

DRAFT MEETING RECORD (*Edited Summary*)
Video Compression Measurements Subcommittee G-2.1.6
Audio Video Techniques Committee G-2.1
Broadcast Technology Society
Institute of Electrical and Electronics Engineers

Fifth Meeting
Ritz Carlton Hotel
401 Ward Parkway
Kansas City, Missouri

August 4, 1997

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

Alan Godber called the meeting to order at approximately 8:15 AM.

Item 2 – Approval of Draft Agenda.

The following items were added:

A presentation on the Sarnoff JND metric by Jeffrey Lubin was included in Item 7.

David Fibush's list of questions from the ITU Joint Rapporteurs Group was added as Item 6B.

Al Morton had a one page report from ITU that was included in Item 10.

Leon Stanger requested a discussion on the group's mission, specifically whether we should be defining an algorithm or defining a calibration standard. This was added as Item 6A.

With these changes, the agenda was approved as modified.

Item 3 – Approval of Minutes of the Previous Meeting #4, May 5th, 1997.

The length and detail level of the minutes was discussed. Several members requested shorter minutes or a summary, while others appreciated the detail.

Alan Godber asked if the minutes were acceptable as written. Two corrections were made. In page 2, item 8, paragraph 3, the sentence was changed to read "The document that specifies scenes is believed to be in 11B. In the next paragraph, Arthur Webster said, "11B" should be changed to "11E".

The minutes were approved as modified. See *Meeting Record, G-2.1.6, Compression and Processing Subcommittee, Meeting #4, May 5, 1997, Room 1107, NTIA/ITS, 325 Broadway, Boulder, Colorado*, Doug Lung, Secretary. (Document G-2.1.6/45, 4 August 1997, corrections added 11 August 1997.)

Item 4 – Matters Arising from the Minutes.

There were no additional items.

Item 5 – Administrative and Policy Matters.

5.1 – Joint Meetings with T1A1.5

Alan Godber believed the current policy of adjacent meetings was working well. In a letter to Eric Hauch and John Grigg, he stated IEEE Headquarters has had problem in the past with joint meetings. He was also concerned a two day meeting might reduce attendance.

David Fibush said that having two meetings results in less efficiency due to duplication of reports and presentations. T1A1 had agreed to joint meetings. He did not see the differences in meeting rules in T1A1 and IEEE as impossible to resolve.

Rick Redford expressed concern a joint meeting would reduce participation in G-2.1.4 work. He made a motion that since this matter has been argued before and we have taken it up with the parent committee and the IEEE, we bring this matter up again in another year and see if there is anything to be done differently. Dick Streeter seconded the motion. Six voted in favor, three against and the remainder abstained.

5.2 Decision-Making Protocols – Face to Face Meetings, Phone Conferences, E-Mail Reflectors, etc.

Alan Godber reported IEEE informed him New York law did not allow using email for making committee decisions. He was also concerned use of email could slow the committee process.

There was a discussion of the proper use of email. David Fibush and Arthur Webster felt the New York law did not apply to routine business. While there was agreement face to face meetings were very important, a lot of the work can be done by email and brought back to the meeting for action.

David Fibush suggested putting specific topics in the subject line to help readers separate different discussions.

Alan Godber ended the discussion stating we don't need to take a vote on this now.

Item 6 – Target Timetable for Completion of Video Compression Measurement Standards.

Alan Godber introduced this item stating that several people have expressed concern that we are not reaching decisions or putting out information. He distributed a timetable which he created: *IEEE G-2.1.6 Video Compression Measurements Standards – Draft Timetable for Implementation of Video Compression Measurement Standards*, Alan Godber, Chairman August 1, 1997. (Document G-2.1.6/47, 1 August 1997.) He was concerned that while we have produced a scope, we now need to discuss how we are going to complete the task.

David Fibush suggested combining this list with one created by Arthur Webster and contributing it to the ITU Joint Rapporteurs Group. Arthur Webster liked the list and wanted to forward it to the Joint Rapporteurs Group.

Alan Godber pointed out a conflict between what broadcasters and equipment manufacturers want and what can be achieved. He received eight responses to a questionnaire on the need for objective picture quality measurement equipment for use with video compression. Two were not convinced adequate equipment could be developed. The dates when this equipment was need clustered around “now” and mid to late 1998. Godber stated we have many things to discuss before we are ready to test equipment. We must be ready when the equipment is ready.

David Fibush said the equipment hasn’t been invented yet. Arthur Webster said there are algorithms ready for testing, but more work and funds are required. He agreed that neither ITU nor we are ready yet. David Fibush emphasized the need for this group to work with the ITU Joint Rapporteurs Group. He also recommended two lists of what we need to do – one listing what we were going to do to validate the technology and the other to list what we need for the full measurement system. The first is immediate and the other is long term. .

Item 6A – Discussion on Subcommittee’s Mission - Defining an Algorithm versus Defining a Calibration Standard

Leon Stanger said he felt strongly that it is not our job to recommend a specific manufacturer’s product or to suggest an algorithm for measurements. Instead, he recommended we develop reference tapes with various material and specific degradations, at different levels. The tapes can be created independent of any system and later used to compare the results from test equipment.

This approach was discussed by the group. A major concern, expressed by David Fibush and Peter Symes, was that the tapes could not cover all possible artifacts, such as those caused by concatenating different systems, and may not work well with new compression methods. Another concern was that if the number of test scenes was too small, manufacturers could build boxes to give a specific number on those scenes that would not perform well on other material.

There was general agreement that reference tapes would be valuable, but we could not stop there. Al Morton said Leon Stanger’s proposal would be a limited starting point for this group. Peter Symes indicated this would be a good first step. He emphasized this is

going to be a long process and we need to go through a number of learning steps. David Fibush agreed some good ideas have come out and we don't want to lose them, but there is more work to do.

Alan Godber stated there is clearly a problem when people want results now and we are looking five years out. We don't come out with something when industry needs it; our work won't seem to be relevant. On the other hand, we don't want to come out with an unsatisfactory product.

Item 6B – Report and Discussion of ITU Joint Rapporteurs Group Activities from David Fibush

Discussion Document for the ITU-T JRG Topics, David Fibush, Tektronix, Inc., August 5, 1997 was distributed. (Document G-2.1.6/49, 4 August 1997.) This document lists discussion topics suggested by Arthur Webster for the ITU-T Joint Rapporteurs Group and the proposed responses by Tektronix.

Most of the discussion of this document centered on the number of HRC's required, whether analog signals should be allowed in the path and the size of the training set versus the test set.

Peter Symes said if we come up with some method of measurement that correlates with subjective results, we need to explore it by testing it with different HRC's to see where it is valid. If it works with different compression methods, all the better. David Fibush said we had previously tried to restrict it to one area. How well the tests work with composite and component signals will determine if we need two different classes for each of them. Adding transmission errors to the path would increase the number of HRC's. Fibush recommended ignoring transmission errors for now.

Arthur Webster said the main problem with allowing analog signals in the path is the processing required to align the signals we are comparing. Beside spatial alignment, DC gain shifts and other items not associated with the compression process have to be removed. There was agreement, however, that analog paths would have to be included at some point. Al Morton said that by excluding analog paths we would drop out the lowest end of the quality classes. David Fibush suggested agreeing on a method to measure alignment, then have a laboratory take out the misalignments we agreed to take out. The tape with the resulting degraded scenes could then be used for testing. He stated Tektronix was prepared to do some of this alignment work.

Arthur Webster asked for clarification of the 10 to 20 percent limit on training set size relative to test set size. David Fibush explained that a smaller training set reduces the chance a test set optimized only for the training scenes would do well in the testing. Michael Brill said it also increases sensitivity. Fibush added that although we may test with 25 scenes, in reality there will be 25,000 scenes or more the system must deal with.

To close the discussion, David Fibush stated that the right place to discuss this is in Arthur Webster's Joint Rapporteurs Group email reflector system. Arthur Webster replied that he would work on something to generate activity there. David Fibush said he would put this on the reflector. **[Action Item]**

Item 7 – Report of Task Force on Compression Measurements Information Gathering – Chair, Bill Zou.

Presentation on the Sarnoff JND Vision Model by Dr. Jeffrey Lubin, Sarnoff Corporation

Sarnoff JND Vision Model, Dr. Jeffrey Lubin, Sarnoff Laboratories, August 4 1997, was distributed to the subcommittee. (Document number G-2.1.6/51, August 4, 1997)

Dr. Jeffrey Lubin presented his paper and answered questions about the model.

Bill Zou wanted to know how they produce one single number. David Fibush said we have a JND per field over the two second measurement. There are more levels of data, but most users will want one number.

Walt Husak asked if a separate number was available for chroma. Dr. Lubin said there was. Jay Ballard asked about weighting. Dr. Lubin said this was done within the JND itself. There are, however, JND's available from each channel if you want them. They all are combined into a single number.

Bill Zou asked when the system would be ready for testing. David Fibush guessed Tektronix would announce a product at IBC.

Task Force Report

Bill Zou asked if the subcommittee needed to collect more information or more papers. Arthur Webster replied we need to decide which test systems and which test scenes we are going to use then ask for the algorithms. David Fibush recommended we get involved in the Joint Rapporteurs Group. We will be able to get information from them on algorithms submitted.

Alan Godber questioned why information couldn't be submitted directly to us, rather than going through the ITU Joint Rapporteurs Group. A lengthy discussion ensued on the role of IEEE and this subcommittee in the processes of collecting information, creating standards and resolving differences with ITU.

David Fibush asked if three groups or one should be asking for information. We have access to everything that goes on from the ITU group. Arthur Webster said we don't want three different standards. Alan Godber was concerned that if we get the information through ITU, we won't have the give and take that goes on in meetings such as this one. He wanted to invite other system proponents to participate in our meetings.

David Fibush said the ITU is the driving force. ITU is where it is happening with the resources and systems. We have access to all those resources if we participate with the ITU Joint Rapporteurs Group. IEEE could write a standard that references the ITU standard. Arthur Webster said we could also go beyond the ITU standard. Fibush noted that while the leaders in this work have been ANSI and ITU, IEEE could go off on its own if it wanted.

Alan Godber said we don't want to do that. Bill Zou's task force could facilitate getting information for those people that don't go to the ITU meetings. Every group should do as much as it can and coordinate closely so we don't duplicate work.

Methods for disseminating the information were discussed. Alan Godber asked if the items could be put on the web site. Doug Lung pointed out the need for permission to

post documents. It was agreed we would not put items on the web site unless we have specific permission to do so. Alan Godber said he would check with IEEE to see if they could make copies of documents and mail them out on request. **[Action Item]**

Bill Zou will ask companies to submit information to the IEEE. He said he could also update the original list. **[Action Item]**

Item 8 - Report of Task Force on Test Imaging Materials - Chair, David Fibush.

Liaison Statement from SMPTE Working Group on Test Materials for Digital Television System Evaluation, David Fibush, Tektronix, August 5, 1997 was distributed to the subcommittee (Document Number G-2.1.6/46, 4 August 1997.)

Proposed Test Scenes for a Measurement Instrument, David Fibush, Tektronix, Inc., August 5, 1997 was distributed to the subcommittee. (Document Number G-2.1.6/50, 4 August 1997.)

David Fibush said many people are looking for test materials. SMPTE wants to distribute the CCIR test scenes. CCIR agreed to discuss it. Alan Godber said he needed to write a letter to IEEE management to make sure they have no interest in publishing this material. **[Action Item]**

Other sources of test scenes were discussed. Dick Streeter said some of the scenes shown at the Microsoft demonstration might be available. Jay Ballard asked about the Rohde & Schwarz test tape. David Fibush said that because it contained all artificial sequences, it wasn't something we could use for subjective evaluation. It might be useful once we have the subjective validation. Alan Godber reported he met with ATTC on June 9. They now have permission from all those interested to use their test images in whatever way they wish. ATTC management is willing to make them available to IEEE for selection of an appropriate measurement system or, with additional discussion, use as a reference standard.

David Fibush said that for reference material, we need component material, especially for the higher bit rates. Walt Husak from ATTC distributed *Pamphlet – Advanced Television Technology Center – A Center of Excellence for DTV*, Advanced Television Technology Center to the subcommittee. (Document number G-2.1.6/48, 4 August 1997.) He said they have most of the ACATS test material in various formats and could down convert from HD to component D-1 or D-5 uncompressed.

Fibush said we need to write a liaison letter to ATTC outlining two different uses of the scenes. One use of the material would be for our own internal testing and validation. The other would involve material that could be given to SMPTE for distribution as test material. **[Action Item]**

Alan Godber said we will make a start by looking at the images to see what is suitable. David Fibush noted that until the images are down converted, we could only view them at ATTC. The viewing was set for Monday, September 22, at ATTC in Alexandria Virginia. David Fibush, Walt Husak and Alan Godber will put this together. **[Action Item]**

There was a discussion of test scene selection. Arthur Webster cautioned against boring scenes. David Fibush said technical complexity is more important here, but that could be an issue for the validation tests. David Fibush said we need to look at the ATTC scenes,

zero in on the attributes we expect, and get it down to a relatively small number of scenes. He hopes to be able to bring the Tektronix scenes to ATTC.

David Fibush asked who would go. Alan Godber read a list of the task force members. Walt Husak cautioned that fifteen people are the maximum the room could handle. Godber suggested people contact Fibush if interested. Fibush said he would coordinate it through the email reflector. . **[Action Item]**

Item 9 – Report of Task Force on Preparation of Scope for Committee Work – Chair, Leon Stanger.

Leon Stanger distributed *DRAFT 6A, Detailed Scope of Activities*, Leon Stanger, IEEE Compression and Processing Subcommittee G-2.1.6 Task Force on Preparation of Scope for Subcommittee Work, June 23, 1997 to the subcommittee. (Document G-2.1.6/52, 4 August 1997.)

Members of the group suggested minor grammatical and meaning corrections. Leon Stanger said include them in version 1.0, post it to the web site and send it to the Joint Rapporteurs Group. Alan Godber suggested Leon Stanger, as task force chair, post it on the ITU Joint Rapporteurs Group email reflector. Arthur Webster said that, alternatively, he could put it on the FTP archive. Stanger asked if this was appropriate. Godber replied it was, so long as Stanger’s name appears on it and people have a way to get back to him. Stanger said he would work with Webster as appropriate. **[Action Item]**

9.1 Further Discussion and Action

Al Morton returned to Item 2, Liaison, under “Activities and Scope of Work”. He asked from which computer graphics organizations we should solicit input. Warner Johnson mentioned ACM. Michael Brill said SIGGRAPH is a part of ACM. Arthur Webster asked if we should eliminate the sentence. Alan Godber mentioned the IEEE Computer Society, but said because it is a large group, our request might get lost. He can find out who their contact person is. **[Action Item]**

After discussion, Leon Stanger changed the last sentence in Item 2 of “Activities...” to “Input will also be solicited from a computer graphic industry organization such as ACM / SIGGRAPH.”

Bill Zou commented there was no mention of testing in the Scope. Alan Godber responded this is a scope, not a process document. Warner Johnson added that judging from past experience, tests would be done by members and we would correlate the results.

Discussion continued on inclusion of a statement on objective testing. Leon Stanger wanted to guard against endorsing specific equipment. David Fibush replied this questions the whole scope. We will look at different methods and see what is best. If we don’t do this, it shouldn’t be implied that we are going to do that. There is no need to correlate if we aren’t going to rate equipment.

Alan Godber said was too soon say if the testing is going to be a bake-off instead of multiple systems. Leon Stanger said we will get the word objective into item 8 without getting into the bake-off versus calibration issue.

Arthur Webster commented on the phrase “test methods to be defined by this test committee” in Item 8. What happens if ITU goes to another system?

David Fibush said we will have to work hard to go in the same direction. We should. If we can't, then we go our own way. Arthur Webster asked if Item 8 forces us to do our own subjective test. Leon Stanger reminded him this is a working document that can change. Alan Godber agreed, saying it isn't set in stone. Our perspective will change.

Leon Stanger said he would post Version 1.0 of the Scope and bring back a revised Scope for further discussion. **[Action Item]**

Item 10 – Report of Task Force on Constraints (Items not to be part of Image Quality Measurement) - Chair, William Meeker.

Bill Meeker was not present. Alan Godber reported Meeker was disappointed at the lack of results. Some of the comments came in late.

Collection of e-mail correspondence – Constraints Task Force, G. William Meeker and David Fibush, June - July 1997 was distributed to the committee. (Document G-2.1.6/53, 4 August 1997)

E-mail correspondence – Comment on Constraints / Not Proposal, Alfred C. Morton, Jr., July 31, 1997 was distributed. (Document G-2.1.6/54, 4 August 1997)

Alan Godber said that due to the lack of results, more work is needed on this.

Discussion focused primarily on transmission errors and the implications of adding analog paths to the system.

David Fibush said transmission errors should be appropriate for the application. If not, the system is broken. Al Morton commented that this is where it is important to distinguish transmission errors is during in-service measurements. John Grigg said he wanted to be on record as saying it is incredibly important we included transmission errors and related issues.

Arthur Webster commented that the same bit error rate (BER) causes problem in one case and not another. JPEG versus MPEG is an example. It is important. Do we want it in this test or another test? Do we want to throw in ten percent error conditions to see what happens? What happens if someone compares two boxes, one costing \$5,000 and another costing \$50,000? Both look the same, but one has more error correction. We need end to end measurements.

Wallace Murray disagreed. Other equipment exists for testing transmission errors. This is an objective test we need to do before the subjective test. David Fibush said he hopes the measurement methods we come up with will be useful for detecting transmission errors, but questioned how much should be put in the validation tests. Arthur Webster asked what percentage of the HRC's should have transmission errors. Leon Stanger said we shouldn't just ignore the errors and give it a high score. We need to throw up a flag.

Discussion showed analog paths may be a necessity at lower quality levels. David Fibush and Al Morton agreed to drop Item 7 – “No analog paths in the system” – from the constraints. There was concern this would make the validation tests more complex. However, Al Morton said the Constraints still specify CCIR-601/656 I/O. Arthur Webster

suggested all systems should start with the same calibrated signal. Fibush questioned “calibrated signal”, preferring to call it the original signal. When the signal comes back after the HRC, give a measurement on how well laboratories have taken out shift and gain errors, then go ahead with the tests.

Discussion continued about the pros and cons of including analog paths in the measurements.

David Fibush asked what happens if the Joint Rapporteurs Group throws out analog. Do we go our own way? Alan Godber answered not necessarily. Fibush suggested we move it into the Joint Rapporteurs Group discussion.

10.1 Further Discussion and Action

Alan Godber said he still wants Bill Meeker to run this task force, but he is open to having the Joint Rapporteurs Group do it. David Fibush suggested submitting the list with comments on the open issues. Arthur Webster noted that not many people were actively discussing it.

Alan Godber asked if we should put out Bill Meeker’s list. Arthur Webster said add Al Morton’s items f and g to Constraint 8.

Alan Godber asked if we had a consensus. David Fibush disagreed with Bill Meeker’s original list. He offered to modify his list to call out areas of concern, including the work involved with adding analog. We need agreement on a method to determine we have spatially aligned pictures.

Alan Godber said he would like to take it back to Bill Meeker to come up with a document we can agree on. David Fibush and Al Morton should write something to submit to the Joint Rapporteurs Group. **[Action Item]**

Meeting adjourned at 3:05 PM for G-2.1.4. G-2.1.6 meeting resumed at 4:37 PM.

Scheduling of meetings with G-2.1.4 was discussed after the meeting was resumed.

Rick Redford explained the reason for having G-2.1.4 on the same day as G-2.1.6 is that it doesn’t deal with flashy topics. There is a tendency to ignore these specifications. There is less priority on what G-2.1.4 deals with, but the projects are being done. If we change the arrangement, people will say they can only devote one day to this IEEE work.

David Fibush suggested starting at 8 AM with G-2.1.4, letting it go until 10 or 11 AM, then starting the G-2.1.6 meeting and letting it go until 6 or 7 PM.

Alan Godber and Rick Redford agreed to try this arrangement for the next meeting.

Item 11 – Discussion of Where Video Compression Measurements are Likely to be Made in Broadcast Systems.

Alan Godber moved this item to the next meeting.

Item 12 – Discussion of Compression Measurement Methodologies, including compression work by T1A1.5, plans for ITU Joint Rapporteurs Group, NTIA, Tektronix, and others.

David Fibush stated many of these items were discussed earlier. We need to get information to this group on the KPN system, etc.

Arthur Webster said there is a Joint Rapporteurs Group meeting in Turin, Italy October 10 through 12th.

Arthur Webster invited G-2.1.6 members to join the Joint Rapporteurs Group email reflector. Send requests to be added to the list by email to webster@its.blrdoc.gov. An archive of Joint Rapporteurs Group documents is available at <ftp.its.blrdoc.gov/dist/ituvidq/>.

The ITU meeting dates were discussed.

David Fibush said he hopes the Tektronix response to Arthur Webster's list will generate some action.

Arthur Webster said NTIA is continuing work on this project. He should have some contributions after the October T1A1 meeting.

Item 13 – Discussion of Future Work, Additional Assignments, etc.

Alan Godber asked Leon Stanger to coordinate a task force to develop a draft "Timetable for Completion of Video Compression Measurement Standards." Arthur Webster, Jim Waschura, Al Morton, Jay Ballard and Alan Godber agreed to help.

Arthur Webster would like to come up with some HRC's to throw out for discussion on the email reflector. David Fibush said they should be more complex than profile and bit rate. Warner Johnson said it would be hard to tell which will survive. David Fibush said they have MPEG and DV compression formats. Johnson suggested a 5x5 matrix. Webster was looking at a 10x10, maybe a 15x15 matrix as a maximum. David Fibush said we might do some in 625 line format and some in 525 line format.

Arthur Webster asked what labs could do the subjective testing. Tape machines are a problem. Jeffrey Lubin quietly mentioned Sarnoff had facilities. David Fibush said manufacturers would loan us the rooms. Arthur Webster asked about AT&T. Al Morton said not since the break-up. Wallace Murray said they had some of the stuff, but will need to check on it. They lost their main person.

Alan Godber said he will discuss what G-2.1.6 is working on at the September IEEE Broadcast Technical Symposium. He will also ask for funding. . **[Action Item]**

Item 14 – Any Other Business.

There was no other business.

Alan Godber thanked Sprint for organizing this meeting. He asked John Grigg and Al Morton to carry the group's thanks to the organizer.

Item 15 – Date(s) of Future Meeting(s).

The next meeting will be with T1A1 in Austin, October 27, 1997.

After that, the next T1A1 meeting is March 16 in Orlando.

There was some concern about the long delay between meetings. Suggestions included the SMPTE engineering meeting in San Francisco December 8-12. David Fibush suggested doing it after that.

Alan Godber asked what the last decision date would be for a December meeting. David Fibush suggested deciding at the October meeting.

The meeting was adjourned at 5:28 PM.

Submitted by:

H. Douglas Lung
Secretary