

COMMITTEE T1  
CONTRIBUTION

Document Number T1A1.5/95-118

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STANDARDS PROJECT: Analog Interface Performance Specifications for  
Digital Video Teleconferencing/Video Telephony Service

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TITLE: Copy of Rapporteur's Report for Question 22  
"Audiovisual Quality in Multimedia Services"  
from the Report of Working Party 2, SG12 ITU-T

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ISSUE ADDRESSED: Video Quality

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SOURCE: National Telecommunications and Information Administration  
Institute for Telecommunication Sciences  
(Arthur Webster)

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DATE: January 9, 1995

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KEYWORDS: Video Teleconferencing, Video Telephony, Video Quality,  
Subjective Quality, Objective Quality

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## **2.6 Question 22/12 - Audiovisual quality in multimedia services (Mrs. L. Contin)**

### **2.6.1 Introduction**

The wording of Q. 22/12 can be found in COM 12-1, p.21. The goal of the Question is the definition of one-way and two-way opinion test methods to evaluate transmission performance of audiovisual systems.

The standardization of this methodology is urgently required to provide both the users and the providers with criteria and tools to select among the huge amount of new audiovisual (and multimedia) services that are going to be introduced into the Telecommunications market.

### **2.6.2. Status of the Question at the end of the last meeting**

During the last meeting (February '94) the following activities have been recognized to be important for the Questions:

- 1) drafting of Recommendations P.VQ and P.VRU, dealing with subjective video quality assessment methods and video impairment reference unit respectively.
- 2) definition of a suitable set of ITU test video sequences
- 3) definition of a set of terms and definitions to be used in the framework of video and audiovisual quality assessment.
- 4) Improvements on P.CTM
- 5) collection of information on the equipment available in the laboratory eventually interested in carrying out validation tests for viewing tests
- 6) Improvement of the video performance reference model

### **2.6.3 Results achieved after the last meeting**

Following the order of the section above, the following results have been achieved:

- 1) A drafting group that has been established during the last meeting. It produced a preliminary draft of Recommendations P.VRU and P.VQ that are reported in TD 34 and TD 30 respectively.
- 2) Guidelines for selecting test video sequences are provided in TD 35. They will be included in P.VQ.
- 3) A preliminary set of terms is provided in D. 41. Further terms and definitions are provided in TD 27.
- 4) No further contributions have been submitted on conversation tests.
- 5) the results of a questionnaire circulated are summarized in Annex I.
- 6) Improvements on the previous Video Performance Reference Model are suggested in D. 34. Further considerations and information related to this topic are presented in TD. 28.

### **2.6.4 Actions promoted by the rapporteur**

The following actions have been promoted by the rapporteur:

- 1) Rapporteur's meeting is convened on the 2nd and 3rd of December. The agenda of the meeting is attached as Annex II.
- 2) A collaborative letter was sent to the SQEG to investigate the interest of the group in carrying out validation tests for video quality assessment methods.
- 3) An E-mail reflector has been established to exchange information related to the Question. (Annex 4 to this Reply).

4) A bibliography on video and audiovisual test procedures has been distributed. It would be highly appreciated any new input.

## **2.6.5 New contributions**

### **2.6.5.1 Video Impairment Reference Unit**

#### **TD 34 Draft recommendation on "Video Reference Impairment Unit" - P.VRU (Rapporteur)**

In this document the results of work carried out by the drafting group on P.VRU is presented.

P.VRU defines a set of impairments that should be simulated to produce video reference signals to be used in subjective testing. Procedures to produce such a degradation are also provided.

#### **COM 12- 36 Preliminary work to include jerky motion impairment in VIRIS1 (Bellcore)**

This contribution reports on further work on the video reference system described in Contribution COM 12-21-E. In particular it reports preliminary results of adding a jerky motion impairment simulation.

#### **COM 12- 35 Modification of Video Reference Impairment System (VIRIS) to improve edge busyness Impairment simulation (Bellcore)**

This contribution reports on further work on VIRIS. It describes changes made in the program to improve the edge busyness impairment simulation based on observations of impairment artifacts in video images produced by an experimental MPEG 1 coding algorithm.

#### **D.40 Utility of video reference signals based on additive random noise process (NTT)**

This contribution proposes a video reference signal generated by adding white noise to the original video signal. The results of a test aimed at evaluating the effectiveness of this reference are quite stable. This suggests that this mono-dimensional reference could be used to convert five-dimensional parameters in P.VRU onto one-dimensional scale.

### **2.6. 5.2 Subjective video quality assessment methods**

#### **TD 30 Preliminary Draft Recommendation on "Video Quality Assessment Methods" - P.VQ (Rapporteur)**

In this document the results of work carried out by the drafting group on P.VQ is presented.

P.VQ defines the methods and tools for subjective quality assessment of video coded at low bitrates by means of widely used transform based coding schemes.

#### **TD. 35 Two criteria for video test scene selection (Rapporteur)**

This contribution describes considerations relevant to video test scene selection and offers two measurements, developed by ANSI T.1-A.1 that can be used during such selection. Measurements of spatial information content and temporal information content are presented and their use as criteria for test scene selection is demonstrated.

#### **TD 29 Preliminary test plan for validation of methods described in P.VQ and P.CTM (Rapporteur)**

A preliminary proposal for the test plan for P.VQ and P.CTM validation experiments is presented.

**TD 38 Liaison statement on Request for subjective tests from the Rapporteur for Q.22/12 (Reply to Collaborative letter) (SQEG)**

This document is a reply to the collaborative letter sent by the rapporteur to ask if the SQEG could be interested in carrying out tests to validate the assessment methods under study in Q. 22/12. AT&T, BT, CNET, CSELT, NTIA, NTT and Royal Dutch PTT indicated possible interest.

**2.6.5.3 Conversational tests**

**COM 12-37 Extension of Combined Audio/Video Quality Model (Bellcore)**

This contribution reports on further work on the combined audio/video subjective test model reported in Contribution COM 12-20-E. This most recent work extends the application of the model across a wider range of impairments.

**2.6.5.4 Glossary**

**TD 27 Terms and definitions in video quality assessment (Rapporteur)**

In this document a few terms and definitions not included in D. 41 are proposed.

**D. 41 Additional Glossary/Definition Items for Video Performance Studies (USA)**

This contribution reports on additional items identified in the USA to support the activities of the Question.

**2.6.5.5 Video Performance Reference Model**

**COM 12-34 Development of the Video Performance Reference Model (USA)**

This contribution proposes the addition of further detail to the Video Performance Reference Model, described in the liaison reported in COM 12-R 11 § 6.1. In particular a new proposal for network categories is presented.

**TD 28 Report on the first meeting of the JCG-AVMMS (Rapporteur)**

This document reports on the first meeting of the JCG-AVMMS. Among the items discussed during the meeting the definition of a Video Performance reference model has been the most interesting for SG 12.

**2.6.5.6 Others**

**D. 37 Proposal for a new question on transmission performance in ATM networks (Canada)**

In this contribution the need for a new question dealing with transmission performance in ATM networks is underlined. A draft text of the question is also provided.

**TD 21 Liaison statement to ITU-T SG 12 (SG 9)**

This liaison inform SG 12 about a number of activities of ITU-T SG 9 and ITU-R that are related to video quality evaluation and video transmission performance.

**TD 22 Reply to liaison statement from SG12 concerning video performance reference model (SG 15)**

Some considerations on video codec characteristics as a function of network performance are reported.

**TD 24 Liaison statement to study group 12, Q. 22/12 (SG 1)**

This liaison state that the VPA reference model proposed by SG 12 is in full agreement with the general multimedia reference model currently being considered by Q.20/1.

## **TD 25 Liaison statement to study groups 2, 4, 12, 13 and JCG-AVMM (SG 1)**

This liaison is to inform SG 12 of the concepts which have been adopted by SG 1 for addressing the specification of telecommunications performance objectives in the framework recommendation for audiovisual/multimedia services (draft Rec. F.700). In the conclusions some considerations about the work of SG 12 are included.

## **TD 26 Liaison to SG 9 and SG12 for information (SG 13)**

This liaison is to inform SG 12 about the work carried out by WP 4/13 on the definition of ATM cell transfer performance parameters and measurement methods potentially relevant to SG 12.

### **2.6.6 Rapporteur meeting report**

The agenda that was agreed is reported in Annex II.

#### **2.6.6.1 Interactive tests methods**

It was agreed to use the expression "interactive tests" instead of "conversational tests" to take into account a broader family of methods. Thus, the draft recommendation P.CTM will be referred as P.ITM.

During last meeting a first draft of this recommendation (TD 6 - Feb.94) was agreed. The only two points that required further studies was the definitions of suitable tasks and the specification of viewing conditions representative of the target applications.

Concerning the first point, it has been agreed that three families of tasks will be suggested:

- 1) Tasks aimed at evaluating the effect of delay
- 2) Tasks focusing the attention on the video signal
- 3) Tasks that just suggest an item for conversation.

Concerning the second point, the viewing conditions will be those specified for video quality subjective test methods.

The updated version of the P.ITM will be sent by the 15 of January to the E-mail reflector established for the Q.22/12. Remarks and suggestions are required by the end of February. The agreed text will be presented as a white document at the next meeting.

#### **2.6.6.2 Video quality assessment methods**

These are the main achievements of the discussion:

- 1) The P.VQ should be addressed mainly to video sequences coded at low and medium bit rates. The recommendation should be defined taking into account at least two possible goals of a viewing test: the optimization of an algorithm and the qualification of a product. In fact, though the same methods can be used in both these cases, different experimental designs and maybe different kinds of subjects and scales could be more appropriate.
- 2) The methods described in P.VQ should be based on ITU-R Rec. 500, but the text of Recommendation should reflect terminology and assessment criteria that have been used within the ITU-T (and before within the CCITT) framework.
- 3) P.VQ should specify how to produce and to select test sequences. A preliminary characterization of the shooting conditions is already provided. The Section 3 of P.VQ will be sent in a liaison statement to ITU-R SG 11-E and comments on such conditions will be requested. The text of this liaison statement is given in Annex III.
- 4) P.VQ should also provide a description of a library of video sequences that should be used at least in the tests carried out by ITU-T. These sequences should be provided in ITU-R 601

format, the content should be representative of the applications to which is addressed P.VQ and finally they could present different amount of movement and spatial detail. This activity will be coordinated by NTIA with the support of Bellcore, BT and CSELT.

5) the three methods proposed will be fully described, though they are similar to some methods of ITU-R Rec. 500 and the methods of ITU-T Rec. P.80. After a discussion it was decided to use the scales recommended by P.80, though further study are required to evaluate the suitability of alternative scales such as continuous scales or scales with an higher number of level.

6) Concerning the viewing conditions, range of parameter values will be provided to take into account the wide range of applications (and terminals) that will be based on audiovisual communications.

In particular the viewing distance should be decided not only according the application and the dimension of the screen but also depending on the goal of the experiment: critical viewing distance will be used for optimization tests and preferred viewing distance will be used for qualification tests.

7) A drafting group coordinated by CSELT have been established to redraft the recommendation. The other members of this group are: Telia Research, PTT Research, NTT, CNET, NTIA and AT&T.

The updated version of the P.VQ will be sent to the E-mail reflector by the 1st of February. Remarks and suggestions are due by the 1st of March. The agreed text will be presented as white document at the next meeting.

#### **2.6.6.3 Video Reference Unit**

All the participants were in agreement with the contents of the Draft P.VRU.

Bellcore will include the missed parts, that are the summary, the introduction and section 9 where some guidelines to define and use the anchor conditions based on the basic impairments described in the draft P.VRU will be outlined.

A drafting group coordinated by Bellcore have been established to redraft the recommendation. The other members of this group are: BT, PTT Research, CSELT, NTT, NTIA and AT&T.

The updated version of the P.VRU will be sent to the E-mail reflector by the 1st of February. Remarks and suggestions are due by the 1st of March. The agreed text will be presented as white document at the next meeting.

#### **2.6.6.4 Validation tests**

The conclusions of the discussion on the validation tests can be summarized in three main points:

- 1) No validation tests are required for the P.VQ methods because these methods are very close to the well tested methods described in ITU-R Rec. 500 and in P.80.
- 2) No validation tests are required for the P.VRU impairment references because the tests carried out by Bellcore can be enough to validate them. In any case, a complete validation would require that the same tests would be carried out in another laboratory. Bellcore can provide the test material to any laboratory that is interested in participating in this activity.
- 3) Validation tests are required for the P.ITM. The rapporteur asked the participants to indicate if any laboratory could carry out the such a kind of tests. It came out that no resources are available for this activity. Then a liaison statement will be send to SQEG to ask for these experiments.

Since the experimental design of these tests strongly depends on the hardware available, only general guidelines on the test plan will be given in the liaison statement that will be sent to SQEG. It is attached in annex I.

#### **2.6.6.5 Audiovisual tests**

A first draft of the P.AVQ will be prepared by the next meeting by merging part of the contents of P.80 and P.VQ. A term of reference will be also included.

#### **2.6.6.6 Video Performance Reference Model**

Q.22/12 have developed a Video Performance Reference Model indicating the segments of a generic connection where impairments on the video signal can be originated. Administrations are required to provide contributions on either the definition of the model or the characterization of the impairments that occur in a particular segment.

#### **2.6.6.7 Objective methods**

During the discussion an interest for the development of objective video quality measurements came out. At least two different approaches can be used in the development of an opinion model: one is mainly focused on the perceptual process, the other is mainly focused on the characterization of the communication system. Often the first approach provides the best opinion models. Administrations are requested to submit contributions on this topic.

A liaison statement illustrating the approach adopted by SG12 to develop objective methods will be sent to SG 1. The text of this liaison statement is attached in Annex V (to this Reply)

#### **2.6.6.8 A.O.B.**

Considering the wide field of work of the Question, a co-rapporteur should be appointed.

The next rapporteur meeting will be in June, joined to the meeting of the SQEG and SG 15. The goals of this meeting are:

- To freeze the text of P.VQ, P.VRU and P.ITM
- To discuss with SQEG the problems related to the validation tests of interactive methods.
- To see and discuss the library of sequences

In the mean time the rapporteur highly recommends the use of the E-mail reflector to exchange information. It is suggested to send to it:

- the updated recommendations
- all the contributions (at least one week before the meetings)
- any kind of comment that can be relevant for the Question

The actual mailing list and the E-mail address of the reflector are given in annex IV.

#### **2.6.7 Workplan**

Study item: **SUBJECTIVE VIDEO QUALITY EVALUATION**

Target: New Recommendation (P.VQ) on the definition of subjective test procedures (experimental design, test material, timing, rating scales, etc.) laboratory set up (viewing conditions, tools, etc.) and data analysis procedures for the subjective evaluation of quality of images coded at low bitrates.

Milestone	Schedule	Status
First draft	Nov. 94	Achieved
First definition of a library of sequences	March 95	
Updated draft	Sept. 95	

Study item: VIDEO IMPAIRMENT REFERENCE UNIT

Target: Draft Recommendation (P.VRU) to define the structure and the operations of the video impairment reference unit

Milestone	Schedule	Status
First draft	Nov. 94	Achieved
Updated draft	Sept. 95	

Study item: GLOBAL QUALITY EVALUATION (one way tests)

Target: Draft Recommendation (P.AVQ) on the definition of subjective test procedures, laboratory set up and data analysis procedures for the subjective evaluation of combined audio and video quality.

Milestone	Schedule	Status
First draft	Sept. 95	

Study item: INTERACTIVE TESTS

Target: Draft Recommendation (P.ITM) on the definition of a methodology for interactive tests on audiovisual terminals.

Milestone	Schedule	Status
Definition of new tasks	Nov. 94	Achieved
Test plan for validation experiments	June 95	
Updated draft	Sept. 95	

### 2.6.8 Discussion

The main points of the discussion can be summarized as follows:

- 1) TD 26, a liaison from SG 13 directed to Q22/12, was reviewed. It was found that the subject matter was not pertinent to the work proposed under this question and thus no action was taken. However, it would appear that with the wording of the current SG 12 Questions, it is impossible to find an appropriate recipient for this liaison. Possibly SG 12 should consider the generation of a new question to deal with liaisons such as this and on all other ATM issues on a co-ordinated basis.
- 2) Provisionally Mr. Webster accepts to be co-rapporteur for Q.22/12
- 3) A rapporteur meeting <sup>could be</sup> is planned by May '95, but in case the number of participants will not sufficient it will be cancelled.



## 2.6.9 List of documents

### New documents

- COM 12-34 Development of the Video Performance Reference Model (USA)
- COM 12-35 Modification of Video Reference Impairment System (VIRIS) to improve edge business Impairment simulation (Bellcore)
- COM 12-36 Preliminary work to include jerky motion impairment in VIRIS1 (Bellcore)
- COM 12-37 Extension of Combined Audio/Video Quality Model (Bellcore)
- D.40 Utility of video reference signals based on additive random noise process (NTT)
- D. 41 Additional Glossary/Definition Items for Video Performance Studies (USA)
- D. 37 Proposal for a new question on transmission performance in ATM networks (Canada)
- TD 21 Liaison statement to ITU-T sg 12 (SG 9)
- TD 22 Reply to liaison statement from SG12 concerning video performance reference model (SG 15)
- TD 24 Liaison statement to SG 12 (SG 1)
- TD 25 Liaison statement to study groups 2,4,12,13 and JCG-AVMMS (SG 1)
- TD 26 Liaison to SG 9 and 12 for information (SG 13)
- TD 27 Terms and definitions in video quality assessment (Rapporteur)
- TD 28 Report on the first meeting of the JCG-AVMMS (Rapporteur)
- TD 29 Preliminary test plan for validation of methods described in P.VQ and P.CTM. (Rapporteur)
- TD 30 Preliminary Draft Recommendation on "Video Quality Assessment methods"-- P.VQ (Rapporteur)
- TD 34 Draft recommendation on "Video Reference Impairment Unit" - P.VRU (Rapporteur)
- TD. 35 Two criteria for video test scene selection (USA)
- TD 38 Liaison statement on Request for subjective tests from the rapporteur for Q. 22/12 (SQEG)

### Previous documents

- COM 12-21 VIRIS, An Experimental Video Reference Impairment System ( Bellcore)
- COM 12-20 Experimental Combined Audio/Video Subjective Test Method (Bellcore)
- D. 15 Tasks for use in assessment of audiovisual connections (Canada: BNR)
- D. 22 Proposed Attributes of a Video Reference Unit (VRU) and the Need for a Standardized Set of Video Test Scenes ( USA)
- D. 10 Proposal for the activities related to the Question (CSELT-Italy)
- D. 11 Assessment of audiovisual terminal performance in the presence of transmission delay (Comsat)

**Annex I**  
**(to Reply to Question 22/12)**

**Question:** 22/12

**Source:** ITU-T Study Group 12(\*)

**Title:** Liaison statement to SQEG

**For:** Information

During the meeting of WP2/12 it came out that only interactive methods for the evaluation of audiovisual quality should be validated.

It has not been defined a detailed test plan, because it depends on the hardware available in the laboratories that will carry out the test.

Taking into account that the goal of the test is not to qualify an equipment, but to validate a method, the general guidelines are given.

The test should be carried out by using a videophone working at different frame rates and bit rates (a couple of values for each parameter will be decided by the SQEG according to the performance of the codecs available) or different videophones working in the same conditions. At least three different tasks will be proposed to the subjects: one task critical for the transmission delay, another one critical for the video quality and at last one task based on the free conversation. The test should be carried out at least in two different laboratories, under conditions as similar as possible.

At least ten subjects per laboratory should take part to the test, each pair of subject should complete the test in no more than half an hour. Further details about the questionnaire and the task will be provided by April.

As preliminary information the results of a questionnaire concerning the equipment available in the laboratories of the administrations that are contributing to Q. 22/12 are attached.

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**Attachment**

(Result of the questionnaire on laboratory tools for video quality assessment)

The rapporteur received the filled in Questionnaire on video equipment from four companies: CNET, COMSAT, NTIA and NTT.

The information collected are summarized in the table below.

CNET will buy video equipment "according to one recommended within the group".

	Test scenes	Video camera	VTRs	Video exchange format	Codecs (Hw)	Codecs (Sw)	Artifact simulation
<b>CNET</b>	-	8mm	-	-	H261 (QCIF/CIF- 64:320 kbits/s - 10,15,30 Hz)	-	-
<b>COMSAT</b>	-	-	2xD2, VHS, VHS video disk player (NTSC/PAL)	4mm DAT	MPEG1		blocking, blurring, jerkiness, scene cut, random noise, rate control
<b>CSELT</b>	MPEG-1/MPEG-2 seq. (720x576)	CCD (PAL, RGB)	D1, rewriteble laser disk, Umatic, VHS.	Exabyte	MPEG1	MPEG1, MPEG2, H261	-

<b>NTIA</b>	T1A1.5 seq. (720x486)	Betacam SP (NTSC, Component)	Betacam SP, VHS	4mm DAT	H261 (variable bitrate)	-	-
<b>BT</b>			Betacam SP, CRV videodisk, VHS videodisk, VHS, S-VHS		MPEG1, H261		
<b>NTT</b>	-	CCD (NTSC, RGB)	D1, Betacam, VHS		H261 (CIF/QCIF, px64 kbps, 3.75:30 Hz), MPEG1 (SIF, 1.5:8 Mbps, 30 Hz)	-	-

	Monitors	Other equipment	Lights	Walls	Statistical analysis
<b>CNET</b>	professional 19" 4:3		Fixed, measurable, fluorescent lamp	White D65	Public SW (?)
<b>COMSAT</b>	4 professional 19" 2 TV		Variable, measurable, incandescent lamp	White	No public SW

<b>CSELT</b>	1 professional 19" 4 TV 13" 4:3	Test pattern & synch generator. PAL/NTSC modulator.	Variable, measurable, incandescent lamp	Grey	SAS
<b>NTIA</b>	professional 13" and 19" 4:3	Test pattern & synch generator.	Variable, measurable, incandescent lamp	Beige	No public SW
<b>BT</b>	professional 21" and 14"	Test pattern & sync generator	Variable measurable incandescent and fluorescent lamp	Light grey	S-Plus GLIM GENSAT
<b>NTT</b>	professional 14" and 20" 4:3	Test pattern & synch generator.	Variable, measurable, incandescent lamp and fluorescent lamp (flickerless)	Light brown (either black or light grey is also possible)	SPSS

**Annex II**  
**(to Reply to Question 22/12)**

**Agenda of the rapporteur's meeting**

- 0. Approval of the agenda**
- 1. Interactive tests methods (P.ITM)**
  - Methods
  - Tasks
  - Workplan
- 2. Video quality assessment**
  - Methods
  - Test sequences
  - Terms and definitions
  - Workplan
- 3. Video reference unit**
  - Possible improvements
  - Combination of the standard impairments
  - Use of the video reference unit
  - Workplan
- 4. Validation tests**
  - test plan
  - scheduling
- 5. Audiovisual quality assessment**
  - Methods
  - Test sequences
  - Terms and definitions
  - Workplan
- 6. Video quality reference model**
  - terms of reference
  - Workplan
- 7. A.O.B.**
  - Summary of the workplans
  - Next rapporteur meeting
  - E-mail reflector
  - Nomination of the co-rapporteur

**Annex III  
(to Reply to Question 22/12)**

**Question:** 22/12

**Source:** ITU-T Study Group 12 (\*)

**Title:** Liaison statement to ITU-R Study Group 11-E

**For:** Action

Q. 22/12 is developing methodology for subjective assessment of video quality at low and medium bit rates. The methods, that are mainly based on ITU-R Rec. 500 and ITU-T Rec. P.80, are described in the draft Recommendation P.VQ.

In section 3 of this recommendation some guidelines concerning the procedures, the lighting conditions and the equipment to produce test sequences are illustrated.

Study Group 12 would be very grateful if ITU-R Study Group 11-E could provide any comment and suggestion concerning these guidelines, taking into account that the parameter values specified should be representative of the common using conditions of services like videophone or videoconference.

**Attachment  
(to Liaison Statement to ITU-R SG 11-E  
(Section 3 of draft ITU-T P.VQ Recommendation)**

**3. Source signal**

In order to control the characteristics of the source signal, the test sequences should be defined according to the goal of the test and recorded on a digital support. When the experimenter is interested in comparing results from different laboratories it is preferable to use a common set of source sequences to eliminate a further source of variation.

**3.1 Recording environment**

Lighting source(s) (bulbs or fluorescent lamps) can be placed above or on the side of the camera. The lighting conditions of the room in the field of view could vary from 100 lux to about 10000 lux for indoor use. The variation (AC frequency) of the light (fluorescent lighting) must be taken into account because this may cause a flicker in the recorded video sequence. Lighting conditions, wall colours, surface reflectance etc. should be carefully controlled and reported.

**3.2 Recording system**

**3.2.1 Camera**

Picture sequences should be recorded by a high quality CCD camera.

The signal to noise ratio of the input video can strongly affect the performance of the codec. Appropriate weighting filters should be specified.

To define the video input the following points should be specified:

- the dynamic range of the Y U V signals
- the gamma (ideally the gamma value should be 0.45)

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(\*) Contact Person - Name: Ms. Laura Contin

- the bandwidth/slopes of the filters
- the sensitivity of the camera at very low lighting conditions and the characteristics of an Automatic Gain Control (AGC), if any.

The weighted S/N should be greater than 45 dB RMS. The instability or the jitters of the clock signals could cause noise effects.

A minimum stability of 0.5 ppm is required for the camera clocking device.

Either fixed or variable focal length systems can be used. For desk-top terminals a focal depth from 30 cm to 120 cm is reasonable, while for multi-user systems a focal depth from 50 cm to infinity might be more appropriate. To support the variation of illuminance in the recording room either an adjustable iris or an electronic shutter should be used. The camera should have an automatic white balance so that adaptation to the colour temperature of the light source can be accomplished. The correction of white temperature can range from

2700 K (indoor use with electrical bulb) to 6500 K (day light temperature with clouded sky).

### **3.2.2 Video signal and storage format**

Video source signals provided by the camera should be sampled in conformance with CCIR Recommendation 601 [1]. In order to avoid distortion of the source signal, it should be stored in digital format on either computer tape format or D-1 4:2:2 tape format, both described in [1].

### **3.3 Scene characteristics**

The selection of test scenes is an important issue. In particular, the spatial and temporal information content of the scene are critical parameters. These parameters play a crucial role in determining the amount of video compression that is possible, and consequently, the level of impairment that is suffered when the scene is transmitted over a fixed-rate digital transmission service channel. Fair and relevant video test scenes must be chosen such that their spatial and temporal information content is consistent with the video services that the digital transmission service channel was intended to provide.

The set of test scenes should span the full range of spatial and temporal information content of interest to users of the devices under test.



Annex IV  
(to Reply to Question 22/12)

Mailing list of reflector on audiovisual quality

The address of the E-mail reflector is: [quality@kim.cselt.stet.it](mailto:quality@kim.cselt.stet.it)

Mr. Gleiss	Telia res.	<a href="mailto:norman.gleiss@haninge.trab.se">norman.gleiss@haninge.trab.se</a>
Mr. Cosier	BT	<a href="mailto:cosier_g@bt-web.bt.co.uk">cosier_g@bt-web.bt.co.uk</a>
Mr. Voelcker	BT	<a href="mailto:rvoelcker@bt-sys.bt.co.uk">rvoelcker@bt-sys.bt.co.uk</a>
Mr. Evans	BT	<a href="mailto:kevans@bt-sys.bt.co.uk">kevans@bt-sys.bt.co.uk</a>
Ms. Contin	CSELT	<a href="mailto:laura.contin@cselt.stet.it">laura.contin@cselt.stet.it</a>
Mr. Baroncini	FUB	<a href="mailto:mc4853@mclink.it">mc4853@mclink.it</a>
Ms. Pascal	CNET	<a href="mailto:pascal@lannion.cnet.fr">pascal@lannion.cnet.fr</a>
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**Annex V  
(to Reply to Question 22/12)  
Liaison statement to SG 1**

Question 22/12

SOURCE: Study Group 12

TITLE: Liaison Statement to Study Group 1

Subject: Telecommunications Performance Objectives

Contact Person: Laura Contin  
CSELT

Study Group 12 wishes to thank SG 1 for sending the liaison statement containing the contribution from the United States titled "Telecommunications Performance Objectives from the End-User's Point of View." The information it contains proved useful during our most recent meeting of WP 2 on 2 - 5 December 1994.

As pointed out on page 16 of the contribution, SG 12 is responsible for addressing the end-to-end performance issues. WP 2 has established a very ambitious work program, see Annex 1 attached, to identify both subjective and objective methods to determine the performance of multimedia systems. SG 12 is starting with the study of subjective assessment methods for video and audio/video systems. Later, after forming a solid foundation of understanding and knowledge of the methods for assessment of and the performance of video and audio/video systems, SG 12 WP 2 plans to focus more attention on the subject of methods for the objective assessment of these systems. Although most of our effort is, at present, focused on subjective assessment methods, we nevertheless welcome any and all contributions on the subject of objective assessment methods.

SG 12 would like to point out that the usual strategy in objective measurements is to model the system under test. Typical models assume that the system is a linear system. While this assumption is still true for many of the parts of an end-to-end video or audio/video connection, some important parts, especially the audio and video codecs for example, are non-linear, time varying systems. Thus for these elements the usual concepts like frequency response and distortion are no longer applicable. One of the best ways to assess the quality of these non-linear, time varying elements is by modelling the human perceptual mechanism. Such models take into account how the human perceives audio and video stimuli and processes these stimuli to extract the information content and to form an opinion about the quality of the audio and video. These perceptual models are very complicated. Perceptual models have been developed for speech systems. They show a very high correlation between objective and subjective results. In order to validate the performance of any objective model of video performance it is necessary to have subjective assessment methods that are accepted and can be used for the validation. This is one of the reasons SG 12 is focusing first on subjective assessment methods for video systems. Another reason is, of course, that such subjective assessment methods will always be needed, even after objective assessment methods are available. Objective assessment methods for video systems is a subject that is under study in SG 12.

Annex 1: Work Program for Question 22/12.

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