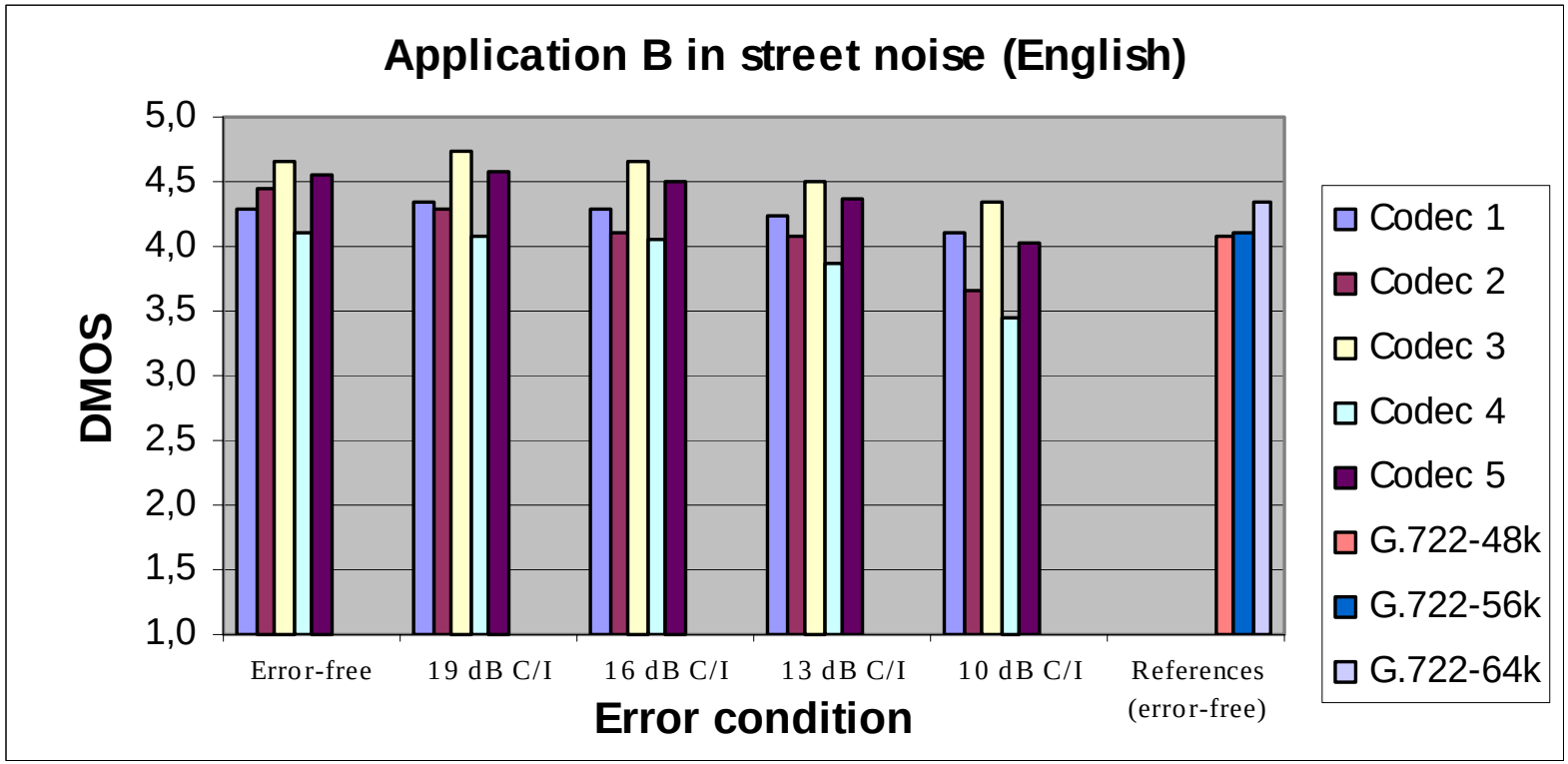
Results of AMR-WB Selection Phase: Examples of codec performance



GSM FR channel

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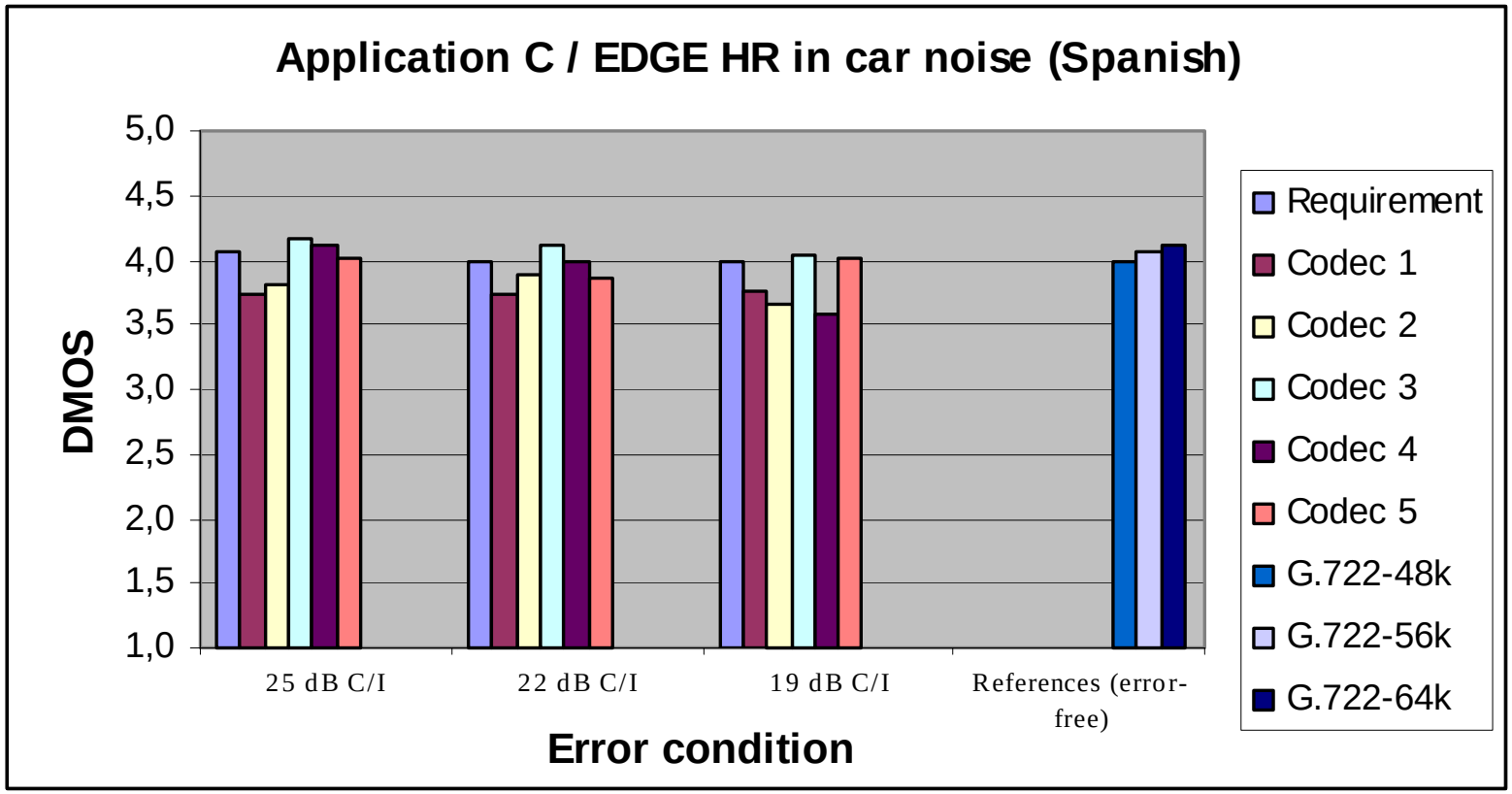

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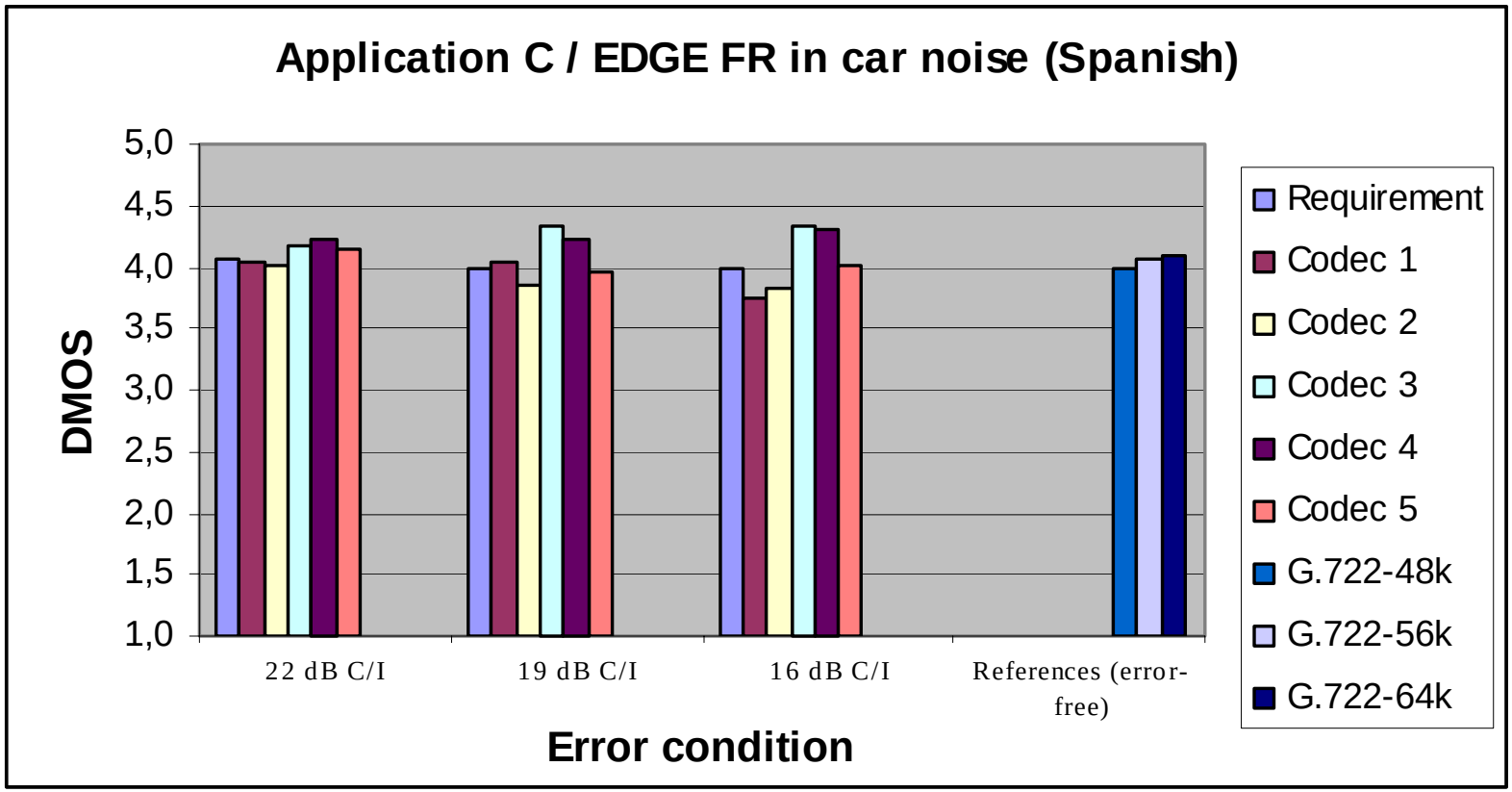

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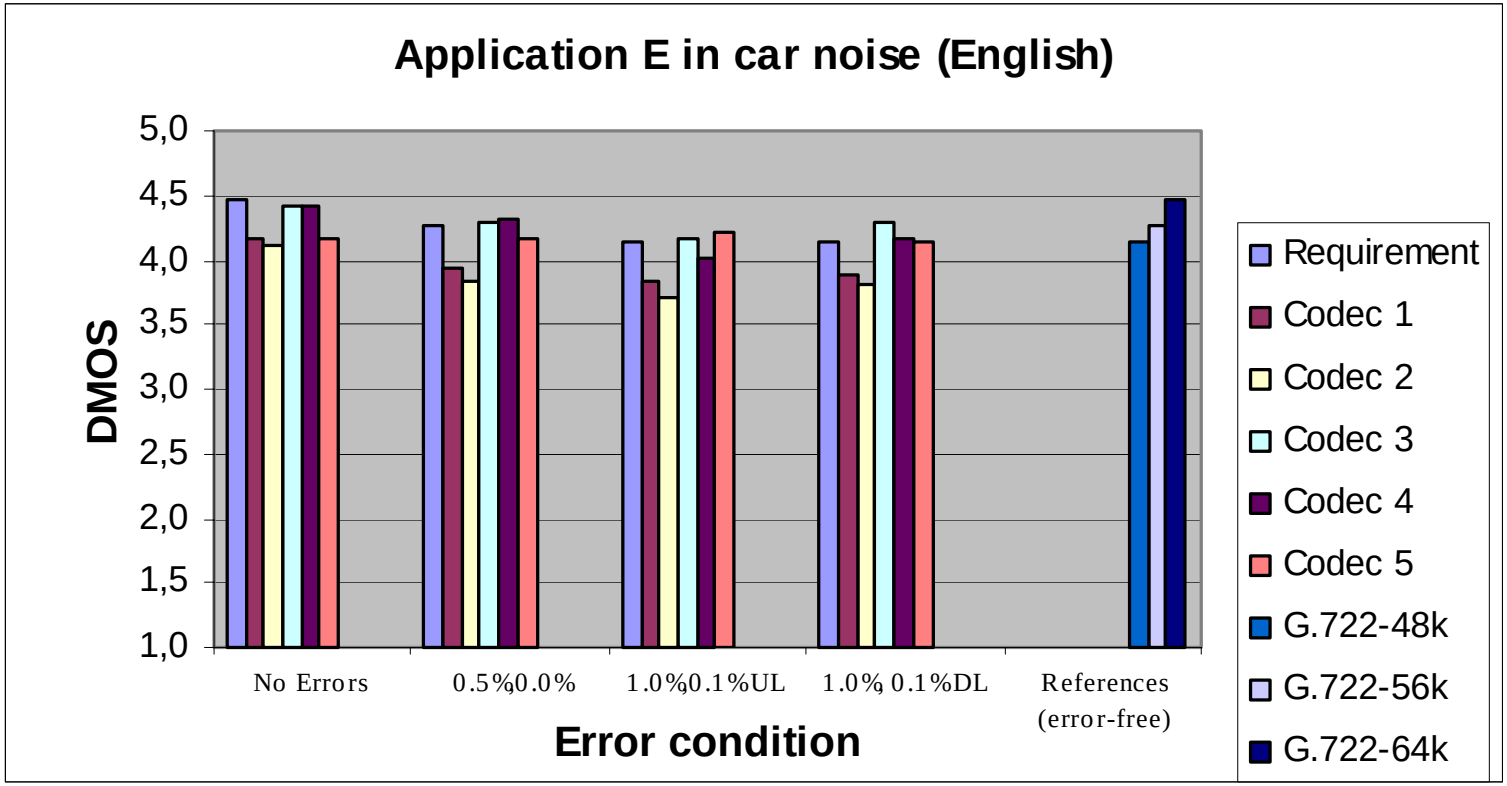


3G UTRAN WCDMA radio channel

Results of AMR-WB Selection Phase: Codec performance

- **Highlights of the performance of the best codec candidate (Codec 3):**

Applications A and B (GSM FR channel):

- For clean speech, the codec provides in Application A error-free quality exceeding G.722-48k and in Application B quality equal to G.722-56k.
- Under background noise, the codec provides in Application A error-free quality equal to G.722-48k and in Application B quality equal to G.722-56k.
- In both Applications A and B, at 13 dB C/I, quality is still equal to the quality of error-free G.722-48k, for both clean speech and in background noise. Below 13 dB C/I, smooth degradation (comparable to degradation for GSM EFR) is provided.

Applications C and E (GSM CS EDGE, 3G UTRAN):

- In the EDGE FR-channel, for clean speech and speech in background noise, at 22 dB C/I and above quality equal to error-free G.722-56k is provided. At 16 dB C/I, quality equal to error-free G.722-48k is still produced.
- In the EDGE HR-channel, for clean speech and speech in background noise, at 25 dB C/I and above quality equal to error-free G.722-56k is provided. At 19 dB C/I, quality equal to error-free G.722-48k is still produced.
- In the 3G UTRAN channel, for clean speech and speech in background noise, quality equal to G.722-64k is provided for error-free transmission. Under transmission errors at FER=1.0% / RBER=0.1%, quality equal to G722-48k is given. (The least significant bits are subjected to the residual error profile with the number of bits in this class 25% of the total bits per frame).

Results of AMR-WB Selection Phase: Codec algorithm (recommended for selection)

- Based on ACELP technology (as the AMR narrowband codec)
- Nine speech codecs with bit-rates: 6.60, 8.85, 12.65, 14.25, 15.85, 18.25, 19.85, 23.05 and 23.85 kbit/s (SID encoding with 1.75 kbit/s)
- Computational complexity about 35 wMOPS
- Codec explained in detail in:
  - "3G TS 26.171 AMR Wideband Speech Codec; General description v.0.0.1", 3GPP TSG-SA Tdoc SP-000556
  - "3G TS 26.173 AMR Wideband Speech Codec; C-source code v.0.0.1", 3GPP TSG-SA Tdoc SP-000557
  - "3G TS 26.190 AMR Wideband Speech Codec; Transcoding Functions v.0.0.3", 3GPP TSG-SA Tdoc SP-000558
  - "3G TS 26.191 AMR Wideband Speech Codec; Error concealment of erroneous or lost frames v.0.0.1", 3GPP TSG-SA Tdoc SP-000559
  - "3G TS 26.192 AMR Wideband Speech Codec; CN for AMR Speech Traffic Channels v.0.0.2", 3GPP TSG-SA Tdoc SP-000560
  - "3G TS 26.193 AMR Wideband Speech Codec; Source Controlled Rate operation v.0.0.1", 3GPP TSG-SA Tdoc SP-000561
  - "3G TS 26.194 AMR Wideband Speech Codec; VAD for AMR Speech Traffic Channels v.0.0.2", 3GPP TSG-SA Tdoc Tdoc SP-000562
  - "3G TS 26.201 AMR Wideband Speech Codec; Speech Codec Frame Structure v.0.0.1", 3GPP TSG-SA Tdoc Tdoc SP-000563
  - 3G TS 26.202 AMR-WB speech codec; interface to Iu and Uu v.0.0.1", 3GPP TSG-SA Tdoc SP-000564

Communication with ITU-T on wideband codec standardisation

- As reported earlier to TSG-SA, wideband codec standardisation is carried out parallel in ITU-T Study Group 16 and in S4 with rather similar quality targets and bit-rates. Some harmonisation of requirements and design constraints done.
- ITU-T SG 16 has proposed a further possibility for harmonisation by offering to include the AMR-WB codec (to be chosen at TSG-SA#10 meeting) as one candidate codec in the ITU-T wideband codec selection process. The ITU-T selection process will be carried out sometime during early 2001.
- To enable ITU-T to analyse the performance of the best AMR-WB codec candidate, some AMR-WB Selection Test results were sent for information to ITU-T on request at their November 2000 meeting by Nokia (endorsed by TSG-S4). From the response of ITU-T, it is understood by S4 that the AMR-WB codec algorithm to be selected by 3GPP will be allowed as a candidate codec in the ITU-T selection process.
- S4 has agreed with the principle that the selected AMR-WB codec should participate into the ITU-T selection process. This could lead into one harmonised wideband codec for both 3GPP and ITU-T.

Release 4: AMR TFO

- **TFO Specification (TS 28.062) now almost finalized (more than 90% stable). Version 1.0.0 presented for information in Tdoc SP-000568**
- **Clarifications and clean-up required in a couple of sections (#10 & Annex C)**
- **Key Decisions:**
  - Agreement on AMR TFO decision algorithm to determine whether the TFO configuration is acceptable or not.
  - Agreement on the algorithm to compute the optimized Active Codec Set.
  - Reference C-code of TFO decision algorithm included in the specification.
  - AMR TFO configuration guidelines (for operators) included in the specification.
  - GSM-3G TFO (or TrFO) requires that the 3G UE supports the GSM version of the AMR codec (FR_AMR Codec Type). [This Codec Type has been introduced in 3G with codec mode change rate restricted to 40 ms as in GSM.]
- **TrFO and TFO operations harmonised, i.e., TFO decision and optimisation algorithms adopted in TrFO.**
- **TFO can be established if TrFO (e.g., OOBTC) is not supported by networks.**

Release 4: Transparent End-to-End Packet Switched Mobile Streaming Applications

- Objectives: standardise the components of a mobile streaming service, including especially multimedia codecs, but also relating streaming and media transport protocols.
- Two phases: The first phase (Rel-4) includes a complete basic streaming service, and is referred to as basic streaming. The second phase (Rel-5) builds on the first phase and includes additional compatible functionality. The present S4 work on streaming is limited to downlink streaming (with a terminal as a streaming client).
- Release 4 will at least include support for streaming session control protocols (based on a subset of RTSP), transport protocols (based on RTP/UDP), presentation control, and support for basic media types. Default codes and RTP payload formats will be defined for speech, video, audio, still images, bitmap and vector graphics, and text.
- Working assumption: minimise the number of different codecs (for each media type) that the terminal needs to support for different services. Codec choices for PSS are made taking into consideration the codec choices already made for defined services (speech, CS multimedia telephony 3G-324M) as well as the on-going work on PS conversational service.
- Video coding: ITU-T H.263 Baseline Profile (Profile 0) Level 10 is the mandatory codec. ITU-T H.263 Profile 3 level 10, and ISO MPEG-4 Visual Simple Profile Level 0 are optional codecs.
- Speech coding: the working assumption is the AMR (Adaptive Multi-Rate) codec.
- Audio coding: the working assumption is to support MPEG-4 AAC codec.
- ISO/IEC JPEG is the working assumption for static images, and GIF for bitmaps.
- Draft specifications presented for information in Tdocs SP-000565 and SP-000566.

Release 5: Multimedia Codecs and Protocols for Conversational Packet-Switched Services

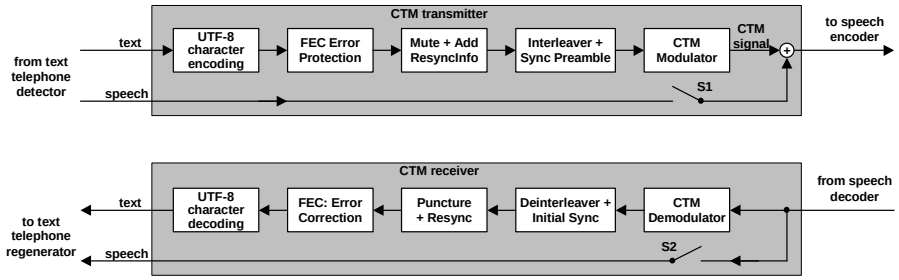
- AMR narrowband codec has been chosen as the mandatory speech codec. The AMR Wideband (AMR-WB) codec will be an optional speech codec.
- For video coding, ITU-T H.263 Baseline Profile (Profile 0) Level 10 is the mandatory codec. ITU-T H.263 Profile 3 level 10, and ISO MPEG-4 Visual Simple Profile Level 0 are optional codecs. (Codecs are the same as for PSS)
- Draft specification of Default Codecs is brought for information in Tdoc SP-000567

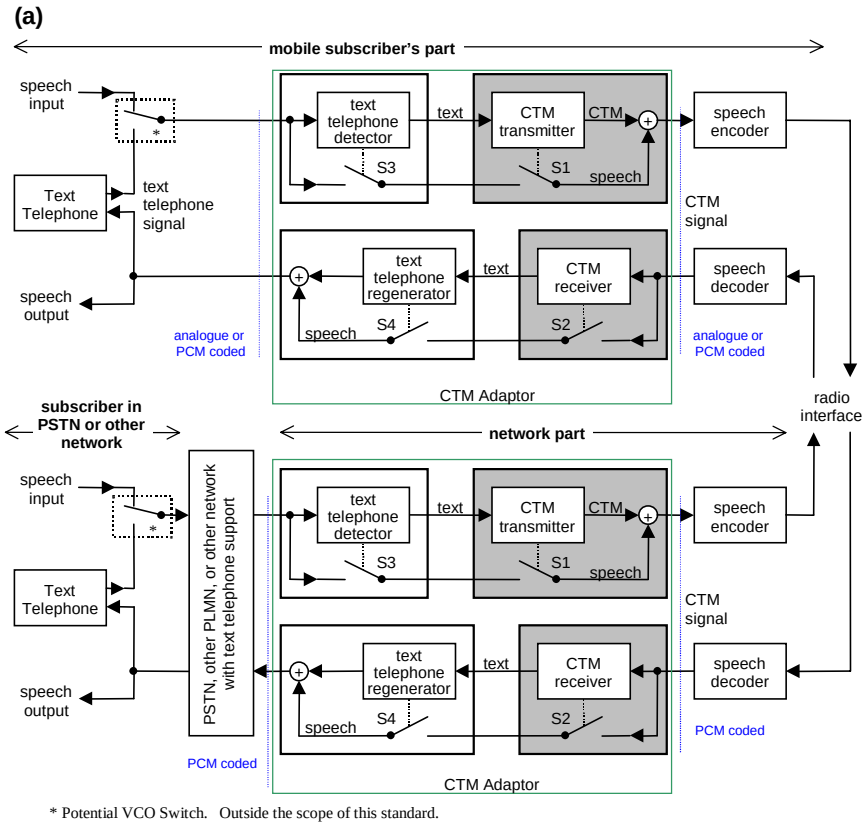
Release 5: Global Text Telephony; Cellular Text Telephone Modem (CTM)

- Text Telephone devices (TTY) perform well in fixed networks. However, in digital cellular systems the modulation developed for fixed network may not provide satisfactory character error rate. This is because of 1) transmission errors and 2) compression and error concealment are optimised for speech-like signals.
- CTM enables traditional TTY equipments to be used also in mobile networks. CTM transforms the TTY characters into a signal that can be transmitted robustly via the speech codec and the radio transmission path.
- CTM adaptor is used in front of speech encoder and after speech decoder
- CTM adaptor consists of text telephone detector/regenerator and CTM transmitter/receiver
- CTM transmitter/receiver consists of CTM modulator/demodulator plus additional functions (e.g. error protection, interleaving)
- CTM transmitter is defined in bit-exact ANSI-C code. For CTM receiver, an example solution is given (informative). The minimum performance requirements cover the overall operation of CTM adaptors.
- Specifications
  - FOR APPROVAL: General description (TS 26.226) in Tdoc SP-000569
  - FOR APPROVAL: Transmitter Bit-exact C-code (TS 26.230) in Tdoc SP-000570
  - FOR INFORMATION: Minimum Performance Specification (TS 26.231) in Tdoc SP-000571 (test sequences in Tdoc SP-000582)
- These specifications are based on T1P1 CTM specifications. US requlatory issue: FCC requirement to use TTY devices for emergency (911) calls

Release 5: Global Text Telephony; Cellular Text Telephone Modem (CTM)

- Overall text telephony architecture
  (specification covers the gray shaded areas)





* Potential VCO Switch. Outside the scope of this standard.

- Note: It may be needed to specify the location where the CTM functionality is located in GSM over the A interface, i.e., whether it is located in the BSS or in the NSS. Otherwise, in a situation when other vendor's BSS is connected to other vendor's NSS, the operator may not have the CTM function in its network. (S2 issue?)

2) Decision Points

Decision points

- **TSG-SA#10 is requested to:**
  - **Approve that Nokia AMR-WB candidate codec is chosen** as the AMR-WB codec (as recommended by S4 in Tdoc SP-000555).
  - **Approve the results of the AMR-WB Selection Phase** of testing (as described in Tdoc SP-000555) to authorise ETSI to pay the involved laboratories.
  - **Approve two Cellular Text Telephone Modem (CTM) specifications**: TS 26.226 "General Description" (Tdoc SP-000569) and TS 26.230 "Transmitter Bit Exact C-code" (Tdoc SP-000570).
  - **Approve the results of the 3G AMR narrowband Characterisation Phase** of testing (as described in Tdoc SP-000580) to authorise ETSI to pay the involved laboratories
  - **Approve CRs** in Tdocs:
    - SP-000572, SP-000573 (test sequence files in SP-000581), SP-000574, SP-000575, SP-000576, SP-000577, SP-000578, and SP-000579

End of presentation