COMMITTEE T1

CONTRIBUTION

Document Number: T1A1.5/92-158

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

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TITLE: Proposed List of Hypothetical Reference Circuits

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ISSUE ADDRESSED: Objective and Subjective Video Performance Testing

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DATE: September 15, 1992

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DISTRIBUTION TO: T1A1.5

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KEYWORDS: Video Performance Testing, Objective Quality,
Subjective Quality

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Introduction

This document suggests a list of 25 Hypothetical Reference Circuits (HRCs) for inclusion in the upcoming VTC/VT subjective and objective tests. To maximize the usefulness of the resulting subjective data, we believe that all test scenes should be subjectively rated for each HRC. If this is not done, low bit rate HRCs (e.g., H.261, p=2) tested only with non-stressful video scenes (e.g., head & shoulders with only the lips and eyes moving) could receive higher composite subjective scores (see step 5 of T1A1.5/92-156) than high bit rate HRCs. Since we intend to uniformly compare the accuracy of the objective parameters over the range of all possible VTC/VT HRCs, we must have subjective test data that permits this comparison. Objective measurements that correlate with abnormal subjective results (obtained from incomplete subjective testing) are not desired.

Further, since the perceived video quality depends upon the input scene (scenes with little motion may be rated as good quality for a given HRC while scenes with lots of motion may be rated as poor quality for the same HRC), we propose that each test scene/HRC combination be subjectively rated. This would also greatly assist in the development of reliable "in service" measurements.

Since the presence of channel errors and the operation of error correction schemes can dramatically affect the perceived video quality, several of the HRCs below have suggested error conditions.

Hypothetical Reference Circuits

1. Null Channel (No Impairment). Quantifies the effect of laboratory equipment on the tests (equipment other than the HRCs). This establishes an upper baseline for the test.

2. Consumer grade VHS record and playback cycle. Provides a common reference point for quality expectations from end-users.

3. Noisy analog channel with x db SNR. Provides a reference point for analog distribution systems.

4. Commercial Grade 45 Mbps codec 1. Provides an example of high quality VTC.

5. Commercial Grade 45 Mbps codec 2, bit-error-rate = 10^{-5}. Provides an example of high quality VTC under error conditions.

6. Proprietary Vector Quantization based codec 3, total bit-rate (video + audio) = 128 kbps. Provides fundamentally different impairments than DCT based coding systems.

7. Proprietary Vector Quantization based codec 3, total bit-rate (video + audio) = 384 kbps, bit-error-rate = 10^{-6}

8. MPEG codec 4.

9. Proprietary codec 5, total bit-rate (video + audio) = 128 Kbps, bit-error-rate = 10^{-5}.

10. Proprietary codec 5, total bit-rate (video + audio) = 384 Kbps.

11. Proprietary codec 6, total bit-rate (video + audio) = 768 Kbps.

12. Proprietary codec 6, total bit-rate (video + audio) = 1536 Kbps.

The following 13 HRCs are H.261 based. Since a number of options are available in the H.261 specification (see ANSI T1.314-1991), we have listed them here in table form. A few explanations are in order. The audio bit-rate plus the video bit-rate is a multiple of 64 Kbps. The resolution mode is selectable, with CIF being 352x288 pixels, and QCIF being 176x144 pixels. Three different video coding modes may be used by the encoder: pure intra-frame coding (Intra), intra-frame coding with inter-frame prediction (Inter), and intra-frame coding with inter-frame prediction, augmented by motion compensation (Inter w/MC). Motion compensation is optional in the encoder. External control of the maximum transmitted frame rate is specified by the H.261 standard. Note that this is the maximum frame rate, and the actual frame rate being used by the H.261 codec may differ. The possible maximal rates are shown in the sixth column of the table. The standard also specifies that the use of forward error correction by the decoder is optional, as indicated in column seven of the table. The bit error ratio column refers to randomly occurring bit errors in the digital circuit between the encoder and decoder.

HRC #	Codec Number	Audio Rate (Kbps)	Video Rate (Kbps)	Resolution Mode (QCIF, CIF)	Coding Mode (Intra, Inter, Inter w/MC)	Max Frame Rate (30, 15, 10, 7.5 fps)	Forward Error Correction (on, off)	Bit Error Ratio
13	7	64	64	QCIF	Inter w/MC	30	on	"0"
14	8	16	112	QCIF	Inter w/MC	30	on	"0"
15	8	64	320	QCIF	Inter w/MC	30	on	"0"
16	9	64	320	QCIF	Inter	30	on	"0"
16	7	64	64	CIF	Inter w/MC	30	on	"0"
18	8	16	112	CIF	Inter w/MC	30	on	"0"
19	7	64	320	CIF	Inter w/MC	30	on	"0"
20	9	64	320	CIF	Inter w/MC	15	on	"0"
21	7	64	704	CIF	Inter w/MC	30	on	"0"
22	9	64	704	CIF	Inter w/MC	30	on	10^{-4}
23	9	64	1472	CIF	Inter w/MC	30	on	"0"
24	8	64	1472	CIF	Inter w/MC	30	on	10^{-5}
25	8	64	1472	CIF	Inter w/MC	30	off	10^{-5}