



## 1. Introduction

This contribution presents a brief summary of the progress and near term goals (0-6 months) of the Video Quality Project at the Institute for Telecommunication Sciences (ITS). The information provided herein supplements previous information that was provided to the VTC/VT Sub-Working Group in April (see references [1] and [2]).

ITS would also like to invite the members of T1Q1.5 for a tour of the Video Quality Laboratory. The tour will begin immediately following adjournment of the T1Q1.5 meeting on July 9 and should take approximately 45 minutes. Participants will have an opportunity to view and subjectively score VTC/VT video scenes. The Video Quality Laboratory is located in Building 1, Room 2218.

## 2. Current Status

The test methodology described in Figure 1 of reference [2] has been successfully applied to a small data set consisting of 5 test scenes, each with 3 impairments (NTSC, VHS, and DS1 compression). The fully automated ITS video quality measurement system was used to measure objective parameter values from the test scenes. The correlation of objective video quality parameters to subjective viewing scores was then measured. The results of this test are described in reference [3]. Several of the proposed objective measures for video quality were shown to be very highly correlated with user-perceived subjective quality. Although these initial results look very promising, larger data sets (consisting of a much larger number of test scenes and impairments) are required to fully validate the proposed objective measures and to establish standard operating values. Testing over larger data sets will also help assure that the objective measures are technology independent (independent of the television coding algorithm and transport architecture). Technology independent measures are strongly desired due to the rapid advancement of coding and transmission technology.

ITS is currently conducting tests using a large data set that consists of 36 test scenes and 29 different impairments. The test scenes span the range of user applications and include everything from still and limited motion graphics to full motion entertainment. A large portion of the test scenes include typical VTC/VT scenes. The subjective performance assessment of the video codec depends very strongly on the input video scene. Thus, many test scenes are required to completely characterize the performance of the video codec and transmission channel. The 29 impairments include analog impairments such as NTSC, S-VHS, VHS, RF transmission + noise, attenuated chroma, and digital impairments including 12 video codecs from 8 manufacturers operating at bit rates from 56 kbps to 45 Mbps and bit error rates from zero to  $10^{-5}$ .

These subjective tests are being conducted in accordance with CCIR Recommendation 500-3 and are described in detail in reference [2]. The total number of scenes that a particular viewer can score is limited by Recommendation 500-3 (four sessions per viewer, 30 minutes per session). This allows for an average of four different impairments for each of the 36 test scenes. Of the 144 unique test scenes that will be shown, 12 will be used for training. The test scenes used for training span the full range of quality levels. Two of the test scenes will be repeated

four times for inter-session consistency checks. Eight of the test scenes will be repeated twice for intra-session consistency checks. The viewers will thus see a total of 158 test scenes. The association of impairments with scenes is both deterministic and random. Deterministic selections have been made so that the results of the ITS subjective tests can be compared with other subjective tests that have used some of the same test scenes. These other subjective tests include the one given in reference [3] and the T1Y1.1 45 Mbps tests. Random selections have been made according to an impairment distribution table that produces more VTC/VT impairments for VTC/VT type scenes and more analog and 45 Mbps impairments for entertainment type scenes.

Editing of the master viewing tapes for the subjective tests has been completed. The impaired video scenes span a very wide range of quality levels and should thus form a good basis for validating technology independent objective measures of video quality. Figures 1 and 2 give examples of viewer scoring forms that will be used for the half hour viewing sessions. The viewing form shown in Figure 1 will be used for the first session where training is included. A total of 12 training scenes will be shown to the viewer, with the last 6 being used to give the viewer practice marking the form. The viewing form shown in Figure 2 will be used for the remaining sessions. Note that the quality scale is the impairment scale defined in CCIR Recommendation 500-3. The impairment scale has been shown to be useful for measurement of the perceptibility threshold as well as larger impairment magnitudes. The impairment scale is also useful when directly comparable results between different laboratories are desired. Figure 3 gives an example of the viewer record form that will be completed at the end of the last session. Comments and suggestions for improving these forms are welcome.

### **3. Near Term Goals (0 to 6 months)**

It is anticipated that the last week of July and the month of August will be used to conduct the subjective tests. Analysis and correlation of the objectively measured parameters to the subjective scores will then be performed. The best set of parameters will be selected and an algorithm for predicting video quality from the measured objective values will be determined. The results of this work will be presented to the T1Q1.5 VTC/VT Sub-Working Group.

### **4. References**

- [1] Institute for Telecommunication Sciences, "Objective Quality Assessment of Digitally Transmitted Video", Committee T1 contribution T1Q1.5/91-118.
- [2] Institute for Telecommunication Sciences, "The Development and Correlation of Objective and Subjective Video Quality Measures", Committee T1 contribution T1Q1.5/91-119.
- [3] Institute for Telecommunication Sciences, "Correlation Between ITS Objective Measures and Subjective Video Quality: Preliminary Results on a Set of 15 Scenes", T1Q1.5/91-124.

# Session Record

## Practice Section

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Imperceptible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceptible but not Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slightly Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

You will be shown two versions of the same video scene. The first version will be the original scene. The second version will be the original passed through some video system. Rate the difference in quality that you perceive between the two versions.

## First Section

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
Imperceptible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceptible but not Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slightly Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Second Section

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>
Imperceptible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceptible but not Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slightly Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Session:            Tape:            Date:           

Position:            Day:            Time:           

Figure 1

# Session Record

## First Section

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Imperceptible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceptible but not Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slightly Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Second Section

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Imperceptible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceptible but not Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slightly Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very Annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Session:            Tape:            Date:           

Position:            Day:            Time:           

You will be shown two versions of the same video scene. The first version will be the original scene. The second version will be the original passed through some video system. Rate the difference in quality that you perceive between the two versions.

Figure 2

## *Viewer Record*

Please enter the following information. All responses will be held in complete confidence. Age is optional.

Occupation: \_\_\_\_\_

Sex:       male             female  
Age:       Under 10     10 to 20     21 to 30     31 to 40  
             41 to 50     51 to 65     Over 65

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### *Television & Computer Use*

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Most Frequently used Television:       Color             Black & White

How Often do you View:			Quality of Video Received (if used):		
rarely or never	some	daily	Good	OK	Poor
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

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Please do not write below this line

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Vision: \_\_\_\_\_      Color Plates: \_\_\_\_\_

Figure 3