ITU-Telecommunication Standardization Sector Temporary Document 83-E (P) **Rev.1**

STUDY GROUP 16

Geneva, 13-17 November 2000

Questions: 15,19,20,21,22, 24/16

SOURCE: Chairman, WP 3/16 (Mr. Simão F. Campos-Neto)

TITLE: WP 3/16 Meeting Plenary report

Contents

1. Introduction

Working party 3/16 (Signal Processing) held its meeting on 13-17 November 2000 in Geneva, under the chairmanship of Mr. Simão F. Campos Neto (LMGT/USA).

The questions currently allocated to WP 3/16 (and respective Rapporteurs) are[1]:

Q.15/16: Advanced Video Coding (Mr. Gary Sullivan, PictureTel/USA)
Q.19/16: Extension to existing ITU-T speech coding standards at bit rates below 16 kbit/s (Mr. Shinji Hayashi, NTT/Japan)
Q.20/16: Audio and wideband coding in public telecommunication networks (Mr. Rosario D. de Iacovo, CSELT/Italy)
Q.21/16: Encoding of speech signals at bit rates around 4 kbit/s (Mr. Paul Barrett, BT/UK)
Q.22/16: Software and hardware tools for signal processing standardization activities (Simão F. Campos-Neto, LMGT/USA)
Q.24/16 Variable rate coding of speech signals (Vacant)

During this meeting, the focus of the work was:
- To review the documentation for Recommendations for Decision (H.263 Annexes U, V, and W, H.262 Corrigendum 1 and Amendment 1, G.722.1 Annex B, and G.191 Annex A);
- To review contributions and complete texts for Consent (H.263 Annex X and Corrigenda to G.7xx);
- To review and coordinate activities at the technical level with other Study Groups and organizations outside the ITU
- To progress the regular work within each of the questions; and
- To review the proposed draft text of the questions for the next Study Period.

2. Organization of the work

2.1 Documentation

Detailed description of the documentation considered under each question is found in Section 3 of this report.

2.2 Division of the work

WP 3/16 adopted the agenda and work schedule in TD (3/16) 7. The discussion of Q.15/16 was held in parallel with the speech coding-related questions (Q.19-22&24/16).

[1] In the next Study Period, the following SG16 WP3 question renumbering will occur: Q.15 is continued in Q.6; Q.20 in Q.7; Q.21 in Q.8; Q.24 in Q.9. Q.22 and maintenance aspects of Q.19 will be dealt with in Q.10.

3. Results

3.1 General WP 3/16 issues

3.1.1 Documentation

3.1.1.1 Input Documents

White Contributions

Number	Question	Source	Subject
W16-135	15	Rap. for Q.15/16	Corrigendum 1 to 2nd. edition of H.262 | ISO/IEC 13818-2 (A.K.A Corrigendum 3 of H.262 | ISO/IEC3818-2) for correction of reserved extension data handling
W16-136	15	Rap. for Q.15/16	Amendment 1 to 2nd edition of Recommendation H.262 | ISO/IEC 13818-2 (A.K.A Amendment 7 of H.262 | ISO/IEC3818-2) for video elementary stream content description data
W16-140	15	Rap. for Q.15/16	Draft for "H.263++" Annexes U, V and W to Rec. H.263
W16-121	20	Rap. Q.20	Draft new Annex B to ITU-T Rec..722.1 - Floating point version of G.772.1
W16-133	20	Rap. Q.20	Proposed Corrigendum to G.722.1
W16-139	22	Rap., Q.22/16	Draft revised G.191 Annex A for Decision

Meeting Reports

Number	Subject
R71	Part I (General) of the Report of Working Party 3/16 (Signal processing)
R72	Part II.A (Determined Recommendations) of the Report of Working Party 3/16 (Signal processing)
R73	Part II.B (Corrigendum to G.722.1) of the Report of Working Party 3/16 (Signal processing)

Delayed Contributions: None.

TSB Circular/Collective Letters

Number	Subject
Circ. 282	Meeting of Study Group 16 with a view to approving two corrigenda, one amendment, nine draft revised and 25 draft new Recommendations in accordance with the provisions of Resolution 1, Section 8, of the WTSC (Geneva, 1996)

Temporary Documents (Plenary)

Number	Question	Source	Subject
TD(P)011	WP3	ITU-R WP 6M	Liaison Statement to ITU-T SG 16 on Multimedia studies - potential overlap
TD(P)013	WP3	WTSA 2000	Questions assigned to ITU-T Study Group 16 (Multimedia Services, Systems and Terminals)
TD(P)016	WP3	Coordination Meeting	Text according to Resolution 1

Temporary Documents (General)

Number	Question	Source	Subject
TD(G)001	WP3	TSAG	Liaison Statement on update on Electronic Document Handling
TD(G)007	WP3	ITU-R	Note to the Director, TSB

Temporary Documents (WP 3/16)

Number	Question	Source	Subject
TD(3)03	WP3	ITU-R SG8	ITU-R Recommendation M.1079 - Performance and Quality of Service Requirements for International Mobile Telecommunications-2000 (IMT-2000)
TD(3)12	WP3	Chair	Opening list of documents for WP3/16

3.1.2 Plenary Results

Working Party 3/16 reviewed and accepted the agenda and the work plan for the week in TD 11 (3/16). WP 3/16 reviewed general documents in its opening Plenary and the progress reports for each of the interim activities. WP 3/16 noted general Liaison Statements that did not need a reply.

Rapporteur meeting activities were reported and approved for Q.15/16 on their interim meetings (Osaka, Japan, 16-18 May 2000; and Portland, OR, USA, 22-24 August 2000). Questions 20 and 21 also reported the activities from their joint meeting in Geneva, 8-10 November 2000, which were also approved. Summaries of the Rapporteur meetings are provided in the respective sections of this report. It was noted in the report of Q.20 and Q.21 meetings that the deliverables of the host and listening laboratories participating in their respective exercises were fully met.

The meeting acknowledged the excellent work of Mr.S.Hayashi (NTT/Japan), Rapporteur for Q.19/16, who is retiring from ITU activities at this meeting.

3.1.2.1 Recommendations for Decision

Recommendation	Final text found in
Draft Corrigendum to ITU-T Recommendation G.722.1	COM 16-133
Draft for corrigendum 1 to second edition of common-text Recommendation H.262 | ISO/IEC 13818-2 (a.k.a. Corrigendum 3 of H.262 | ISO/IEC 13818-2) for correction of reserved extension data handling	COM 16-135
Draft new Annex U to ITU-T Recommendation H.263 – Enhanced reference picture selection	COM16-140+TD(P)51
Draft new Annex V to ITU-T Recommendation H.263 – Data partitioned slice (DPS)	COM16-140+TD(P)51
Draft new Annex W to ITU-T Recommendation H.263 – Additional Supplemental Enhancement Information	COM16-140+TD(P)51 & TD(P)19 [A.5 material]
Draft for amendment 1 to second edition of common-text Recommendation H.262 | ISO/IEC 13818-2 (a.k.a. Amendment 7 of H.262 | ISO/IEC 13818-2) for video elementary stream content description data	TD(P)71
Draft revised G.191 Annex A– List of software tools available	COM 16-139
Draft new Annex B to ITU-T Recommendation G.722.1 (Floating point version of G.722.1)	TD(P)43

All texts were approved with the proposed changes (if any) for forwarding for Decision by SG 16 on its session on Friday 17, afternoon.

3.1.2.2 Recommendations for Consent (AAP)

The following texts were proposed by WP 3/16 to be Consented under the AAP at this meeting of SG 16:

Subject	Availability	Report Part
H.263 Annex X	TD(P)53	Part II.B
Proposed Corrigenda to G.729 Annexes	TD(P)42	Part II.B

3.1.2.3 Appendices and Implementer's Guides

No Appendices or Implementer's guides were produced by WP3/16 at this meeting.

3.1.2.4 Relationship with other bodies

A consolidated list of liaison statements sent and received by WP 3/16 is found in Annex WP3.A.

Liaison statements were received from SG 15, ITU-R SG8, and ISO/MPEG [TD (3/16) 4,5,6], ITU-R SG8 [TD (3) 3], and ITU-T SG 15 [TD (3/16) 1,2]. Specific responses were drafted by the questions from which action was required. The LS from TSAG [TD (G) 1] and ITU-R SG8 were noted.

The texts for the LS prepared by WP3 are found in TD (P) 84.

3.1.2.5 ISO/IEC MPEG Calls for Evidence and for Proposals

In this SG 16 meeting, a Coordination Meeting between MPEG and SG 16 took place. Among other matters, future cooperation between the two bodies was discussed. Of direct interest to WP3/16 was the fact that MPEG is issuing a Call for Proposals for new video technologies and Call for Evidence for new audio coding schemes in the in the January 2001 timeframe, and Call for Proposals for new audio coding schemes in the July 2001 timeframe. SG 16 has been invited to contribute with its current status of the H.26L work, and this issue is addressed in the section with the report of Q.15/16. It was also discussed the possibility that the results of the ongoing wideband standardization work could be provided to the MPEG Audio Call for Proposals in July 2001. This idea needs to be investigated further, and some issues are identified in the Q.20/16 Section of this report.

3.2 Question 15/16: Advanced Video Coding

Working Party 3/16 addressed Question 15/16 under the chairmanship of Mr. Gary Sullivan (Microsoft/USA) and Mr. Thomas Wiegand (Heinrich Hertz Institute/Germany). The group conducted work on adding new material to Recommendation H.263, amending and correcting the common text Recommendation H.262 | ISO/IEC 13818-2, and furthering the work on the future video coding standard development project known as H.26L.

The group thanks Mr. Keiichi Hibi for his valuable service as Associate Rapporteur for Advanced Video Coding during the 1997-2000 study period. We regret that he has chosen not to continue in this post.

The group is pleased to note that Mr. Thomas Wiegand of the Heinrich Hertz Institute has volunteered to aid in the future work of the ITU-T Advanced Video Coding Question, and recommends that he be designated as Associate Rapporteur of the Question to recognize his new leadership role.

3.2.1 Documentation

3.2.1.1 Input Documents

White Contributions

Number	Source	Title
COM 16-120-E	*Q.14/16 Rapp.*	Draft H.245v7 for Decision
COM 16-135-E	*Q.15/16 Rapp.*	Draft Corrigendum 1 to 2nd Edition of Common-Text Recommendation H.262| ISO/IEC 13818-2 for Correction of Reserved Extension Data Handling for Approval
COM 16-136-E	*Q.15/16 Rapp.*	Draft Amendment 1 to 2nd Edition of Common-Text Recommendation H.262| ISO/IEC 13818-2 for Addition of Video Elementary Stream Content Description Data for Decision
COM 16-140-E	*Q.15/16 Rapp.*	Draft H.263 Annexes U, V, and W for Decision

Delayed Contributions

Number	Source	Title
COM-16 D.35	*PictureTel*	Proposed H.245 changes for H.263 Annexes U and W.6.3.12
COM-16 D.36	*PictureTel*	Proposed H.242 changes for H.263 Annexes U and W.6.3.12
COM-16 D.37	*PictureTel*	Proposal for additional profile for Draft H.263 Annex X
COM-16 D.49	*Microsoft*	Corrections needed to COM 16-140 Draft Annexes U, V, and W for H.263
COM-16 D.50	*Microsoft*	Proposal for Header Content in H.26L

Temporary Documents

Number	Source	Title
TD (P) 19	*Q.15/16 Rapp.*	Information on reference to ISOC/IETF RFC 2396 in H.263 Annex W
TD (G) 08	*Q.11/16 Rapp.*	Draft Implementers Guide to the H.320 Series
TD (3/16) 03	*ITU-R*	Revision to Rec. ITU-R M.1079 – Performance and QoS Requirements for IMT-2000
TD (3/16) 04	*ISO/IEC JTC1/SC29/ WG11*	Liaison Statement to ITU-T SG 16 Regarding Video Coding Activities and IDCT Specification

TD (3/16) 05	*ISO/IEC JTC1/SC29/ WG11*	Liaison Statement Reply to ITU-T Study Group 16 on Future Video Coding Work
TD (3/16) 06	*ISO/IEC JTC1/SC29/ WG11*	Liaison Statement to ITU-T Study Group 16 on ISO/IEC 13818 (MPEG-2 Systems and Video) Common Text and MPEG-4 on IP
TD (3/16) 11	*WP3 Chair*	Agenda and schedule for Working Party 3/16
TD (3/16) 12	*WP3 Chair*	List of documents for Working Party 3/16
TD (3/16) 16	*Q.15/16 Rapp.*	Q.15/16 Meeting agenda and status report
TD (3/16) 17	*Q.15/16 Rapp.*	Meeting Report of the Tenth Meeting (Meeting J) of the ITU-T Q.15/16 Advanced Video Coding Experts Group – Osaka, Japan, 16-18 May, 2000
TD (3/16) 18	*Q.15/16 Rapp.*	Meeting Report of the Eleventh Meeting (Meeting K) of the ITU-T Q.15/16 Advanced Video Coding Experts Group – Portland, Oregon, USA, 22-24 August, 2000
TD (3/16) 22	*Q.15/16 Rapp.*	Information on usage of H.263 profiles in 3GPP environments

3.2.1.2 Output Documents

TD (P) 51	*Q.15/16 Rapp.*	Corrections needed to COM 16-140 Draft H.263 Annexes U, V, and W
TD (P) 53	*Q.15/16 Rapp.*	Draft H.263 Annex X for Consent

3.2.2 Summary

The primary results of the meeting in regard to video coding activities are as follows:

- Draft Annexes U, V, and W to Recommendation H.263 were forwarded for decision with minor modifications.
- Draft Annex X to Recommendation H.263 was forwarded for consent.
- Coordination work was conducted to ensure that the new Annexes U, V, and W had proper support in the H.320, H.323, and H.324 suites.
- Additional future work is planned on developing an implementers guide or corrigendum to Recommendation H.263.
- Additional future work is planned on developing a test model encoding appendix to Recommendation H.263.
- The first amendment to the 2000 edition of the common text Recommendation H.262 | ISO/IEC 13818-2 was forwarded for decision with modifications requested in ISO/IEC liaison activity.
- The first corrigendum to the 2000 edition of the common text Recommendation H.262 | ISO/IEC 13818-2 was forwarded for approval without alteration.
- Work was furthered on the future video coding standardization project known as H.26L
- A plan was adopted to provide demonstrations of the capabilities of the draft H.26L design in an upcoming test to be conducted by ISO/IEC JTC1/SC29/WG11.

3.2.3 Results

The group adopted the following agenda for the advanced video coding activities of the meeting:

- Opening
- Agenda approval, meeting schedule, document assignment review [TD (3) 11, TD (3) 12, TD (3) 16]
- Status review and report of interim and ad-hoc activities [TD (3) 17, 18]
- Patent policy remarks (http://www.itu.int/ITU-Databases/TSBPatent/)
- Incoming Liaison Statements (3GPP, MPEG, etc.) [TD (3) 04, TD (3) 05, TD (3) 06] and information regarding other organizations [TD (3) 22] and coordination with work in other Questions (e.g., Q.13 and H.323 Annex I and MPEG-4 ES RTP TD (3) 6) TD (P) 11 TD (3) 3, SG9]
- Maintenance and coordination issues for current recommendations
- Actions in regard to Rec. H.263:
  - Reviewing the draft text of Annexes U, V, and W to Rec. H.263 for Decision [COM16-140], including consideration of the changes proposed by Microsoft [D.49] and the referencing requirements of A.5 [TD (P) 19]
  - Reviewing the draft text of Annex X to Rec. H.263 for Consent [Q15-K-51r3], including consideration of the changes proposed by PictureTel [D.37] and information regarding the progress of work in 3GPP/3GPP2 [TD (3) 22]
  - Coordinating with Q.11-14 regarding the system support and capability exchange requirements for Rec. H.263 [COM16-120, D.35, D.36, TD (G) 8]
  - Progressing the work toward adopting a test model encoding description as Appendix II.
  - Consideration of the approval of an H.263 Implementers Guide or Corrigendum [Q15-K-47, Q15-K-49]
- Actions in regard to Rec. H.262 | ISO/IEC 13818-2 in coordination with ISO/IEC JTC1/SC29/WG11:
  - Reviewing the draft text of Amendment 1 (Content Description Data) to the 2000 edition of Rec. H.262 | ISO/IEC 13818-2 for Decision [COM16-136], including consideration of the modifications made by ISO/IEC JTC1/SC29/WG11 as conveyed in [TD (3) 06]
  - Reviewing the draft text of Corrigendum 1 (Reserved Extension Syntax Correction) to the 2000 edition of Rec. H.262 | ISO/IEC 13818-2 for Approval [COM16-135], including consideration of the remarks made by ISO/IEC JTC1/SC29/WG11 as conveyed in [TD (3) 06]
- Progressing the work on the H.26L future video coding standard development effort, including consideration of the proposal from Microsoft [D.50]
- Consideration of the inclusion of ITU-T video coding technology in the testing to be performed by ISO/IEC JTC1/SC29/WG11 [TD (3) 05 (with attachment)]
- Outgoing liaison statements [MPEG, SG9, 3GPP/3GPP2, IETF]
- All other business necessary for Q.15 consideration
- Workplan review and future meeting plans (Q.15 Germany 9-12 January 2001, ~March/April 2001)

3.2.3.1 Status Report and Report of Interim Activities

The status and priorities and reports of interim activities at the Osaka and Portland meetings of Q.15 were approved.

3.2.3.2 H.263 Annexes U, V, and W for Decision

The draft text COM 16-140 of H.263 Annexes U, V, and W was reviewed. In response to delayed contribution D.49, the group agreed on making some minor changes to the draft and produced TD (P) 51 to specify those changes. The group recommended that these annexes be put forward for decision by SG 16 as COM 16-140 as amended by TD (P) 51.

3.2.3.3 H.263 Annex X

The draft text of H.263 Annex X was discussed. A delayed contribution D.37 was received that proposed adding a new profile to the annex. Although the group had a generally favorable view of the concept of adopting an additional profile similar in complexity and performance to the proposed profile, there was not an agreement in the group to add the specific profile that was requested. The proposal was therefore not adopted. In consultation with the H.245 editor, some H.245 generic capabilities syntax was drafted for inclusion in Annex X. A draft text TD (P) 53 was produced and is forwarded to WP3 with a recommendation to forward the text for consent.

3.2.3.4 Coordination on H.263 with Systems Support Requirements

The H.245 [COM 16-120] and H.320/H.242 [TD (G) 08] designs for support of H.263 Annexes U, V, and W were reviewed, along with the proposals to change these designs [D.35, D.36]. The group believes that these discussions resulted in proper support of the new H.263 annexes in the output documents produced by Questions 11 to 14.

3.2.3.5 Test Model Appendix for H.263

The group discussed its plan to adopt an Appendix to H.263 containing a test model reference encoding description. No particular action was taken in regard to this planned appendix at this meeting. The plan remains in place to adopt such an Appendix at the next meeting of SG 16.

3.2.3.6 Implementers Guide for H.263

The group discussed the status of work on drafting an implementers guide for H.263. As the drafting work on this implementers guide has not yet reached sufficient maturity, the group plans to continue work toward adopting this work at the next meeting of SG 16.

3.2.3.7 Common Text H.262|ISO/IEC 13818-2 Amendment and Corrigendum

The group reviewed the status of the draft corrigendum [COM 16-135] and the draft amendment [COM 16-136] to the common text Recommendation H.262 | ISO/IEC 13818-2. A liaison statement [TD (3) 06] was received that contained changes proposed for adoption into the draft amendment. The group approved this work and requests that:

- The corrigendum be adopted as given in COM 16-135, and
- The amendment be adopted as given in COM 16-136 plus the modifications provided in the liaison statement TD (3) 06.

3.2.3.8 Progress of work on H.26L

A delayed contribution D.50 was provided that suggested several header-level changes proposed for H.26L:

- Color space flexibility
- Number of components flexibility
- Spatial subsampling of components flexibility

- Spatial sampling grid alignment flexibility
- Number of bits per sample flexibility
- Display rectangles
- User data support
- H.263 Annex L supplemental enhancement information
- Hypothetical reference decoder / video buffering verifier
- Time tag representation

The group agreed with the spirit and goals of this contribution. It was noted that a number of these items required significant further work to specify the precise impact on syntax (some more than others) and that we must ensure that any specific syntax for these features is carefully designed. There was some questioning of how to carry the type of information described in the document as "sequence header level" data. There was also some questioning of the proposed manner of representing timing information.

3.2.3.9 Testing to be performed by ISO/IEC JTC1/SC29/WG11

ITU-T SG16 was invited to participate in upcoming tests of video coding technology performance to be conducted by ISO/IEC JTC1/SC29/WG11 [TD (3) 05]. This invitation was warmly received and the group requests that SG16 send a liaison statement to accept this invitation. The group plans to provide a demonstration of the performance of the draft H.26L design for evaluation in these upcoming tests.

Pending the conclusions that could be reached as a result of these tests, we look forward to discussing possible joint efforts with ISO/IEC JTC1/SC29/WG11 for future video coding standardization activities.

3.2.4 Liaison Statements

Four liaison statements have been drafted including
- Proposed Liaison Statement to ISO/IEC JTC1/SC29/WG11 on Video Coding Activities,
- Proposed communication to IETF AVT and MMUSIC Working Groups on Video Coding Activities,
- Proposed communication to 3GPP TSG-S4 and S2 and 3GPP2 TSG-C on Video Codec Support for Wireless Multimedia Terminals,
- Proposed communication to IMTC.

3.2.5 Future work

The basic schedules for our future work are outlined in Annex Q15.A.

The primary means of document distribution within the Q15/16 Video Coding Experts Group is electronic, and our documents can be found on an ftp site that is maintained at PictureTel:

ftp://standard.pictel.com/video-site or
http://standard.pictel.com/ftp/video-site

This information is also linked to PictureTel's broader standards web site which is maintained by Patrick Luthi of PictureTel:

http://standard.pictel.com/

The group conducts its email conversations over an email reflector that is graciously maintained by PictureTel through a majordomo software system:

itu-adv-video@standard.pictel.com

Requests for subscriptions and "unsubscriptions" for this email reflector should be sent to the majordomo automated list manager address:

itu-adv-video-request@standard.pictel.com

The address of the email reflector maintained within the TIES system (**tsg16q15@ties.itu.int**) is included in the addresses for email to the **itu-adv-video** list as well, to ensure that those subscribing to the ITU-maintained list receive all group communcations.

We plan two interim Rapporteur's group meetings between the November '00 and May/June '00 meetings of SG 16. These plans are shown below. The group plans to also continue the ad-hoc activities created at the Portland meeting and described in the report of that meeting.

Siemens AG has offered to host the first of the two interim meetings in Eibsee, Germany, and the host organization plan for the second meeting is not yet complete. Judging by the level of interest in our prior work (between 40 and 50 participants at each meeting), we are expecting attendance at the two interim meetings of 40-50 people (generally widely scattered in geographical representation).

3.3 Question 19/16: Extension to existing ITU-T speech coding standards at bit rates below 16 kbit/s

Working Party 3/16 addressed Question 19/16 under the chairmanship of Mr. Shinji Hayashi. The major activities of the question in this meeting were:

(1) Certification procedure and test vectors for current speech coding recommendations, especially floating-point implementation,
(2) External reset in G.728 and G.729 Annexes with DTX function,
(3) Maintenance of existing speech coding Recommendations, especially G.729.
(4) Liaison to other Sectors, SGs.

3.3.1 Documentation

3.3.1.1 Input Documents

White Contributions/Reports: None

Delayed Contributions:

Number	Source	Title
COM16-D71-E	*Conexant*	Investigation of discrepancy between the description and C-code of the VAD in G.729 Annex B.
COM16-D79-E	*NTT.*	Proposal of editorial corrections to ITU-T G.729 Annexes C+, F, G, and I

Temporary Documents

Number	Source	Title
TD (3/16) 01	*SG15*	LS: Synchronous reset of G.728 and G.729 CODECs in CME
TD (3/16) 02	*SG15*	LS re: Approval of Appendix II to G.711, Annexes to G.728 and G.729
TD (3/16) 19	*Rapporteur*	Existing Implementer's guides for G.7xx speech coders

3.3.1.2 Output Documents

Number	Source	Title
TD (P) 16	*Rapporteur*	Proposed corrigenda to G.729 Annexes B, C+, F, G, and I
TD (3/16) 27	*Rapporteur*	Chairman's report of Rapporteur's meeting of Q.19/16

3.3.2 Summary

The group reviewed the proposed corrections to the Annexes B, C+, F, G, and I and agreed to issue a corrigendum.
The group showed preference of external resetting of G.728 in CME under DTX operation, and will study the quality of G.729 under the same condition.

3.3.3 Results

The group adopted the following agenda:

1. Opening
2. Document assignment
3. Certification procedure and test vectors for current speech coding recommendations, especially floating-point implementation.
4. External reset in G.728 and G.729 Annexes under DTX operation,
5. Maintenance of existing speech coding Recommendations, especially G.729.
6. Liaison to other Sectors, SGs.

3.3.3.1 Test vectors for various implementation of Recommendation

The floating-point implementation of G.729 lacks the test vectors and extensive verification procedures. No contributions were received at this meeting and the Rapporteur encourages participants to contribute on this issue.

3.3.3.2 Maintenance of existing speech coding Recommendations, especially G.729

COM16-D71 investigates the discrepancy between the textual description of G.729 Annex B and the C-code of G.729 Annex B. It experimentally proved no major quality effects with this discrepancy and the group preferred correction of the textual description to solve the discrepancy.

COM16-D79 presents editorial corrections to G.729 Annexes C+, F, G, and I. The group recognized necessity of purely editorial corrections of the description.

TD19(3/16) shows the summary of the algorithm changes of the speech coding Recommendations published in Implementers Guide. The meeting recognized necessity of issuing formal Corrigenda to officially incorporate all identified corrections, so that a correct set of C-source code and associated text will be available from the ITU. An editorial group was set up and prepared the text of the corrigendum, which is found in TD(P) 42.

3.3.3.3 External reset in G.728 and G.729 Annexes under DTX operation

TD (3/16) 1 presents the request by Q.6/15 to provide them with guidance on synchronous reset capability into circuit multiplication equipment (CMEs) using G.729 and G.728 codecs.

Q.19/16 experts agreed that it would be advisable to support a synchronous reset capability in CME using G.728. It was noted however that G.729 is known to quickly converge after

synchronism loss between coder and decoder (such as would happen due to the use of DTX). On the other hand, the experts agreed that the use of synchronous reset under DTX operation in CME is not likely to introduce quality degradation. Experts present at the SG16 meeting manifested intention to submit experimental results to SG15 addressing the effect of synchronous reset on the speech quality for G.729.

3.3.4 Liaison Statements

ITU-T SG16 replied to SG15 about the external reset of speech codec in DTX operation of CME (see Section 3.3.3.3 above).

3.3.5 Future work

Next experts meeting will take place during the next meeting of SG16 scheduled for May 2001. The major issues to be addressed will be following:

1. Certification procedure and test vectors for current speech coding recommendations, especially floating-point implementation.
2. Maintenance of existing speech coding Recommendations

3.4 Question 20/16: Audio and wideband coding in public telecommunication networks

Working Party 3/16 addressed Question 20/16 under the chairmanship of Mr. Rosario Drogo De Iacovo (CSELT S.p.A./Italy). Objectives of the question for this meeting were to review the Qualification test results for the wideband speech coding algorithm at around 16 kbit/s and to plan for the Selection phase.

3.4.1 Documentation

3.4.1.1 Input Documents

White Contributions

Number	Source	Title
COM16-121	*Rap. Q.20*	Draft new Annex B to ITU-T Recommendation.722.1 - Floating point version of G.772.1
COM16-133	*Rap. Q.20*	Proposed Corrigendum to G.722.1
COM16-142	*PictureTel*	Results of the interoperability test between the fixed-point G.722.1nd the proposed floating-point version

Delayed Contributions

Number	Source	Title
D.019	*Motorola UK*	Codec description and IPR Statement for the Motorola 16 kHz wideband codec candidate
D.020	*Motorola UK*	WP Experiment 1 Qualification Test results for the Motorola candidate
D.021	*Motorola UK*	WP Experiment 2 Qualification Test results for the Motorola candidate
D.032	*PictureTel*	Summary of G.722.1 Interoperability Tests
D.033	*PictureTel*	Corrections to G.722.1 Annex B floating point source code

D.063	*Matsushita*	High-level description for proposed wideband (7kHz) codec algorithm
D.064	*Matsushita*	WB Experiment 1 Qualification test results for candidate codec F (Matsushita codec)
D.065	*Matsushita*	WB Experiment 2 qualification test results for candidate codec F (Matsushita's codec)
D.067	*Lucent*	Comments for consideration during the drafting of the selection test plan for "a Wideband Speech Coding Algorithm around 16 kb/s"
D.068	*Lucent*	High level description and qualification test results of the Lucent Technologies candidate wideband coding algorithm at 12.8 to 24 kbit/sec
D.069	*Lucent*	Intellectual property statement relating to the Lucent Technologies candidate wideband speech codec algorithm at bit rates around 16 kbit/sec
D.076	*Nokia*	Communication with ITU-T Q.20/16 "Audio & Wideband Coding"
D.077	*Nokia*	BER/RBER/FER mapping used in 3GPP/GSM AMR wideband codec selection tests
D.078	*Nokia*	High level description of the 3GPP/GSM AMR-WB codec recommended for selection in 3GPP
D.080	*NTT*	High level description of NTT's wideband coder around 16 kbit/s
D.081	*NTT*	WB experiment 1 qualifications test results for NTT's wideband speech coder
D.082	*NTT*	WB experiment 2 qualification test results for NTT's wideband speech coder
D.084	*Texas Instruments*	Experiment 1 test results of Texas Instrument's 16kbit/s wideband speech codec
D.085	*Texas Instruments*	Experiment 2 test results of Texas Instrument's 16 kbit/s wideband speech codec
D.086	*Texas Instruments*	High level descriptions of TI's wideband coder
D.087	*Texas Instruments*	IPR statement for TI's wideband coder
D.088	*Texas Instruments*	High level description of TI/Nokia/Ericsson 4kb/s coder
D.090	*Canada*	WB Experiment 1 qualification test results for VoiceAge's candidate codec
D.091	*Canada*	WB Experiment 2 qualifications test results for VoiceAge's candidate codec
D.092	*Canada*	High level description of VoiceAge's candidate codef for ITU-T WB speech coding standard

Temporary Documents

Number	**Source**	**Title**
TD(3/16)07	*Editor*	Editorial correction to draft new Annex B to ITU-T Rec. G.722.1
TD(3/16)08	*Rap.Q.20*	Additional results of the interoperability test between the fixed-point and the corrected floating point version of G.722.1
TD(3/16)15	*Rap.Q.20*	Q.20/16 Rapporteur's meeting report (Geneva, 8-10 November, 2000)

3.4.1.2 Output Documents

Number	Source	Title
TD (3/16) 30	*Rapporteurs Q.20/16, Q.21/16*	LS to Q.22/12 (SQEG) – Speech coding issues
TD(P)84	*Rapporteur Q.20/16*	Communication to ETSI: information on wideband speech coding activity
TD (3/16) 32	*Rapporteur Q.20/16*	Q.20/16 meeting report
TD (P) 43	*Editor*	Corrections to draft Annex B to ITU-T Rec. G.722.1

3.4.2 Summary

The time schedule for wideband coding at around 16 kbit/s was reviewed aiming to a Consent during a possible WP3/16 meeting in July 2001.

A Liaison Statement to SG12 and a communication to ETSI/3GPP SA4 were drafted.

The Corrigendum to G.722.1 and the new Annex B to G.722.1 (floating-point version) were submitted to SG16 plenary for Decision. The agreed changes to the G.722.1 Annex B (editorial and related to the C-source code) are summarized in TD(P)43.

3.4.3 Results

The group adopted the following example agenda and document allocation:

1. Review and approval of the agenda
2. Allocation of documents
3. 16 kbit/s wideband coding: revision of the time schedule .....[TD (3/16) 15]
4. 16 kbit/s wideband coding: LSs and communications
5. 16 kbit/s wideband coding: additional issues
6. G.722.1 matters: Corrigendum G.722.1 .....[COM16-133]
7. G.722.1 matters: Annex B to G.722.1[COM16-121,142; D.32,33; TD(3/16)7,8]
8. Future work
9. AOB

The Delayed Contributions not allocated to the above-mentioned agenda items were considered for information since they was already addressed during the previous Rapporteur's meeting (8-10 Nov., 2000).

3.4.3.1 WB coding around 16 kbit/s: revision of the time schedule

The draft time schedule contained in TD(3/16)15 was revised according to the next planned WP3 meeting in July 2001 (Consent of Recommendation). The updated time schedule is contained in Annex Q20.A to this report.

3.4.3.2 WB coding around 16 kbit/s: LSs and communications

It was agreed to send a Liaison Statement to SG12 and a communication to 3GPP S4. The content of those documents is reported in a separate contribution.

3.4.3.3 WB coding around 16 kbit/s: additional issues

The following issues were briefly introduced for further discussion within the Ad-Hoc group via e-mail.

List of additional issues to be addressed within the Ad-Hoc group:
- definition of the kind of Global Analysis to be performed
- definition of a completely blind procedure in evaluating the Selection Test results
- definition and generation of appropriate background noise material
- issues related to the use of soundcards for playback in the listening sessions

Other issues, already agreed for discussion within the Ad-Hoc group:
- drafting of the Selection test plan
- definition of the processing stages for the host laboratory function
- guidelines for production of demonstration material (random BER and music conditions)
- computation of the codec frequency response using white noise

Ad-Hoc group for drafting the Selection test documents:

Name	**E-mail**
Simão F. Campos-Neto (LMGT)	simao.campos@labs.comsat.com
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The Rapporteur encouraged experts to volunteer for this Ad-Hoc group.

3.4.3.4 ISO/MPEG Audio Call for Proposals

In a coordination meeting held between ITU-T SG16 and ISO/MPEG leaderships, the possibility that the current WB16k work could be provided in the Call for Proposals that will be considered by MPEG in its 23-27 July 2001. This possibility would imply, among other issues, that the Q.20 Rapporteur's meeting currently planned for that week may need to be anticipated by one week. The following topics were also addressed:

- Impact on the planned schedule for ITU-T wideband coding. It was noticed that the WP3/16 meting planned to evaluate the ITU-T wideband selection test results and the MPEG meeting planned to evaluate the proposed algorithms are overlapping (23-27 July, 2001). Fortunately, the ITU-T wideband schedule allows for a moderate tightening and it was felt possible to move the July meeting one week before the planned date without any serious impact on the overall plan. This would allow, in case of a successful ITU-T selection process, the said participation.
- Kind of information to be submitted following the Call for Proposals. No detailed information was available at the meeting and it was pointed out that the matter could be solved through exchanging of e-mails between the two experts' groups.
- Agreement at WP3/16 level to submit the ITU-T selected wideband algorithm. It was agreed that such participation would be useful with the goal of developing harmonized solutions.
- Agreement at candidate proponent level to submit its wideband algorithm. This issue, with its implications, was not addressed in detail and was left for further considerations during the next SG16 meeting.

As a general conclusion, the meeting agreed the principle that the ITU-T wideband selected algorithm should participate in the ISO/IEC JTC1/SC29/WG11 audio tests and that more detailed information should be exchanged between the two groups in order to evaluate all possible impacts in current timescale assumptions.

3.4.3.5 G.722.1 matters: Corrigendum to G.722.1

White Contribution COM16-133 contains the corrigendum the group agreed to submit to SG16 plenary for Decision.

3.4.3.6 G.722.1 matters: Annex B to G.722.1

The editor (P.Luthi, PictureTel/USA) presented all the documentation allocated to this agenda item and the group agreed to submit the new Annex B of G.722.1 to SG16 plenary for Decision. The agreed changes (editorial and related to the C-source code) contained in TD(3/16)7, TD(3/16)8 and D.33 were summarized in TD(P)43. The new C-code of G.722.1 Annex B (Release 1.1) will be made available to TSB.

3.4.4 Liaison Statements

A liaison statement to SQEG/SG12 was drafted to ask support in developing an appropriate Selection Test Plan for the wideband coding algorithm around 16 kbit/s and also consider, during the SG12 meeting in February 2001, the identification of organizations willing to perform the host laboratory, cross-checking laboratory, listening laboratory and global analysis functions with the associated cost.

3.4.5 Future work

A Q20/16 Rapporteur's meeting, followed by a WP3/16 meeting, is provisionally planned for July 23-27, 2001. Since this meeting will happen after the next SG 16 meeting, it will be re-confirmed in the next SG 16 meeting.

Between now and the next SG 16 meeting, the work will continue by correspondence as planned in the time schedule for the wideband coding algorithm at around 16 kbit/s.

3.5 Question 21/16: Encoding of speech signals at bit rates around 4-kbit/s

The meeting addressed Question 21/16 under the chairmanship of Mr. Barrett (BT, UK). The current objective of this question is to select an algorithm that is likely to meet the terms of reference for the future ITU-T 4-kbit/s speech coding standard (G.4k). The specific objective of this meeting was to begin planning the fixed-point selection phase.

3.5.1 Documentation

3.5.1.1 Input Documents

Delayed Contributions:

Number	Source	Title
COM16-D.23	*LMGT*	LMGT ITU-T 4 kbit/s Selection Host Laboratory Report
COM16-D.24	*LMGT*	ITU-T 4 kbit/s Selection Host Laboratory Crosscheck Procedures
COM16-D.25	*LMGT*	ITU-T 4 kbit/s Selection Experiments 1A and 3B - LMGT Results
COM16-D.26	*LMGT, Samsung*	High Level Description of LMGT-SAMSUNG 4 kb/s Coder
COM16-D.70	*ACDFMN*	High level description of the 4 kbit/s algorithm submitted by AT&T, Conexant, Deutsche Telekom, France Telecom, Matsushita, and NTT

COM16-D.74	*ACDFMN*	Notice of audio demonstration of 2.4 and 6.4 kbit/s extensions and DTX-enabled version of ACDFMN's 4-kbit/s speech coding candidate
COM16-D.88	*Ericsson, Nokia, TI*	High Level Description of TI/Nokia/Ericsson 4 kb/s Coder
COM16-D.89	*FT*	France Télécom R&D Results for the ITU-T 4 kbit/s Selection Phase – Experiments 1 & 3b

Temporary Documents

Number	Source	Title
TD 26(3/16)	*Rapporteur*	Draft liaison statement to Q.22/12 (SQEG)
TD 23(3/16)	*Rapporteur*	Draft agenda and objectives for Q.21/16
TD 24(3/16)	*Rapporteur*	Q.21/16 Meeting Report (Geneva, 7-10 November, 2000)
TD 25(3/16)	*Rapporteur*	Draft of 4kbit/s Selection Phase results

3.5.1.2 Output Documents

Number	Source	Title
TD 31(3/16)	*Q.21/16*	Liaisons to Q.22/12

3.5.2 Summary

The objective of this meeting was to review the results of the floating-point selection phase of the ITU-T 4-kbit/s speech coding work. The meeting agreed to begin a fixed-point selection phase in August 2001 with two of the three candidates presented at this meeting. The target for selection and consent of the fixed-point recommendation is October 2001.

3.5.3 Results

The group adopted the following agenda:

1. Opening of the meeting
2. Approval of the agenda ..... [TD 23(3/16)]
3. Allocation of documents
4. Last meeting report and interim activities ..... [TD 24(3/16), 25(3/16)]
   .....D.22, D.23, D.24, D.25, D.26, D.70, D.74, D.88, D.89]
5. Liaisons from other groups.....
6. Fixed-point selection phase matters.....
7. Review of schedule.....[TD 24 (3/16)]
8. Approval of liaisons statements.....[TD 26(3/16)]
9. AOB .....

Delayed contributions D.22 to D.89 were addressed during the Rapporteur meeting held 7 - 10 November, and were therefore only provided for information at this meeting.

3.5.3.1 Last meeting report and review of interim activities

The main interim activity of Q.21/16 was the floating-point selection phase. The results of this selection phase were reviewed at a Rapporteur meeting held in Geneva, 7 - 10 November 2000. The main decisions made at that meeting are summarised as follows:

3.5.3.2 Review of selection phase activities

The meeting agreed that the two host laboratories and the six listening laboratories had fulfilled the terms of their memoranda of understanding (MoU) with the ITU.

3.5.3.3 Review of candidate algorithms

Candidate algorithms were presented by the following three consortia:

A. AT&T, Conexant, Deutsche Telekom, France Telecom, Matsushita, and NTT;
B. Texas Instruments Incorporated, Nokia Corporation, and Ericsson Radio Systems AB;
C. COMSAT Corporation (now part of Lockheed-Martin Global Telecommunications, LMGT) and SAMSUNG.

All eleven consortia members verbally declared that they would abide by Option 2.2 of the ITU patent policy.

3.5.3.4 Review of results

The meeting reviewed the results of the float-point selection phase, which are summarized in Annex Q21.A. Candidates A and B will proceed to a fixed-point selection phase starting in August 2001. Candidate C will not be considered any further. The new deadline of August 2001 is intended to allow codec developers time to both implement their algorithms in fixed-point arithmetic and to effect performance improvements.

Q.21/16 agreed that an independent party should perform a detailed global analysis of the fixed-point selection phase. The calculations and presentation of results for the global analysis will be agreed and frozen at the first SG16 meeting in 2001. The global analysis will be performed on blind-mapped data, and will be funded by the candidate proponents. The Rapporteur invited contribution on this topic for the next SG16 meeting.

As an aid to the codec proponents, the meeting identified which requirements and objectives are seen as particularly important in the development of a 4-kbit/s speech coding standard. This list is provided in Annex Q21.C.

3.5.3.5 Liaisons from other groups

There were no incoming liaison statements.

3.5.3.6 Fixed-point selection phase matters

The meeting agreed to follow the following double-blind procedure for the fixed-point selection phase. The candidate executables will be delivered to the Q.21/16 Rapporteur on 1 August 2001. The Rapporteur will forward the two executables to the host laboratories using a blind mapping (Codecs 1 and 2). After processing the speech material for the selection phase experiments, the host laboratory will forward the processed speech material to the listening laboratories using a second blind mapping (Codecs A and B). The same mapping will be used for all experiments. The global analysis laboratory will perform its analysis on the double-blind data and forward the results to the Rapporteur. After receiving the global analysis, the Rapporteur will request the second mapping from the host laboratories, and will upload the global analysis information with the first and second mapping labels to the Q.21/16 informal ftp site prior to the deadline for submissions to the selection meeting. The selection meeting will therefore discuss the codecs under their consortium names rather than under blind labels.

Ericsson Radio Systems stated that in their opinion, by not requesting a 2.4kbit/s extension for the fixed-point selection phase, the ITU-T is missing the opportunity to fill a market need in a timely manner. The Rapporteur reminded the meeting that this subject had been addressed during the Rapporteur meeting on 8 - 10 November, and that the proposal to include the 2.4-kbit/s extension in the selection phase was not accepted because it represented a significant change to the existing work-plan of Q.21/16.

3.5.3.7 Review of schedule

The meeting reviewed the revised schedule and list of deliverables attached in Annex Q21.B. Due to the lack of a future meeting calendar, this schedule and the use of the alternative approval procedure (AAP) are provisional, and will be reviewed at the next SG16 meeting.

3.5.3.8 Approval of liaisons

The meeting approved a liaison statement to Q.22/12 (SQEG) requesting the following actions: preparation of a test plan for the fixed-point selection phase; the identification of organisations to perform the host laboratory, listening laboratory, and global analysis functions; guidance on the preparation of the global analysis.

The meeting agreed to include an item in the liaison to Q.22/12 (SQEG) requesting that those laboratories who participate in both ITU-T 4-kbit/s selection phases use different talkers in the fixed-point selection phase to those used in the floating-point selection phase; and that the noise material has not been used in any preceding standardization exercise.

The liaison statement also includes feedback from the floating-point selection phase, which suggests several refinements to the subjective testing procedures that were identified during the Rapporteur meeting on 8 - 10 November.

3.5.4 Future Work

No Q.21/16 Rapporteur meetings are planned prior to the next SG16 meeting.

3.6 Question 22/16: Software and Hardware Tools for Standardization of Speech and Audio Coding Algorithms

3.6.1 Summary

Currently the question is dealing with the maintenance and future enhancements of the STL96. At the last SG 16 meeting, the group agreed to officially issue a new release of the ITU-T Software Tool Library (STL2000), reflected as a revision to G.191 Annex A.

Release 1 of the STL2000 was made available at the February meeting both via the TSB as well as in the IFA for SG16. Some minor bugs were corrected and identified in two subsequent releases (R2 and R3). R3 was delivered to the ITU on July 13, together with the final text for G.191 Annex A (see COM16-139E). The draft revised G.191 Annex A is proposed for Decision at this meeting. The group unanimously agreed that G.191 should be forwarded for approval (Decision) by SG 16.

3.6.2 Documentation

Group Reference:	Number	Subject:
	COM-16-1 (97-2000)	[Text of questions]
	TD(P)13	New Questions
	COM-16 71R	[Report, WP 3/16 meeting, February 2000]
Action:	**Software tools:**	
	W139	G.191 Annex A for Decision
	TD10(3/16)	Info on 3GPP/SA4 activities regarding basic operators

3.6.3 Results

The following agenda was adopted:
1. Opening
2. Approval of the agenda
3. Review progress on Software Tools
4. G.191 Annex A (STL2000) for approval
5. Future activities under the question: maintenance and software tools
6. Outgoing Liaison Statements (SG12, 3GPP, 3GPP2)
7. AOB
8. Closing of the meeting

3.6.3.1 Progress on Software Tools

The following are the changes from the STL2000R1 to STL2000R3.

General. Updated pre-defined symbol for compilation under Win32/gcc (from `__CYGWIN32__` to `__CYGWIN__`) for modules G711, G722, BASOP, FIR, UTL, and UNSUP. Compilation scripts were updated and tested for automatic binary generation and testing from the STL2000 root directory (covering modules EID, FIR, G711, G722, G726, G727, IIR, IS54, MNRU, RPELTP, SV56, UNSUP, and UTL) for several platforms/compilers (HPUX/gcc; Win32/cl; CygWin/gcc; Sol7-Sparc/gcc).

Basic operators. Work by correspondence confirmed inclusion of shiftless 32-bit multiplication operators `L_mult0()`, `L_mac0()`, and `L_msu0()`. No discussions was held on the revision of the weights for the 32-bit operators.

EID. No functional changes performed in the module core (`eid.c`). Added a global variable `PORTABILITY_TEST_OPERATION` to `eid.c` that does not affect the module operation but allows the demonstration programs to print a warning to the user that the C code has been compiled with the portability test operation (which causes the module to produce systematic error patterns for portability purposes) and modified the demo programs to use this feature (`eiddemo.c`, `eid8k.c`, and `gen-patt.c`). Identified execution problems of `gen-patt.c` and `ep-stats.c` with Win32/cl and Win32/gcc while the same code works properly in Unix systems. It seems that both Win32 compilers share a buggy malloc run time library. The problem has not been corrected.

G711. Corrected `g711demo.c` for the calculation of the number of blocks to process under Win32/cl and Win32/gcc by including `<math.h>`. No changes performed in the module core (`g711.c`).

G722. The ZIP file with the restricted set of test vectors was renamed from `g722-unx.zip` to `tst-g722.zip`, for consistency with other modules. Changed makefiles accordingly. Found a bug in g722demo.c (not solved), whereby options N1 and N2 are ignored by the code and the whole file is processed. No changes performed in the module core (`g722.c`).

G726. Corrected bug in `vbr-g726.c` when the user does not specify the bit-rate. The array for bit rates was not initialized and caused a segmentation fault, and now it defaults to 32 kbit/s operation. Also fixed the incorrect calculation of the total number of blocks to process when the block size is not a multiple of the file size. No changes performed in the module core (`g711.c`).

G727. Editorial corrections were done in the C code self-documentation (comments). No changes performed in the module core (`g727.c`).

MNRU. In `mnrudemo.c`, changed memory allocation of floating point buffers in[] and out[] from static to dynamic, to prevent memory invasion when block sizes larger than 256 are specified. No changes performed in the module core (`mnru.c`).

FIR. In `fir-irs.c`, replaced the `RXIRS` filter coefficients (8 and 16 kHz) with a new set that more closely follows the Modified-IRS receive mask and generated new test vectors and updated the relevant makefiles. Removed compilation warnings observed with Win32/cl in modules `fir-{dsm,irs,pso,tia}.c`. Updated `filter.c` to display online help for option `-delay`. Also in `filter.c`, disabled down-sampling with FIR filters when block size is 1 (i.e. sample-based operation) because of a bug in fir_downsampling_kernel() [in fir-lib.c] that causes the output file to be one sample long. Until the function is corrected, this operation will be disabled in this program. In the makefiles, purged test files that had the same CRC32: test022.ref & test023.ref, test009.ref & test011.ref, test014.ref & test016.ref, test004.ref & test006.ref, test020.ref & test021.ref, test008.ref & test010.ref, test012.ref & test013.ref, and test005.ref & test007.ref.

SV56. Changed memory allocation in `sv56demo.c` and `actlevel.c` from static to dynamic, command line added options (`-blk`, `-start`, `-end`, and `-n`) options, updated makefiles and revised the read-me files. No changes performed in the module core (`sv-p56.c`).

UTL. Added a new informational symbol definition in `ugstdemo.h`, labeled `COMPILER`, which contains a text string describing the compiler used in a given built. No changes performed in the module core (`ugst-utl.c`).

Unsupported tools[2]. A minor bug was corrected in `sb.c` for the temporary filename (-over) when compiled with Win32/cl and added an option for conditional byte-swapping when overwriting a file (depending on whether the system is little or big-endian). Changed memory allocation in `sine.c` for data buffer from static to dynamic, to prevent memory invasion when block sizes larger than 256 are used. Corrected bug in `oper.c` that made incorrect calculation on total number of blocks to process when the block size is not a multiple of the file size. Added two new unsupported tools: `astrip.c`, `concat.c` to the UNSUP directory with test vectors. Updated makefiles and test vectors, as well as the top-level makefiles/batchs for automatic compilation of the STL.

[2] NOTE: This portion of the STL2000 is non-normative.

After review of the changes, the group unanimously agreed to forward G.191 Annex A for approval (Decision) by SG16.

3.6.3.2 Other working items

Basic Operators. A set of 40-bit operators was circulated to the reflector before the meeting but no feedback was received. It was mentioned at the meeting that 3GPP-2 is likely to use the 40-bit operators in their upcoming SMV variable bit rate coding standard. The group also reviewed information from 3GPP, that they only foresee usage of the 32 bit operators. Q.22 agreed to inform both groups of the approval of the STL2000, including the 32-bit basic operator set, and on the on-going work on the basic operators.

The group agreed to continue the work on the 40-bit basic operators.

STL User's Manual. Q.22 agreed that the Manual should be maintenance. The Rapporteur provided a draft version of the STL2000 User's Manual, which is also available in the SG 16 IFA. The group discussed ways to publish the Manual, but no firm conclusion was reached. Options included: current means (an attachment to the C code distribution), an Annex, or an Appendix (either in paper or as a one-page paper with electronic attachment). The current text is available as a postscript/PDF file, since the source of the document is typeset with LaTeX, and not MS Word. The possibility of converting the text into MS Word was noted. The Rapporteur will consult with the TSB trying to identify the best publication means. In the meantime, the Rapporteur invited interested parties to review chapters of the Manual and provide feedback. Discussions towards a final version of the Manual will continue via the WP3 reflector (wp3audio@ctd.comsat.com).

New work items. The group also agreed to try to identify a frequency-response tool, which would have direct use in the Q.20/16 work. At least a framework of the tool should be discussed and agreed to in the reflector discussions by mid February 2001. Other possible relevant work items include: G.728 implementation, linear interface to G.726 and G.727 (i.e. Annex A to G.726 and G.727), and G.711 packet loss concealment (G.711 Appendix I).

3.6.3.3 Action points

Annex Q22.A contains the revised list of action items for Q.22/16. The group reviewed the list in COM 16R-71 eliminating a number of work items that were obsolete. The remaining action items will be progressed by correspondence.

3.6.4 Liaison Statements

No Liaison Statements were received. A joint LS was produced for SG 12, notifying of the Decision of the STL2000, and a communication was prepared to ETSI/3GPP and TIA TR45.5/3GPP-2 with information on the status of basic operators in the STL.

3.6.5 Future work

Q.22/16 will continue its work by correspondence and is planned to meet again in the next meeting of SG 16.

3.7 Question 24/16: Variable Rate Coding of Speech Signals

3.7.1 Summary

Currently the question is refining its terms of reference. The current terms of reference can be found in COM16R-71E (report from the Feb 2000 SG 16 meeting). This session of Q.24 was chaired by the acting Rapporteur (Mr.S.F.Campos-Neto, LMGT/USA) on November 14.

Several contributions were reviewed and three different approaches were discussed. The group could not agree at this meeting which line would be more appropriate for the intended applications, and decided that three threads of discussions should be held over the email reflector (vbr@ctd.comsat.com[3]) trying to generate initially three sets of terms of reference, that would be harmonized as a next step. The group will formally review the results of the discussions in the next SG16 meeting.

3.7.2 Documentation

3.7.2.1 Input Documents

No.	Source	Title	Question
D066	Ericsson	Communication to ITU-T Q.24/16 on "Parameters for variable bit rate voice codec operation and information on channel models"	24
D072	Conexant, Lucent	Technical merits of VBR coding system and SMV	24
D073	Qualcomm	CDMA2000 and IS95 system capacity benefits derived from a VBR coding scheme	24
TD(3)03	ITU-R	ITU-R Recommendation M.1079 - Performance and Quality of Service Requirements for International Mobile Telecommunications-2000 (IMT-2000)	WP3
TD(3)09	TR45.5	Discussion on VBR requirements	24

3.7.2.2 Output Documents

Communications: Communication to 3GPP/3GPP2.

3.7.3 Results

The group adopted the following agenda:
1. Opening of the meeting
2. Approval of the agenda
3. Documentation
4. Review of documents
5. Review of terms of reference
6. Outgoing documents
7. Continuation of the work
8. AOB
9. Closing of the meeting

[3] Subscription requests should be sent to <simao.campos@labs.comsat.com>

3.7.3.1 Discussion

Document D066 (Ericsson, *"Communication to ITU-T Q.24/16"*) was presented and conveyed an answer to communication sent to 3GPP early in the year. The document explained several VBR aspects of the existing and soon-to-be-adopted AMR system, which in summary can be seen as a mix of VAD/DTX source-controlled system with multi-rate options that are network-controlled.

The paper D072 (Conexant, Lucent, *"Technical merits of VBR coding system and SMV"*) and Corrigendum described the VBR solution soon-to-be-adopted in 3GPP2. In summary, it is a scheme that supports different bit-rates which are somewhat specialized for a range of portions of the speech signal (voiced segments, transitions, silence, etc) and is controlled by a front-end signal classification module (Rate Determination Algorithm). Different modes can be network-controlled, in order to achieve different average bit rates (ABR).

D073 (Qualcomm, *"CDMA2000 and IS95 system capacity benefits derived from a VBR coding scheme"*) shows the gain in capacity that can be achieved from lower average bit rates in IS95 and CDMA2000 systems.

TD(3)09 (TR45.5 [via SG 16 Chairman], *"Discussion on VBR requirements"*) discusses and proposes a number of issues that in their view are relevant for the refinement of the Terms of Reference in Q.24.

Table 3 in page 21 of TD(3)03 (ITU-R, *"ITU-R Rec. M.1079 - Performance and QoS Requirements for International Mobile Telecommunications-2000 (IMT-2000)"*) was briefly reviewed by the group and contains reference values for bit rates, delay, delay jitter, and channel errors for IMT-2000 applications. These values should be taken into account in the elaboration of the Terms of Reference for the question.

As part of the discussions, it was brought to the attention of the delegates an early contribution discussed in 1999 on embedded VBR schemes.

After the presentation of the documents and exchange of points of view, the group recognized merits in the three technological approaches discussed:
1. Multirate/VAD VBR approach (MVV)
2. Specialized Codec VBR approach (SCV)
3. Embedded VBR approach (EV)

However, the group could not agree at this time which of the three approaches would be more promising towards the intended applications. It was clarified in the discussions that the objective of this Question is not to standardize a codec for use in the first wave of Third-Generation (3G) systems, but for the next wave of systems as well as packet-based systems where gains may be obtained from variable packet sizes.

As a result the group adopted the Rapporteur's suggestions to pursue a three-pronged approach in which three ad-hoc groups will develop three sets of terms of reference (ToR), one for each of the technologies above, to be conducted over the VBR e-mail reflector (vbr@ctd.comsat.com) and moderated by three different members. The MVV discussions will be moderated by Mr. Paul Barrett <paul.a.barrett@bt.com>; the SCV discussions will be moderated by Mr.Huan-Yu Su <Huan-Yu.Su@conexant.com>, and the EV discussions will be moderated by Mr. Sean Ramprashad <ramprash@research.bell-labs.com>. The discussions will be based on past and present contributions, as well as on new material that will be circulated through the reflector. The conclusions of the work will be submitted to the next SG 16 meeting as TDs, when the three different ToRs will be

compared and a common set of ToRs will be derived. It is the ultimate objective however that a single standard would be identified as a result of this question. Strong consideration will be given to application areas not already covered by existing ITU coding standards.

3.7.4 Liaison Statements

One Liaison Statement was prepared by Q.24 ETSI/3GPP SA4 and TIA TR 45.5 informing on the progress of the question and inviting interested experts to contribute to the discussions over the reflector. In the SG 16 Plenary it was decided that this text will also be sent as a LS to the newly created Special Study Group on IMT-2000. Interested parties should send an email to <simao.campos@labs.comsat.com> requesting subscription to this VBR reflector.

3.7.5 Future work

No Rapporteur's meetings are planned. The work is expected to progress via the email reflector (vbr@ctd.comsat.com) and the group will review the outcome of the discussions at the next SG 16 meeting.

4. Summary of Liaison Statements produced by WP 3/16

Annex WP3.A of this report contains the summary of all Liaison statements considered and produced by WP 3/16 during this meeting of SG 16. The agreed texts of the Liaison Statements are available in TD (P) 84.

5. Summary of future Rapporteur meetings for WP 3/16

Tentative Dates	Tentative Host/Place	Q	Detailed agenda items
9-12 January 2001	Siemens / Eibsee, Germany	15/16	• Further the work toward H.26L long-term coding standard • Generate the material to be used for H.26L performance demonstration in tests by ISO/IEC JTC1/SC29/WG11 • Discuss comments received during the comment period for H.263 Annex X (provided the comment period has expired) • Develop implementers guide or corrigendum to H.263 • Develop test model appendix to H.263 • Coordination of video coding needs for Q.11-14/16 standards • Study of H.263 capabilities and limits • Particular study of video coding for packet network and mobile applications • Coordination of relationship with video coding technology in ISO/IEC JTC1 SC29/ WG11 (MPEG) • Consideration of video coding needs for non-conversational services • Consideration of video coding needs for users of sign-language and lip-reading • Maintenance of existing ITU video coding standards (H.120, H.261, H.262, H.263) • Other business as necessary for Q.15
March / April 2001	TBD	15/16	Continuation of agenda items shown above

Annex WP3.A
Liaison Statements received and sent by WP 3/16

Received				
Number	Question	Source	Subject	Action
TD(G)001	WP3	TSAG	Liaison Statement on update on Electronic Document Handling	Noted
TD(3)01	19	SG 15	Liaison Statement to SG16 on synchronous reset of G.728 and G.729 codecs in CME	Replied
TD(3)02	19	SG15	Reply to LS on the approval of Appendix II to G.711, Annexes to G.728 and G.729	Noted
TD(3)03	WP3	ITU-R SG8	ITU-R Recommendation M.1079 - Performance and Quality of Service Requirements for International Mobile Telecommunications-2000 (IMT-2000)	Noted
TD(3)04	15	ISO/IEC	Liaison Statement to ITU-T SG16 regarding video coding activities and IDCT specification	Replied
TD(3)05	15	ISO/IEC	Liaison Statement reply to ITU-T Study Group 16 on future video coding work	Replied
TD(3)06	15	ISO	Liaison Statement to ITU-T Study Group 16 on ISO/IEC 13818 (MPEG-2 Systems and Video) Common Text and MPEG-4 on IP	Replied

Sent				
Number	Question	Destination	Subject	Purpose
TD(P)84	15	ISO/MPEG	Reply to LS to ISO/IEC JTC1/SC29/ WG11 on Video Coding Activities	Reply
	15	IETF AVT and MMusic	Communication IETF AVT and MMusic on Video Coding Activities	Information
	15	ETSI/3GPP TIA TR45.5	Communication to 3GPP TSG-S4 and S2 and 3GPP2 TSG-C on Video Codec Support for Wireless Multimedia Terminals	Reply
	15, 11	IMTC	Communication to IMTC	Information
	19	SG15	Reply to LS on on Synchronous Reset of G.728 and G.729 codecs in CME	Info & reply
	20,21,22	Q.22/12 (SQEG)	Forthcoming testing activities and STL2000	Action (Feb 2001)
	20	ETSI/3GPP TIA TR45.5	Information on wideband speech coding activity	Info
	22	ETSI/3GPP TIA TR45.5	Basic operators	Info
	24	SSG IMT2k ETSI/3GPP TIA TR45.5	Progress on variable rate voice coding	Info

Annex Q15.A
Terms of Reference for Advanced Video Coding Activities

Q15.A.1 Scope

The goal of this Question is to produce advanced moving image coding methods appropriate for conversational audio/visual services. However, moving image coding should also consider applications for non-conversational services. This Question will focus on advanced techniques leading to significant quality and performance improvements. Video coding standardization needs will be investigated for multimedia systems without regard to transport type (Internet, LAN, Mobile, N-ISDN, B-ISDN, GSTN, etc.). The Question will also include maintenance issues regarding existing video coding standards.

Q15.A.2 Current Projects

The primary project under way is the development of a new "H.26L" video coding standard. H.26L will investigate new video coding algorithms with the objective of achieving a significant improvement in performance relative to the best available version of prior standards. The target date for decision of a new H.26L recommendation is around the middle of the year 2002. The workplan schedule for the H.26L project is shown below.

Also under way are some activities for Recommendation H.263. A new Annex X containing profile and level definitions has reached SG 16 consent status and needs to have work completed in response to any comments that may be provided. An appendix is under development to describe a test model reference encoding method for H.263. A corrigendum or implementers guide is also planned.

The activities for this Question will continue the work on both H.263++ and H.26L. Both of these activities relate closely to work being conducted within the MPEG-4 project of ISO/IEC JTC1 WG11/SC29, and should be coordinated closely with that effort, including liaison communication.

Q15.A.3 Study Items

- Advanced coding methods in order to achieve the following objectives:
    - improvements in compression efficiency;
    - reduction of real-time delay;
    - improvements in picture quality;
    - robust operation in error prone environments (e.g., non-guaranteed-bandwidth packet networks or mobile wireless communication);
    - organization of the compressed data format to support packetization and streaming;
    - temporal and spatial alignment of streams of varying coding;
    - reduction of complexity;
    - additional features such as object coding and multi-view operation.
- Maintenance of existing H series video coding Recommendations, including H.120, H.261, H.262|ISO/IEC 13818-2, and H.263.
- Variable Bit Rate coding.
- Video coding needs for those using sign language and lip reading communication.
- Video bit rate reduction for compressed-digital to compressed-digital processing.
- The impact of colorimetry, video quality assessment, and quality control requirements on video codec development.
- Impact of downloaded video algorithm coding.

Q15.A.4 Methods of Work

Work will be conducted via correspondence to the maximal possible extent, especially using email and ftp communication (per the SG16 EDH policy) and also possibly fax/or and written letters. Rapporteur's group meetings will be conducted in the interim between meetings of Working Party 3 of Study Group 16 to further the work toward the above goals. Liaison communication should also be conducted with ISO/IEC JTC1 SG11/SC29 as authorized by the rapporteur experts group during this period.

H.26L Workplan

Meeting	Approx Date	Type	Milestone
SG16-1	17 March '97	Study Group	
Q15-A	24 Jun '97	Experts	
Q15-B	8 Sep '97	Experts	
Q15-C	2 Dec '97	Experts	
SG16-2	26 Jan '98	SG16	Issue Call for Proposals
Q15-D	21 Apr '98	Experts	
Q15-E	21 Jul '98	Experts	
SG16-3	14 Sep '98	Study Group	
Q15-F	3 Nov '98	Experts	First Formal Evaluations
Q15-G	16 Feb '99	Experts	
SG16-4	17 May '99	Study Group	
Q15-H	Aug '99	Experts	First Formal Draft Adoptions
SG16-5	Sep '99	Study Group	
Q15-I	Oct '99	Experts	
SG16-6	Feb '00	Study Group	
Q15-J	May '00	Experts	
SG16-7	Jun '00	Study Group	-
Q15-K	Aug '00	Experts	
WTSA	Sep '00	WTSA	-
SG16-1N	Nov '00	Study Group	
	Jan '01	Experts	Final Major Feature Adoptions
	Apr '01	Experts	
	May '01	Study Group	
	Oct '01	Experts	Bug-Checking
	Nov '01	Study Group	
	Jan '02	Experts	
	May '02	Study Group	Consent

ANNEX Q20.A
Terms of Reference for the ITU-T Wideband (7 kHz) Speech Coding Algorithm around 16 kbit/s

- Background

The following general guidelines are considered relevant for this wideband activity:

- Input and output audio signals should have a bandwidth of 7 kHz at a sampling rate of 16 kHz.
- Primary signals of interest are clean speech and speech in background noise. Music performance objectives set at higher bit-rates (24 kbit/s).
- High speech quality with the objective of equivalence to G.722 at 56/64 kbit/sec.
- 16 kbit/s is the main bit-rate. It is required the ability of the candidate to scale in bit rate to lower bit-rates (less then 16 kbit/s) and up to 24 kbit/s with no fundamental changes in either the technology or the algorithm used.
- Robustness to frame erasures and random bit errors.
- Low algorithmic delay (frame size of 20ms or integer sub-multiples)

- Applications

In the following the applications foreseen for a wideband (7 kHz bandwidth) speech coder around 16 kbit/s are listed:

1. Voice over IP (VoIP) and Internet Applications

Features: Wideband transmission over the internet
High quality speech for IP video-conferencing
Robust under background noise conditions
Robust to frame erasures
Scalable bit rate (e.g. 12...24 kbit/s)
Main focus on speech, good music performance at higher bit rates desirable

2. Mobile Communications

Features: High-quality speech for third generation services
Mainly to be used under relatively small residual channel error conditions
Robust under background noise conditions
Robust to random bit errors
Robust to frame erasures
Scalable bit rate (e.g. 12...24 kbit/s)
Main focus on speech

3. PSTN applications

Features: High-quality audio-conferencing
Business applications (point-to-point, multi-point-links)
Robust under background noise conditions
Fixed bit rate sufficient
Main focus on speech

4. ISDN wideband telephony

Features: High-quality audio conferencing for multi-point applications
Robust to background noise
Fixed bit rate sufficient
Main focus on speech

5. ISDN video-telephony and video-conferencing

Features: Enabling high-quality speech using only one ISDN channel
Improve video quality using two or more ISDN channels
Robust under background noise conditions
Fixed bit rate sufficient
Main focus on speech

The experts group consider that VoIP, Internet Applications and Mobile Communications (listed in item 1 and 2 of the application list) are the primary applications. The Terms of Reference reflect that consideration.

- Performance requirements & objectives

The performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s are shown in Table Q20.1.

Table Q20.1 – (Part 1/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s (Note 1)

Parameter	Requirement	Objective
Bit-rate(s)	- not exceeding 13 kbit/s - not exceeding 16 kbit/s - not exceeding 20 kbit/s - not exceeding 24 kbit/s (Note 2)	Scalable on finer increments of bit-rate. The number of bit per frame should be an integer multiple of 8.
Speech (single speaker) in error-free condition at input signal nominal level -26 dB with respect to the overload point (Note 3):		
1) at 13 kbit/s (Note 4)	No requirement	Not worse than ITU-T Rec. G.722 at 48 kbit/s
2) at 16 kbit/s	Better than ITU-T Rec. G.722 at 48 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s
3) at 20 kbit/s (Note 4)	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s	Not worse than ITU-T Rec. G.722 at 64 kbit/s
Narrowband speech (single speaker) in error-free condition at input signal nominal level -26 dB with respect to the overload point: (Note 5)		
1) at 13 kbit/s	No requirement	
2) at 16 kbit/s	Not worse than ITU-T Rec. G.726 at 32 kbit/s (Note 6)	
3) at 20 kbit/s	No requirement	
4) at 24 kbit/s	Not worse than ITU-T Rec. G.726 at 32 kbit/s (Note 6)	

Table Q20.1 – (Part 2/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Speech (single speaker) in error condition at input signal nominal level –26 dB with respect to the overload point:		
- Robustness to random bit errors (BER=10^{-3})	No requirement	(Note 7)
- Detected frame erasures (3% Random) (Note 8, 9)		
1) at 13 kbit/s	No requirement	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 48 kbit/s under error free condition
2) at 16 kbit/s	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 48 kbit/s under error free condition	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 56 kbit/s under error free condition
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 56 kbit/s under error free condition	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 64 kbit/s under error free condition
- Detected double-frame erasures (3% random)		
1) at 13 kbit/s	No requirement	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 48 kbit/s under error free condition
2) at 16 kbit/s	No requirement	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 56 kbit/s under error free condition
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	No requirement	No more than 10% additional degradation, in terms of PoW (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 64 kbit/s under error free condition

Table Q20.1 – (Part 3/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Speech (single speaker) quality dependency on the input signal level between –36 dB and –16 dB with respect to the overload point:		
Low level input speech (-36 dBov)		
1) at 13 kbit/s	No requirement	Not worse than ITU-T Rec. G.722 at 48 kbit/s with –36 dBov input level
2) at 16 kbit/s	Better than ITU-T Rec. G.722 at 48 kbit/s with –36 dBov input level	Not worse than ITU-T Rec. G.722 at 56 kbit/s with –36 dBov input level
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s with –36 dBov input level	Not worse than ITU-T Rec. G.722 at 64 kbit/s with –36 dBov input level
High level input speech (-16 dBov)		
1) at 13 kbit/s	No requirement	Not worse than ITU-T Rec. G.722 at 48 kbit/s with –26 dBov nominal input level
2) at 16 kbit/s	Better than ITU-T Rec. G.722 at 48 kbit/s with –26 dBov nominal input level	Not worse than ITU-T Rec. G.722 at 56 kbit/s with –26 dBov nominal input level
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s with –26 dBov nominal input level	Not worse than ITU-T Rec. G.722 at 64 kbit/s with –26 dBov nominal input level
Speech (single speaker) quality dependency on speakers at input signal nominal level (Note 10):		
1) at 13 kbit/s	No requirement	Not worse than ITU-T Rec. G.722 at 48 kbit/s
2) at 16 kbit/s	Better than ITU-T Rec. G.722 at 48 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s.	Not worse than ITU-T Rec. G.722 at 64 kbit/s

Table Q20.1 – (Part 4/7)

Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Music in error-free condition at input signal nominal level –26 dB with respect to the overload point:		
1) at 13 kbit/s	No requirement.	No requirement.
2) at 16 kbit/s	No requirement.	No requirement.
3) at 20 kbit/s	No requirement	No requirement
4) at 24 kbit/s	No requirement	Not worse than ITU-T Rec. G.722 at 48 kbit/s (Note 11)
Performance in the presence of the following background noises for 1, 2, asynchronous tandem encodings (foreground signal is single speaker): - office noise (SNR=15dB) - babble noise (SNR=20dB) - car noise (SNR=15dB) - interfering talker (SNR=15dB) - *performance in the presence of reverberant speech conditions. For further study (Note 12)*		
1) at 13 kbit/s	No requirement	No more than 10% additional annoying degradation, in terms of annoying or very annoying (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 48 kbit/s
2) at 16 kbit/s	No more than 10% additional annoying degradation, in terms of annoying or very annoying (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 48 kbit/s	No more than 10% additional annoying degradation, in terms of annoying or very annoying (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 56 kbit/s
3) at 20 kbit/s	No requirement	Better than the 16 kbit/s under the same condition
4) at 24 kbit/s	No more than 10% additional annoying degradation, in terms of annoying or very annoying (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 56 kbit/s	No more than 10% additional annoying degradation, in terms of annoying or very annoying (i.e. % of 1+2 votes), with respect to ITU-T Rec. G.722 at 64 kbit/s

Table Q20.1 – (Part 5/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Tandeming capability for asynchronous tandeming (Note 13):		
1) at 13 kbit/s	No requirement.	No requirement.
2) at 16 kbit/s	Not worse than ITU-T Rec. G.722 at 48 kbit/s under the same tandem condition (2 tandems)	Not worse than ITU-T Rec. G.722 at 56 kbit/s under the same tandem condition (2 tandems)
3) at 20 kbit/s	No requirement.	No requirement.
4) at 24 kbit/s	Not worse than ITU-T Rec. G.722 at 56 kbit/s under the same tandem condition (2 tandems)	Not worse than ITU-T Rec. G.722 at 64 kbit/s under the same tandem condition (2 tandems)
Transcoding with ITU-T G.722 or other standards	For further study	For further study
One-way coder/decoder delay (Note 14, 15):		
- frame size	20 ms (or integer sub-multiples of 20ms)	10 ms (or integer sub-multiples of 10 ms)
- total codec delay (algorithmic delay+processing delay)	≤ 50 ms	≤ 25 ms
Encoder-decoder synchronization (Note 16)	Provided externally	
Capability to transmit voice-band data (Note 17)	Not needed	For further study
Capability to transmit information and signaling tones (Note 18)	DTMF	

Table Q20.1 – (Part 6/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Effect of switching signal sources to the codec (Note 19)	Capability required	
Effect of switching between bit-rates (Note 20)	Capability required	No annoying effects
Convergence time (Note 21)		
1) at 13 kbit/s	For further study	For further study
2) at 16 kbit/s	For further study	For further study
3) at 20 kbit/s	For further study	For further study
4) at 24 kbit/s	For further study	For further study
Idle channel noise (Note 22)		
- unweighted	Less than –66 dBm0	
- weighted	For further study	
- single frequency	For further study	
Sampling rate (Note 23)	16 kHz	
Timing requirements (Note 24)	Equivalent to those contained in ITU-T Rec. G.722 as preliminary indication	
Jitter tolerance (Note 25)	The network interface to the codec is assumed to be compliant to the jitter limits appropriate to digital equipments as specified in ITU-T Rec. G.823, G.824 and I.430 (Note 26)	
A/D and D/A converter accuracy	Testing performed with 14 bit linear PCM. 15 and 16 bit linear PCM are for further study.	
Overload point of the A/D and D/A converters	As for ITU-T Rec. G.722 as preliminary indication (+9dBm0 ±0.3dBm0)	

Table Q20.1 – (Part 7/7)
Performance requirements and objectives for a wideband (7 kHz) speech coding algorithm around 16 kbit/s

Attenuation/frequency response of encoder and decoder analog circuitry	As for ITU-T Rec. G.722 as preliminary indication	
Nominal frequency range at 13, 16, 20 and 24 kbit/s (Note 27)	50 to 7000 Hz	
Digital transport compatibility	ITU-T Rec. H.221, H.320, H.323, H.324	
Variable bit-rate compatibility	Capability of switching bit-rate at frame boundaries required. The frame size should be equal for the different bit-rates.	For further study
Interoperability		Interoperability with 3G and 2G systems (Note 28)
Complexity	As low as possible (Note 29). Encoder and decoder in 1 DSP (single CPU)	
Memory	As low as possible in terms of RAM used	For further study
Specification description and implementation	Bit-exact 16 bit fixed-point modular ANSI-C code (Note 30) electronic format, using the ITU-T 32-bit basic operators	Interoperable floating-point specification to follow after fixed-point specification

Notes to Table Q20.1

1. The requirements and objectives refer to the distortion introduced between the defined input PCM interface of the coder and the defined output PCM interface of the decoder, unless otherwise specified.

2. Hereafter in the Terms of Reference, the wording “at x kbit/s” should be intended as “not exceeding x kbit/s”, as applicable to the bit-rates of the candidate algorithm.

3. When all requirements are met, the objectives will be used as one of the criteria to discriminate between candidates.

4. That bit-rate is not tested in the Qualification test. In the **Selection test** the objectives will be considered and tested.

5. In some possible scenarios the wideband speech coder may have to code a signal coming from a narrowband source. One such application is the wideband teleconferencing scenario where some of the callers participate in the call using narrowband terminal equipment while others use the wideband option. It should therefore be possible for the wideband speech coder to encode a narrowband signal with high quality.The input characteristic of the narrowband speech is for further study.

6. The requirement for narrowband input speech is not tested in the Qualification test, where the candidate proponents are requested to provide only *demonstration material*. This requirement will be tested in the **Selection test**.

7. The candidate proponents are requested to provide *demonstration material* for the Qualification and **Selection test** at 16 and 24 kbit/s operation modes with the entire bit-stream subjected to a random BER=10^{-3}. Additional material at different levels of BER will be provided for information. More specific guidelines will be agreed and inserted in the Selection Plan documents.

8. Detection of frame erasures will be indicated to the decoder by external signals. If the test codec has a frame size other than 20 ms, a 20 ms frame boundary will be used for FER testing. Hence, multiples of 20 ms will be erased in the event of frame erasures.

9. The evaluation of speech quality in detected random frame erasure conditions will consider a requirement in terms of percentages of PoW (Poor or Worse) allocated in addition to the PoW percentage obtained from the reference codec. The additional degradation is an absolute increase of 10% (or 5%). In other words, the %(P+B) is first determined for the reference codec and an absolute value of 10 (or 5) is added to produce the increased reference degradation.
   The new 'absolute' criterion, introduced to avoid using the ΔMOS concept (subject to relative shifts depending on the context of the experiment, the instructions to the team, the listeners, etc.), needs that the limits at 95% confidence level of PoW are calculated, following a defined computation rule.

10. Further studies are required to establish an appropriate methodology to test speaker dependency.

11. The candidate proponents are requested to provide *demonstration material* for the **Selection Test** at 24 kbit/s operation mode. More specific guidelines will be agreed and inserted in the Selection Plan documents.

12. Further studies are required to identify realistic reverberant conditions to be tested (room geometry, distance between microphone and talker(s), reverberation time vs. frequency, etc.). The requirements and objectives related to this type of signal are to be defined.

13. A primary application requiring tandemed codecs is in multipoint control units (MCU), where signals are also mixed from several codecs before recoding and transmission. Test conditions with 3 tandems will be considered in the Characterization phase.

14. Algorithmic delay includes the frame size, that is the block size of acquired input signal, plus any other delays inherent in the algorithm (look ahead). Processing delay is the time taken by encoder to process samples and by decoder to decode the incoming bit stream. Total codec delay is the sum of algorithmic delay and processing delay.
It is assumed that the processing delay is equal to the frame size.
The channel transmission delay assumes that transmission occurs on a serial channel matched to the bit rate of the codec, which typically is equal to the frame size. The total system delay is the sum of algorithmic delay, processing delay, channel transmission delay and such other delays caused by the test equipment and interfaces connected to these. The total system delay can be measured. The test system delay consists of the delay caused by the test equipment and the interface between the wideband speech encoder/decoder and the test equipment. The test system delay can be measured by passing PCM data directly through the system, bypassing only wideband speech encoder and decoder. The total codec delay can be calculated by subtracting the test system and channel transmission delay from the total system delay.

15. The size of frame acquired by the encoder should be 20ms or a sub-multiple of 20ms, as a requirement. For example, xz = 20ms, where x is an integer and z is the frame size in ms. Maintaining 10ms boundaries provides easy compatibility with ITU-T Rec. H.221.

16. Bit stream alignment between encoder and decoder.

17. ITU-T Rec. H.221 provides for data transmission in ISDN applications. In other applications, including DCME, PCME and ATM networks, separate transmission facilities will be provided for voice-band data.

18. The actual distortion requirements and objectives for the tones to be transmitted are for further study.

19. In a voice activated MCU where the broadcaster is selected according to voice signal levels, there should be no annoying artifacts caused by switching signal source to the codec.

20. Switching between operating bit-rates shall not introduce subjectively noticeable effects.

21. The convergence time should be as small as possible in order not to miss any significant parts of words. The convergence time of a speech codec is the amount of time it takes for the state in the decoder to approximate the state in the encoder, when the decoder has been reset to its initial state during the middle of a talk spurt. This definition readily suggests a methodology for measuring convergence time.
Begin with a test signal of speech. It is encoded and output bit stream is saved. The entire bit stream is decoded and the output is uninterrupted decoded speech. In this encoding and decoding, the states of the encoder and decoder are initialized to be equal. Next, remove the beginning of the bit stream. Decode the remainder of the bit stream, having re-initialized the decoder first. Receive a decoded output signal which will evolve toward the true output signal decoded earlier. Then measure the sequence of individual segment signal-to-noise ratios (SNR). The convergence time will be the time beyond which the segment SNR always stays above the pre-determined threshold.

22. Idle channel noise measured with an encoder and decoder connected back-to-back as described in ITU-T Rec. G.722. Three cases are considered:
    - unweighted (unweighted noise power measured in the frequency range 50 to 7000 Hz)
    - weighted (weighted noise power measured in the frequency range 50 to 7000 Hz)
    - single frequency (the level of any single frequency, in particular 8000 Hz, the sampling frequency and its multiples, measured selectively).

23. Nominal sampling rate of the analog-to-digital and digital-to-analog converters.

24. Accuracy of the analog-to-digital and digital-to-analog converters clocks.

25. Jitter tolerance of the incoming bit-stream (peak-to-peak variation) that avoids introduced errors at the decoder.

26. In order to ensure that any equipment can be connected to any recommended hierarchical interface within a network, it is necessary to arrange that the input ports of all equipment are capable of accommodating levels of jitter up to the maximum network limit defined in ITU-T Rec. G.823 “The control of jitter and wander within digital networks which are based on 2048 kbit/s hierarchy” and ITU-T Rec. G.824 “The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy”. For equipments connected to an ISDN Basic Rate Access, the NT jitter characteristics contained in ITU-T Rec. I.430 are also relevant.

27. The nominal 3 dB bandwidth measured with an encoder and decoder connected back-to-back as described in ITU-T Rec. G.722. The measurement should be performed by injection of white noise to the codec in order to compute its transfer function between input and output.

28. If there is one or more than one bit-rate in common with the source bit-rates for wideband coding defined in 3G (including at least 3GPP and 3GPP2) and 2G systems, the objective is to provide bit-stream compatibility at those bit-rates, i.e. the bit-stream produced by this wideband encoder should be correctly decoded by the 3G and 2G wideband decoder and vice-versa.

29. When all requirements are met the complexity and memory figures will be used as one of the criteria to discriminate between candidates.

30. Modular means a software implementation made in accordance to the guidelines given in ITU-T Software Tools Library User Manual.

- **Schedule for wideband coding around 16 kbit/s**

A timetable for the development of a wideband speech coding algorithm around 16 kbit/s is reported in the following:

Note: the draft time schedule is split in two parts: *Technical Activity and Contractual Activity.*

Date	Technical Activity
Study Group 16 meeting Nov. 13-17, 2000	At the Study Group meeting in November 13-17, 2000 : • A clear statement is made indicating whether or not the Host Laboratory Cross-Checking and Listening Laboratory have been judged compliant in meeting their deliverables according to the contents of the Memoranda of Understanding. • Evaluation of the test results of the Qualification Phase. • Define an Ad Hoc group for drafting the Selection Plan documents. (editor of each individual experiment and document is appointed within the Ad Hoc group)
20 November 2000	Start drafting the Wideband Selection Plan documents within the Ad Hoc group.
[t.b.d. 22 November 200]	Qualification Test processed speech material available to Candidate Proponents (each candidate will have access to its own processed material)
20 December 2000	• Draft Wideband Selection Plan documents available on the e-mail reflectors (tsg12q20@itu.int and tsg16q20@itu.int) and on IFA. • Call for host/cross-checking/listening/global analysis labs issued by the Q.20/16 Rapporteur via e-mail.
19-23 February 2001 **(SG12 meeting)**	Final version of the Wideband Selection Test Plan approved.
9 March 2001	• The Host Laboratory receives the source material from the Listening Laboratory. • The Host Laboratory generates the Noise Files and the Error Files.
12 March 2001	• Preliminary submission of executable code to the Host Laboratory. • The Cross-checking Lab receives a subset of source material for cross-checking activities.
28 March 2001	The Host Laboratory receives the fixed-point executable code, with test vectors, from each Candidate Proponent.
30 March 2001	The Cross-checking Lab receives the necessary executables for cross-checking activities.
14 May 2001	The Listening Laboratory will receive, with blind mapping, the processed (already cross-checked) material for the Candidate Algorithms.
20 June 2001	Deliverables (raw data and test results) are sent via e-mail by the Listening Laboratories to the Q.20/16 Rapporteur (Mr Rosario Drogo De Iacovo, CSELT/ITALY; e-mail: rosario.drogodeiacovo@cselt.it), to the WP3/16 Chairman (Mr Simão F. Campos Neto, COMSAT/USA; e-mail: simao.campos@labs.comsat.com) and to the appointed contacts of the Candidate Proponents.
22 June 2001	A notification (e-mail) is sent by the Q.20/16 Rapporteur informing the group, through the ITU-T e-mail reflector (e-mail: tsg16q20@itu.int) that the deliverables (raw data and test results) have been received from Listening Laboratories.
3 July 2001	Submission of deliverables as Rapporteur's meeting documents: • Each Listening Laboratory submits a report (in the form of a technical contribution) with test results. The test results will be presented according to the format described in the ITU-T Wideband Selection Test Plan. • Global analysis is performed and submitted as a report by the Global Analysis Laboratory. • Host Laboratory makes available demonstration material (random bit errors and music conditions) to the Candidate Proponents with a blind mapping different from the one used for the Listening Laboratories. Additional contractual deliverables (e.g. computation of the nominal frequency range) are also submitted as a report.
16 July 2001	Submission of deliverables as Rapporteur's meeting documents: • Each Candidate Proponent submits the High Level description of its Candidate Algorithm.

WP3/16 meeting July 23-27, 2001 [July 16-20, 2001]	• Evaluation of the results of the Selection Phase. • Evaluation of the algorithm complexity. • **Consent of Recommendation and C-source code.** • Draft version of the Characterization Test Plan. • The selected candidate proponent submits the Detailed description of the algorithm
	Final version of the Characterization Test Plan available on SG16 IFA.
	Start the organization of the Characterization Phase (based on MoUs and NDA as done in the Qualification Phase).
	Start of Host Laboratory sessions.
	End of Host Laboratory sessions.
	Start of Listening Laboratory sessions.
	End of Listening Laboratory sessions.
	Each Listening Laboratory submits a report (in the form of a technical contribution) with test results. Global analysis performed.
Study Group 16 meeting February 2002	• Evaluation of the results of the Characterization Phase. • Completion of the algorithm implementation verification test procedures. • **Decision of Recommendation.**

Date	Contractual Activity
17 November 2000	Letter Of Intent (LOI) available on SG16 Informal FTP Area (IFA). (Note: The LOI will contain the intention to submit a candidate algorithm to the ITU-T Selection process and the intention to follow item 2.2 of the ITU-T patent policy)
end Nov. 2000	Draft version (without price and work allocation) of MoU (A), MoU (B) and MoU (C) and NDA available on IFA. (Note: MoU(A) will be signed between each candidate proponent and the ITU-T, i.e. one per candidate. MoU(B) will be signed between the host lab and the ITU-T. MoU(C) will be signed between the listening lab and the ITU-T. The NDA requires the host and cross-checking laboratories to keep the candidate executables in confidence. Global Analysis Laboratory work may require a separate MoU)
1 December 2000	LOI received by ITU-T TSB from Candidate Proponents.
4 December 2000	Information on the LOI received is made available on the e-mail reflector (tsg16q20@itu.int)
15 January 2001	If a Candidate Proponent whishes to withdraw its ITU-T Wideband Candidate Algorithm it must inform the TSB (Fabio.Bigi@itu.int and Thierry.Perewostchikow@itu.int) via fax and e-mail, and Q.20/16 Rapporteur (rosario.drogodeiacovo@cselt.it) and WP3/16 Chairman (simao.campos@labs.comsat.com) via e-mail not later than close of business for the recipients on 15 January 2001.
19-23 February 2001 **(SG12 meeting)**	• Pricing and work allocation defined. • Final version of MoU (A), MoU (B), and MoU (C) prepared and uploaded to IFA.
2 March 2001	• Two signed copies of MoU(A) received by ITU-T TSB from Candidate Proponents (via fax, original mailed on the same date). • Two signed copies of NDA received by Host Lab and Cross-checking Lab from each Candidate Proponent (if required).
9 March 2001	Completed copies of NDA received by Candidate Proponents from Host Lab and Cross-checking Lab (if required).
12 March 2001	Two signed copies of MoU(B) and MoU (C) received by ITU-T TSB from Host Laboratory and Listening Laboratory, respectively.
19 March 2001	Selection costs placed in ITU-T bank account by close of business (proof of transfer may be requested).

Annex Q21.A
Summary of 4-kbit/s codec floating-point selection results

In the following Tables CuT denotes Codec under Test.

Table Q21.A.1
Codec overview.

Proponent	CuT	Algorithm	Frame-size/ms	Look-ahead/ms	Total delay/ms
AT&T, Conexant, DT, FT, Matsushita, NTT	A	eX-CELP	20	12.5 (encoder) +/- 2.5ms	52.5 +/- 2.5ms
Ericsson, Nokia, TI	B	MELP/CELP	20	15 (encoder)	55
LMGT, Samsung	C	HE-LPC	20	10 (encoder) 5 (decoder)	55

Table Q21.A.2
Codec Complexity.

CuT	MIPS	ROM/kword	RAM/kword	Noise Suppression
A	<38	6 (program) 9 (table)	7	Yes
B	70	20 (program) 25 (table)	5	Yes
C	40	10 (program) 30 (table)	5	Yes

Table Q21.A.3
Requirements achieved.

Requirements	Exp	Language	CuT A	CuT B	CuT C
Normal Level (-26 dBov)	1	NAE	n	Pass	-
	1	F	n	-	-
	1	J	Pass	Pass	-
High Input Level (-16 dBov)	1	NAE	-	Pass	-
	1	F	n	n	-
	1	J	Pass	Pass	-
Low input Level (-36 dBov)	1	NAE	-	n	-
	1	F	Pass	Pass	-
	1	J	Pass	Pass	-
Tandem	1	NAE	Pass	Pass	-
	1	F	Pass	Pass	-
	1	J	Pass	Pass	Pass
3% Frame erasure	2	G	Pass	Pass	-
	2	J	Pass	Pass	Pass
	2	S	Pass	Pass	Pass
Vehicle noise at 15dB SNR	3a	BE	Pass	Pass	-
	3a	J	Pass	Pass	-
Babble noise at 30dB SNR	3b	NAE	Pass	Pass	-
	3b	F	Pass	Pass	-
Interfering Talker at 20dB	3c	BE	-	-	-
	3c	S	-	-	-

Notes to table:

a) "Exp" denotes in which experiment the requirement was tested.

b) Key to languages: BE - British English; F - French; G - German; J - Japanese; NAE - North American English; S - Spanish.

c) "Pass" denotes a pass at the 95% confidence interval; "n" denotes a pass at the 99% confidence interval; "-" denotes a fail.

Annex Q21.B
Proposed schedule for ITU-T 4-kbit/s Speech Coding Algorithm

The revised skeleton schedule for the development of a 4-kbit/s speech-coding algorithm is as follows. Due to the lack of a stable study group meeting calendar at SG16 in November 2001, this schedule and the use of the alternative approval procedure (AAP) are provisional.

SG16 Nov 2000	-	Identification of two candidates final selection
Jan 2001	-	Q.21/16 agreement of test conditions by correspondence
SG12 Feb 2001	-	Completion of selection test plan by SQEG
	-	Organisation of the host laboratory (software);
	-	Organisation of listening laboratory sessions;
SG16 May 2001	-	Review of draft selection test plan
	-	Definition of global analysis
	-	Definition of complexity evaluation rules
1 August 2001	-	Submission of fixed-point executables;
Oct 2001	-	Global analysis results available two weeks prior to Rapp. Meeting
Nov 2001	-	wMOPS based complexity evaluation available;
(Rapp. Meeting)	-	Review of selection test results and pre-selection deliverables (note 1);
	-	Selection of one candidate;
(post selection)	-	Draft text of Recommendation available for review (note 2)
	-	Fixed-point ANSI C-code available for review (note 2)
SG12 [tbd]	-	Completion of characterisation test plan by SQEG
	-	Organisation of host laboratory session (software);
	-	Organisation of listening laboratory sessions;
	-	Commence characterisation phase;
SG16 Feb 2002	-	Review of characterisation test results;
	-	Initiation of alternative approval process (AAP)
April 2002	-	G.4k approved

Notes to schedule:

1. Proponents must provide the following four pre-selection deliverables for their submission to be accepted as a candidate:

    a) A high level description comprising the following parts: description of the codec algorithm (formulas are not necessary); block diagrams of the encoder and the decoder; allocation of bits for each coded parameter; a clear description of any noise suppression techniques employed in the codec.
    b) Complexity figures derived using the evaluation rules agreed by Q.21/16. These figures will comprise wMOPS (worst-case and average), RAM, table ROM, and an estimate of program ROM.
    c) An analysis of the encoder and decoder delay.

d) A verbal indication of intent regarding intellectual property with respect to the ITU-T patent policy.

2. Prior to the selection meeting, the candidates proponents must deliver the following two deliverables to the TSB, where they will be kept in confidence. After the selection of a single codec, these deliverables will be made available for review (in the case of the C-code this may by under a software agreement until the final approval of the recommendation):

   a) Text for the paper component of G.4k that provides sufficient algorithmic detail to enable an implementer to produce a non-bit exact implementation of the algorithm, i.e. all low-level steps and equations, but not quantiser values. This text will be used as the first draft of the recommendation, and should be formatted according to the ITU-T drafting guidelines.
   b) Fixed-point ANSI C-code that provides the normative bit-exact description of the G.4k speech coding algorithm. In the event that bugs are found in the executable delivered to the host labs, the proponent must deliver two versions of the C-code: the first version should be provide bit-exact operation with the executable tested in the selection phase

Annex Q21.C
Key Requirements and Objectives

The following list identifies those requirements and objectives that the Q.21/16 experts have identified to be of particular importance in the development of the 4-kbit/s speech coding algorithm.

Key requirements:

1. Speech quality at normal input level (-26dBov)
2. Speech quality at high input level (-16dBov)
3. Speech quality at low input level (-36dBov)
4. Talker dependency
5. Performance with 2 tandem encodings
6. Detected frame erasures (3% random)
7. Performance with vehicle noise (15 dB SNR)
8. Performance with babble noise (30 dB SNR)
9. Performance with interfering talker (20 dB SNR)
10. Bit rate (4-kbit/s)
11. Variable bit-rate operation needed
12. Delay (≤ 55 ms)
13. Complexity (single DSP)
14. Bit-exact implementation (G.729 operators)
15. Specification (bit-exact ANSI C-code)

Key objectives:

16. Performance with random bit errors ($2x10^{-4}$)
17. Detected frame erasures (3% bursty)
18. Complexity (as low as possible)
19. Interoperation with floating-point needed

Annex Q22.A
UGST Action Points as of November/2000

Number	Status	Description	Task Force
9606.03	Stalled	Verify PCM-domain multiplier and tone and noise generation tools	S.Campos/LMGT
9606.04	Stalled	General Processing Framework tool	S.Campos/LMGT
9801.01	Stalled	Investigate the P.56 problem and suggested changes by Mr.Kabal	S.Campos/LMGT
9801.02	Stalled	Investigate the G.711's 1's/2's complement issue	S.Campos/LMGT
9801.0	Stalled	Solve inconsistencies in IS54 code	J.Stegmann/T-Nova S.Campos/LMGT
9809.02	Stalled	Add filters to speech voltmeter demo programs	S.Campos/LMGT
0002.01	Ongoing	Ad-hoc Group on Basic Operators: - review weights - consider alternative set of basic operators	R.Salami/Canada
0011.01	New	Correct error in fir_downsampling_kernel() [in fir-lib.c] with one-sample operation	
0011.02	New	Correct run-time problem in `gen-patt.c` and `ep-stats.c` with Win32/cl and Win32/gcc	
0011.03	New	Discuss a frequency-response calculation tool	
0011.04	New	Prepare STL2000 User's Manual	S.Campos/LMGT

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ITU - Telecommunication Standardization Sector **Temporary Document 84 (Plen) Rev.1**

STUDY GROUP **16**

Geneva, 13-17 November 2000

Question: 15,19-22/16

SOURCE: Chair, WP 3/16 (Mr. Simão Campos-Neto, COMSAT/USA)

TITLE: Liaison statements produced by WP 3/16 (13-17 November 2000)

This TD contains all Liaison Statements produced by WP 3/16.

CONTENTS:

A. To IMTC on Video Coding Activities

QUESTIONS: 1,6/16 (formerly Q.11,15/16)

SOURCE: ITU-T SG 16

TITLE: ITU-T Video Coding Activities

COMMUNICATION

FROM: ITU-T SG 16 Q. 1,6/16 (formerly Q.11,15/16)

TO: IMTC

APPROVAL: Approved by SG 16 (Geneva, 13-17. November 2000)

FOR: Information

DEADLINE: N/A

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The purpose of this communication to inform the members of IMTC, who are implementing H.320, that the approval process for new Annex to H.263 (Annex X) is being started at this Study Group meeting. The text of this Annex contains a list of preferred feature combinations, which are structured into "profiles" of support. The Annex also includes some groupings of maximum performance parameters as "levels" of support for these profiles. The present Appendix II (informative text) of H.263 is intended to be replaced by H.263 Annex X (normative text). Among the levels of Appendix II, Level 1is being retained as Profile 1 of Annex X however, there will no longer be a profile that corresponds to either Level 2 or 3.

We intend to include the signalling to support H.263 Annex X in the H.242 (via Implementers Guide revision) at the next ITU-T SG16 meeting in May or June of 2001.

Comments are welcome in the Last Call process for H.263 Annex X (see ITU-T Rec. A.8). We look forward to continued work in this area.

END

B. To ISO/MPEG on Video Coding Activities

QUESTIONS: 6/16 (formerly 15/16)

SOURCE: ITU-T SG 16

TITLE: Q.15/16 Video Coding Activities

LIAISON STATEMENT

FROM: ITU-T SG 16 Q.6/16 (formerly Q.15/16)

TO: ISO/IEC JTC1/SC29/WG11

APPROVAL: Approved by SG 16 (Geneva, 13-17. November 2000)

FOR: Information

DEADLINE: N/A

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Video Technology Testing

ITU-T Study Group 16 thanks ISO/IEC JTC1/SC29/WG11 for its liaison statement and for its invitation therein to participate in a test of new technologies to enhance video coding performance. ITU-T Study Group 16 warmly accepts the invitation of ISO/IEC JTC1/SC29/WG11 to participate in these tests.

We plan to participate in the test by providing results from a software implementation embodying a draft design of the next-generation video coding standard known as H.26L. The technical design of this new standard is expected to be completed near the end of next year (with final approval of the standard to follow a few months thereafter).

Pending the conclusions that could be reached as a result of these tests, we look forward to discussing possible joint efforts for future video coding standardization activities.

Status of Other ITU-T Video Coding Activities

Three new annexes to ITU-T Recommendation H.263 (as a result of an effort known as the H.263++ project) have been decided (given final standardization approval) by SG16. These new additions include the following:

- Annex U: an Enhanced Reference Picture Selection mode enhancing compression efficiency and error resilience performance,
- Annex V: a Data Partitioned Slice mode enhancing error resilience performance, and
- Annex W: defining Additional Supplemental Enhancement Information, which can be added to video bit-streams in a backward-compatible manner.

We currently plan not to add any more optional operational modes to H.263, in order to allow ourselves to focus on the H.26L project in future work.

ITU-T Study Group 16 also started the preliminary approval process for the new Annex X to H.263, which contains a list of preferred feature combinations, which are structured into "profiles" of support. The annex also defines some groupings of maximum performance parameters as "levels" of support for these profiles. The primary objectives of this Annex X are

1) to provide a simple means of describing or negotiating the capabilities of a decoder (by specifying profile and level parameters), and
2) to encourage common enhancement features to be supported in decoders for achieving maximal interoperability, and
3) to describe feature sets chosen as particularly appropriate for addressing certain key applications.

Status of ITU-T & ISO/IEC Video Common Text

The first amendment and the first corrigendum to the 2000 edition of Recommendation H.262 | ISO/IEC 13818-2 have been approved by ITU-T SG16 as requested in the Liaison Statement from the La Baule meeting of ISO/IEC JTC1/SC29/WG11.

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END

C. To TIA-TR45.5 and ETSI-3GPP on Video Codec Support for Wireless MM Terminals

QUESTIONS: 6/16 (formerly 15/16)

SOURCE: ITU-T SG 16

TITLE: Communication to 3GPP TSG-S4 and S2 and 3GPP2 TSG-C on Video Codec Support for Wireless Multimedia Terminals

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COMMUNICATION

FROM: ITU-T SG 16 Q.6/16 (formerly Q.15/16)

TO: 3GPP TSG-S4 and S2 and 3GPP2 TSG-C

APPROVAL: Approved by SG 16 (Geneva, 17. November 2000)

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ITU-T Study Group 16 thanks 3GPP TSG-S4 for its consideration of H.263 Annex X and H.26L. We appreciate the good reception of the profiles in Annex X and the interest in our H.26L work.

ITU-T Study Group 16 started the approval process for Annex X to the H.263 standard containing a list of preferred feature combinations, which are structured into "profiles" of support. The annex also defines some groupings of maximum performance parameters as "levels" of support for these profiles. The primary objectives of this Annex X are

1) to provide a simple means of describing or negotiating the capabilities of a decoder (by specifying profile and level parameters), and
2) to encourage common enhancement features to be supported in decoders for achieving maximal interoperability, and
3) to describe feature sets chosen as particularly appropriate for addressing certain key applications.

These new profile definitions should simplify capability establishment for use in protocols such as SIP/SDP. Comments are welcome in the Last Call process for H.263 Annex X (see ITU-T Rec. A.8).

Three new annexes to ITU-T Recommendation H.263 (as a result of an effort known as the H.263++ project) have been decided (given final standardization approval) by SG16. These new additions include the following:

- Annex U: an Enhanced Reference Picture Selection mode enhancing compression efficiency and error resilience performance,

- Annex V: a Data Partitioned Slice mode enhancing error resilience performance, and
- Annex W: defining Additional Supplemental Enhancement Information, which can be added to video bit-streams in a backward-compatible manner.

We currently plan not to add any more optional operational modes to H.263, in order to allow ourselves to focus on the H.26L project in future work.

We also ask for any comments you may have to aid us in the development of our next-generation video coding standard known currently as H.26L. This project also includes plans for addressing wireless conversational and streaming video applications. Support for network-friendly syntax design, data partitioning error resilience, and significantly improved compression efficiency (approximately a 2:1 gain) are already included in the H.26L design. The technical design of the new standard will be mainly completed around the end of next year (with final approval of the standard to follow a few months thereafter).

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END

D. To IETF AVT and MMUSIC on Video Coding Activities

QUESTIONS: 6/16 (formerly 15/16)

SOURCE: ITU-T SG 16

TITLE: Communication to IETF AVT and MMUSIC Working Groups on Video Coding Activities

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COMMUNICATION

FROM: ITU-T SG 16 Q.15/16

TO: IETF AVT and MMUSIC

APPROVAL: Approved by SG 16 (Geneva, 17. November 2000)

FOR: Information

DEADLINE: N/A

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We are sending you this liaison statement to update you on the status of our work. ITU-T Study Group 16 started the approval process for Annex X to the H.263 standard containing a list of preferred feature combinations, which are structured into "profiles" of support. The annex also defines some groupings of maximum performance parameters as "levels" of support for these profiles. The primary objectives of this Annex X are

1) to provide a simple means of describing or negotiating the capabilities of a decoder (by specifying profile and level parameters), and
2) to encourage common enhancement features to be supported in decoders for achieving maximal interoperability, and
3) to describe feature sets chosen as particularly appropriate for addressing certain key applications.

These new profile definitions should simplify capability establishment for use in protocols such as SIP/SDP. Comments are welcome in the Last Call process for H.263 Annex X (see ITU-T Rec. A.8).

Three new annexes to ITU-T Recommendation H.263 (as a result of an effort known as the H.263++ project) have been decided (given final standardization approval) by SG16. These new additions include the following:

- Annex U: an Enhanced Reference Picture Selection mode enhancing compression efficiency and error resilience performance,
- Annex V: a Data Partitioned Slice mode enhancing error resilience performance, and
- Annex W: defining Additional Supplemental Enhancement Information which can be added to video bit-streams in a backward-compatible manner.

We currently plan not to add any more optional operational modes to H.263, in order to allow ourselves to focus on a new project for development of the next-generation video coding standard known as H.26L. The H.26L project has achieved notable improvements in video coding technology, in particular including approximately a 2:1 improvement in compression efficiency. This project also includes plans for addressing wireless conversational and streaming video applications with strong support for network-friendly syntax design. The technical design of the new standard will be mainly completed around the end of next year (with final approval of the standard to follow a few months thereafter).

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END

E. To ITU-T SG 15 on Synchronous reset of G.728 and G.729 in CME

ITU-T STUDY GROUP 16 (Geneva, 7-18 February, 2000)

QUESTIONS:	Q.10/16 (formerly Q.19/16); SG15
SOURCE:	ITU-T SG 16
TITLE:	Reply to LS on Synchronous reset of G.728 and G.729 codecs in CME

LIAISON STATEMENT

FROM:	Q.10/16 (formerly Q.19/16)	
TO:	ITU-T SG 15	
APPROVAL:	Approved by SG 16 (13-17 November 2000, Geneva)	
FOR:	Information	
DEADLINE:	-	
CONTACT:	Simão Campos-Neto LMGT	Tel: +1-301-428-4516 Fax: +1-301-428-9287 Email:simao.campos@labs.comsat.com

This is a reply to the liaison statement regarding external reset of a speech codec used together with a DTX mechanism in circuit multiplication equipment. SG 16 experts discussed the issue and the experts showed a preference for the existence of a synchronous reset capability in CME using the G.728 algorithm. Aligning the internal status of the encoder and decoder of G.728 using an external synchronous reset will be beneficial in speech quality, particularly at the transient from silence to active speech when the codec is used under DTX condition in CME.

The SG16 experts expect no negative effects on speech quality because of synchronous reset for G.729 under DTX function in CME. Experts present at the SG16 meeting manifested intention to submit experimental results to SG15 addressing the effect of synchronous reset on the speech quality for G.729.

END

F. To ETSI/3GPP SA4 on Information on wideband speech coding activity

ITU-T STUDY GROUP 16 (Geneva, 13-17 November, 2000)

QUESTIONS: ITU-T SG16 Q.7/16 (formerly Q.20/16); ETSI/3GPP

SOURCE: ITU-T SG 16

TITLE: Information on wideband speech coding activity

COMMUNICATION

FROM: ITU-T SG16 Q.7/16 (formerly Q.20/16)

TO: ETSI 3GPP SA4 / TIA TR45.5

APPROVAL: Approved by SG 16 (13-17 November 2000, Geneva)

FOR: Action

DEADLINE: November 10, 2000

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ITU-T Study Group 16 (*Multimedia Services and Systems*) would like to thank ETSI/3GPP S4 for their communication on wideband speech codec development prepared in their October 2000 meeting in Osaka.

The Q.7/16 (formerly Q.20/16) experts reviewed, during last SG16 meeting (13-17 November 2000), the ITU-T Qualification test results for wideband coding around 16 kbit/s. After that review the group agreed to enter into a Selection process. This phase will use fixed-point implementations based on 32-bit basic operators. One candidate withdrew its wideband candidate algorithm whereas the other five candidates (Lucent, Motorola, NTT, Texas Instruments and VoiceAge) declared their willingness to enter into the Selection process. This participation is subjected to the result of further self-analysis requested by the five candidates on the processed speech material used in the Qualification phase.

The S4 input documents, presented by Nokia, were discussed and, on the basis of the provided information, it was agreed that the wideband algorithm selected by 3GPP will be allowed as a candidate codec in the ITU-T Selection process. It was clarified that the formal selection of the 3GPP AMR-WB codec candidate is expected to take place at the TSG-SA meeting on 11-14 December 2000.

Since the VoiceAge and the 3GPP-selected algorithm are the same algorithm, at the floating-point level, Q.7/16 group also agreed that either the VoiceAge algorithm or the 3GPP selected algorithm will be included in the ITU-T Selection process. That means a maximum of five candidate algorithms will be tested in the ITU-T Selection process, namely:

1. Lucent
2. Motorola
3. NTT
4. Texas Instruments
5. VoiceAge or the 3GPP-selected algorithm.

All participants are expected to share the costs of the Selection process.

Q.7/16 will continue with its work plan, as contained in the attachment to this document, and is pleased to continue the collaboration with S4.

Attachment:
(A) Q.20 Terms of Reference [Annex Q20.A in TD(P)83]

END

G. To Q.22/12 (SQEG) on Forthcoming testing activities and STL2000

ITU-T STUDY GROUP 16 (Geneva, 7-18 February, 2000)

QUESTIONS:	Q.7,8,10/16 (formerly Q.20,21,22/16); SG12 Q.??(SQEG, formerly Q.22/12)
SOURCE:	ITU-T SG 16
TITLE:	Forthcoming testing activities and STL2000

LIAISON STATEMENT

FROM:	Q.7,8,10/16 (formerly Q.20,21,22/16)
TO:	SG12 Q.??(SQEG, formerly Q.22/12)
APPROVAL:	Approved by SG 16 (13-17 November 2000, Geneva)
FOR:	ACTION (Q.7 and 8/16) and INFORMATION (Q.10/16)
DEADLINE:	February 2001

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Q.7/16 - Audio and Wideband coding in public telecommunication networks

Study Group 16 wishes to inform SQEG (formerly Q.22/12) that at the last SG16 meeting (November 13-17, 2001) the Qualification test results for wideband coding around 16 kbit/s were reviewed and it was agreed to start a Selection process with a maximum of 5 (five) candidate algorithms. The Terms of Reference and time schedule for the wideband coding activity were revised (See Annex A). The time schedule for this activity calls for a Selection Test Plan to be made available soon after the February 2001 meeting of SG12 and Selection test results to be reviewed in July] 2001.

In addition to the Selection test plan, Q.7/16 intends to develop a set of other documents, which includes the specification of the processing stages for the host laboratory function, guidelines for production of demonstration material and computation of the codec frequency response. Those

additional documents will be developed by correspondence and presented to SQEG for information in the February 2001 meeting. The topics include:

- definition of a completely blind procedure in evaluating the Selection Test results
- definition and generation of appropriate background noise material
- definition of the processing stages for the host laboratory function
- guidelines for production of demonstration material (random BER and music conditions)
- computation of the codec frequency response using white noise

Q.7/16 is also willing to provide at that meeting some proposals for the test conditions to be included in the test plan that can be used as a useful starting point in the definition of the detailed test plan.

Q.7/16 would like to kindly ask SQEG to also consider, during its meeting in February 2001, the definition of the pricing and work allocation for the Laboratories involved in the Selection phase.

ACTIONS:

Q.7/16 would be very grateful if SQEG addresses the following actions points:

1. To prepare a Selection Test Plan for the wideband coding algorithm at around 16 kbit/s.
2. To identify organisations willing to perform the host laboratory, cross-checking laboratory, listening laboratory and global analysis functions for the selection phase.
3. To define an estimate of the cost associated with the functions listed in item 2.
4. Definition of an appropriate global analysis procedure.

Q.8/16 Speech coding at bit rates around 4 kbit/s

Progress

SG16 would like to thank SG12 for the support in the performance of subjective assessment of the three candidates in the 4-kbit/s Floating-point Selection Tests. SG16 is pleased to report that, based on their respective performance, it has identified two 4-kbit/s speech coding algorithms for further consideration. SG16 wishes to perform a selection phase on the fixed-point implementations of these algorithms starting in August 2001, with the aim of reviewing the results in November 2001.

Fixed-point selection phase test plan

SG16 requests SQEG to prepare a subjective test plan for the 4-kbit/s speech coding fixed-point selection phase. Q.8/16 intends to test the same requirements and objectives that were tested in the floating-point selection phase, and the new test plan is expected to be broadly similar to that used in the floating-point selection phase. The Q.8/16 experts will prepare a list of conditions to be tested by correspondence, and will provide these to SQEG for consideration at SG12 in February 2001.

Laboratories

SG16 requests SQEG to identify organisations willing act as a host laboratory, listening laboratory or global analysis laboratory for the fixed-point selection phase. SG16 will also require a breakdown of the funding required for this exercise.

Global analysis for fixed-point selection

To aid the selection process in November 2001, Q.8/16 wishes to have a detailed global analysis of the results of the forthcoming fixed-point selection phase. We intend to freeze the procedures, calculations, and presentation of the global analysis information at the next SG16 meeting (May 2001). Q.8/16 has agreed that the analysis should be performed using blind mapped data, and that it should be funded in the same way as the listening and host laboratory functions. SG16 would be very pleased to receive guidance from SQEG on suitable statistical methods for the global analysis. The aim is to present an analysis of the selection phase results that will enable the Q.8/16 experts to clearly determine which candidate best meets or exceeds the requirements and objectives.

Feedback from floating-point selection phase

During the presentation of the floating-point selection phase in Q.8/16, several experimental procedures were identified that could be improved or refined in the fixed-point selection phase. We present these here for the consideration of SQEG.

For the floating-point selection phase, one listening laboratory reused listeners across three experiments (n.b. the Q.8/16 and SQEG experts were notified of this before testing began). SG16 requests that in future subjective experiments, listeners not be reused across multiple experiments.

Two listening laboratories reported that some subjects were confused by the test stimuli used in Experiment 3c, misinterpreting the interfering-talker as a problem with the test apparatus, such as electrical cross-talk. SQEG is therefore asked to consider whether a sentence pair is the most appropriate noise signal to use in an interfering-talker experiment. There were also concerns over subjects' interpretation of the CCR scale for interfering-talker conditions. Finally, one laboratory reported that the long duration of Experiments 3a and 3c led to listener fatigue, and there was also a proposal that the number of preliminary conditions be increased from six to twelve.

SG16 wishes to emphasise the need to use speech and noise material that has not been available to codec developers, and the following refined principles are proposed for the fixed-point selection phase:

1. speech source material must not be used if either samples from the same speaker or recordings from the same recording session are, or have been, available to candidate proponents;
2. a segment of noise taken from a longer noise recording must not be used if any section of the longer sample is, or has been, available to codec developers.

SG16 would also like to request that those laboratories who participate in both ITU-T 4-kbit/s selection phases use different talkers in the fixed-point selection phase to those used in the floating-point selection phase; and that the noise material has not been used in any preceding standardisation exercise.

SQEG is requested to provide guidance in the test-plan on how to choose background noise files, e.g. what constitutes "babble noise", and to consider the possibility of including multiple examples of a particular noise type, e.g. babble, within a single experiment.

***ACTIONS**:*
The 4-kbit/s schedule and ToR are attached in Annexes (B) and (C) respectively, and SG16 would be very grateful if SQEG addresses the following actions points:

1. To prepare a detailed subjective test plan for the 4-kbit fixed-point selection phase, taking into account feedback from the floating-point exercise.
2. To identify organisations willing to perform the host laboratory, listening laboratory and global analysis functions for the fixed-point selection phase.
3. To provide an estimate of the cost of providing the functions listed in item 2.
4. To provide Q.8/16 with guidance regarding the content of the global analysis.

Q.10/16 Software Tools

Q.10/16 would like to inform you that a new release of the ITU-T Software Tool Library (STL) has been Decided, and dubbed as STL2000.

Attachments:
(A) Q.20 Terms of Reference [Annex Q20.A in TD(P)83]
(B) Q.21 Schedule [Annex Q.21.B in TD(P)83]
(C) Q.21 Terms of Reference [Annex K to COM16-R71E]

END

H. To ETSI and TIA on basic operators

ITU-T STUDY GROUP 16 (Geneva, 13-17 November, 2000)

QUESTIONS:	Q.10/16 (formerly Q.22/16); ETSI 3GPP SA4; TIA TR45.5
SOURCE:	ITU-T SG 16
TITLE:	Cooperation on basic operators

COMMUNICATION

FROM:	Q.10/16 (formerly Q.22/16)
TO:	ETSI 3GPP SA4 / TIA TR45.5
APPROVAL:	Approved by SG 16 (13-17 November 2000, Geneva)
FOR:	Action
DEADLINE:	May 2001

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TR45.5.1.1 (MM services)

ITU-T Study Group 16 Question 10 (*Software tools*, formerly Q.22/16) is the question within ITU-T to maintain and improve the ITU-T Software Tool Library. One of our recent work items was the inclusion of 32-bit basic operators, which was formally approved at this SG 16 meeting.

We are currently working on an “alternative” library, that comprises 40-bit basic operators. The first version of this library has been distributed for assessment by the experts over the SG16 WP3 audio questions reflector (wp3audio@ctd.comsat.com), however no feedback was received so far. We expect to progress this work by correspondence, and would welcome any comments on the 40-bit library currently under discussion from your interested parties of your attendance. This would greatly help us progress the standardization work of the 40-bit basic operator library.

END

I. To SSG IMT2000, TIA-TR45 and ETSI-3GPP SA4 on progress on variable rate voice coding

ITU-T STUDY GROUP 16 (Geneva, 13-17 November, 2000)

QUESTIONS:	Q.9/16 (formerly 24/16); SSG on IMT2000 and Beyond; and ETSI 3GPP; TIA 45.5
SOURCE:	ITU-T SG 16
TITLE:	Progress on variable bit rate voice question

LIAISON STATEMENT/COMMUNICATION

FROM:	Q.9/16 (formerly 24/16)
TO:	LS: ..... SSG on IMT-2000 and beyond Communication: TIA/TR45; ETSI/3GPP-SA4
APPROVAL:	Approved by SG 16 (Geneva, 13-17 November, 2000)
FOR:	Information
DEADLINE:	

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ITU-T Q.9/16 (formerly Q.24/16, *Variable Bit Rate coding of speech signals*) would like to thank TIA TR45.5 and ETSI/3GPP-SA4 for the information provided on your VBR approaches.

After the presentation of the documents and exchange of points of view, the group recognized merits in the three technological approaches discussed:

1. Multirate/VAD VBR approach (dubbed MVV)
2. Specialized Codec VBR approach (dubbed SCV)
3. Embedded VBR approach (dubbed EV)

However, the group could not agree at this time which of the three approaches would be more promising towards the intended applications. It was clarified in the discussions that the objective of this Question is not to standardize a codec

for use in the first wave of Third-Generation (3G) systems, but for the next wave of systems as well as packet-based systems where gains may be obtained from variable packet sizes.

As a result the group adopted the Rapporteur's suggestions to pursue a three-pronged approach in which three ad-hoc groups will develop three sets of terms of reference (ToR), one for each of the technologies above, to be conducted over the VBR e-mail reflector (vbr@ctd.comsat.com) and moderated by three different members.

The MVV discussions will be moderated by Mr. Paul Barrett <paul.a.barrett@bt.com>; the SCV discussions will be moderated by Mr.Huan-Yu Su <Huan-Yu.Su@conexant.com>, and the EV discussions will be moderated by Mr. Sean Ramprashad <ramprash@research.bell-labs.com>.

The discussions will be based on past and present contributions, as well as on new material that will be circulated through the reflector. The conclusions of the work will be submitted to the next SG 16 meeting as TDs from the moderators. In the next SG 16 meeting, the three different ToRs will be compared and a common set of ToRs will be derived. It is the ultimate objective however that a single standard would be identified as a result of this question. Strong consideration will be given to application areas not already covered by existing ITU-T standards.

Interested parties from your groups are welcome to contribute to the email discussions. Interested parties should contact simao.campos@labs.comsat.com for subscription to the email reflector.

Attachments:
(A): Text of Q.9/16

END

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ITU-Telecommunication Standardization Sector Temporary Document 85 **(Plen) Rev.1**

STUDY GROUP 16

Geneva, 13-17 November 2000

Questions: 15,19,20,21,22, 24/16

SOURCE: Chairman, WP 3/16 (Mr.Simão F. Campos-Neto)

TITLE: WP 3/16 Recommendation Status Report

This document contains the Status Report for WP 3/16 as of the 13-17 November 2000 meeting of SG 16.

STATUS REPORT FOR RECOMMENDATIONS OF ITU-T STUDY GROUP 16 WORKING PARTY 3

Recommendation	ST	Ques	Timing	Pri	Pag	Liaison	Area	Domain	References	Subject
H.26L	N	15/16	2002	M	150	ISO/IEC JTC1/SC29; 3GPP	30	23		Improved Video Coding for Multimedia Communication
H.263 Appendix III	N	15/16	2001	M	40	ISO/IEC JTC1/SC29, 3GPP	30	23		Software test model reference encoding description
G.WB16k	N	20/16	2001	M	30	SG 12; ITU-R SG 8 3GPP, 3GPP2	30	16		Wideband (7 kHz) speech coding at around 16 kbit/s
G.4kbps	N	21/16	2001	H	10	SGs 2, 12; ITU-R SG 8; ISO/IEC JTC1/SC29	10,15,30	16		Speech coding at 4 kbit/s
G.191	DR	22/16	2002-02	M	20	SG 12	17	30,16		Software tools for signal processing standardization activities

A1 = Determined - Final text to be supplied by Rapporteur as a White Contribution
A2= Stable text - Planned for determination at the next SG meeting
B = Determined - Final text is or will be in Part IIB of the WP report. This text will be translated.
DR = Draft text, not stable - The text may be in Part I of WP report or be in a Temporary Document or a Contribution.
N = New, not yet available