G-2.1.6/55

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

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.

Jeffrey Lubin said he had a presentation for the subcommittee on the Sarnoff JND metric. David Fibush had a list of questions from the ITU Joint Rapporteurs Group that needs discussion. Arthur Webster suggested doing it before 10AM. Al Morton had a one page report from ITU that was placed before item 10.

Leon Stanger asked to open a discussion on the group's mission, asking whether we should be defining an algorithm or defining a calibration standard. Alan Godber said this relates to Item 6 and suggested adding it as 6A, followed by the ITU list from David Fibush as item 6B. Al Morton's report was included as part of item 10 and the Sarnoff presentation as part of item 7.

With these changes, the agenda was approved as modified.

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

There was a discussion about the length of the minutes. David Fibush commented that a brief summary is all that IEEE requires and that shorter minutes are more likely to be read. Alan Godber said the details were useful for people that don't attend. Dick Streeter recommended that the action items be broken out of the minutes. Bill Zou agreed. Dick Streeter said we shouldn't discourage long minutes if there is a summary. Rick Redford suggested a summary and a list of action items. Jim Waschura likes the details. Warner Johnson said it was difficult to find people willing to do minutes and suggested we leave Doug Lung alone.

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 reported he sent a letter to Eric Hauch and John Grigg stating that the holding of adjacent meetings was working fine and expressing concern that while joint meetings may save time, there are problems with it. Specifically, IEEE Headquarters has had problems in the past with joint meetings and, separately, there was concern a two day meeting may reduce attendance. IEEE management was happy with this arrangement, but would want to discuss it further before considering joint meetings.

David Fibush answered that the meetings wouldn't have to be appreciably longer. The part of T1A1.5 dealing with video conferencing could be done later. He noted that people giving presentations now have to do it twice. One meeting would be more efficient, since many things discussed at today's IEEE meeting will be discussed again at tomorrow's T1A1.5 meeting. Alan Godber agreed we had to consider that. Fibush suggested calling it an ad-hoc meeting to cover the voting issue. Warner Johnson said T1A1.5 doesn't vote – that is done at the next level up. Alan Godber answered that with IEEE, the final vote is conducted at the subcommittee level. Arthur Webster commented that he would not want to see people stop coming because of a two day long joint meeting. David Fibush stated we could do all the topics dealing with objective picture quality in one day and added that most here aren't concerned with differential gain [referring to G-2.1.4].

Rick Redford said he sees joint meetings as a one time affair, remarking that we have accommodated T1A1 enough by following them around the country. He would prefer we had some separate meetings on either coast. Regarding G-2.1.4, Rick Redford reminded the subcommittee that IEEE had worked this out so we could try to revise some of these old standards and get participation. He would not want to see it pushed aside for T1A1. Dick Streeter observed that membership attended and came to adjacent meetings. He suggested taking a poll to see what would work. Clustering meetings has an advantage.

Rick Redford made a motion that we leave things as they are and take up this matter a year from now. David Fibush said we had agreed to a joint meeting. Alan Godber replied that wasn't agreed to in an IEEE meeting. John Grigg answered that T1A1.5 had agreed to joint meetings. Alan Godber was concerned we don't have many broadcasters involved, although we should. Dick Streeter recommended we give it a year and stay with what we are doing. He had no strong preference.

Rick Redford repeated his motion that since this matter has been argued before and we have taken it up with the parent committee and the IEEE, we take 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 started the discussion by commenting that now that we have email, many have raised concerns as to where and when decisions will be made by the subcommittee. How will decisions be made given the use of email and telephone? He said IEEE informed him New York law did not allow email use for making committee decisions.

David Fibush said that while decisions of substance need to be made by written ballot, routine business doesn't matter. SMPTE could vote on written ballot by email. Arthur Webster agreed with David Fibush – any kind of work we do can be done by email, but can be changed by face to face meetings or on written ballot. The rest of us shouldn't have to wait until the next meeting. David Fibush agreed that face to face meetings are very important and added we really need to do both.

Alan Godber noted that while we have tried to organize task forces using email, the completed work comes back to the committee. He asked if this was sufficient. Dick Streeter replied that the trend is to make use of electronic information, with email the preferred method. You work on the document by email, then bring it to the meeting. David Fibush said we need to do more on the email reflector, including starting discussions that may not have been agreed to previously.

Alan Godber suggested a procedure where we use email to discuss a document, let the group deal with it, invite anyone to add their comments and have the chairman bring it back to the next meeting. At the meeting, we would review and possibly over-rule it. David Fibush was concerned about the "over-rule" part, preferring to keep the discussions open. Godber was concerned that while we must observe due process, we can't keep going for five years. We must set deadlines. Jim Waschura asked if email was slowing the process. Godber replied it could.

Al Morton noted that on the Joint Rapporteurs Group email reflector there had been very little feedback on technical issues. This must be fixed. He noted that Microsoft etiquette is one sentence emails. Leon Stanger said the issue is focal points. We meet together, discuss things jointly and take action items. Items are discussed later under email and brought back to the committee. He said the report and assignment of the next action item ought to be face to face here. Alan Godber said that is what we have been doing. Warner Johnson suggested email as a method of distribution. There is no discussion.

Jim Waschura asked if each task force had a separate email reflector. Alan Godber asked if we needed it. Waschura agreed one was enough. David Fibush suggested putting specific topics in the header. Doug Lung added that this would allow email filter software to separate the topics.

Arthur Webster said email was very helpful in ITU Study Group 12, although it took about a year for it to get rolling.

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 time table which he had 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 emphasized the need to work with the Joint Rapporteurs Group. He recommended combining this list with one created by Arthur Webster. As far as the time scale is concerned, he observed that the equipment hasn't been invented yet.

Alan Godber pointed out a conflict between what broadcasters and equipment manufacturers want and what can be achieved. Six broadcasters and two equipment manufacturers responded to a questionnaire he sent to people on our mailing list. The first question asked, "By what date would you like to be able to purchase objective measuring equipment designed to measure video quality in 525 line interlaced TV systems which have been compressed and decompressed?" The second question was "By what date is it essential to have such test equipment available?" The third asked, "By what date would like to be able to purchase similar equipment for 1080I / 750P television systems. The final question was "By what date is it essential to have that equipment?" Of the respondents, two didn't have much faith in what we could do. They were not convinced adequate equipment could be developed. Another said subjective / objective correlation is important. The dates when the respondents said they needed the equipment clustered around "now" and mid to late 1998. He stated we have many things to discuss before we are ready to test equipment. We must be ready when the equipment is ready.

Arthur Webster agreed that neither ITU nor we were ready yet. He noted that although Study Group 9 wanted a finished version and vote by October, he had to say they couldn't go it. He

liked Godber's time table and said he may send it to the Joint Rapporteurs Group. He said there are algorithms ready for testing. There is physical work that needs to be done and funds are required.

David Fibush mentioned there are several systems proposed internationally that aren't available to this group. Alan Godber asked why they weren't available. Fibush said he wasn't going to bring them in. Godber replied he wouldn't expect him to, but he felt these companies would like to present their systems to this committee. Fibush explained there was a difference in system proponents' willingness to have their system tested and making the effort to bring the systems here. That is why we must work with the Joint Rapporteurs Group.

Arthur Webster said that they expected to have two or more tapes with data, compressed and uncompressed (David Fibush suggested "degraded" instead of "compressed".), that we can send to manufacturers for evaluation. Then we would have to submit the tapes to subjective testing. He said Mr. Schertz from IRT had agreed to do some subjective testing. D-1 and D-5 machines will be needed for this.

David Fibush 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 started an extensive discussion on the approach the subcommittee will take in achieving its goal. He felt strongly that it is not our job to recommend a manufacturer. Suggesting algorithms is beyond this group. Instead, he recommended we develop reference tapes with various material and specific degradations at different levels that we can run through any test equipment to check the results. Using them, we can validate, verify and calibrate test equipment. Manufacturers would not have to disclose algorithms.

David Fibush said he would find that none of the objective methods precisely match subjective results. They will correlate, but they won't give you the subjective number.

Leon Stanger said it is not all that uncertain. Given enough accuracy in the process, they come out surprisingly reliable. Given there are absolute errors somewhere, if we endorse a tape and say it is close, by definition it is the standard. An instrument can be used to give numbers that are more precise. That will be valuable because it can discern small differences in systems. The tapes can be created independent of any system and later used to compare the results from test equipment.

Jim Waschura asked about rigor. Stanger replied each tape would be tested against subjective results. He suggested developing a tape with specific artifacts such as blocking and mosquito noise and allowing expert viewers to grade them.

David Fibush agreed that tapes were needed and that we would have to do this in any case. If this approach becomes the standard, we would need tapes to cover all the various artifacts. He warned that comparison with subjective measurements is always going to be fuzzy. He suggested that what will happen is that one or more methods that provide good correlation

with subjective tests without too many odd values will become the standards. People tend to settle on one way to do a measurement.

Bill Zou commented that we need to specify whether we want to specify an algorithm or a black box. Jeffrey Lubin added that we are not able to come up with an extensive data set that would cover all defects. Arthur Webster said the tape and subjective data are needed to train on, but a test set is needed to test manufacturers' equipment. The tape might be a good idea. He was looking at a standard with algorithms instead of a black box.

David Fibush observed that we can't make a set that covers all possibilities. There are many concatenated standards. For the measurement set, we need some confidence it would work with these.

Peter Symes said we need the algorithm, since it is unlikely we will be able to train a system to produce measurements when dealing with multiple artifacts. Bill Zou said we can't test an algorithm -- we must test the complete system. Symes replied we should test the measurement technique. Leon Stanger stated our job isn't to select a system. Bill Zou said we would have to either select a system or select a set of algorithms. Symes said we need to define the black box. This is where the training and test material is important. David Fibush commented that even 625 hypothetical reference circuits (HRC) and 25 test scenes did not cover all the possibilities. Leon Stanger thought we could deliver a subset of the material.

Alan Godber commented that we must be sure the standard we produce must be meaningful to the industry. David Fibush said a set of test scenes with subjective results is needed but it alone is not sufficient. Arthur Webster was concerned that if we had 20 test scenes with subjective scores and gave them manufacturers they could build boxes to give the right number for that particular scene.

David Fibush said this would be a long process. Once we have scenes and HRC's we agree on, we can standardize them. However, we can't stop there. Peter Symes observed that future compression systems might involve artifacts we haven't seen before and therefore don't have any calibration systems for. However, if given a set of test scenes correlated with subjective data, you can make a machine that not only gives results that match subjective data on those scenes but when presented with different scenes predicts subjective results then you have something useful. David Fibush reported that Bellcore has done work in this area. They have algorithms to put in variable noise and blocking to see how the system works from scene to scene. It is a glass box system.

Peter Symes warned this approach is valid only for artifacts we know of today. We could still have something objectionable that the system won't recognize. David Fibush said you could have a system that includes artifacts from analog problems, wavelet compression and concatenation that a standard scene won't test. Jim Washura noted his customers had an interest in quantifying artifacts into recognizable numbers for blocking, blurring, mosquito noise, etc. Symes said this committee has to look into how these things affect the subjective quality of the picture.

Arthur Webster reminded the committee there is an incredible amount of work to do. People need something that works right now. We need to break the problem down. He suggested MPEG-2, classes 1, 2 and 3 as the first goal, then go on from there. Peter Symes disagreed. If

we come up with something that only works with a defined compression algorithm and we can't test an alternative compression system using a different algorithm against something known, while not useless, this isn't what we are looking for.

Al Morton said Leon Stanger's proposal would be a limited starting point for this group. However, if we come up with some interim object that we agree would be useful for the industry, we should pop that out. Arthur Webster agreed. Peter Symes recommended going a step further. If we reach a level where we have test material and test data on it, we have made some progress. If we have an algorithm that gives us valid numbers, that is another level. While it is good to have goals and while we may be tempted to leap ahead, these learning steps are important. Until we know how these systems work and practically realize how they behave, we are not going to be able to iterate these goals. 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. If we don't come out with something when industry needs it, our work won't seen to be relevant. On the other hand, we don't want to come out with an unsatisfactory product.

David Fibush said no one is offering equipment that will do the toolbox from the ANSI standard. Work is continuing on that. We don't want to come out with something no one will use. We could come out with something and modify it to something people will use.

Leon Stanger said his goal in starting this discussion was to "drop the bomb." He concluded it by stating "It has been achieved."

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.

David Fibush started the discussion by asking about 4:2:2 profile for MPEG-2 tests. He also said we need more test scenes.

Alan Godber asked for an explanation of the HRC's (hypothetical reference circuits). David Fibush explained that in this document we only talking about how many HRC's we are going to look at. We could list a hundred circuits and try to reduce it to 20.

Peter Symes commented that 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. He reported they [Tektronix] have been able to test composite input and output circuits. The goal is to test with references that are either CCIR-601 or that have gone through a high

quality encoder / decoder circuit. The technique is the same inside, but the references are different.

David Fibush continued, saying that we use 601 in and out. If it becomes misaligned, how do we realign it? He noted that stronger measurement methods require alignment. Some don't. Repeating frames aren't an issue here, but they are an issue in teleconferencing. It would be nice to have a measurement system that worked well for both. Also, we want to remove DC gains and other items not associated with the compression process. As part of validating the process, it would be good to keep these things aside. He agreed that transmission errors are interesting, but that increases the number of HRC's required. For now, ignore them. Training and subjective methods should tell you what the channel is doing. The objective tests are a comparison method.

Arthur Webster commented that it makes sense to use tapes that have been spatially aligned and gain corrected as well. This makes them more correct on an algorithmic level. He felt it was acceptable not to allow an analog channel in the HRC, so that we are dealing with integer pixel shifts only. Otherwise, it is very difficult to correct for the 1/20 pixel shifts possible in analog.

Peter Symes said this is part of the iteration process he mentioned earlier. What we trying to measure is best defined by saying we are staying with all digital paths. However, if it happens that when we plug an analog signal in the middle it still works, that is nice. If we start with analog, it will be much more difficult to know what we are looking at. Arthur Webster pointed out the main problem is aligning the video. That requires a lot of processing. Later, analog will be important.

Al Morton agreed, saying that by excluding analog paths we are dropping out the lowest end of the quality classes. The lowest class will always have some analog in it. Perhaps this means we can only measure equipment in the studio, not set top boxes. This group has agreed that measurement input and output will be digital, but we can have conversions in the path. For purposes of calibration and validation, all the analog errors would have to be reversed.

David Fibush said that a system that works only on CCIR-601 might not be terribly useful. His idea is to define a method to measurement alignment, then have everyone agree that is the method. Someone or different groups of laboratories take out the misalignments we agreed to take out, and then we work with the resulting degraded scenes. Arthur Webster commented that the KPN system puts markers in the signal to make the alignments. Fibush replied that Tektronix does the same things.

Arthur Webster observed that to evaluate the algorithm, we don't have the markers to put in, which is an extra burden on processing. Therefore, it is sufficient to stick with digital for the measurement. Otherwise, someone would have to take the misalignments out of the tapes. David Fibush said that was another issue to sort out. He added that Tektronix is prepared to do some of the alignment on the tapes. Jay Ballard supported the 601 only position. He was concerned about the artifacts generated by the decoders. Fibush suggests setting a bit-rate above which composite is not appropriate.

Arthur Webster asked for clarification of Tektronix's limit on training set size to less than 10 to 20 percent of the test set. He said that typically they are equal in size. David Fibush

emphasized the importance of measurement systems that can go beyond the known degradations today. By having a smaller portion of the scenes in the training set we reduce the chance a test set optimized only for the training scenes will do well in the tests. Michael Brill commented that it makes sense to use a larger set of scenes to test against than to train against because this gives you greater sensitivity. David Fibush pointed out that although we may test with 25 scenes, in reality there will be 25,000 scenes or more out there 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.

The subcommittee took a break from 10:37 AM to 10:57 AM

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. Lubin answered questions and provided additional details not available in the paper. The number of pixels on the JND map corresponds to the resolution of the eye, roughly 120 pixels per degree of vision. The viewing distance is calibrated for 4H (screen height). The model can be used in the encoding map to optimize MPEG encoding of difficult areas. Dr. Lubin said they didn't want to be too closely linked to any one decoding / encoding model.

Bill Zou asked about the time domain. Dr. Lubin said it is averaged over the test sequence. David Fibush added that they are doing two seconds on the Tektronix gear. Questioned about dissolves, Dr. Lubin said the system doesn't care – the best we can do is an average across subjects. Fibush explained we need to look at what we have done in the past with objective measurements. If we can get an idea of what we are doing with a variety of scenes that cover a large set, that is good. It is too big a leap to do what we've never been able to do before – consider everything.

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. Al Morton said this was actually four fields, going one frame back.

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. Michael Brill said this was good for seeing what was going on with images and for system development. Dr. Lubin said the system could trace any object. The static channel has priority over any temporal channel.

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 asked if we could have the information submitted to us. Fibush asked what we would do with it. Bill Zou answered we would have it for information, like Dr. Lubin's presentation. Fibush replied that unless we are willing to cooperate with the Joint Rapporteurs Group, there is no point in getting this information. Should three people be asking for this or should one group ask for it?

Alan Godber requested other thoughts. Arthur Webster said we don't want three different standards. Alan Godber replied that at the same time, the members of this group must understand the standards if we are going to vote on them. David Fibush said we have access to everything that goes on from the ITU group. Alan Godber noted, however, that obtaining information that way doesn't allow the give and take we have in this room. He felt we should invite other system proponents to come to our meetings. We know that there are other systems. We should know more about them.

Arthur Webster commented that when it comes to other countries, asking for the KDD system proponent to come over here from Japan with large amounts of equipment for a four hour meeting is asking for a lot. Bill Zou said we would simply ask them to submit a system. Webster replied that they would love to submit a system, if it is just a paper.

Bill Zou initiated a discussion on the relationship of IEEE and ITU in this work.

David Fibush described the ITU work. He said that sometimes ITU takes standards from a contributing organization and sometimes they are more of the driving force. In this case, what is happening is that the ITU is trying to be more of the driving force. ITU is where it is happening with resources and systems. We can use all those potential resources if we participate with the Joint Rapporteurs Group. Our part [IEEE] is to give our input to that and get knowledge back. If we try to do it independently, we lose the inputs and the resources.

Bill Zou asked if we had agreed to that relationship. Alan Godber answered no, explaining the scope says we agree to produce a standard, agree to cooperate with ITU and T1A1, but we reserve the right to differ. There is so much work to be done all of us must be involved with it for it to happen. We ought to have lots of information from these different groups, and then we can decide where we are going to go with our efforts. We have had contributions from Japan in the past. The situation may be different now, but it is too early to say we are going to delegate this to someone else.

David Fibush said the Joint Rapporteurs Group doesn't write or approve standards, but it is the place where the industry provides input and generates output so we can process the information together. The individual groups – ANSI, IEEE, etc. – may then produce their

own standards. He added there is a lot of work to do before we have a standard. It may be more efficient to have one standard.

Bill Zou asked if everything would go to ITU eventually. Alan Godber said we had to get information now. People proposing systems should be prepared to submit information. There is going to be a deadline.

David Fibush stated that the Joint Rapporteurs Group would develop a plan and a deadline. We can set our own deadline. Alan Godber emphasized the most important thing is to get information to the group. The Joint Rapporteurs Group information is second hand. Should we have it first or get more information? Fibush disagreed, saying if the information is available everywhere, it is not second hand.

Leon Stanger referred to this group's Scope, which says we will cooperate with ITU Study Group 9 and Study Group 12 and review information for suitability for use in G-2.1.6. Arthur Webster, joint chair of the Joint Rapporteurs Group, said this is such a big problem we are going to have to try to work together. We don't want ITU and IEEE at different levels. It doesn't have to be an ITU-T standard. We can write our own.

David Fibush added that if we find the Joint Rapporteurs Group isn't doing what we want, we can go off on our own. If we start out on our own, we aren't doing the standards world a service. Bill Zou asked if this meant ITU would do the standard. Fibush replied if it works, why not. At this time, we don't know enough to know if the IEEE should write its own standard.

Alan Godber disagreed. We will write an IEEE standard. The IEEE standards board would not be happy to have us meet if we are not going to create a standard. David Fibush pointed out that the standard we write might say that ITU-T-XYZ is the reference and these are the items important to IEEE. It could be a single page saying use the ITU standard. It could still be an IEEE standard without the technical details. Arthur Webster said we could also go beyond the ITU standard. Michael Brill commented that it could go the other way – we write the standard and it goes to the ITU. Fibush noted that the leaders in the work have been ANSI and ITU. We could go off on our own if we want.

Alan Godber said he wasn't suggesting that. People that don't go to ITU need information. Maybe Bill Zou's task force could facilitate that. We need to get all the documents available. No time should be wasted. There are not enough people to do all the work. The standards committees are the ones that are behind. The algorithms are ahead. We are several years behind. Every group should do as much as it can and coordinate closely so we don't duplicate work. Bill Zou commented that we need to specify coordination.

Al Morton noted what is a couple years away is not systems that will make these measurements, but gathering an industry consensus that we have one or two systems we can agree on. That is the work ahead of us on a global scale. Charles Fenimore presented a system a year ago and it was glossed over.

Alan Godber asked if we could make the documents we have available on the web site. He is putting together an index. The next job will be to make the index available. Doug Lung questioned whether we had permission to post these documents. Godber answered that we need to find out if we can get electronic editions or permissions. David Fibush warned that

asking for permissions would slow things down. He suggested IEEE make copies and mail them out for requests, as SMPTE does. Godber will check with IEEE on this. Al Morton said ATIS has documents and is able to distribute them. Fibush added that to obtain ITU documents you must be a member their TIES system. Arthur Webster said he might be able to make a few copies for those that need them.

Leon Stanger warned that making copies could be a problem. We would not want to risk making illegal copies. Warner Johnson cautioned that if someone makes copies of illegal copies, it is counted as two violations of the copyright rules. David Fibush answered if we go to the lawyers; we know what the answer will be. This hasn't been a problem.

Arthur Webster suggested that the index include the name of the person who brought it in and the author. That way you could contact either one for copies. Alan Godber agreed it we should not put items on the web site unless we have specific permission. Arthur Webster said the Joint Rapporteurs Group FTP site has an archive of documents.

Bill Zou will ask companies to submit information to the IEEE. Leon Stanger suggested keeping it simple. Have Bill Zou maintain the list as current. As part of the web site reference material, it would be valuable. Zou said he could update the original list.

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. If we can look for them together, that is fine. We need to let people know others are looking for material and that SMPTE would likely be the one to distribute them. Fibush will bring a tape with sequences Tektronix has to the next meeting. 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. He didn't see a problem with it, since SMPTE has done it for years. David Fibush said this is a liaison letter to start the discussion.

Arthur Webster said the Working Group had asked ITU to suggest scenes. Dick Streeter said some of the scenes shown at Microsoft might be available. Alan Godber met with Paul Degonia from ATTC on June 9. Walt Husak is here today. The items we talked about were agreed to, except for the funding issues. These would have to be discussed with the board. The following items were discussed:

Test Images – can these be made available to the subcommittee? ATTC now has 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. The HDTV images could be down converted to other formats.

ATTC is willing to show these images to our task force working on imaging materials. This can be set up at some suitable point if we want to see them.

Is ATTC willing to be the test facility? They are interested.

ATTC may be able to provide some funding. This has not been confirmed. The ATTC board must discuss it.

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 virtually all the ACATS test material in various formats. They also have a viewing room that can seat twelve "cozily". They have HD, D-5 and D-3 tape machines and can get D-1 machines.

Alan Godber suggested adjacent to the IEEE Broadcast Technology Society meeting in Washington D.C. in September as a possible date to look at this material.

David Fibush asked what do we do if, after seeing them, we like them. Alan Godber would like to get a list of all the characteristics of the test images and distribute it. Fibush said it would be good to look at the images at ATTC. We need a list of what we want. We need to say that we are going to be doing our work primarily in 525 and 625, since it is likely HD recorders, if any, available to us will use compression. Walt Husak said they have NTSC images shot on D-2 and can do conversions. Fibush commented that as reference materials go, we need component materials, especially for the higher bit rates. Husak answered that they can down convert HD to component D-1 or D-5 uncompressed.

David Fibush had another concern – we need to write another 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.

The subcommittee discussed the date to view the material. David Fibush said SMPTE was meeting in Princeton the same week as the IEEE BTS meeting. Doug Lung suggested the Monday after the IEEE BTS meeting, as was done for the subcommittee meeting at NTIA last year.

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.

Arthur Webster commented that the CCIR test scenes are boring. David Fibush countered that technical complexity is more important. Webster said this could be a problem in subjective tests. Fibush said the time period is short. Basketball scenes were boring and they had the widest range of scores. Webster added that towards the end of the test, people scored scenes lower. Fibush said that for the validation tests we might need to get scenes that aren't boring.

Al Morton said they suffered from very long tests and sessions during the T1A1 testing. They were at the outer limits of what people could endure. Arthur Webster recommended we consider boringness. Viewers will look at them differently. Alan Godber noted there was a lot

of correlation between CRC (Canadian Research Center) non-expert and ATTC expert viewing tests. Morton cautioned if the test is long enough, viewers become tuned in to it.

David Fibush asked Alan Godber if he could put the list of scene properties on the web site. Godber said he would have to retype it.

David Fibush said we needed to get the discussion going. 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. It is an iterative process. He hopes to be able to bring the Tektronix scenes to ATTC. Currently they are all on disk. The source of some of them is unknown and some might have composite artifacts. Alan Godber agreed it would be a good idea to compare the CCIR scenes. David Fibush said he got as close to the original tapes as CTRC could supply. Walt Husak asked about the Dr. Hardy material. Alan Godber answered that they were not on the list.

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.

Jay Ballard asked about the Rohde & Schwarz test tape. David Fibush answered that it contained all artificial sequences designed for encoder testing. It wasn't something we could use for subjective evaluation. Once we have the subjective validation, we might want to consider using artificial sequences.

Break for Lunch at 12:48 PM – return at 1:32 PM

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.)

He outlined a four step process for reviewing the document. First, open the floor for correcting minor grammatical errors. Second, open the floor for correcting meaning. Third, release this as version 1.0. Fourth, consider major changes of substance.

Corrections to Grammatical Errors and Meaning

Al Morton noted on page 3, under " Activities Beyond the Scope of this Subcommittee", item 3, "lipsync" is usually hyphenated – "lip-sync". Warner Johnson suggested adding "event-sync" to "lip-sync".

Al Morton asked if we could fill out the "TBD" relating to the computer graphics industry in item 2 under " Activities and Scope of Work". Leon Stanger said hold it until we discuss substantive changes.

In the same item, Warner Johnson suggested adding EIA/TIA to EIA. David Fibush said that is a substantive change. He questioned what coordination is. We need to discuss that. Alan Godber said it is limited to sending copies of draft of standards when ready for comment. Dick Streeter suggested adding "as appropriate" to coordination.

Leon Stanger said he would make the changes, list it as version 1.0, post it to the web site and send it to the Joint Rapporteurs Group. Arthur Webster said we could post it on the Joint Rapporteurs Group email reflector. Alan Godber suggested Leon Stanger, as task force chair, post it on the email reflector. 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. It is appropriate that he get all the credit and the brickbats. Stanger said he would work with Webster as appropriate.

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.

David Fibush asked that we define "coordinate efforts". Giving these organizations a copy of standards to review is a different issue. Alan Godber said that is what IEEE requires us to do. We need only send them drafts. He agreed that "coordinate efforts" was a little broad and needed definition.

Al Morton noted that collaboration is already a separate level. (Item 3 under "Activities and Scope of Work)

Bill Zou suggested we extend "review this work" (Item 3) to see if we need to change standards. David Fibush said we need to give them a little longer, but we can review their work at every meeting.

Dick Streeter said that as written, this [Items 2 and 3] requires us to coordinate with each of these groups. Alan Godber responded that the group agreed to this and that some of the coordination is mandated by IEEE. It is not a hardship and we may not need to do much now.

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. David Fibush reminded the group that this is still a committee activity. An objective results paragraph as Bill Zou suggested would make sense. Zou agreed, or add a statement to say this committee is not going to do any tests. Fibush said we would still do them, alone or with others.

Leon Stanger said objective results is implied but not stated. He suggested adding a statement on objective results in Item 8 under "Activities…" He wants to avoid endorsing someone's method.

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.

Michael Brill asked if this limited the use of our standard to one system. Al Morton said the standards could be re-written. Arthur Webster added if one method works for all systems, that is fine. Otherwise, we will need to add other pieces. Considering how long it will take to get a standard done, we should do one piece, then work on the rest and revise as necessary.

Leon Stanger asked are we doing a bake-off or providing tools to the industry that allow them to test equipment.

Alan Godber said we could have multiple standards around the world, as we had with audio peak meters where we once had six de facto standards. That would be undesirable. Now we have one, the IEEE standard. Everyone agreed we didn't want six standards. We have the same situation here.

David Fibush said that if JND is the best method, all companies would have an opportunity to license it. We need to have a common base technology and let multiple companies try to satisfy their needs. Different equipment has to be limited in different ways.

Alan Godber answered Leon Stanger's question by saying it is too soon to say it is going to be a bake-off instead of multiple systems. Otherwise, there is no need for the standards. Let the market-place fight it out. Arthur Webster added that the Japanese don't like the bake-off idea. His intention was to have the bake-off, but, if multiple systems must be combined, that is another possibility.

Leon Stanger said we will get the word objective into item 8 without getting into the bake-off versus calibration issue.

Still on Item 8, Bill Zou asked what happens if ITU uses different viewing methods than the ones we decide on. If we agree with that group, we use their methods. If we don't get what we want, then we move off in our own direction.

Arthur Webster also 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.

Alan Godber added a comment from Bill Meeker by email saying the document is already way too long and perhaps muddling as well. There were no other comments.

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. David Fibush commented that some of these constraints are already part of the JND system. Variable frame rates aren't an issue for broadcast. Leon Stanger asked what about film where the information is transmitted at 24 fps. Fibush answered the alignment doesn't change. Stanger felt this could be a failure method. Fibush answered we don't measure picture quality if there is a failure.

Bill Zou noticed Bill Meeker didn't include colorimetry on the list.

David Fibush said transmission errors should be appropriate for the application. If not, the system is broken. Because of the large number of HRC's, Fibush said they decided to drop it from the measurement. Warner Johnson asked how do we put a number on it if people decide to go with a broken system. Fibush answered that it is very difficult for a picture quality measurement to cover this.

Al Morton commented that where it is important to distinguish transmission errors is during in-service measurements. There we want to know what is affecting the picture. We have to be careful to be sure we get the right set of circumstances applied to the right set of measurements.

John Grigg said it was of primary importance that transmission errors or end-to-end measurements are included in picture quality measurements. Transmission errors will have a different effect on different compression systems – i.e. JPEG versus MPEG. Grigg said he wanted to be on record as saying it is incredibly important we included transmission errors and related issues. If there is an error, give it a lower number. An example would be a gun fight where, due to dropped bits in the encoder, the gun disappeared as it was being drawn. One CODEC will be affect more by errors than others. With a PQM (Picture Quality Measurement), we have no common denominator for service – pounds, kilograms or whatever.

Wallace Murray disagreed. There are things built in like EDH. Shouldn't we be making sure these things aren't going off? This is an objective test we need to do before the subjective test. Leon Stanger said just say it is a lot of JND's and give it a lousy score. What it will come down to is whether the commercial will be paid for by the advertiser or not.

David Fibush asked what happens today. Alan Godber answered that they don't pay. Warner Johnson added we have to prove there wasn't a problem, using expensive test equipment. Leon Stanger said that is usually done using vertical interval codes, which will be dropped by the digital equipment. David Fibush understands why we want to it. He noted this is a

constraint on the validation tests, not on the product. If there are errors, the system will show a worse signal. This doesn't say the measurement system won't give us a number.

Warner Johnson agreed, saying this is equivalent to saying you can't test a spectrum analyzer in a high EMF.

David Fibush said he hopes the measurement methods we come up with will be useful for this, 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 at least throw up a flag.

Bill Zou agreed with David Fibush. You can read an on screen display to see you have a transmission problem. Using subjective test results to view transmission errors will be difficult to correlate with objective measures. It is difficult to measure transmission error that way.

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.

Jeffrey Lubin said that for drastic errors we see a black streak. In other cases, it is more difficult. Bill Zou asked how do you simulate an error concealed system. Lubin answered we can simulate bit errors and see how an encoder / decoder system works. Arthur Webster said the customer wants video at the other end and doesn't care about error correction or how the video got degraded.

David Fibush asked if we need to subject our proposed measurement systems to these tests to validate them with subjective measurements. People will want this capability and manufacturers will provide it. Is the test part of our system?

Al Morton questioned the phrase "no change through the system…" in David Fibush's email. Zero is a small number. If we allow any picture cropping, we could have spatial shift and resizing. He suggested adding Items f – "Spatial Shift (no change =< 1 pel, measurement must compensate for remainder, this is a static shift) and Item g – "Spatial Scaling (size)", as described in his email.

Analog paths may be a necessity at lower quality levels. Should we remove the constraint on analog paths?

Wallace Murray said A/D and D/A conversion is always a problem. Whenever we go down and back up again there are problems. David Fibush commented the picture can be good even with spatial shifts.

Arthur Webster said the problem is that when you do the shifts you have to do some processing that adds noise to the system. It would be a cleaner test without analog. If they are important, we have to do this. No one Webster talked to has any problem eliminating analog from the path.

David Fibush said the best signal you can get out of a set top box is S-VHS. Al Morton said the measurement has to go all the way down to the user. Jim Waschura asked if that is the stat-muxes or the end to end all the way to the home. Morton replied yes, all of the above.

Waschura asked about a digital output on a set top box. Fibush said reference boxes are available. Brill said the performance is set by the encoder. Fibush agreed. Set top boxes vary in quality.

Al Morton said eliminating analog paths is fine for the first two quality classes, but not for the last. Arthur Webster said the only reason for eliminating analog is the picture shift. Leon Stanger asked if the viewer cared even if there are several pixel shifts. Al Morton suggested reporting shifts but not assessing a penalty for them. If you go through the path a hundred times it is a problem. David Fibush said the problem is that with a shift of a quarter pixel, matrix measurements won't work unless you remove the shift.

Alan Godber stated these issues need more thought. David Fibush agreed. We don't have a consensus. The discussion continued.

David Fibush and Al Morton agreed to drop Item 7 – "No analog paths in the system" – from the constraints.

Discussion continued on the affect of analog paths on the system. David Fibush said it affected how complex the validation tests will be. The original idea was to make the validation tests less complex. Arthur Webster agreed, saying all systems should start with the same digital data. Al Morton agreed, saying the Constraints still specify CCIR-601/656 I/O. 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.

Leon Stanger said there could be an analog segment inside the path. Alan Godber said we need to discuss that in the industry. If we take out Item 7, we must include analog. David Fibush reminded Godber that Bill Meeker didn't want included items in the Constraints.

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. Al Morton commented that this discussion would have taken 50 years on email. Alan Godber agreed. What drives email is the next meeting.

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. He suggested submitting what we have to the Joint Rapporteurs Group and ask for discussion. 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. Godber said this couldn't be an official document. He is concerned about the due process issue. Fibush said that applies during the standards process, not during discussions.

Al Morton said it could be sent as a document by Fibush and Morton, a group of experts that discussed it at the G-2.1.6 meeting, not as a G-2.1.6 document.

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.

Rick Redford made a motion that G-2.1.6 adjourns for G-2.1.4.

Alan Godber said items remain to be discussed. David Fibush stated we have to give him the floor. Rick Redford said, at least temporarily. Fibush commented this shows we need to consider how we schedule future meetings.

Leon Stanger said he had to leave. Alan Godber jumped to Item 13 on the Agenda, Discussion of Future Work, Additional Assignments, etc. He would like Leon Stanger to coordinate a task force to develop a draft "Timetable for Completion of Video Compression Measurement Standards." Leon Stanger agreed to chair the Task Force. Arthur Webster, Jim Waschura, Al Morton, Jay Ballard and Alan Godber agreed to help.

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.

Alan Godber commented that the problem is only going to get worse. Rick Redford suggested combining the two meetings. G-2.1.4 doesn't even need half a day. Godber questioned this, saying it would if G-2.1.4 was going to get standards done.

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.

There was a discussion about different options for the G-2.1.4 meeting. Warner Johnson and Dick Streeter suggested starting G-2.1.6 on Sunday afternoon. David Fibush suggested G-2.1.4 start on Sunday. Arthur Webster suggested sandwiching G-2.1.4 in the middle of G-2.1.6. There was some concern this would require two days. Warner Johnson suggested a longer day, as is the case at SMPTE meetings.

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.bldrdoc.gov. An archive of Joint Rapporteurs Group documents is available at ftp.its.bldrdoc.gov/dist/ituvidq/.

The ITU meeting dates were discussed.

David Fibush said he hoped 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.

The assignment of the timetable task force to Leon Stanger was covered near the end of Item 10.

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.

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

APPENDIX "A"

List of Documents Distributed

4 August 1997

Amended Draft Agenda - IEEE Compression and Processing Subcommittee G-2.1.6 Fifth Meeting, Monday, August 4th, 1997 , Alan Godber, Chairman, 4 August1997.

Draft 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, Doc. G-2.1.6/45, 4 August 1997.

Liaison Statement from SMPTE Working Group on Test Materials for Digital Television System Evaluation, David Fibush, Tektronix, August 5, 1997, Doc. G-2.1.6/46, 4 August 1997.

IEEE G-2.1.6 Video Compression Measurements Standards – Draft Timetable for Implementation of Video Compression Measurement Standards, Alan Godber, Chairman August 1, 1997, Doc. G-2.1.6/47, 1 August 1997.

Pamphlet – Advanced Television Technology Center – A Center of Excellence for DTV, Advanced Television Technology Center, Doc. G-2.1.6/48, 4 August 1997.

Discussion Document for the ITU-T JRG Topics, David Fibush, Tektronix, Inc., August 5, 1997, Doc G-2.1.6/49, 4 August 1997.

Proposed Test Scenes for a Measurement Instrument, David Fibush, Tektronix, Inc., August 5, 1997, Doc G-2.1.6/50, 4 August 1997.

Sarnoff JND Vision Model, Dr. Jeffrey Lubin, Sarnoff Laboratories, August 4 1997. Doc. G-2.1.6/51, 4 August 1997.

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, Doc. G-2.1.6/52, 4 August 1997.

Collection of e-mail correspondence – Constraints Task Force, G. William Meeker and David Fibush, June - July, 1997, Doc. G-2.1.6/53, 4 August 1997.

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

APPENDIX "B"

ATTENDANCE RECORD

4 August 1997

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