Technical Specification Group Services and System Aspects **TSGS#2(99)057**

Meeting #2, Fort Lauderdale, 2-4 March 1999

Source: **TSG-S4 (Codec Working Group) Chairman Elect**
TSG-S4 (Codec Working Group) Convenor

Title: **Status Report at TSG-SA#2**

Document for: **Information and Decision**

Agenda Item: **9.4**

TSG-S4 Codec Working Group Status Report

Executive Summary

TSG-SA WG4 (also called in this report TSG-S4 or Codec Working Group) held two meetings since TSG-SA#1. The first 'one-day' meeting was held on January 21-22. It was co-located with SMG11#9. The agenda essentially consisted in reviewing the ongoing 3G codec activities in the 3GPP partners and in the definition of the working group Terms of Reference. A preliminary list of work items was also established. The final Work Items Descriptions were prepared and discussed during the second meeting held on February 24-26. The results of the evaluation of mandatory speech codec candidates were also reviewed during TSG-S4#2.

A presentation of the current work relevant for 3GPP was given by ARIB (CODEC WG) and ETSI (SMG11) during TSG-S4#1:

ARIB has been working on the selection of a mandatory speech codec among 5 pre-selected candidates: GSM AMR, GSM EFR (also included in GSM AMR), IS-127 EVRC, G.729 Annex E and MPEG-4. The results, initially expected by late February 1999 were reviewed during TSG-S4#2. ARIB also plans to test candidate codecs for other (non-mandatory) speech/audio services (audio broadcast like) by March 1999. Finally, ARIB has scheduled to test candidate video multimedia codecs for service over circuit-switched IMT-2000 networks. The corresponding testing is planned for March 1999 as well.

In SMG11, the 3G work targeted the definition of a mandatory default speech codec for UMTS, the working assumption being the AMR speech codec. Preliminary results from simulations of AMR over a W-CDMA channel have been presented in SMG11. The support of AMR was subject to a later confirmation. SMG11 has also actively considered the relevant issues and arguments concerning the selection of the optimum speech codec for UMTS. The work of the joint ETSI SMG1/SMG4/SMG12 Multimedia Adhoc Group was also noted.

The Terms of Reference for the Codec Working Group were reviewed and expanded. The ToRs include the development and maintenance of the relevant 3G specifications for speech, audio, video, and multimedia codecs; guidance concerning the required QoS parameters, quality evaluation, end-to-end performances, and interoperability aspects from the codec point of view.

Five work items (WI) were approved by TSG-S4 and are submitted to TSG-SA for approval:

WI S4-1: Mandatory Speech Codec for Narrowband Telephony service
WI S4-2: Codec for Low bit rate Multimedia Telephony service
WI S4-3: QoS for Speech and Multimedia Codec
WI S4-5: Codec(s) for Wideband Telephony services
WI S4-6: Tandem free aspects for 3G and between 3G and 2G systems

Other items were also discussed (Very low bit rate speech codec, High Quality speech codec for broadcast audio services, 3G terminal characteristics) but the final approval or rejection of these proposals was delayed to the next TSG-S4 meeting.

Most work items are targeting December 99 (Release 99) for the approval of their deliverables (Technical Specifications or Technical Reports). For the first two work items, TSG-S4 expects to approve the baseline specifications by April 1999. Permanent rapporteurs and supporting members were also identified for all work items. TSG-S4 identified a number of items requiring close collaboration with other TSG working groups: essentially with TSG-RAN WG1 for the definition of the radio bearer capabilities associated with the mandatory speech codec (WI S4-1), and with TSG-SA WG1, WG2 and TSG-CN for the definition of the multimedia service characteristics (WI S4-2).

The results of the evaluation of mandatory speech codec candidates as specified by ARIB were presented and discussed during TSG-S4#2. Results from test performed by COMSAT (sponsored by Ericsson and Nokia), NTT DoCoMo and NEC were available. Some of these results provided a direct comparison of the performances of the candidate codecs pre-selected by ARIB.

The main conclusions of the test results review are:

- The GSM EFR (also highest mode of GSM AMR) provides the best performances of all pre-selected codecs, often exceeding the performance level set by ARIB (ARIB defined a set of requirements for which the G.726 ADPCM was taken as the reference);

- The internal codec modes of AMR always provide equivalent or better performances than the other candidate speech codecs with comparable source rates. For example the AMR codec modes at 7.95 kbit/s (and 7.4 kbit/s) were found equivalent or better than the IS-127 EVRC (8.55 kbit/s mode) or the G.729 (8 kbit/s);

- All results were found in line with the subjective tests already performed on the candidate codecs by other standardisation committees (ETSI, T1, TIA, JTC).

As a result, considering that:

- The GSM AMR provides the toll quality expected from a 3G default codec and the flexibility to trade quality and capacity without major performance impact for a wide range of operational conditions;

- The GSM AMR, recently approved by SMG, includes the GSM EFR and the IS-136 EFR providing a high level of compatibility with existing 2G networks which is essential for 3G networks based on an evolution of the GSM Core Network as defined by 3GPP;

- The GSM AMR specifications and C-Code are publicly available which is essential to meet the target dates for the availability of the Baseline specifications (April 1999) and the final specifications (December 1999);

- The deadline for the edition of the Baseline specifications (Transcoding functions) requires to select the mandatory speech codec as soon as possible

TSG-S4 recommends that TSG-SA approves the selection of the GSM AMR for the mandatory and default speech codec to be supported by all Terminals and Network Equipment compliant with the 3GPP specifications (operating in FDD or TDD mode).

TSG-S4 received one candidature for the Chairmanship position and two for Vice-Chairman. Consequently, the candidates were nominated to their preferred position without vote, in line with the 3GPP working procedure. The positions will be assumed by:

TSG-S4 Chairman:	Alain Ohana: GSM North America, T1
TSG-S4 Vice-Chairman:	Kari Jarvinen: Nokia, ETSI
TSG-S4 Vice-Chairman:	Hiroyuki Yamaguchi, NTT DoCoMo, ARIB

1. Introduction

The first meeting of 3GPP TSG-SA WG4 (Codec Working Group=TSG-S4) was held on January 21-22, 1999. The meeting was co-located with SMG11#9 and hosted by Nokia in Helsinki. The relevant 3G work in the partner organisations was discussed during that meeting (with presentations from ARIB CODEC WG and ETSI SMG11). The Codec Working Group Terms of Reference (ToR) were also discussed and approved during the meeting.

The second meeting took place on February 24-26 in Stockholm, hosted by Ericsson. The Work Item Descriptions were reviewed and 5 were approved for submission to TSG-SA#2. The results of the evaluation of mandatory speech codec candidates were also reviewed during this meeting. Based on this review, TSG-S4 agreed to recommend that TSG-SA approves the selection of GSM AMR as the Mandatory Speech codec to be supported by all 3G Terminals and Network Equipment.

Meetings held:

TSG-S4#1: January 21-22 in Helsinki, Finland	hosted by Nokia
TSG-S4#1: February 24-26 in Stockholm, Sweden	hosted by Ericsson

Next Meetings dates:

TSG-S4#3: March 24-26	hosted by NTT DoCoMo
TSG-S4#4: April 21-23	Possible host identified
TSG-S4#5: June 14-16	host required
TSG-S4#6: September 8-10	host required
TSG-S4#7: October 20-22	host required
TSG-S4#8: December 1-3	host required

2. Terms of reference for TSG-S4

The responsibilities of TSG-SA WG4 (Codec Working Group) were defined as follows:

- Development and maintenance of specifications for speech, audio, video, and multimedia codecs, as required to enable services specified for 3G terminals and systems.

- Guidance to other 3GPP groups concerning required QoS parameters and other system implications, including channel coding requirements, imposed by different multimedia codecs in both circuit-switched and packet-switched environments.

- Speech, audio, video, and multimedia quality evaluation (including new evaluation methods, testing, verification, characterisation, selection criteria).

- End-to-end performance, including terminal characteristics, of speech, audio, video, and multimedia services.

- Interoperability aspects with existing mobile and fixed networks from the codecs point of view.

In conducting its work, the Codec Working Group will strive to specify best possible technical solutions at the same time as considering the planned global use of the codecs and the flexibility needs imposed by different regional requirements and preferences, including differences in quality/capacity trade-offs. It was understood that, to avoid overlap, the Terms of Reference could be refined in future meetings when the division of responsibilities between the different TSG WGs would become clearer.

Decision No1: TSG-SA is requested to review and approve the proposed Terms of Reference for the Codec Working Group (TSG-S4) included in Tdoc SP-99059

3. Review of the on-going work in the Partner Organisations

ETSI SMG11 and ARIB Codec WG presented their current and planned activities in specifying codecs for 3G systems during TSG-S4#1. No complete specifications were felt existing at this moment of time to be used as baseline documents for 3GPP.

3.1 ARIB CODEC WG

ARIB Acoustic Group (ACG) has been working on the selection of a Mandatory Speech Codec for the Narrow band Telephony Service for IMT-2000 among 5 pre-selected candidate codecs: G.729 Annex E, MPEG-4 NB CELP, GSM EFR, GSM AMR and EVRC. Subjective tests were to be carried out according to an agreed test plan (by each codec proponent) and the results had to be submitted to ARIB Codec WG by February 26th, 1999. The test plan contains five experiments: 1) Input level and tandeming, 2) Background noise, 3) Channel errors, 4) Talker dependency, and 5) Music on hold. ARIB Acoustic Group is also working on the evaluation of other (non-mandatory) codecs for optional or recommended services (High quality audio broadcasting services providing AM or FM listening quality capabilities or Hi-Fi CD like for Music broadcasting). Audition test results for these codecs will be available in March.

ARIB Video and Multimedia Group (VMG) has also been evaluating candidate codecs for the required video multimedia specifications to be included into IMT-2000. The current activity targets the support of bi-directional circuit-switched services over IMT-2000 networks. Eleven companies are participating in the evaluation of several proposals based on either MPEG-4 Simple Profile or H.263 Ver. 2 video coding. The testing covers performance of VM codecs over mobile channels at the average BER=10^{-3} and 10^{-4}. The tests are also designed to clarify the relation between the source and channel codec parameters, the channel QoS parameters of the available bearer and the actual quality of the service provided. These tests should be completed by March 1999.

ARIB plans to stop all codecs activity after the completion of the on-going evaluation tests. At that point, ARIB plans to transfer the available specifications or test results to 3GPP. (except for other aspects not related to 3GPP, e.g., satellite services).

3.2 ETSI SMG11

UMTS speech coding has been discussed in SMG11 since 1997, but the main focus of the work as well as most of the resources were focusing on the on-going GSM activities and especially the selection of the AMR speech codec. However, SMG11 has always targeted the end of 1999 for the development and approval of the UMTS speech codec specifications.

SMG11 believed that, given the flexibility of the AMR codec, the high quality achievable and the capability to trade-off between quality and capacity, the AMR codec would likely be the best candidate for the default UMTS speech codec. The application and suitability of the AMR codec to the W-CDMA and TD-CDMA radio interfaces has also been discussed. Preliminary results from simulations of AMR codec modes over a W-CDMA channel were reviewed. However, the selection of AMR was approved by TC SMG subject to a later confirmation. SMG11 has been actively considering the relevant issues and arguments concerning the selection of the optimum UMTS speech codec until the transfer of the corresponding activities to 3GPP and the Codec Working Group.

SMG11 has been working under the following assumptions:

- A mandatory default speech codec is required for UMTS; the working assumption is that it will be the AMR codec.
- This single source codec will be adopted for both FDD and TDD modes.
- The source codec will be transmitted and controlled in different ways in FDD and TDD.
- It is essential that speech is transmitted as efficiently as possible on the UMTS air-interface and, as a minimum, with at least the same quality and spectral efficiency as in second generation systems.

SMG11 has also considered basic principles regarding the use of unequal error protection as well as

DTX or variable rate operation for the default speech codec. No decisions have been taken in this area, but the corresponding views have been communicated to SMG2:

Different levels of error protection for different classes of coded bits (unequal error protection) are likely required for spectrum efficient transmission of speech. There would typically be two main classes of bits. The exact requirement for BER for each class of bits is dependent on the particular codec, but a good design criterion is to require a BER of 10^{-4} for Class1 (protected) and a BER of 10^{-3} for Class2 bits (unprotected). The Frame Error Rate required for producing high speech quality with no quality degradation compared to error free speech is typically lower than 0.5%.

Variable rate or DTX operation has the potential to provide higher capacity and should be supported. In absence of voice activity, the expected DTX comfort noise generation bit rate is below 1 kbit/s, but values very close to 1 kbit/s are possible. An exact periodicity for this information is not necessary, but a minimum update rate needs to be guaranteed. Depending on the selected scheme the minimum update rate would likely be in the 200-500 ms range.

TSG-S4#1 also noted that SMG1, SMG4 & SMG12 have debated Multimedia service issues and targeted the GSM Release 99 in two meetings of the Joint ETSI SMG1/SMG4/SMG12 Multimedia Adhoc Group. The final report from the group suggested that both circuit switched and packet switched multimedia services (H.324M and H.323) should be supported by UMTS Release 99, a multimedia service specific call control signalling should be developed and a specific multimedia messaging service should be specified.

4. TSG-S4 Work Items (WI Descriptions included in SP-99060)

Five work items were approved by TSG-S4 and are presented to TSG-SA#2 for approval (Full Descriptions included in SP-99060)

WI S4-1: Mandatory Speech Codec for Narrowband Telephony Service

Technical Scope:
Evaluation of possible candidate speech codecs as defined by ARIB
Selection of a default 3G speech codec
Elaboration of specifications for the selected codec
Collaboration with TSG-RAN-WG1 for the evaluation and definition of the characteristics of the associated radio bearer characteristics

Intended Output: Codec selection, Technical Specifications, Codec Characterisation

Proposed Deliverables Schedule:
Baseline specification by April 99, Final Specifications (TS) and Reports (TR) approval by December 99

Rapporteur: E. Ekudden (Ericsson, ETSI)

WI S4-2: Codec for Low bit rate Multimedia Telephony service

Technical Scope:
Specification of one low bit rate Multimedia video telephony service based on H.324M for Circuit-Switched services, H.323 for Packet services and other relevant standards
Liaison with other 3GPP groups regarding system aspects of Multimedia services

Intended Output: TSs and TRs

Schedule: Baseline TS by April 99 and final TSs and TRs by December 99

Rapporteur: B. Aronson (Toshiba, ARIB)

WI S4-3: QoS for speech and multimedia codec

Technical Scope:
Definition of requirements on quality, bit rates, Bit Error Rates, Frame Erasure Rate, Delay etc for speech and multimedia services

Intended Output:	TSs and TRs
Schedule:	Final TSs and TRs by December 99
Rapporteur:	H. Honko (Nokia, ETSI)

WI S4-5: Codec for Wideband Telephony Services

Technical Scope:
Selection and specification of Wideband speech codec(s) based on the results of the corresponding on-going activities in the 3GPP partners

Intended Output:	TSs and TRs
Schedule:	Codec Requirements approved by October 1999, codec selection by April 2000 and specifications approval tbd
Rapporteur:	Imre Varga (Siemens, ETSI)

WI S4-6: Tandem free aspects for 3G and between 3G and 2G systems

Technical Scope:
Produce specifications for the Tandem Free Operation of Speech Codecs within 3G systems, and between 3G and 2G systems

Intended Output:	TSs and TRs
Schedule:	Final TSs and TRs by December 99
Rapporteur:	W. Navarro (Nortel Networks, ETSI)

Decision No2: TSG-SA is requested to review and approve the 5 proposed Work Items under the responsibility of TSG-S4 which descriptions are included in Tdoc SP-99060

TSG-S4 discussed the possibility to specify other type of optional speech codecs:

- A very low bit rate speech codec (<4 kbit/s) for enhanced system capacity performances
- High Quality Audio codec(s) for broadcasting or listening services with equivalent quality performances to the AM or FM broadcast services or Hi Fi CD type of music listening service. These codecs could be standardised as ‘preferred’ or ‘recommended’ codecs for Terminals supporting the corresponding services.

TSG-S4 also considered the necessity to define 3G Terminals characteristics for Acoustic, Speech, Video and Multimedia services. However, these last activities did not received enough support from the TSG-S4 members either because of a lack of definition or specification for the associated services (Audio Broadcast for example), or lack of performance objectives for the very low bit rate codec, or simply because of the limited available resources. It was also recognised that 3G Terminals characteristics could be guided by regional standards and consequently could only be specified by each 3GPP partner. A Liaison Statement was sent to TSG-T1 requiring guidance on this issue.

Finally, TSG-S4 identified a number of instances where a close collaboration with other TSG working groups would be necessary, especially for WI S4-1 (Mandatory Speech Codec) and WI S4-2 (low bit rate for Multimedia Telephony service). The characteristics of the radio bearers associated with the mandatory speech codec must be evaluated with TSG-RAN WG1 in order to define the suitability of the existing bearers and the potential system benefits of implementing a dedicated bearer with or without Unequal Error Protection (Unequal Error Detection and/or Unequal Error Correction). The characteristics and QoS associated with the Multimedia services will certainly need to be reviewed with TSG-SA WG1 and TSG-SA WG2. It is also expected that once a video and speech codec have been selected for the Multimedia services, specific call set up procedures enhancements will be required compared to the procedures defined in the existing standards. These evolutions

would have to be reviewed with TSG-CN.

5. Evaluation of Mandatory Speech Codec Candidates and Decision

The TSG-S4#2 meeting date was set to correspond with the delivery date of the results of the evaluation of candidate mandatory speech codecs conducted by ARIB. As presented above, ARIB had defined basic requirements for the mandatory speech codec based on the performances of the wireline G.726 ADPCM speech codec, also inspired by the corresponding requirements set by ITU for IMT2000 networks. The performances requirements were:

> Better or equivalent to the G.726 in error free channels with or without background noise
> Less than 0.2 MOS degradation compared to G.726 error free under channel errors with BER of 10^{-3}
> Less than 0.5 MOS degradation compared to G.726 error free in tandeming and under channel errors with BER of 10^{-3}

Dedicated Error Patterns representative of W-CDMA channel errors were specially developed by ARIB for the purpose of this evaluation. ARIB pre-selected 5 speech codecs: the GSM EFR, the GSM AMR (which also includes the GSM EFR and the IS-136 EFR also known as IS-641), the IS-127 EVRC, the G.729 Annex E and the MPEG-4. As required by ARIB, these codecs were all already supported by one standardisation committee (either ETSI, TIA, ITU or ISO) and sponsored by at least one organisation ready to contribute to the execution of the subjective listening tests required for the comparative evaluation of the candidates. The candidate proponents were required to performed a number of subjective listening tests following a test plan prepared in the past year by ARIB. The results were expected for February 23, 1999, the day before the TSG-S4#2 meeting.

The following sets of test results were presented and reviewed by TSG-S4#2:

- Tests performed by COMSAT, USA (sponsored by Ericsson and Nokia) in English language including the GSM AMR and EFR, the IS-127 EVRC and the G.729

- Tests performed by NTT DoCoMo in Japanese language including GSM AMR and EFR, the IS-127 EVRC and the G.729;

- Tests performed by NEC and Matsuchita Communications Industrials Ltd. in Japanese language including an evolution of the MPEG-4 scheduled for standardisation by ISO in March 1999;

The key conclusions of the result analysis are:

- The GSM EFR (also highest mode of GSM AMR) provides the best performances of all pre-selected codecs, often exceeding the performance level set by ARIB. The GSM EFR only failed one test condition under background noise conditions in Japanese language (not failed in English) and failed to approach the performances of the wireline codec with Music on Hold. However, no other codec performed better than the GSM EFR for any test where the performances of the candidates were compared;

- The internal codec modes of AMR always provide equivalent or better performances than the other candidate speech codecs with comparable source rates, showing that they also provide best in class performances. For example the AMR codec modes at 7.95 kbit/s (and 7.4 kbit/s) were found equivalent or better than the IS-127 EVRC (8.55 kbit/s mode) or the G.729 (8 kbit/s);

- All results were found in line with the subjective tests already performed on the candidate codecs (especially on the GSM EFR, IS-136 EFR, GSM AMR and IS-127 EVRC) by other standardisation committees (ETSI, T1, TIA, JTC);

- The subjective tests of the MPEG-4 did not include any other candidate codec making it quite difficult to compare these results with the performances of other candidates. However, it appeared that the highest mode of this codec failed a slightly higher number of test conditions than the GSM EFR. It was also noted that this codec was an evolution of the standardised version of MPEG-4 (also planned to be standardised by ISO), only available in a proprietary floating point implementation.

After the analysis of the results, it was clear that the evaluation promoted by ARIB was providing the required

data to select the mandatory speech codec for 3G systems, especially considering the aggressive schedule adopted for the production of the baseline specifications (April 1999).

It was also clear that:

- The GSM AMR provides the toll quality expected from a 3G default codec and the flexibility to trade quality and capacity without major performance impact for a wide range of operational conditions;

- The GSM AMR would allow 3G systems to provide a speech quality level at least as good as any existing 2G system;

- The GSM AMR, recently approved by SMG, includes the GSM EFR and the IS-136 EFR providing a high level of compatibility with existing 2G networks which is essential for 3G networks based on an evolution of the GSM Core Network as defined by 3GPP;

- The GSM AMR specifications and C-Code are publicly available which is essential to meet the target dates for the availability of the baseline specifications (April 1999). The baseline specifications are in turn essential to complete the evaluation, definition and characterisation of the speech codec operation over the 3G radio bearers;

- The deadline for the edition of the baseline specifications (Transcoding functions) requires to select the mandatory speech codec as soon as possible.

As result, TSG-S4#2 discussed the possibility and finally decided to propose to TSG-SA#2 the adoption of the GSM AMR as the 3G mandatory speech codec. This proposal is the result of all known subjective tests performed on the potential candidate speech codecs. It is also compatible with the ETSI SMG11 working assumption and secures the time scale for the delivery of the mandatory speech codec specifications as defined by the WI S4-1 Description.

Decision No3: TSG-S4 recommends the adoption of the GSM AMR for the 3G mandatory speech codec to be supported by all 3G Terminals and Network equipment in FDD or TDD mode. This recommendation is supported by Tdoc SP-99061.

6. Election of the TSG-S4 Chairman and Vice Chairmen

As required in the 3GPP Working Procedures, the TSG-S4 Chairman and Vice-Chairman elections were planned for the second meeting of the Codec Working Group. TSG-S4 received one candidature for the Chairmanship position and two candidatures for the two opened Vice-Chairmanship positions. As a result, the respective candidates were all nominated to their preferred position.

The elected TSG-S4 Chairman and Vice-Chairmen are:

Mr. Alain Ohana (GSM North America, T1)	TSG-S4 Chairman
Mr. Kari Jarvinen (Nokia, ETSI)	TSG-S4 Vice Chairman
Mr Hiroyuki Yamaguchi NTT DoCoMo, ARIB)	TSG-S4 Vice Chairman

7. TSG-S4 Work Program

The production of detailed Work Programs for the approved Work Items was not possible within the time frame of the TSG-SA#2 meting. A preliminary Work Program was prepared for WI S4-1 regarding the mandatory speech codec. It is provided in Annex 1 for information.

Annex 1: Draft Work program for Mandatory Speech Codec for Narrowband Telephony Service

This document outlines the work program for the work item Mandatory Speech Codec for Narrowband Telephony Service. The required specifications and the proposed schedule is given.

Schedule

Selection of Mandatory Speech codec completed by: April 1999
Baseline specifications for Mandatory Speech codec completed by: April 1999
Completed specifications for Mandatory Speech codec by: Dec. 1999

Specifications

The following specifications have been identified as required specifications. The tentative numbering will be updated following TSG decisions on document numbering.

Specification	Title		First draft availability	TSG Approval
XX.YY.01	Mandatory Speech codec speech processing functions; General description (similar to GSM 06.71)	TS	TSGS4#3	TSG SA#3
XX.YY.02	ANSI-C code for the Mandatory speech codec (similar to GSM 06.73)	TS	TSGS4#3	TSG SA#3
XX.YY.03	Test sequences for the Mandatory Speech codec (similar to GSM 06.74)	TS		TSG SA#5
XX.YY.04	Mandatory Speech Codec transcoding (similar to GSM 06.90)	TS	TSGS4#3	TSG SA#3
XX.YY.05	Error concealment of lost frames for the Mandatory Speech codec (similar to GSM 06.91)	TS	TSGS4#3	TSG SA#3
XX.YY.06	Source controlled bit-rate operation for the Mandatory Speech codec (similar to 06.92)	TS	TSGS4#3	TSG SA#3
XX.YY.07	Voice Activity Detector (VAD) for the Mandatory Speech codec (similar to GSM 06.94)	TS	TSGS4#3	TSG SA#3
XX.YY.08	Frame structure for the Mandatory Speech codec	TS	TSGS4#3	TSG SA#3
XX.YY.09	Mandatory Speech codec interface to the RAN	TS	TSGS4#4	TSG SA#5
XX.YY.10	Performance characterization of the Mandatory Speech codec	TR		TSG SA#5

Specifications which are similar to existing GSM specifications will be re-drafted with identical algorithmic technical content. Special care should be taken to ensure that C-code which is defined as normative parts for specifications in 3GPP and e.g. ETSI should be kept completely aligned.

Open Issues

	Related TSGs and WG
The use of 3G bearers for the speech service	TSG RAN WG1
System capacity using different codec modes (bit-rates)	TSG RAN
The use of unequal error protection (UEP) or equal error protection (EEP)	TSG RAN WG1
The use of unequal error detection (UED) or equal error detection (EED)	TSG RAN WG1
Codec mode (bit-rate) control	TSG SA, TSG RAN
Funding of characterisation phase	

History

v 0.0.1	First version. 3GPP TSG SA WG4 #2