

## MEETING RECORD

Video Compression Measurements Subcommittee G-2.1.6

Audio Video Techniques Committee G-2.1

Broadcast Technology Society

Institute of Electrical and Electronics Engineers

Eighteenth Meeting

Holiday Inn River Walk

217 N. St. Mary's St.

San Antonio, Texas 78205

October 30, 2000

Item 1 - Welcome and Introduction by Interim Chairman, of IEEE G-2.1.6.

Interim Chairman Alan Godber called the meeting to order at 11:45 AM. Attendees introduced themselves. See Appendix B for a list of attendees.

Item 2 - Approval of Draft Agenda

The draft agenda was approved.

Item 3 - Review and Approval of Minutes of the Previous Meeting #17, August 7, 2000

The Minutes from Meeting 17, August 7, 2000 were accepted as prepared.

Item 4 - Matters Arising from the Minutes

There were no matters arising from the Minutes.

Item 5 - Update Report of ITU Video Quality Experts Group (VQEG) re ongoing testing plans - Arthur Webster, David Fibush, Phil Corriveau, Al Morton, Ann Marie Rohaly and other participants.

Arthur Webster reported on activity related to the new ITU-T Study Group 9 (SG9) recommendation on objective perceptual video quality measurement techniques (J144). He said that five contributions, from Tektronix, NTIA, CRC and Sarnoff (including one duplicated) were submitted to Working Party 1, Study Group 9 (SG9) and said essentially the same thing – none of the objective video quality measurement methods listed in the SG9 recommendation Appendix 1 should be included as normative. A method must be fully disclosed and validated before it could be considered normative. Working Party 1 (WP1) will meet at Tektronix the first week of November to determine how methods would be validated. It was noted that if any

changes to the recommendation go beyond editorial revisions, the SG9 recommendation might not become a standard until 2002.

David Fibush reported VQEG had set up three ad-hoc groups to study objective video quality measurement methods using a full reference (FR), reduced reference (RR) or no reference (NR). Current activity is limited to the RR/NR group. A draft test plan has been formulated and an ad-hoc meeting is scheduled for December 11 to go over it. A full VQEG meeting was considered for early next year, with a goal of having the test plan completed by March 2001. There has been no additional work on FR measurements. It was suggested that they might to include FR tests with the RR tests, since multiple bandwidths are already being looked at in the RR tests. FR methods could be included with the RR objective tests without requiring additional subjective measurements. For the RR subjective testing, SSCQE would be used. Subjects would see a continuous, 20 to 30 minute, concatenated video sequence and continuously rate quality using a slider. There was some concern about the use of SSCQE for the tests.

#### *5.1 Further Discussion and Recommendations from the Subcommittee to the next meeting of VQEG*

The need for some standardized method of measuring picture quality was discussed. The Video Services Forum has proposed using analog NTSC measurements to provide some indication of quality. While this method is useful for testing the linear parts of the system, it doesn't tell us anything about picture quality. There was a suggestion that one of the methods listed in the proposed SG9 – J144 document be selected, after considering equipment size and cost, as a standard. While it was noted that people were working on this, there was concern that until VQEG does more validation work the standard won't progress. If a standard is needed now, it was suggested that NTIA T1.801.03- *Digital Transport of One-Way Video Signals - Parameters for Objective Performance Assessment* – would be better than using analog measurements.

#### Item 6 - Selecting Test Method, Test Material and Test Labs for a Unit of Measure (JND) & a Means of Calibration for Video Impairment, Chair, Leon Stanger.

Andrew Watson presented *Efficient Adaptive Estimation of Sensory Scales*, IEEE Doc. G-2.1.6/119. He described the underlying theoretical model of how people make decisions about what they see. Assuming the variance has a normal distribution, when an individual is shown two samples and asked to choose between them, the probability they will get the right result is determined by how far apart the two responses are. After optimizing the likelihood of a correct choice, you can determine the number of JNDs for any sample. The curve showing response to an artifact in the sample will be defined by three points – threshold, an upper point and an asymptote.

Ideally, the samples should be about one JND apart when compared. Using Andrew Watson's EASE (Efficient Adaptive Scale Estimation) method, the curve is estimated and set of samples about one JND apart is selected and used for the subjective test. As data is collected, the curve is re-estimated. When the difference is less than one JND, you can't get an accurate estimate of its point on the curve.

Andrew Watson described the experiments he had done using this method. He selected five SRCs from the VQEG material. Only 60 Hz sequences were used and those with transmission impairments were eliminated. Subjects made choices looking at one HRC from one SRC. There were 32 trials using 20-second sequences. Each trial took about 30 seconds. A computer uses EASE to select which sequences are displayed. He estimated that about 32 trials are required per JND. This could pose a problem for large errors – measuring 10 JNDs could require 320 trials. It was noted that where the points don't agree, the reason is always too few trials.

He said that in comparison with the VQEG data, the results agree well, with a correlation of 0.9. JND, he noted, is a fidelity measurement. No one has to give a rating or opinion. The VQEG tests resulted in a quality measurement.

#### *6.1 Further Discussion and Action*

It was noted that on a graph showing HRC number versus JND, the error bars were greater for larger JND. There was also a comment that because these experiments used a subset of the VQEG data, higher correlations would be expected. Correlation between the JND of the source and the objective models at 5H viewing distance

was generally in the range from 0.8 to 1.0, with model 6 less than 0.2. The correlation between the VQEG data and the objective models was better with the subset, also in the range of 0.8 to 1.0.

There was a comment that the data correlation of 0.93 achieved in Andrew Watson's experiments doesn't make a case that it's a better method than VQEG used. On the surface, people will question why this method should be used instead of DMOS. Watson responded that you don't have to use the method, just the results. Another comment was that this method gives us a scale that is very valuable and is context free. There was some concern that people would try to build models that would match the calibrated test sequences derived from this work. To prevent this, we would need a wide variety of material in the calibrated set. If a proponent can match all the curves, that would be okay. Even if someone did build a model that exploited data from certain sequences, the data set could be expanded in the future. The goal is to produce a JND scale, a calibrated unit of measurement that could be used to generate calibrated test tapes, not to help VQEG do its next study. Eventually, we could set a method on how to measure picture quality, but that is not the point of this work.

Methods for handling differences of less than one JND were discussed. Fractional JNDs would be useful when equipment is concatenated. This technique does not give results below one JND. It was suggested that if sub-JND degradation was to be measured, the degradation had to be repeated a number of times until you had a difference of at least one JND. Given a measurement system, you could run multiple passes through it then work backwards to obtain a fractional JND. It was also noted that closer viewing distances would serve the same purpose.

A plan of action was discussed. The method has to be documented sufficiently for other labs reasonably expert in the field to be able to repeat the experiments to see if they get similar results. There was concern, however, that if we wait for a standard, then for other labs to verify it, we may not have standard tapes for a long time. Conversely, the calibrated samples won't have any value unless they have a standard to back them up. It was suggested that the best way to speed the process was to first release the method as a draft IEEE standard and say that after it has been looked at, it will be adopted. Andrew Watson said he already had a document that was close to what we want. The draft standard is important before we try to collect additional data.

**ACTION ITEM:** Andrew Watson and Leon Stanger will draft wording for the standard, using scientific language rather than the formal standards language, to present at the January meeting.

Andrew Watson and Leon Stanger were thanked for their work and guidance on this.

#### Item 7 - Further Discussion of Compression Measurement Methodologies.

##### *Item 7.1 – Discussion of Future Work, Additional Assignments*

There was no further discussion.

#### Item 8 - Any Other Business.

In a follow-up to Item 5, additional input to VQEG was requested.

Suggestions were: 1) Add full reference TV to the RR/NR tests; 2) Use appropriate methods for determining the results. Plan how the comparisons will be made. It was noted that there is no simple linear correlation of the data. How do handle rank order, outliers, etcetera with SSCQE?

After it was reported there had been problems finding subjective test labs, there were comments that, as a last resort, proponents could run some subjective tests provided proper precautions were followed.

It was suggested if VQEG did not make progress on FR over time, this group could be considered to take up the work, perhaps using a JND method. Under the ITU Study Group 9 language, IEEE could be another group to validate the measurements. There was concern, however, that our group might not be a completely independent body as we include some VQEG proponents. It was suggested that we could do a smaller subjective test, and once we got started, others would join the effort.

Item 9 - Date(s) of Future Meeting(s).

The next meeting will be held in conjunction with the T1A1 meetings, planned for January 29, 2001, with the precise date and location to be determined.

The subcommittee thanked John Grigg and T1A1 for arranging the room.

The meeting was adjourned at 4:30 PM.

Submitted by:  
H. Douglas Lung  
Secretary

APPENDIX "A"

List of Documents Distributed

30 October 2000

*Draft Agenda - IEEE Compression and Processing Subcommittee G-2.1.6, Eighteenth Meeting, Monday, October 30, 2000, Alan Godber, Chairman, ([216m18an.pdf](#))*

*Draft Meeting Record, G-2.1.6, Compression and Processing Subcommittee, Seventeenth Meeting, August 7, 2000, Schaumburg, IL, Doug Lung, Secretary, [IEEE Doc. G-2.1.6/118](#), October 16, 2000.*

*Efficient Adaptive Estimation of Sensory Scales, Andrew B. Watson, NASA Ames Research Center, IEEE Doc.G-2.1.6/119, October 30, 2000.*

APPENDIX "B"  
ATTENDANCE RECORD  
October 30, 2000

<b>Name</b>	<b>Affiliation</b>	<b>Telephone</b>	<b>Fax</b>	<b>E-mail</b>
Chairman: Alan Godber	Consultant	(732) 846-4476	(732) 846-4476	<a href="mailto:agodber@idt.net">agodber@idt.net</a>
Secretary: Doug Lung	Telemundo	(305) 884-9664	(914) 412-2886	<a href="mailto:dlung@transmitter.com">dlung@transmitter.com</a>
Michael H. Brill	Sarnoff Corp.			
David Fibush	Tektronix	(503) 628-3040	(503) 627-4486	<a href="mailto:dave@fibush.net">dave@fibush.net</a>
John Grigg	Qwest	(303) 707-5604	(303) 707-9041	<a href="mailto:jjgrigg@uswest.com">jjgrigg@uswest.com</a>
Michel Poulin	Leitch	(416) 443-2716	(416) 445-4762	<a href="mailto:michel.poulin@leitch.com">michel.poulin@leitch.com</a>
Paul Randal	Delta Info Sys	(215) 657-5270	(215) 657-5273	<a href="mailto:prandall@delta-info.com">prandall@delta-info.com</a>
Ann Marie Rohaly	Tektronix	(503) 617-3048	(503) 627-5177	<a href="mailto:ann.marie.Rohaly@tek.com">ann.marie.Rohaly@tek.com</a>
Leon Stanger	DirecTV	(310) 726-4676		<a href="mailto:LStanger@compuserve.com">LStanger@compuserve.com</a>
Dick Streeter	Consult/CBS	(908) 791-9876	(908) 791-9878	<a href="mailto:rstreeter@att.net">rstreeter@att.net</a>
Andrew Watson	NASA	(650) 604-5419	(650) 604-0255	<a href="mailto:abwatson@mail.arc.nasa.gov">abwatson@mail.arc.nasa.gov</a>
Arthur Webster	NTIA / ITS	(303) 497-3567	(303) 497-5969	<a href="mailto:webster@its.bldrdoc.gov">webster@its.bldrdoc.gov</a>