more serious for the consumers purchasing interlaced equipment to observe a degradation if progressive technology were introduced at a later date. Delayed introduction of progressive-scan-transmission technology would be a great disservice to the Nation.

I believe the broadcasters will benefit in two ways from such a progressive-scan-transmission-only policy. The increased flexibility and usability of their potential future service offerings would be greater, opening future revenue possibilities to them, and they would be less subject to needless retrofitting costs that could occur as any early interlaced equipment was replaced by progressive scan as that technology advances. Broadcasters and media owners and producers will also benefit from the improved presentation and longevity of their video products.

I believe there is a substantial parallel between the natural reluctance exhibited recently by proponents of analog HDTV techniques to yield to more productive digital approaches, and the similar reluctance of interlace proponents to embrace today the advantages of progressive scan and our near-term technical future. The urgency to make this move decisively now is amplified by the perception of many, including myself, that any transition from a temporary use of interlaced transmission standards to progressive-scan transmission would inevitably be delayed and costly to everyone.

I hope these views are useful, and I would be happy to amplify if you wish.

Sincerely yours,

David H. Staelin

DHS:emc

480 x analog
720 x 1280 } 3:2
1080 x 1920 } 3:2

"Square pixel" = "Square sample distribution"

Define interface at 720 x 1280 & 1080 x 1920

"Allow" internal use of lower H resolution if needed for ease of compression (like 1440). The interface would still be 1920 in this case.

Picture rates of 23.97/24, 29.97/30, 59.94/60. Switchable at studio, automatic in receiver.

Want MPEG-2 compatibility. Want highest quality. If MPEG is wrong, fix it.

"Allow" interlace transmission. If an application requires progressive, use progressive.

"Allow" interlace display. If an application requires progressive, use progressive.

Inclusive not Exclusive.

R. Hopkins
6 Oct 93

THE LIBRARY OF CONGRESS
WASHINGTON, D.C. 20540

AMERICAN MEMORY

October 12, 1993

Dear Robert:

This letter is a follow-up to the October 6-7, 1993, meeting of the Interoperability Panel ("panel") associated with the Federal Communications Commission (FCC) development of the transmission standard for the Advanced Television System (ATV) proposed by the Grand Alliance (GA). This letter is my statement (as a panel member) to the chair of the Joint Experts Group on Interoperability.

Two factors make it difficult for me to compose a response. First, my technical knowledge is at a layman's level and, in any case, the Library of Congress has less of a stake in the details of a transmission standard than do participants from the industry.

Second--and more important--there is a disjunct between the panel's "charge" and my perception of a greater "need." A strict interpretation of the charge would limit commentary to the technical details of the transmission standard. At the same time, the meeting of this panel and the Joint Experts Group appears to provide the only formal opportunity for comment on the connections between ATV development and the emergence of an effective National Information Infrastructure (NII). The perception of the need to discuss this connection motivated the remarks offered by several panelists at the meeting and also motivates my follow-up letter.

The Library of Congress has a profound stake in nurturing the rapid and complete development of the NII. The Library feels a strong need to ensure the most widespread dissemination of both information (software) and access tools (hardware) to the American people. The American Memory project is one of several Library of Congress activities that will employ the NII to provide reference, historical, and other educational materials to the American people.

The Library's role, of course, is that of an information creator and--in some cases--provider: We have created an extensive catalog of our holdings and provide access to it via Internet. We have begun digitizing important historical collections and look forward to working with other organizations to provide national access to these materials. We view national electronic access as the logical expansion of the reading-room access we have offered in Washington for two centuries. We believe that effective presentation of Library of Congress information will depend upon several technical features discussed at the panel meeting: progressive scan for clear reproduction of text and images, square

pixels, imbedded headers, conformance to standard approaches like MPEG-2, etcetera.

We understand that the GA has proposed a modular and versatile system that includes the above-named technical features as optional elements. The GA states their sympathy with the desire to ensure the presence of an NII-capable display monitor in most American homes, but argues that the current discussion is limited to the transmission standard. Demands pertaining to hardware, the GA argues, ought to heard in another forum.

My counterargument is that the discussion of the transmission standard is, in fact, part of a broader negotiation within the nation and that this occasion is a reasonable one for the articulation of broad ideas. The case for stating "policy" positions at this time reflects the lack of other ATV forums devoted the convergence of what is called "television" with the other forms of data-dissemination. In this regard, I endorse the October 4, 1993, letter to the Joint Experts Group from Bob Myers of the Hewlett-Packard Company. Myers's technical commentary is very thorough and persuasive but, in this context, I commend the following three sentences:

> As the GA report itself notes, what is being discussed is a transmission standard--not a production standard and not a display standard. However, while it is true that production, transmission, and display are decoupled in a digital system, we cannot neglect the impact that standards in any of these areas will have on the other two. They are decoupled but cannot be considered unrelated.

Thank you for inviting me to be a member of the panel; I hope my remarks are of assistance. I have sent copies of this letter to some of my Library of Congress colleagues, inviting them to review the documents you and the GA provided. If any of them have particular comments, I will suggest that write to you. Meanwhile, please let me know how else I can be of service. Best wishes.

Sincerely,

Carl Fleischhauer
Coordinator, American Memory

Mr. Robert L. Sanderson
Eastman Kodak Co.
Image Telecommunications Center
1447 St. Paul St.
Rochester, NY 14653-7102

cc: Mr. Michael Liebhold

NVISION®

PAVING THE WAY IN
HIGH DEFINITION TECHNOLOGY

JEGI Doc.-059

RECEIVED

NOV 29 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

October 23, 1993

To: Dr. Robert L. Sanderson
Chairman
Joint Experts Group on Interoperability
Advisory Committee on Advanced Television Systems

Dear Bob,

After carefully reading through the voluminous addenda to your interoperability report, I find myself compelled to comment.

The comments submitted to date vary from quite constructive, through uninformed paranoia, all the way to outright misinformation. It is notable that the Grand Alliance already has agreed to include capabilities proposed in several of the constructive comments. My concern stems from the overall tone of the report with the addenda included. The casual reader, who has no historical background in how we got where we are today is very likely to come away with the sense that the whole ACATS process is disconnected from reality. As one who has been actively involved in the development and standardization of HDTV for over 15 years, I feel that, on the contrary, the process is working very well, and has gone to great lengths to hear and weigh the views of all stakeholders.

For the benefit of the above mentioned casual readers, I will review my involvement with HDTV. In the late seventies, I was a member of the SMPTE Study Group on High Resolution Television. It was in this group that the term HDTV was coined. That group was concluded with a resolution to form a Working Group that would act as a standards development body. I was assigned to co-chair the resulting Working Group on High Definition Electronic Production with Richard Stumpf of Universal Pictures. WG/HDEP was active throughout the decade of the eighties and was the body that wrote the SMPTE 240-M standard.

When the ACATS was formed, I was asked to chair the Systems Analysis Working Party (SS/WP1). This working party has, over the last five years, been the group that has reviewed and analyzed all the incoming proposals for ATV systems submitted to the ACATS. As the chairman, I have had the responsibility and the opportunity to carefully evaluate ***all*** the ideas submitted.

In addition to the above committee responsibilities, I have spent over 20 years designing

NVISION, INC. • P.O. Box 1658, Nevada City, California 95959 • (916) 265-1000 • FAX: (916) 265-1010

and manufacturing equipment for the television and film industries. Personal computers are an avocation of mine, so I keep quite current in the state of the computer art. Please find enclosed my comments on the addenda to your report.

Sincerely,

Birney Dayton
President
NVISION, Inc.

cc
Mr. Robert Bromery, FCC
Mr. Richard Wiley
Dr. Joseph Flaherty
Dr. Irwin Dorros

October 23, 1993

To: Dr. Robert L. Sanderson
Chairman
Joint Experts Group on Interoperability
Advisory Committee on Advanced Television Systems

From: Birney Dayton
NVISION, Inc.

Re: Comments on Interoperability Report and Comments to Date

A careful reading of the *comments* to the Interoperability Report gives me reason to believe that a number of people are operating under assumptions that variously need clarifying, exposing, or otherwise correcting.

Assumption #1

TV Sets and Computer Terminals Should be Interchangeable.

or

It Is in the National Interest for ATV sets to be Computer Terminals.

or

TV Sets Must Be the Window into the NII for the Masses.

Statements with the above basic assumption abound in many of the negative comments attached to the interoperability report. Before it is assumed by anyone that the price of a television set should be raised even by a few dollars to make it into a computer terminal, much less the hundreds, or even thousands, of dollars implied by the above assumption and its corollaries, the validity of the assumption needs to be tested against some facts.

NTSC television sets are designed to be viewed from a distance of 6 to 10 picture heights.

ATV sets will be designed to be viewed from a distance of 3 to 4 picture heights.

*Computer monitors (as determined by the 14" focus distance of bifocals) **must** be designed to be viewed from a distance of 1 to 2 picture heights (for 21" to 12" monitors).*

TV sets are intended to communicate unilaterally to a relaxed (read kicked back on the couch) audience of more than one, typically the whole family.

Computer monitors (and computers) are intended to communicate interactively with one person who is positioned to operate a keyboard (i.e. sitting up straight).

Given the above facts, the assumption of convergence between TV sets and computers presents a formidable set of ergonomic challenges. Numerous attempts have been made over the last ten years to interest the consumer in using his or her TV set as an interactive device. So far, the only financially successful ventures in this vein have been video games. It is not clear that there is any meaningful correlation between the use of an ATV set as a giant GameBoy and the numerous NII applications that are hinted at in the report addenda.

It is probable that a video interface added to the telephone will be more acceptable as an interactive window to the information highway of the future. On the other hand, by far the most practical window into the NII will be a computer.

The computers of the future will, no doubt, include high definition video in their capabilities, and there will be a percentage of usage where a computer is used to display to a large audience.

Assumption #2

TV Sets and Computers Must Share Common Standards for the NII to Succeed.

This assumption is plagued by the fact that the term *Standard* has a very different meaning in the entertainment industry than it does in the computer industry. The NTSC standard has been with us for 40 years, and will be around for at least another 20. A program generated for NTSC in 1955 is totally compatible with a television receiver manufactured today. 35 mm film has enjoyed an even longer lifetime, and shows no sign of aging.

In a span of 10 years, the computer industry has employed a series of display "standards" that has migrated from 640 by 200 to 1600 by 1200 with a bewildering array of signal timings and monitor synchronization methods. Computer software (and hardware) changes at such a breakneck pace that a serious user needs a subscription (usually called a service contract) to keep up to date. The newest industry buzzword is "Legacy software". This means "the stuff we sold you last year that we aren't supporting anymore". One of the serious computer user's biggest problems is figuring out how to keep last year's effort from being lost forever because this year's application won't read data from last year's legacy application software, and last year's legacy application won't run on the new version of the operating system, etc.

Consumers of entertainment equipment and software (i.e. programming) simply <u>will not</u> tolerate the rate of change that business computer users have endured over the last decade. If and when a new television service is launched, consumers will have to be convinced that it will be around 20 years later before they will line up to buy new television sets.

All this is not to say that there should be no attempt to make computers talk to TV sets, but rather that the computer industry will not be constrained by any standard for long, and by the time any ATV system has built up enough momentum to be in the mainstream, computers will, at best, see the ATV screen as one kind of output device among many. The great convergence of television and computers will necessarily be transitory, because entertainment programming has a lifetime measured in decades, and computers will have new frontiers to conquer annually for many years to come.

Assumption #3

Interlace Doesn't Work on Computers and Was Abandoned Years Ago

It is largely true that $40,000 workstations abandoned interlace a number of years ago. However, if we look at the IBM compatible PC, which represents the majority of computer screens in the world, the vast majority of monitors with more than 640 by 480 resolution have at least one interlaced mode.

For example, the computer I am using to generate this report, has a 17" high quality monitor. It will support up to 1024 by 768 progressive with a frame rate of 70 Hz. It also supports a 1280 by 1024 interlace mode. The interlace mode will unquestionably put more useful resolution on the screen, and the interlace itself is not objectionable for most applications. What is objectionable is the loss of dynamic range (256 colors to 16 colors), and the confusion of aspect ratio. 1024 by 768 has square pixels for a 4 by 3 screen. 1280 by 1024 has square pixels for a 5 by 4 screen. Bit mapped images such as icons and scanned in photographs are looking for square pixels, but without exception, all my fancy vector graphics programs are smart enough to recognize the change, and make circles round

when the screen is adjusted for an overall aspect ratio of 4 by 3 in both scan formats. This certainly makes the case for square pixels, but does not support the notion that interlace is unusable, or that VESA has successfully defined a "family" of standards as claimed in one submission.

Assumption #4

Interlace Is Unusable for "Hard-Edge" Graphics

Depending on the content, interlace can be objectionable on a "hard-edge" graphic image. The important point here is to understand what a "hard-edge" graphic image is and why it will not survive unscathed in any encounter with a compression system optimized for real pictures.

All digital television systems use sampling techniques to represent the image. Sampling theory (Nyquist) requires that information which is to be accurately reproduced with samples must be band-limited to less than half the sampling frequency.

All film and television systems break the rules in the temporal direction because the human eye is very good at integrating out the temporal aliases generated, and moving pictures appear sharper when the camera uses a short shutter angle.

Modern digital television systems obey the Nyquist rules very well in the horizontal direction. Depending on camera design, interlaced systems break the Nyquist rule to a greater or lesser extent in the vertical direction. Progressive cameras can obey the rules in both the H and V directions quite well.

Hard-edged, that is pixel on, pixel off, style graphics break the Nyquist rule ***absolutely*** in all three directions. Unfortunately for the so called hard-edged computer graphics image, the most common compression techniques for television images involve a transformation from the time domain to the frequency domain. MPEG-2 is no exception, since it utilizes the discrete cosine transform (DCT) as a key element of the compression process.

In order for a computer graphic image to successfully pass through any television transmission system, it must first be band-limited to fit into the system. In the case of a compressed system that uses spatial transforms, the input must be appropriately band-limited (pre-filtered) in both the horizontal and vertical directions. How successfully this band-limiting can be done is demonstrated by modern NTSC television graphics generators, which make quite smooth, readable graphics through the limitation of interlace and through the far more severe limitation of minimal NTSC color bandwidth.

Except at the very high end, computers do little in the way of pre-filtering or anti-aliasing signals before they go to the screen. The result is jagged diagonals and ragged text even on a progressive scan monitor. The price of anti-aliasing is substantial processing power and far more dynamic range (e.g. 24 bit color) than most personal computers yet have.

At the current rate of progress in computer technology, by the time ATV is launched, most computers will have 24 bit color and plenty of processing power to anti-alias images prior to sending them to the display. At that point, the question of compatibility with interlaced television systems will be moot. Pre-filtering for an interlaced display of a particular resolution will be just one of many software settings determined automatically.

Assumption #5

The Film Industry Had No Say in the 16:9 Aspect Ratio.

and

No Films Have ever Been Made at 16:9

On the contrary, the 16 by 9 aspect ratio was chosen by the SMPTE Working Group on High

Definition Electronic Production before the ACATS was formed. WG/HDEP met on an almost monthly basis for nearly ten years. Most of the meetings were held in the board room of the Academy of Motion Picture Arts and Sciences in Beverly Hills. A few meetings were held at the offices of the Association of Motion Picture and Television Producers in Studio City, and, if my memory serves correctly, a total of four meetings were held in conjunction with industry shows in places like Las Vegas, New York, and Montreux.

In any case, the film industry was dominantly represented and had a great deal to do with the selection of 16 by 9. Strictly speaking, it is true that no films have been made (i.e. released) at a 16 by 9 aspect ratio. However, approximately 80% of the feature films made in the last 20 years have been released at 1.85:1 in the U.S.

Most of those same movies have been simultaneously or subsequently released in Europe and Asia at 1.66:1. The geometric mean between 1.85:1 and 1.66:1 is 1.76:1 which is less than 1% away from 16:9. 16:9 is also bears a simple integer relationship with 4:3 which represents all the world's television systems and all made-for television films as well as many of the remaining feature films.

16:9 Television Screen

Figure 1. Wide Screen Letterbox

The final remaining widely used film aspect ratio of 2.35:1 (Cinemascope) can be letterboxed rather nicely into a 16 by 9 screen (see Fig. 1). All these issues were debated at length, in fact for years, before the 16 by 9 aspect ratio was **unanimously** chosen.

Assumption #6

ATV Must Fit Through All Existing Computer Protocols to Be Useful for the NII.

To satisfy this assumption, the ATV signal would have to be able to jump through all the hoops endured by E-Mail. A review of the submissions in the report addenda offers a vivid insight into just how advanced E-Mail is. The message arrives in 10 pitch courier with ***absolutely no*** typographical enhancement. Troff source files go so far as to tell you how many lines beyond a cryptic cue you should mentally underline. This does not make a useful *accent* **TOOL.**

If ATV signals are expected to pass through this same filter, the light at the end of the tunnel is very far away.

In fact, before the NII is likely be successful for any kind of complex graphical information exchange, the incredible clutter of computer communications protocols will have to be distilled down to a very few. If the telephone companies are successful deploying ATM (Asynchronous Transfer Mode), then that approach has real promise to be the dominant communications protocol for anyone wishing to use a wide area network, e.g. the NII. It is noteworthy that the Grand Alliance has already addressed ATM transport with their selection of packet length.

Additional Comments

Interlace

Interlace is an old and in some ways archaic method of compression. On the other hand, it still offers substantial economies in the design of both cameras and displays. Interlace makes a

very complex trade-off in spatio-temporal resolution. Vertical spatial resolution is partially reduced all the time, and more severely reduced during vertical motion. Horizontal resolution, on the other hand, is maintained both for stills and motion. The fact that horizontal motion is far more prevalent than vertical motion in both television and film action scenes may have a great deal to do with the psychophysical deadlock that has endured for so many years over the relative merits of interlace and progressive scan.

Certainly, the inclusion of a progressive format at 720 by 1280 in the GA system is attractive for those applications where high motion rates and high vertical resolution are needed together. It would also be desirable for the GA to define, before the launch of service, the preferred method of enhancing the 1080 by 1920 format from interlace to progressive scan. This may, however, prove to be very difficult due to the unavailability of sufficient 1080 by 1920 progressive scan material upon which to base a valid judgement.

Film Mode Issues

It is important to note that film makes a different trade-off which is supported by the GA system. Film can be looked at as a progressive scan system running at 24 frames per second. In order to reduce flicker to an acceptable level, movies are displayed with a split shutter. I.e. each frame of the movie is displayed on the screen twice before the film is pulled down. This results in a perceived unsteady motion (known as judder), particularly for certain pan rates. Cinematographers have learned to cope with this problem by very carefully avoiding certain rates of motion.

Displaying film with a triple shutter at 72 light applications per second dramatically improves the perceived flicker, but can slightly increase the judder perceptibility. The 3/2 pulldown technique used to display 24 frame film in a 60 field television system causes the film judder to appear intermittent, which further aggravates the problem. This artifact is substantially independent of whether the television system is interlaced or progressive. Large screen, wide viewing angle, and high resolution all conspire to make the problem worse.

Fortunately, much the same technology that permits motion compensation in an MPEG encoder will allow the design of a device that creates intervening frames (or fields) with enough accuracy to fool the eye into seeing smooth motion. In theory, this motion compensated frame regenerator could be included in the receiver. In practice, some human assistance will likely be needed to get the best results on difficult scenes, which suggests that such a device will most likely be associated with a high definition telecine (film-to-video transfer device).

The choice that will then have to be made will be between the higher resolution and more efficient compression possible at 24 frames, and the far smoother motion portrayal possible at 60 frames (or fields). This will likely be a selection-by-selection choice. Action films with a lot of difficult scenes will be enhanced by motion compensated frame interpolation. Films with detailed splendor and well controlled motion may look better with the enhanced resolution possible in film mode. This last situation is particularly true for any films shot at 30 frames per second, since the 3/2 artifact is missing.

Computers and Update Rate

One dominant theme in the comments submitted thus far is the notion that computers require a high frame rate. This requirement is related to human flicker sensitivity, not motion rendition requirements. Few current computers exist that can stress the motion capabilities of a 60 frame (or field) high definition television display. The issue comes up because computer monitors are closely viewed in high ambient light situations,

and three parameters dominate human flicker sensitivity; field rate, display brightness, and viewing angle. The worst case exists with a low field rate, a high display brightness, and a wide viewing angle. Film has a low field rate (48 light applications/sec), and is displayed at a low brightness. Computers use a high field rate and a high display brightness. Television is often in-between.

Conclusions

The Grand Alliance system, and the process leading up to its definition have, at great length, taken into account the tradeoffs between cost and flexibility in an advanced television system. The inputs of stakeholders have been considered all along the way. The twin concepts of computer multimedia, and the National Information Infrastructure are very recent developments in the 15 year saga that has led up to the GA system.

Where multimedia is going, and how much it relates to the device a consumer uses for audio-visual entertainment is far from certain, but one point is clear. Raising the television frame rate to 72 or 75 Hz with progressive scan, and forcing all TV sets to pass the bifocal test, will define a television receiver that has no economic possibility of being a consumer item in this century.

JEGI Doc.-060

ADVANCED TELEVISION TEST CENTER, INC.

1330 BRADDOCK PLACE SUITE 200 ALEXANDRIA, VIRGINIA 22314-1650
703/739-3850 FAX 703/739-3230

RECEIVED
NOV 29 1993
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

October 14, 1993

Mr. Robert Sanderson
Chairman, Joint Experts Group
on Interoperability
FCC Advisory Committee
c/o Eastman Kodak Company
1447 St. Paul Street
Rochester, New York 14653-7102

Dear Bob:

Attached for the record of your Experts Group is a copy of the handout provided to those who visited ATTC for the two screenings on October 5, and the one on October 6, 1993. It lists all the NTSC and ATV pictures which were used in the screenings, conducted by Messrs. Alan Godber and Paul Hearty. Also attached is a list of those who signed in as attending the screenings.

Sincerely,

Peter M. Fannon
Executive Director

Attachments

cc: Paul Hearty, CRC
Alan Godber, ATTC

ACATS Joint Experts Group on Interoperability
Tape Screenings at ATTC*
October 5-6, 1993

ATTENDEES SIGNED IN:

Barry Bronson, Hewlett Packard
William Connolly, Sony Pictures
Bob Sproull, Sun Microsystems
Carl Fleischhauer, Library of Congress
Craig Van Degrift, NIST
David Baylor, DirecTV
Glenn Reitmeier, DSRC
Irwin Dorros, ACATS
Leo Cloutier, Comsat
Michael Haley, IBM
Michael Tsinberg, TOSHIBA
Peter Symes, Grass Valley Group
Robert Keeler, AT&T
Stanley Baron, NBC
Wayne Bretl, Zenith
Werner Wedam, Sharp
Neil Izenberg, Nemours Foundation
John Weaver, Liberty Television
Tony Uyttendaele, CC/ABC
Daniel Weitzner, Electronic Frontier Fdn.
Didier Le Gall, C-Cube
Douglas Waister (company ?)
Jack Fuhrer, Hitachi
Robert Kahn, CNRI
Robert Hopkins, ATSC
William Zou, PBS
Robert Hummel, Disney
Jukka Hamalainen, Matsushita
Jules Bellisio, Bellcore
Bernard Lechner, Consultant
Art Gravel (company ?)

*Presenters: Paul Hearty (CRC), Alan Godber (ATTC)

FCC Advisory Committee on Advanced Television Service

Screening for
Joint Experts Group on Interoperability

October 5, 1993

ADVANCED TELEVISION TEST CENTER
Alexandria, Virginia

Part I

Examples of Artifacts*

A. Transmission Impairments into NTSC

Cut #	Image	Artifact
1	*"Texas Dude"***	*Random-like Noise into NTSC*
2	" "	*Impulse-like Noise into NTSC*
3	" "	*NTSC into NTSC*
4	" "	*Analog ATV into NTSC*
5	" "	*Digital ATV into NTSC*

B. CCIR Impairment Levels for *NTSC*

Cut #	Image	CCIR Level
1	Girl with Toys	CCIR 5 ***Imperceptible***
2	" " " "	CCIR 4 ***Perceptible, But Not Annoying***
3	" " " "	CCIR 3 ***Slightly Annoying***
4	" " " "	CCIR 2 ***Annoying***
5	" " " "	CCIR 1 ***Very Annoying***

* Content determined by FCC Advisory Committee
**The official name of this image is "Co-channel".

C. Coding & Transmission Impairments into *ATV*

	Cut #	Image	Artifact
Reference	1	Lamp	*1125 Reference*
" "	2	Den	" " " "
" "	3	"Texas Dude"*	" " " "
" "	4	Fax Machine	" " " "
" "	5	Mannequins	" " " "
" "	6	Paint Store	" " " "
" "	7	Rotating Pyramids	" " " "
" "	8	"Cheshire Cat"	" " " "
" "	9	Metal Table & Chairs	" " " "

Coding	10	Fax Machine	*Edge Busyness*
" "	11	Den	" " " "
" "	12	Mannequins	*High Saturated Flat Field Texture Noise*
" "	13	Paint Store	*Loss of Resolution due to Motion*
" "	14	Den	*Loss of Resolution due to Motion*
" "	15	Rotating Pyramids	*Blockiness*
" "	16	Rotating Pyramids	*Blockiness*
" "	17	Metal Table & Chairs	*Motion Artifacts in a Still Picture*

(More)

*The official name of this image is "Co-channel".

C. Coding & Transmission Impairments into *ATV* (continued)

	Cut #	Image	Artifact
Transmission	18	Lamp	*Minor Hit*
" "	19	Den	*Major Hit*
" "	20	"Texas Dude"*	*Analog TOV (just beyond TOV)*
" "	21	" " " "	*Analog POU (just before POU)*
" "	22	" " " "	*Digital TOV (just beyond TOV)*
" "	23	" " " "	*Digital POU (just before POU)*
" "	24	"Cheshire Cat"	*Blocks*
" "	25	Den	*Severe Mottling*
" "	26	"Texas Dude"*	*Panel Wipe Hit*
" "	27	Rotating Pyramids	" " " "

*The official name of this image is "Co-channel".

D. CCIR Impairment & Quality Levels for ATV

	Cut #	Image	CCIR Level
Impairment Scale	1	Den	CCIR 5 ***Imperceptible***
" "	2	" "	CCIR 4 ***Perceptible, But Not Annoying***
" "	3	" "	CCIR 3 ***Slightly Annoying***
" "	4	" "	CCIR 2 ***Annoying***
" "	5	" "	CCIR 1 ***Very Annoying***

Quality Scale	6	Den	***Excellent***
" "	7	" "	***Good***
" "	8	" "	***Fair***
" "	9	" "	***Poor***
" "	N/A	N/A	***Bad***

Part II

Comparison of Interlaced & Progressive Camera Source Material

Image #	Name/*Attribute*	1050 Interlaced	787 Progressive	1050 Interlaced	787 Progressive
S3	**Wavy Wall** *Luminance Rendition*				
S8	**Toys** *Chrominance Dynamic Range*				
S11	**Woman with Roses** *System-specific "Free-form" Viewing*				
M1	**Window** *Luminance Resolution, Low Acceleration*				
M14	**Co-channel "Texas Dude"*** *System-specific "Free-form" Viewing*				
M16	**Rotating Pyramids** *Electronic Graphics Sequence*				

*The official name of this image is "Co-channel".

Part III
Transconversion ("Xcon") of Images

		1035i-to-960i Lines (Active)				1035i-to-720p Lines (Active)				
Image #	**Name**/*Attribute*	*1035 cs*	*960 Xcon GI (1991)*	*960 Xcon GI (1993)*	*960 cs*	*1035 cs*	*720 Xcon GI (1992)*	*720 Xcon AT&T (1993)*	*720 cs*	*1035 cs*
M5	**Living Room** *Motion Rendition, Camera*									
M10	**Woman & Room** *Motion Rendition, Camera & In-Scene Movement Combined*									
M16	**Rotating Pyramids** *Electronic Graphics Sequence*			XXXXXX						

Xcon = Transconversion
cs = Camera Source

Part IV
Examples of "Transmitted Quality"

Image #	Name/*Attribute*	*1125 Reference*	*Best System**	*Worst System**	*1125 Reference*
S1	**Metal Table & Chairs** *Luminance Resolution*				
S6	**Sculptures** *Chrominance Resolution,* *System-specific "Free-form" Viewing*				
S8	**Toys** *Chrominance Dynamic Range*				
S7	**Fruits & Vegetables** *Color Gamut*				
S10	**Memorial Arch** *Depth Portrayal*				
M3	**Paint Store** *Dynamic Chrominance Resolution,* *Low Acceleration*				
M14	"Texas Dude"** *System-specific "Free-form" Viewing*				
M10	**Woman & Room** *Motion Rendition, Camera &* *In-Scene Movement Combined*				

* "Best, Worst" as per subjective testing results (ATEL) on four original ATV systems (1991-92).
** The official name of this image is "Co-channel".

Sun Microsystems, Inc.
Two Elizabeth Drive
Chelmsford, MA 01824

RECEIVED NOV 2 1993
NOV 2 9 1993
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

17 October 1993

Mr. Robert L. Sanderson, Chair
Mr. Michael Liebhold, Vice-Chair
Joint Expert Group on Interoperability
Advisory Committee on Advanced Television Service

Gentlemen:

We are writing to stress Sun Microsystems' view that the interoperability of the current Grand Alliance (GA) proposal must be improved before it is adopted by the FCC. The proposal is in most respects commendable—its all-digital design may form an important basis for delivering information of many different kinds to the public. In three respects, however, the proposal should be improved.

First, the proposal should not allow "interlaced scan" transmission formats because they interoperate poorly with "progressive scan" formats. While techniques are available for converting between interlaced and progressive scan, these techniques introduce artifacts such as flicker, which is especially annoying on images with detailed text or diagrams. The computer industry has struggled unsuccessfully for twenty years to overcome these artifacts when presenting computer-generated images on interlaced displays. If interlace is allowed, it will reduce by almost a factor of two the effect of the greater resolution of the image.

Second, the GA must not be allowed to "extend" the international standard for compressed video, MPEG-2, which in our view meets the video compression requirements for terrestrial broadcast. The extensions proposed by the GA will prevent interoperation with equipment manufactured to the world-wide standard, including the great majority of multimedia computers that will be offered in the United States.

Third, the GA formats do not make adequate provision to allow broadcasters to transmit other data in addition to an HDTV program. We believe it is important for the United States to adopt a transmission standard in which its agencies, notably the FCC, retain the flexibility to determine what kinds of data can be transmitted. The GA proposal allows new formats only within the confines of the international MPEG-2 video standard, which the U.S. does not control. We contend that exactly the reverse is required: the GA format should label the type of data that is being transmitted, which may be an

MPEG-2 digital stream, or may be something else. A single transmission channel can carry many different streams of traffic by attaching different labels to different segments of the data. By leaving many of these "label types" unassigned at the outset, the GA format can be augmented to meet new needs simply by assigning new label types, with complete backward compatibility and independence of the international standards process. While Sun strongly endorses using international standards for the specification of content, such as the MPEG-2 content standard, the current MPEG transport standard does not go far enough in separating transport (networking) issues from content (coding) considerations.

The "new needs" for broadcast embrace the greatest potential value for digital broadcast. The economic health of a digital broadcaster may well depend on its ability to transmit many kinds of digital data—not just HDTV signals. For example, a broadcaster might find that transmitting four video streams at today's resolution better serves its community than transmitting a single HDTV program. The broadcaster can transmit digital forms of newspapers, magazines, weather maps, calendars, financial market data, and so on. Moreover, the country's agendas, such as those for education and health care, will be served by transmitting digital data to inform our citizens. If the broadcast channel enjoys a flexible way to label the data it carries, it will be a full-fledged part of the emerging "information highway" system the country is building. Otherwise, the channel will carry little more than a single television program.

Interoperating successfully with other digital information infrastructures was probably not a requirement when the ACATS started its work. Indeed, until the GA proposed a digital transmission format, the broad scope of the interoperability issues was not evident. We believe that the extra time required to undertake the small changes required to fix the GA proposal and to carefully review all aspects of interoperability will reap enormous benefits during the years the standard is in service.

Sincerely,

Wayne E. Rosing
President, FirstPerson, Inc.
Corporate Executive Officer
Sun Microsystems, Inc.

Robert F. Sproull

Vice President and Fellow
Sun Microsystems, Inc.

JEGI Doc.-062

RECEIVED

NOV 29 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

OCT 25 1993

Walt Disney Television

Rob Hummel

October 18, 1993

Congressman Edward J. Markey
2133 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Markey,

I sent you a letter last Friday regarding my concerns about Interlace being supported by the Grand Alliance.

I want to clarify that my letter was not intended to indicate a formal position of the Walt Disney Company. It is my personal position on this issue and as an associate member of the American Society of Cinematographers.

I hope I did not mislead you in this regard.

Yours truly,

Rob Hummel
Vice President, Animation Technology

cc: Vice President Albert Gore
Honorable James H. Quello
Robert Sanderson, Chairman ACATS Joint Experts Group on Interoperability
Richard Wiley, Chairman ACATS