The transmission and receiver formats of the Zenith HDTV system are suitably changed to enable utilization of today's unusable portion of the spectrum with the result that every existing NTSC broadcast station can obtain a second 6 MHz channel over which a true HDTV program can be broadcast simultaneously with his existing NTSC program. Thus, the Zenith system is spectrum compatible with existing NTSC signals.

An additional feature of the new, spectrum compatible HDTV transmission is that the required average transmitter power is less than 0.2% of that required by an NTSC transmitter with the same service area. Benefits to broadcasters of transmitter power consumption, transmitter hardware, antenna gain and/or antenna height will result.

FEATURES OF ZENITH'S SPECTRUM COMPATIBLE TRANSMISSION SYSTEM

The major feature of the new transmission format used by the Zenith system to enable the new, robust, spectrum compatible signal is the separation of the video picture information into two frequency bands. The video frequencies below 200 kHz are transmitted in a digital format while the video (picture) components having frequencies greater than 200 kHz are transmitted in analog format.

For all live video the energy associated with the high-frequency components is less than 1% of the total energy. That is, virtually all of the power associated with a video signal is contained in the low-frequency video information, the synchronization information (which is also low-frequency) and the average (or d.c.) value of the video. Thus, removal of the d.c. component (the picture carrier), the sync and low-frequency video components allows transmission of the high-frequency video components at substantially less power for signal-to-noise ratio performance better than that of NTSC, but with very small carrier power which causes less interference to other television signals, be they on the same channel, adjacent to the HDTV signal or located elsewhere in the VHF/UHF spectrum.

As much of the low-frequency information is transmitted redundantly in NTSC (i.e., the average value and sync information), it needs to be

(frame) rate of 59.94 Hz. The system is capable of providing pictures with width-to-height aspect ratios of 5:3, 16:9 or 4:3, with the marketplace making the ultimate decision. Extensive digital signal processing will be required in receivers, but it is anticipated that only one megabyte of field (frame) memory will be needed.

The HDTV source may be the 787.5 line, 59.94 Hz display format, or a 1050/59.94 source (progressive or interlaced), capable of providing 29 MHz R, G, and B signals.

The low-frequency video information, two channels of CD-quality audio and synchronization information are all digitized and transmitted during the 22.5 line vertical blanking period. Consistent with the ruggedness of the Zenith spectrum compatible system, the digital information is encoded using appropriate error-correcting codes. The digital audio is encoded using either of the two encoding systems proposed by Digideck or Dolby. A small amount of RF carrier is added back into the system to enable signal acquisition and tuning of the receiver.

APPLICATION TO CABLE, SATELLITE AND RECORDING

The reduced average power and peak power of the spectrum compatible system will also enable 6 MHz HDTV transmissions with improved interference and signal-to-noise ratio characteristics in cable systems, without rebuild of cable plants or decrease in the number of channels available.

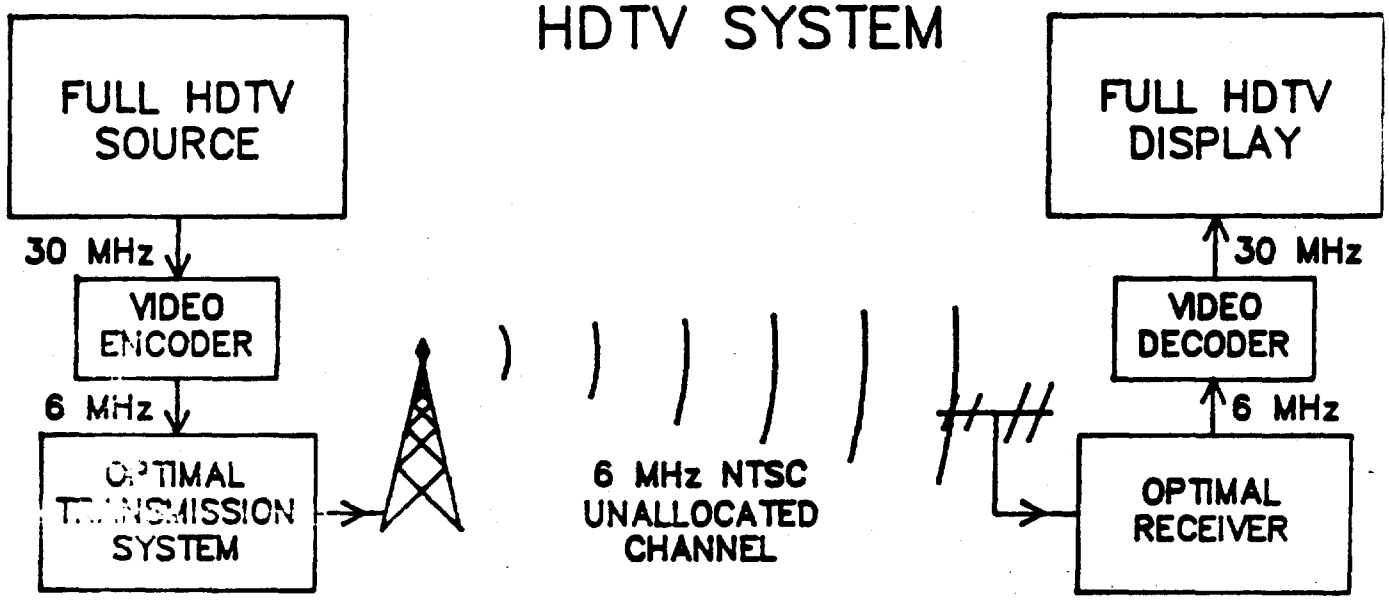
Directly transcodable to FM signals used in satellite broadcasts, the new Zenith system will result in threshold improvement, and hence smaller receiving antennas (dishes) in the Direct Broadcast Satellite (DBS) environment. Furthermore, network-feed satellite transmission of HDTV can take place over existing NTSC links.

The HDTV signal is FM recordable in its encoded format. As only a 6 MHz bandwidth is required to record the full HDTV signal, minimum technology improvement (over S-VHS) is required.

ZENITH

SPECTRUM COMPATIBLE HDTV SYSTEM

HDTV SYSTEM



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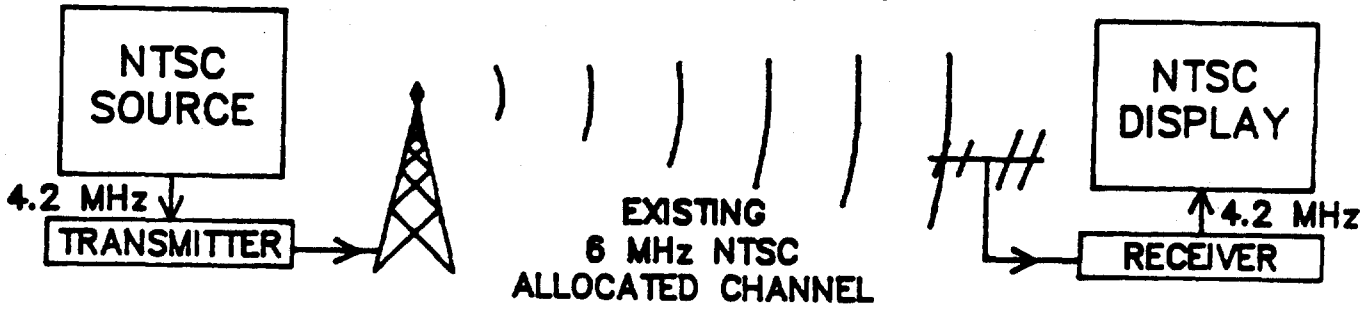

H. Chairman's Report: Working Party 5

Advanced TV

Advisory Committee on
Advanced Television (ATV) Service

Doc. No. WP-5

Date March 12, 1990

WP-5: THE THIRD INTERIM REPORT

The current work of WP-5 is principally concerned with the projection of future market size and market penetration of ATV/HDTV.

The projection of the likely penetration of HDTV receivers presented in the second interim report was deliberately conservative, in part because no clear indication of the price of receivers was available, or any information on the probable price elasticity. It was not certain whether the introduction of color TV or the VCR was an appropriate historical analogy to use as a reliable base for developing projections..

Since that time, some better data on likely receiver components and their cost has been developed, and WP-5 is now attempting a revised penetration projection. A dialogue with SS WP-3 including joint meetings, is being undertaken for that purpose.

WP-5 is conducting an analysis of relationships between price trends, price elasticity, and market penetration. Although demand for color TV, incorporating display sizes up to 20 inches, demonstrates a considerable price elasticity, demand for the larger displays that are most appropriate to HDTV receivers does not.

Large CRTs represent a large portion of the total cost of a receiver. CRTs are a mature product with little potential for cost reduction through economies of scale. Recognizing that development of solid-state wall displays are now advancing more rapidly with intense R&D efforts, it is likely that economies of scale will be available during the maturation of these new products. It is important to understand the likely future dynamics of price reductions and price elasticity in order to project market penetration. A key consideration will be the extent to which the US market for HDTV receivers and VCRs benefits from global economies of scale and manufacturing.

The slow penetration rate of color TV in its early years was caused partly by the delay in providing full schedules of color programming. HDTV penetration will not be thus hindered because high-definition programming is now growing, and is economically viable and subjectively superior even when down-converted to NTSC. Moreover, a large high-definition library is available in the form of 35mm film, which can be down-converted to the HDTV format. For these reasons, market penetration data from the color TV experience may need to be adjusted to remove the effects of the early lack of programming.

Similarly, there are related problems in using historical VCR penetration as a model. VCR growth in the early years was restricted by a lack of software, both for rent and for sale. Indeed, its early use was necessarily confined to the time-shifted viewing of broadcast programs. Again, the VCR experience may be modified to reflect such limited early utility.

Pay cable has also been examined as a penetration model. Over a five-year period, a present value calculation of consumer investment demonstrates a close parallel with the consumer investment in a VCR and the rental of programs. However, its value as a model for HDTV is suspect, since pay cable is essentially a program service rather than an equipment purchase. Further, pay cable is available to only 55% of TV households that have basic cable service. For these reasons, it is concluded that pay cable may not be a useful model. It may be added that pay cable has experienced significant competition from the technology of the VCR.

These considerations, together with consideration of likely global economies of scale in manufacturing for HDTV, suggest that a range of projections for market penetration, including projections showing significantly greater market penetration than that indicated in the existing WP-5 projection, may be appropriate.

At this point in the ongoing studies, it is believed that the VCR penetration experience, modified for the conditions cited above, may be the most useful model for the projection of HDTV penetration. The projection will be based on best- and worst-case assumptions relating to component and total receiver cost, and price elasticity.

I. Chairman's Report: Working Party 6

THIRD INTERIM REPORT OF THE CHAIRMAN

PLANNING SUBCOMMITTEE WORKING PARTY 6

FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

BRONWEN L. JONES, Chairman
CRAIG K. TANNER, Vice Chairman
March, 1990

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STATEMENT OF PROGRESS

PSWP6 progress includes unanimous agreement, achieved or reconfirmed, on the subjective test methods, materials, procedures and approaches (see CCIR Rec. XB/11, attached).

The required still test material is nearly completely collected and/or photographed and is undergoing various stages of review. Some of the images are digitized slides which have been provided and scanned by Kodak. Additional material from NASA has been reviewed and may be scanned or reshot by Kodak, which has also offered their library for any still test material needs that are not yet met. After final approval of the last stills, it will be possible to conduct validation studies of the attribute-specific content and image sensitivity to various impairments. NTSC pilot tests of the schedule interferences and other impairments will also be possible and could begin in the third quarter of 1990, if an appropriate facility were to be made available.

The requirements for motion sequences, needed primarily for the picture-quality tests have been reviewed and reduced. At present it appears that approximately fourteen 10-second segments will be needed.

A prioritization of the specific interference tests has been recommended, the interferences from the ATV system into NTSC being characterized as the most important. In addition to thresholds, ranging, and full subjective assessments, a new category of tests called "expert observation and commentary" (EO&C) was added. Two new attributes from PSWP-1 fell into this category. The idea of deferring a decision as to whether to conduct full subjective tests or not (i.e., keep the master tapes) was formalized and is called "Range Recording Only". A detailed explanation of this concept can be found in Attachment 3 of this report.

Selection and production of subjective test material was the dominant area of work for the third interim period. Motion sequences and stills are needed to test picture attributes, interferences and other impairments. They must be identical for each system in order that: 1) they themselves will not cause differences among systems and 2) comparisons among systems can be made. The fact that the proponents require test materials to be input in various scanning formats is a complicating factor. The different formats require unique and some yet-to-be developed/invented hardware and software.

WORK STATEMENT

The August 14, 1989 PSWP6 Work Statement identified three tasks yet to be completed: 1) evaluate test material production approaches, 2) evaluate any new approaches and, 3) coordinate the production of subjective test materials.

1. The Ad Hoc Group on Production Planning is preparing demonstrations of the test material production techniques in order to facilitate a recommendation on the best one. "Prove-in" measurements comparing state-of-the-art equipment versus the new telecine/s and multi-standard camera/s, are presently underway.

   A transcoder has been developed and is currently being evaluated. It will transcode from 1125 lines (interlaced) to 1050 lines interlaced or to 525 lines progressive. It is scheduled for demonstration early in 1990.

2. Evaluation of other or "new" approaches has not become an issue to date.

3. Test materials consist of two types: still and motion pictures. The production of still test material is complete. The rest of the process is well under way and, pending a visit to Kodak's laboratory and Committee review, will also be complete (see Progress Statement and Chairman's Report). The production of the moving segments awaits the arrival and validation of a Tektronix "format converter", specially modified VTR's or an acceptable transcoder.

PICTURE IMPAIRMENT TESTS

Interferences and Other Impairments Recommended for Test

Tests of interference and other impairments are designed to give regulators guidance in setting broadcast rules and regulations based on factors such as protection ratios. The test method is one of pair comparison (or A/B) involving test and reference pictures.

The ATV signal is modulated and demodulated. The test pictures will have varying amounts of impairment added (there is one exception, that of impairment-signal-off). The reference is the same picture but with no impairment added. The assessor is told that the first picture is the reference and is instructed to vote on the second one relative to the first.

There are three levels of subjective tests to be conducted and recorded: thresholds, or that point at which the signal can just be detected; ranges, or those steps or levels of impairment over which it is reasonable to test; and full subjective assessments which employ non-expert viewers to scale picture-quality and picture-impairments. Threshold and ranging determinations are made by "expert" observers: defined as those having "extensive recent experience in observing picture quality or impairment, particularly of the type under study."

Threshold-only determinations are recommended for the following impairments using an expert panel:

Discrete Frequency Interference
Main/Augmentation Channel Differential
Airplane Flutter

Tapes of "Range Recording Only" (i.e. full subjective tests may be wanted or needed, but the decision to proceed might be postponed to a later date) are recommended for the following interferences and other impairments using expert panels:

Intermodulation Distortion, Second and Third Order
Cross Modulation Distortion
High-Level Sweep
Hum and Low Frequency Noise
Impulse Noise
Group Delay

Co-channel Interference (NTSC into ATV, ATV into ATV)
Lower Adjacent-Channel (NTSC into ATV, ATV into ATV)
Upper Adjacent-Channel (NTSC into ATV, ATV into ATV)
UHF Taboos (NTSC into ATV, ATV into ATV)

"Expert Observation and Commentary" (i.e. a written opinion from the panel) is recommended for the following impairments using expert panels:

Video Cuts
Video Peaking & Image Enhancement
Camera Unsteadiness
Conditional Access Systems
Subjective Resolution

Full subjective assessments of ATV System interference into NTSC (and from any augmentation channel or from the ATV main where appropriate) are recommended for co-channel, upper- and lower-adjacent channel interference and for some UHF Taboos (to be chosen by the expert panel after viewing them). Experts are employed for threshold and ranging tests and non-experts for the subjective picture assessment tasks. In addition to those mentioned above, the following impairments and/or interferences have been recommended for full subjective tests:

Carrier to Noise (Broadcast)
Carrier to Noise (Cable)
Multipath
Microreflections
Non-Linear Distortion

Test Issues

The conduct of these tests is described in detail in Document PSWP6-0050 and in the Subjective Test Procedures Manual. However, a brief mention of some of the issues of interest in this interim period follows.

The decision regarding the undesired picture material/signal (interferor) for these tests will be revisited. Presently it is to be either a matrix signal composed specifically for these tests (see the Terrestrial Objective Test Procedures Manual) or the PSWP6 agreed signal made up of color bars with different sized letters scrolling through. The reason for this decision review is that there is a better signal for exercising motion vectors which involves fades and cuts (see "Undesired Signal Criteria" Report, attached).

The decision regarding the undesired audio/signal (interferor) for these tests will also be revisited. Presently it has been agreed that the audio channels will be fully modulated with pseudorandom data or noise during the picture quality and interference tests. The audio interferor, when there is a need for one, is to be a warbled swept tone (20 Hz to 20 kHz). The reason for this decision review is, as above, that a better signal to test these systems now can be identified. It is currently under study.

The reference picture is always the same picture as the test picture, but with no impairment added. The primary test methodology will use double-stimulus impairment scale recommended world-wide by the CCIR (see Recommendation XB/11, attached). Impairment test material consists of a total of three still pictures and one (or perhaps two) moving pictures. The three still pictures have been identified and are in the possession of the ATTC. Two are from a set donated by Kodak; one is from the EBU. They received the approval of PSWP6 at its October 4, 1989 meeting, and will undergo validation studies, hopefully early in 1990. They are: a young blond girl with a background of colored balloons, Keil Harbour (boats in the water with detailed rigging), a known and standard test slide from the EBU, and a blond woman with blue background. The last one is very similar to the old standard SMPTE test slide called "A Woman with Makeup" which also had a blue background which was sensitive to noise. Backup negatives have been provided by NASA in case any of these proves insensitive to interferences or other impairments. The NASA pictures include 1) a woman with dark hair and with a salmon colored background and 2) a flower arrangement with a solid blue background. These received PSWP6 approval at its December 6, 1989 meeting.

Timetable/Schedule Estimate

A single impairment test session takes approximately one hour. The exact time depends on the number of test pictures and the number of levels of impairment (here estimated to be 5 pictures and 10 levels of impairment, with each trial repeated once, considered to be a maximum). The number of sessions required depends on the number of viewers required and on the size of the display (the larger the display, the more viewers, to a point); Document PSWP6-0050 calls for 20-30, with 20 being a declared minimum. If 5 sessions were to be required to complete one impairment test (i.e., 25 viewers), it will take approximately five hours. This estimate does not include time to conduct threshold and ranging tests or to make the master, threshold, ranging and two pseudo random orders of each subjective test tape.

The actual number of subjective impairment tests is unknown at this time as the review and prioritization process has just begun, but [16] appears to be a reasonable number if no augmentation or ATV into ATV channel conditions are tested. This suggests three weeks of impairment tests (excluding picture quality tests) per system, i.e. 16 five-hour days.

Please note a key point in addressing the timing issue: the removal of three variables, such as one picture and two impairment levels, will reduce a test session time from fifty to 32 minutes and the total test time by one hour per day. This is not true in picture quality tests where adding or subtracting a picture will change the test time only a total of, perhaps, two minutes.

PICTURE QUALITY TESTS

Basic Picture Quality

Basic picture quality tests are those which evaluate the best image a system can produce. The ATV signal is modulated and demodulated but is not impaired in any way. The reference picture, SMPTE 240M, is not modulated/demodulated. The attributes from PSWP1 are the basis upon which the ATV systems are to be judged. They are matched to the stimulus material. This approach allows basic system strengths and weaknesses to be identified, and thus a detailed analysis of each system will be possible in addition to merely a rank order. The attributes for still test material are:

Static Luminance Resolution
Static Chrominance Resolution
Luminance Rendition
Luminance Dynamic Range
Color Gamut/Rendition
Color Dynamic Range
Depth Portrayal
Peripheral Performance
Electronically-Generated Picture

The attributes for motion test material are:

Dynamic Luminance Resolution
Dynamic Chrominance Resolution
Motion Rendition (Camera)
Motion Rendition (in-scene)
Motion Rendition (camera and in-scene)
Electronically-Generated Picture
Film Source (conversion artifacts)

Dynamic Spatial Performance
Amplitude Differential (center-edge discontinuity)

Each of these attributes is represented by a stimulus picture which has been created or chosen because its composition/content was heavily weighted with the specific attribute.

Validation of the attribute-specific picture contents will be carried out by exposing expert, but naive-to-this-task, viewers to the pictures prepared in two distinctly-different formats. One will be of very good quality, and one will have the attribute filtered in such a way as to mask it. When viewers are asked to describe how the pictures differ, the dominant theme of the answers should be the intended attribute. The CABSC has volunteered to perform this test -- Kodak may also be of assistance.

Compatible Signal Picture Quality

Impaired and unimpaired compatible picture-quality tests are necessary for those systems which deliver the NTSC signal by a means other than a regular (simulcast) 6 mHz channel.

The unimpaired compatible picture-quality test is much the same as the basic picture quality test, except that the reference is full-bandwidth NTSC. It has been unanimously agreed that studio picture quality is too good to be used as the reference. An investigation as to whether down-converted (from 1125/60) material can be used is underway. A demonstration given at the December 6, 1989 PSWP6 meeting was well received, and a decision was made to go further and make a tape of material which has been modulated and demodulated. There is a concern that the quality of such a signal also may be too good.

The impaired picture-quality test is a single test employing a composite interference/ impairment which has yet to be completely defined. It will be composed of some noise and some co- and adjacent- channel interference. Again, the reference is NTSC, as described above, modulated and demodulated, and also impaired in the same manner as the ATV test signal.

Test Issues

The conduct of these tests is described in detail in Document PSWP6-0050 and in the Subjective Test Procedures Manual. However, a brief mention of some of the issues of interest in this interim period follows.

While the still test material has been the focus of much discussion, the motion segments have received even more attention. For a detailed review of those activities, see the next (Subjective Test Materials) section of this Report.

At its meeting on November 17, 1989, the Ad Hoc Still Test Material Group made its second recommendation, this time regarding the recently-shot NASA photographs. As with the Kodak photographs, some were and some were not accepted. A detailed report of that meeting is attached. Briefly, all the impairment stills have been recommended, agreed upon and (except for backups) scanned. All but three of the quality stills have been recommended, and some are in need of scanning. Scanning plans and schedules are being pursued with Kodak's Film Lab in Rochester, NY by the Chairman. Picture material which is from their library will be provided by Kodak at no cost. Test material from a different impairment test will be used as instruction/training slides and for demonstrations.

Timetable/Schedule Estimate

Picture-quality tests differ from impairment tests in that the picture is the only variable; that is, there are no interference levels or impairments. Therefore the test-time calculation is quite simple: the number of pictures times the number of trials. A trial in this case is about a minute in length, and each is repeated once. After considerable winnowing, it is expected that 9 still pictures and 14 motion sequences will comprise the total body of the picture-quality test material. Thus, 46 minutes should be the length of a test session not including instruction time.

If, as before, a calculation is made for five sessions, or 25 viewers assuming 5 per session, and 46 minutes is assumed to be an hour, each of the three picture-quality tests should take about 5 hours.

SUBJECTIVE TEST MATERIALS

The primary focus of the Specialist Group on Test Materials during this working period has been the planning and budgeting for the production of the stills and motion sequences needed for subjective testing of the proposed ATV systems.

Options for Production of Test Materials

Stills

The still test materials will be derived from original photographs in a 4"x 5" Vericolor™ negative format, which will be converted to digital data via a Kodak-owned scanning microdensitometer. Some of the stills selected for use to date are already available in the appropriate digital form, as required by the PIXAR image processing computer owned by the Advanced Television Test Center (ATTC). The remaining stills are being produced by the photographic department of NASA's Lewis Research Center in Cleveland, Ohio. When available, these new negatives will be scanned via the Kodak device to allow their input into the PIXAR system. The ATTC has contracted for the creation of interpolation software (and associated hardware) that will translate the extremely-high-resolution image format of the PIXAR to each of the scanning formats needed for input to the various ATV systems, i.e. 525-progressive, 787.5-progressive, 1050-interlace, and 1125-interlace.

Motion Sequences

The motion sequences, or "dynamic" test materials, as they are sometimes referred to, will be produced by one or more of the following techniques, each of which will be demonstrated on June 1, 1990 with a limited set of test sequences produced for the purposes of evaluation of each approach:

1. Video materials will be imaged in four distinct scanning formats by the BTS KCH-1000 multiscan camera, operating in the 525-progressive, 787.5-progressive, 1050-interlace, and 1125-interlace formats. Recordings will be made with a format converter to be supplied by the ATTC. The sequences will be recorded in serial, or sequential, fashion as opposed to a parallel, or simultaneous, fashion. Camera movement will be automated, and scene action will be repeated. The practicality of this relatively complex approach is one of the key issues to be determined at the June 1 demonstration.

2. Video materials for the 1050-interlace and 525-progressive formats also will be produced by a standards converter being supplied by Sony and NHK through the coordination of CBS Inc. Satisfactory results from this device at the June 1 demonstration could simplify the four-format shoot described in item 1 above to a two-camera shoot. In other words, the full set of test materials could be provided through use of only two cameras -- an 1125-interlace camera and a 787.5-progressive camera. The other two formats would be derived via standards conversion. The quality of this standards conversion is the key issue to be determined at the June 1 demonstration.

3. Film-to-tape transfers in all four formats may be created by transfer of Showscan™ footage (65 mm, 60 frame-per-second film) to video via a special telecine being constructed by Showscan Film Corporation and BTS under contract to Zenith. An electronic projector mechanism will be coupled with a BTS KCH-1000 multiscan camera to achieve a transfer of each film frame to a field of video. The transfer would be a non-real-time process, thus eliminating tube lag and image unsteadiness as possible distortions. The large image size (65mm negative format) would assure sufficient resolution. The telecine's output would be recorded on videotape via an ATTC-developed format converter and a Sony HDD-1000 digital VTR. Suitability of film images, with their distinctive look, is a key issue to be evaluated at the June 1 demonstration. Working Party 6 has already decided that the ATV test materials could not be primarily based upon film originals, in any format. However, there may be a place for the Showscan/telecine technique among the many sequences required.

4. Film-to-tape transfers in all four formats from 35mm, 24 frame-per-second film. These transfers may be made utilizing the Zenith-owned telecine described above, which will have the capability for 35mm, 24 fps, non-real-time transfer.

5. Electronic graphics animation sequences, to be created by a computer system yet to be selected, and recorded with a format converter and Sony digital HDTV VTR.

6. NTSC test materials will be required to serve as the reference against which subjective assessments will be made of the NTSC-compatible picture provided by ATV systems (for those that are not simulcast systems). These may be made available via electronic downconversion from the 1125/60 video shot as described in item 1 above, or by an NTSC camera/recorder placed alongside the the two or four HDTV cameras described above. The Specialist Group hopes to be able to

select downconversion of the 1125-interlace materials in favor of shooting directly in NTSC, thus avoiding an additional recording repetition for each motion sequence produced.

The descriptions of content of the stills and motion sequences has been agreed upon by the Working Party following drafting by specialists. Final approval of each still or motion sequence will follow examination of the as-produced materials, as described later in this report.

Time Line

Despite a pro forma testing schedule established by the Advisory Committee which calls for ATV testing to begin on June 4, 1990, it appears that subjective test materials cannot be expected to be complete until September 1, 1990.

A principal cause of this delay is the later-than-expected delivery of the ATTC-developed format converter which will make possible the recording of the four different scanning formats. Original expectations were for a mid-December, 1989 delivery of a prototype format converter that would have been used to prepare for a scheduled January 17, 1990 demonstration of the various production techniques, with actual production to follow in time for the June 4 start of testing. Delivery of this prototype is now not expected until mid-April, 1990. Assuming this prototype is functioning as required on that date, it would be loaned by the ATTC for production of the demonstration subset of the test materials, from mid-April though the end of May.

Following the June 1, 1990 demonstration of the various production techniques, two weeks would be required for a final decision on the technique(s) to be used for production of the full set of test materials.

Beginning on June 18, field recording of the actual test materials can be expected to require 6 weeks, or until the end of July, 1990. The time required for field recording has been substantially reduced, relative to original plans, as a result of the Working Party's reductions in the required quantity of test sequences.

Screening of the test materials by the ATV system proponents and by the Advisory Committee, and subsequent editing of the final reels needed by the test labs, can be completed during the month of August, with delivery on September 1, 1990.

Note that this is an optimistic schedule, with no major provisions for breakdowns or fundamental technical difficulties.

Cost Estimate for Production of Test Materials

The Ad Hoc Group on Production Planning was formed for the purpose of determining how to create and then organize the creation of source materials for subjective testing in multiple formats which would be acceptable to all parties concerned.

The Group consists of the following members:

Associates & Ferren
BTS Broadcast Television Systems Inc.
Capital Cities/ABC Inc.
CBS Inc.
David Sarnoff Research Center
Eastman Kodak Company
Faroudja Laboratories Inc.
International Video Conversions
National Broadcasting Company Inc.
Philips Labs, (North American Philips Corp.)
Paramount Film Corp.
Showscan Film Corp.
Sony Broadcast Inc.
Zenith Electronics Corp.

A plan has been outlined, and is now being detailed, to create the appropriate source material. The costs involved are considerable. Much of the required expense has been offset by the offer of the loan of equipment by various participants at no charge, or of facilities at no charge or at cost. Almost two-thirds of the estimated total cost has been committed by the members of the Ad Hoc Group. Other costs not covered at this time include production professionals, talent, the balance of studio and mobile facilities not presently committed, and organizational/administrative costs.

The group is in need of further funding to complete this work, and suggests that there may be organizations or individuals interested in the success of the ACATS process who would be willing to contribute. Cash is the primary need, but loan of equipment or expertise is also desirable.

Costs are estimated on the basis of cash cost or equivalent rental cost. Costs are calculated for production of the number of scenes presently specified by PS/WP6, and in the four desired production standards (and NTSC, if required). They are as follows:

		Full Cost	Committed By AHG Members	Out -of - Pocket
1.	5 production standards serial shoot, live camera, film transfer, graphics, Showscan 65mm 60fps.	$2.2M	$1.4M	$0.8M
2.	4 production standards (without NTSC) serial shoot, live camera, film transfer, Showscan 65mm 60fps, graphics.	$2.15M	$1.37M	$0.78M
3.	2 production standards (1125/60 and 787.5/59.94) serial shoot, live camera, film transfer, graphics,Showscan 65mm 60fps.	$2.013M	$1.368M	$0.645M
4.	Difference in cost if NTSC production standard is eliminated as a requirement.	$ 50K	$ 30K	$ 20K
5.	Difference in cost between production in two standards and production in four standards.	$ 137K	$ 2K	$ 135K

Note:

Over 90% of the out-of-pocket expenses required are in cash to pay for professional services of various types. The only remaining equipment items in out-of-pocket expenses are some items such as small picture monitors.

Prove-In of Production Technologies and Test Materials

Much of the equipment being considered for production of test materials is either custom-built or specially modified for the purpose. In order to assure proper performance of this equipment, the Specialist Group has agreed that certain tests must be conducted to certify the technical characteristics of the equipment.

Specifically, the BTS KCH-1000 multiscan camera, which will operate in four scanning formats, will be evaluated in the 1125/60 scanning mode relative to a state-of-the-art camera manufactured specifically to the SMPTE standard. A range of basic performance measurements will be taken to assure that the BTS multiscan camera is operating at an acceptable level of quality in this scanning standard. Performance in the other three scanning formats will also be evaluated and measured, although comparison with another camera will not be possible. Detailed planning for these performance evaluations have not yet been completed.

Secondly, the Zenith telecine, which involves a Showscan-modified projector and a BTS camera with custom optics, will be evaluated via comparison to a state-of-the-art high definition telecine operating in the SMPTE 240M standard. Measurements will be taken to document the new telecine's performance and assure it operation at an acceptable level of quality. Performance of the telecine in the remaining three scanning formats will also be evaluated, although comparison with another telecine device will not be possible. Detailed planning for these performance evaluations has not yet been completed.

Finally, the test materials themselves, both still and motion, will be evaluated to assure their suitability for the intended purpose. This will assure that test materials described and produced are indeed appropriate and sufficient for the task at hand. These evaluations may range in technique from critical review by experts to laboratory simulations of the intended tests, also with review by experts. These confirmation evaluations will be conducted as the materials are produced, rather than at the completion of production of all materials, in order to allow production of alternate materials where necessary.

Screening of Test Materials for ATV System Proponents

Working Party 6, in its meeting of December 6, 1989, unanimously agreed upon the following recommendation regarding the proponents' access to the test materials:

1. No recordings of the subjective test materials, either complete or partial, should be distributed to the ATV system proponent organizations in advance of the start of testing.

2. Upon completion of production of the full set of test materials, both still and motion, Working Party 6 will conduct a meeting to which all proponents will be invited. The full set of test materials will be screened for the proponents, who will be permitted to take notes, but will not be permitted to make recordings of any kind.

The Working Party believes that the above-recommended procedure will:

1. Eliminate the delay in testing that would result from advance distribution of test materials to proponents. Testing can begin immediately upon completion of the test materials without waiting an additional 60 or 90 days as required by "advance" distribution of the materials.

2. Eliminate the unfairness that could result from distributing test reels to all proponents when only some will have the financial resources to access the digital VTR and format converter needed for their playback.

3. Eliminate the unfairness that could result from distribution of test materials to proponents with more than one ATV system for submission. For example, if distribution were permitted, a proponent with two ATV systems might receive test materials, say, 60 days before testing of his first system, but would then have the materials in hand many more months in advance of testing of his second system.

4. Eliminate the need to prepare special test materials similar to, but not exactly matching, the actual test materials, or preservation of outtakes. This had been suggested as a way of distributing materials useful to the proponents but without compromising the value of the actual test materials. The Working Party believes that the funding shortfall and schedule for production of the actual set of test materials is such that the stress of additional production and/or editing must be avoided.