intensity function that varies sinusoidally in the vertical direction.[1] The spatial frequency is usually specified in samples (or cycles) per active picture hieght.[2] For example, a pattern of alternating black and white scan lines in an NTSC frame with 480 active lines would have a fundamental frequency of 240 cycles or 480 samples per picture height.

Horizontal frequency is often stated as "cycles (or samples per picture height", even though it is the horizontal direction that is being characterized. This value may be converted to samples/picture width by multiplying by the aspect ratio.

The need to have a measure of diagonal resolution comes about because many systems have diminshed diagonal resolution. Because the corner is cut out of the 2-dimensional frequency plane in various ways, "diagonal" resolution should be measured.

It is desired to have a single number to characterize the MTF-vs-frequency curve such as "Otto Shades Ne."

Nearly all TV systems have different resolution in the stationary and moving areas. The "dynamic" resolution curves and numbers refer to this phenomenon. In some cases this is because of camera integration. The effect we are referring to here is not related to camera integration, but rather to the blurring caused either by spatiotemporal subsampling or transmitting the spatial high frequency components at a lower frame rate. This differing response requires plotting a second set of curves specifying the performance in image areas subject to this effect. Note that this measure does not directly give the spatial resolution of moving objects; that depends on the velocity of the moving object.

The purpose of the graph of samples/frame vs frame rate is to give another fairly simple measure of the diminished spatial performance as a function of frame rate, this time independent of the relative vertical, horizontal, and diagonal resolution. This graph also indicates the efficiency with which the system utilizes the channel for transmitting image samples. For the purposes of this graph, a picture element is considered resolved at frequencies having 30% response. For a further explanation of this curve, see PS/WP1-054 Section A.

The effect of pixel or subpixel movement by the gathering imager (i.e. live or film camera small motion) should be investigated.

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1 Since light values must always be nonnegative, these sinusoidal variations must be superimposed on a suitable (specified) dc level.

2 A "sample" in this sense is a "picture element", "pel" or "pixel". There are two samples per cycle.

1.2 Chrominance spatial/temporal resolution

This is done as in section 1.1. For systems having different resolution for the two chrominance signals, separate data is required for each.

1.3 Chromaticity/Colorimetry Characteristics

Colorimetric fidelity is the transparent passage of the color signal through a given system.

1.3.1 Color Difference Signals Axes

For luminance/chrominance systems, the axes of the chrominance plane are to be indicated on the CIE chromaticity diagram. Alternatively, the equations of transformation between RGB (referred to the system primaries) and YUV (or YIQ) signals can be given. For further information see the recently adopted SMPTE standard for 1125/60 studio systems. (SMPTE 240M.)

1.3.2 Transfer Characteristics

Any systematic color shift the transmission system introduces for small or large color signals.

1.4 Artifacts

Some systems may have artifacts (such as cross effects in NTSC) including blurring of moving objects, spatial or temporal aliasing, unsmooth motion rendition, side panel effects, geometric distortions, etc. that cannot easily be characterized numerically. Such defects should be described in plain text.

1.5 Transient response

The response of the system to luminance and chrominance step and impulse functions, both spatially and temporally, should be given.

1.6 Aspect ratio

This is the ratio of the width to the height of the entire image less blanking periods, as displayed on a receiver having correct geometry and no overscan.

1.7 Baseband Video Bandwidth

This is the bandwidth of the signal or signals applied to the transmitter. In a composite system, it is the bandwidth of the composite signal. In a multiplexed time component system, it is the bandwidth of the signal after all the components are time-base transformed and multiplexed together. If more than one video signal is applied to the transmitter, it is the sum of their spearate bandwidths.

1.8 Subjective Assessment of Overall Picture Quality

This is the rating given by viewers, under specified viewing conditions, with specified subject matter. The test should be carried out under studio conditions (no transmission degradation) under "average" at-home conditions, and under "poor" at-home conditions. (To be defined). The test should be carried out with natural scenes and test scenes and material including computer-generated material.

All systems shoudl be evaluated with the same type of source material and motion protrayal should be included. The source material should be of sufficient high quality so as to not limit transmsssion system performance. The same display devices should be used for all system if practical.

2. Compatible NTSC Image Issues

For compatible systems, the same measures of image quality should be obtained on "standard" (to be defined) NTSC receivers as well as ATV receivers.

2.5 Sync/Blanking/Subcarrier Modifications

The proposed systems shall note any deviations from the specifications noted in FCC Rules, Part 73.

2.7 Aspect Ratio

Specify the aspect ratio of the compatible picture. Provide a description of how aspect ratio is achieved in a compatible fashion. Describe any compromises or artifacts in the compatible NTSC picture. Is "pan-and-scan" included?

2.8 Use of Overscan/Underscan

Does the system require the use of overscan or underscan in the NTSC receiver to conceal sound, data, or picture information?

2.9 Subject Assessment of Overall Picture Quality

These tests should be performed in parallel and with the same materials as in Section 1.8.

3. ATV Audio Issues

3.1 Numbers of Channels - Number of audio channels and intended use of those channels.

3.2 Modulation Scheme
FM, Digital or other Modulation System

3.3 Signal to Noise Ratio (per channel) (dB)
Self Explanatory

3.4 Nonlinear Distortion
3.4.1 The THD of each audio channel should be specified (%).
3.4.2 The Intermodulation Distortion of each audio should be specified

3.5 Channel Crosstalk (dB) (Audio/Audio, Video/Audio)
Channel Crosstalk will be measured in each audio program channel and may originate from any other or combination of other audio program channels or the video channel.

3.6 Audio/Video Delay (lip sync) (±ms) Lip sync errors may be caused by system video or audio signal processing.

3.7 Dynamic Range (dB)
Should be specified for each channel.

4. Degradation of Compatible NTSC Audio (MTS)

4.1 Can the proposed system in any way affect intercarrier audio recovery.

5. Ancillary Signals
Ancillary signals include the broad range of non-video or sound signals that are carried with the television signal. They include both program related and non-program related signals.

5.1 Provisions for Ancillary signals

Under this topic, the provisions for carrying ancillary signals included in each ATV system should be described including the method and the amount of data.

5.2 Lines available for Ancillary signals in compatible NSTC signal

Under this topic the number of vertical interval lines in the compatible NTSC signal that are available for use by the broadcaster should be listed.

6. Terrestrial Transmission Issues

NOTE: For systems employing a main channel and an augmentation channel, the susceptibilities of each to noise, multipath, etc. should be evaluated separately. For compatible systems, both ATV and NTSC compatible signals should be fully evaluated.

6.1 Characterization of Compatibility

Compatible with existing receivers?
Compatible with existing channels?
Compatible with existing transmitters?

6.2 Susceptibility to Noise

For what carrier-to-noise ratio is noise just perceptible in the picture? What indirect effect(s) does noise have? What effects are caused by reduced carrier-to-noise ratio? Subjective tests of carrier-to-noise ratio vs picture quality should be performed.

6.3 Susceptibility to Multipath or Echo

Under a variety of multipath conditions, what direct and indirect effects does multipath have? What is the required ratio of desired signal to undersired signals to make all such effects imperceptible? When strongest signal is a reflection, do leading signals present a special problem? What problems are there when multipath is complex, as with smear caused by vegetation?

Performance should be examined with a variety of single and multiple echoes of different phases and amplitudes and with time variations representing those found in characterization of the terrestrial transmission media.

6.4 Susceptibility to Interference

6.4.1 Adjacent Channel Interference

Indicate the desired signal to undesired adjacent signal ratio for which adjacent channel interference is just perceptible in the ATV picture for each type of adjacent channel signal under varying desired signal level conditions. Where augmentation channel signal bandwidth is other than 6MHz further consider all possible cases for augmentation channel frequency assignment(s) within the adjacent channel.

	UPPER	LOWER
NSTC		
main ATV		
augmentation ATV		

Indicate the desired signal to undersired adjacent channel signal ratio for which adjacent channel interference is just perceptible in existing NTSC receivers in each case.

Where augmentation channel signal bandwidth is other than 6MHz further consider all possible cases for augmentation channel frequency assignment(s) within the adjacent channel.

	Upper	Lower
main ATV		
augmentation AVT		

6.4.2 Co-Channel Interference

Indicate the desired (D)/ undesired (U) ratio for which co-channel interference is just perceptible in each case. Where augmentation channel signal bandwidth is other than 6MHz, further consider all possible cases for augmentation channel frequency assignment(s) within the adjacent channel.

		D	
	NTSC	main ATV	Aug. ATV
NTSC			
U main ATV			
augmentation ATV			

6.4.3 Airplane Flutter
Indicate what direct and indirect effects airplane flutter has. I system more or less susceptible than NTSC system is to airplane flutter?

6.4.4 Impulse Noise
Indicate for what carrier-to(peak) noise ratio for which noise is just perceptible in the picture. What indirect effect(s) does strong impulse noise have?

6.4.5 Other
Is system more or less susceptible than NTSC system ot interference from other services?

6.5 Susceptibility to Group Delay Errors
Measure system susceptibility to group delay errors between different frequency video waveform components (e.g. envelope delay)? Are some frequency components more critical than others?

6.6 Susceptibility to Nonlinear Distortion
Measure system susceptibility to nonlinear distortion of video waveform. Are some frequency components more critical than others?

6.7 Transmitter/Antenna Requirements

6.7.1 Required Number of Transmitters/Antennas

Number of transmitters. Number of Antennas. If more than one, must antennas be co-located?

6.7.2 Complexity of Transmitter/Antenna

Are special techniques (e.g., quadrature modulation of visual carrier) employed? Is there a need for wideband antenna, ultralinearity, etc.?

6.7.3 Use of Present Transmitter/Antenna

To what degree of modification is necessary?

6.8 Bandwidth Requirements

6.8.1 Near Term

Example: 6MHz + 4MHz

If more than one 6MHz channel, is contiguous bandwidth a requirement?

6.8.2 Long Term

Example: 6MHz + 4MHz

If more than one 6MHz channel, is contiguous bandwidth a requirement?

6.9 Transmission Field Testing

What new image artifacts are introduced as a result of transmission? What system artifacts are made worse? Field testing should be performed to confirm laboratory results.

6.10 Coverage Relative to NTSC

What is the ATV coverage area relative to existing NTSC service? How is it achieved? If NTSC compatible, what is the compatible coverage area relative to existing NTSC.

6.11 Gracefulness of Degradation

6.11.1 Video

Under increasing fringe conditions, is degradation abrupt or gradual? Does degradation of NTSC compatible picture approximate that of NTSC under the same conditions?

6.11.2 Audio

Under increasing fringe conditions, is degradation abrupt or gradual?

6.11.3 Audio vs. Video

Under increasing fringe conditions, which first becomes unusable?

7. Suitability for Alternate Media Distribution

The main objective of the tests described in Sections 7.1 to 7.4 is to evaluate the attributes of a proposed ATV signal in order to determine how it can be interfaced with various media other than terrestrial broadcasting. To achieve this, the medium under consideration shall be characterized to establish the baseline parameters by which the performance of ATV systems can be compared.

One way of defining an unacceptable signal is by using the FCC's criteria for service grading contours A and B. It relates to the quality of service by considerations of field strength, receiver sensitivity and noise figure, and signal to noise ratios in the absence of interfering signal. (See NAB Handbook, Seventh Edition, page 2.7-204.) Modifications to the above criteria may be required to take into account the improvements in receiver technology.

7.1 Suitability for Cable Television Distribution

7.1.1 Channel Bandwidth: This defines the RF spectrum occupied by a complete composite ATV signal and specified in terms of half-power (3-dB), 20-dB and 40-dB bandwidths. Such bandwidths shall be specified for contiguious and non-contiguous channels, the primary channel and the augmentation channel. Modulation shall be vared and the spectral content shall be checked for bandwidth changes during static and dynamic modulation.

7.1.2 Cochannel Interference: Theoretically, since cable television is a "closed" medium, there should be no cochannel interference. However, "ingress" which is the penetration of off-air signals in poorly-shielded TV receivers or distribution paths, can corrupt the desired ATV signal. The effect of ingress between cochannel ATV and NTSC signasl shall be investigated. This test is an extension of 6.4.2

7.1.3 Adjacent Channel Interference: The objective of this test is to determine the mutual effect of adjacent channel interference among ATV and NTSC signals. This test is similar to 6.4.1 except that ratio between picture and sound (P/S) carrier levels in terrestrial transmission may be different from the P/S ratios used in CATV transmission.

7.1.4 Interference to/from other services: The ideal CATV system is "clean" in terms of ingress or egress. However, in practice the transmission of ATV signals require investigation because some bands (e.g. aeronautical band) require greater protection than others. Investigate how variations in ATV spectral density can affect the following bands:

7.1.4.1 Navigation/Aeronautical Bands
7.1.4.2 Amateur radio bands
7.1.4.3 FM Band
7.1.4.4 Citizens Band
7.1.4.5 Industrial Bands

7.1.5 Effect of micro-reflections: Reflections result from poor impedance matching between cables, amplifiers and other passive devices, which manifests as contant ghosts or echoes in the picture. Due to the coheretnt (6MHz) nature of NTSC transmission, micro reflections are masked and are not readily visible in NTSC. The objective of this test is to find out how micro reflections appear in the ATV picture and whether or not such defects are tolerated by ATV viewers. Quantify if possible.

7.1.6 Intermodulation Distortion: This artifact is generated in amplifiers with nonlinear characteristics when two or more fundamental frequencies and harmonics are present. In NTSC transmission, such artifacts are well known, predicatble, and they are currently factored into amplifier cascade design. In these tests, determine how Intermods are altered or created by ATV signals of various spectral contents, and determine if the interactions among NTSC and ATV signals cause objectionable artifacts.

7.1.7 Channel Loading: This relates to the maximum number of channels that can be carried in a CATV system. As loading is increased, intermodulation, cross modulation, composite triple beat and other spurious signals also increase. An objective of these tests is to consider the tradeoff between channel capacity and minimum acceptable signal quality. Note that channel bandwidth as in 7.1.1 can approximate channel capacity; but channel loading as described here provides a greater perspective of the exact number of channels that can be accommodated because it takes into account the acceptability of artifacts as ATV signals are added.

7.2 Suitability for Satellite Distribution
The objective of these tests is to determine if the ATV signal can easily interface with standard origination (uplink) facilities, satellite distribution systems such as C-Band and KU-Band, and various receiving equipment. Both commercial television distribution and satellite transmission to consumers shall be considered.

7.2.1 Bandband Video Bandwidth: This is defined as the half-power (3-dB) bandwidth occupied by the ATV video signal. In cases where audio (analog or digital) is embedded in the video, consider the overall composite baseband video signal bandwidth.

7.2.2 Bandband Audio Bandwidth: This is defined as the half-power (3-dB) bandwidth occupied by the ATV audio signal. Specify this bandwidth for each audio channel, whether analog or digital.

7.2.3 Audio Bandwidth Requirement: This is defined as the amount of baseband spectrum allocated to the aural portion of the ATV signal. This bandwidth may vary depending on the number of audio channels being carried, the frequency response of each audio channel and the method used to combine all audio channels.

7.2.4 Exciter Modifications: The objective of this test is to determine if the exciters currently used or existing in the market require modification(s) in order to accommodate the proposed ATV signal. Some considerations are: AFC requirements, sync, video levels, and frequencies response.

7.2.5 Uplink Power Requirements: The objective of this test is to determine if the porposed ATV system requires changes in uplink power in order to properly saturate the satellite transponder while maintaining proper cross-polar/co-polar/adjacent channel/co-channel charrier-to-interference ratios.

7.2.6 Optimum FM Deviation: The objective of this test is to determine optimum deviations for existing satellite channel allocations.

7.2.7 Minimum C/N: The ojective of this test is to determine the carrier-to-noise (C/N) ratio required for proper demodulation of the ATV signal in order to provide acceptable signal quality.

7.2.8 Minimum Antenna Size: The main objective of this test is to determine the smallest antenna size both at C-Band and KU-Band that can deliver reliable ATV signals with acceptable signal quality.

7.2.9 Satellite Receiver Requirements: The objective of this test is to determine the modifications that may be required of existing satellite receiver designs and manufacturer. The ATV signal shall be evaluated to determine its impact on the receiver functions listed below. Quantify the associated costs if possible.
7.2.9.1 Clamping
7.2.9.2 Deemphasis
7.2.9.3 IF bandwidth

7.2.10 Compatibility W/ Satellite Security Systems: The objective of this test is to determine if the satellite security systems currently in use or in the market, can be used to secure the ATV signal. Some compatibility issues are: The ATV signal's ability to easily interface with the scrambling equipment at the origination (uplink) facility; and, the same ATV signal's ability to easily interface with existing descrambling equipment. The above shall be considered for both network television distribution and satellite television emmission to consumers. Some examples of existing satellite security systems are VideoCipher 1, VideoChipher 2, Oak Orion, Starloc, S/A A-MAC, B-MAC ... etc.

7.2.11 FM Channel Artifacts: While the effects of FM channel non-linearities are well understood for NTSC, the problems which will attend the use of ATV signal formats through FM channels must be investigated.

7.3 Suitability for Other Terrestrial Distribution Systems: The purpose of the following tests is to evaluate the attributes of a proposed ATV signal and determine how it can be interfaced with other terrestrial media not including VHF/UHF broadcasting.

7.3.1 Amplitude-Modulated Microwave Links (AML) Amplitude modulated links are specific applications of the Cable Television Relay Service (CARS) at 12.7 to 12.95GHz for short-haul point-to-point transmission of up to 40 television channels per link. The ATV issues to consider are: the effects on channel capacity, distortion, interference and the compatibility with existing transmitter/receicer systems.

7.3.2 Frequency-Modulated Linds (FML) Frequency modulated links are coaxial cable wideband systems used as trunks for high-quality television transmission. Channel capacity depends on the frequency division multiplexing scheme. The proposed ATV system shall be evaluated for effects on channel capacity, distortions and compatibility with existing transmitter and receiver systems.

7.3.3 Microwave Distribution Service (MDS) MDS is a common carrier point-to-multipoint AM microwave television distribution service. Channel one is at 2150-2156MHz while channel two is at 2156-2162MHz. Channel two may be 2156-2160 because 2160-2162MHz is shared with directional radio systems authorized in other common carrier service. Determine if ATV can be accommodated as a secured, non-interfering service.

7.3.4 Multi-Channel MDS)MMDS) MMDS shares the Instructional Television Fixed Service (ITFS) at 2550-2680MHz. The FCC Rules and Regulations, Part 74, Subpart I govern the specifications of this service. Determine how may ATV signals can be accommodated in this frequency band and the possible impact on ITFS.

7.3.5 Fiber-Optic Cables (FO) Fiber optics can be used for analog or digital transmission of ATV signals. Determine the maximum number of ATV channels that can be accommodated in a fiber strand using existing transmission schemes.

7.3.6 Television Co. Lines (TELCO). In this section, investigate how common carrier telephone companies distribute television signals and determine how the proposed ATV system being evaluated may be accommodated in such distribution media.

7.3.7 Video Cassette Recorders (VCR)
This section considers current consumer VCR formats. Some issues under compatibility are:
7.3.7.1 Playback only of ATV
7.3.7.2 Record/Playback of ATV
7.3.7.3 Record/Playback of both NTSC and ATV
7.3.7.4 Connector Interfacing requirement
7.3.7.5 Electronic (blackbox) Interfacing requirement
7.3.7.6 Audio Artifacts
7.3.7.7 Video Artifacts

7.3.8 Video Disk Recorders
In this section, only current consumer videodisk recorder/players shall be considered. Some issues are:
7.2.8.1 Playback only of ATV
7.3.8.2 Record/Playback of ATV
7.3.8.3 Record/Playback of both NTSC and ATV
7.3.8.4 Connector Interfacing requirement
7.3.8.5 Electronic (blackbox) Interfacing requirement
7.3.8.6 Audio Artifacts
7.3.8.7 Video Artifacts

7.4 Transmission Security
The basic objectives of this section are:
1. To investigate the compability of the ATV signal with security systems in various media other than terrestrial broadcasting; and
2. To evaluate the ATV signal for transparency during secured transmission, including image reconstruction artifacts of both the center image and full aspect ratio image.

Current Video/Audio security techniqes include:
1. Trapping
2. Jamming
3. Frequency Conversion
4. Video Inversion by line, field or frame
5. Permutation by line, field or frame
6. Rotation by line, field or frame
7. Sync Elimination
8. Sync Alteration
9. Time/Frequency Compression
10. Digital Techniques
11. Mechanical
(Switched Star topology using Fiber Optics or Coaxial Cables)

8. Consumer Equipment Issues
8.2 ATV Receiver Input/Output Characteristics

The purpose of this section is to describe and characterize the consumer television receiver interface(s) which are available for ATV service signals, both input and output. The interface(s) will describe functional, technical and physical characteristics.

8.2.1 RF Interface (Composite video+audio+ancillary signal)

Describe RF signal characteristics including modulation, bandwidth, channel requirements, etc.

8.2.2 Baseband Video Interface

Define technical specification of the ATV baseband video signal(s), where available.

8.2.3 Baseband Audio Interface

Define technical specification of the ATV baseband audio signal. Define also available number of audio channels supported by the proposed ATV system.

8.2.4 Interfacing with Ancillary Signals

Define the technical, physical and functional requriements of all proposed ancillary signals (e.g., control, teletex, other data).

8.3 Compatibility with Existing NTSC Consumer Equipment
The purpose of this section is to describe the proposed method of compatibility with NTSC consumer equipment including receivers, tuners, CATV set top converters, etc.

8.3.1 RF Compatibility with NTSC Equipment
Describe RF level interconnection and compatibility of ATV with NTSC consumer equipment.

8.3.2 Baseband Video Compatibility
Describe the relationship of the ATV video baseband signal parameter values with respect to NTSC baseband video signal. This section should provide explanation whether the ATV and NTSC video signals have common baseband parameter values and how complex is the signal conversion or transcoding from ATV or NTSC.

8.3.3 Baseband Audio Compatibility
Describe the relationship of the ATV audio baseband signal parameter values with respect to NTSC baseband video signal. This section should provide explanation whether the ATV and NTSC audio signals have common baseband specification and how much better the ATV sound provisioning is.

9. Other Considerations

This section is to be used to cover all items that do not fall under one of the previous categories.

9.1 Practically of Near-Term Technological Implementation

Is the technology required to implement the proposed system available or if it requires extensive further development, what is the anticipated time required?

9.2 Long-Term Viability/Rate of Obsolesence

Indicate the anticipated life of the proposed system. Indicate the changes in technology which may obsolete this system.

9.3 Upgradability/extendability

Can the proposed system be improved without obsoleting then existing hardware, and if so, how?

9.4 Studio/Plant Compatibility

Describe the extent to which the proposed system is compatible with current broadcast studios and other facilities.

MEETING OF
FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE [ATS]
PLANNING SUBCOMMITTEE
WORKING PARTY 1 [PS/WP1]
ON ATS TECHNOLOGY ATTRIBUTES AND ASSESSMENTS

The meeting was called to order by the Chairman, Ren McMann at approximately 9:40 a.m., on 20 September 1989, in Mezzanine Conference Room B, NBC, 30 Rockefeller Plaza, New York, NY 10112.

Those present were:

Ren McMann, Chairman
Stan Baron, Vice-Chairman (NBC)
Bernard Dickens (CBS)
James Ennis (Fletcher, Heald and Hildreth)
Alan Godber (NBC)
Tom Gurley (ATTC)
John Storey (CABSC/CRC)

1. The draft agenda (PS/WP1-053) was accepted.

2.1 The minutes of the previous meeting (PS/WP1-051) were reviewed and accepted with the following changes:

a. Insert on page 2, after the 7th. paragraph, a new paragraph: "The Working Group concurred on Chairman McMann's recommendation noting that such a recommendation did not necessarily imply support of any particular implementation."

b. Delete on page 4, Section 6, 3rd paragraph, line 4, the first occurance of "be".

2.2 A <u>draft</u> of Rev.1 of the Attributes Matrix (PS/WP1-054) was distributed for review.

3. Ghost Cancelling Attributes: The attributes added as section 2.10 of the Attributes Matrix and the additional paragraph to section 6.3, on page 9 of the notes, were reviewed. and approved with the following addition:

2.10.4 Performance Characteristics
- 2.10.4.1 Single Ghost
- 2.10.4.2 Multiple Ghosts
- 2.10.4.3 Noise Performance
- 2.10.4.4 Short Term Ghost
- 2.10.4.5 Long Ghosts

4. IDTV Prefiltering Attributes: The issue of temporal and spatial prefiltering of compatible NTSC signals and their effect on IDTV systems was discussed. WP1 agreed to add a new section 2.11 to the Attributes Matrix as follows:

2.11 Temporal and/or spatial prefiltering of NTSC signals
- 2.11.1 Is Prefiltering used, and if so:
- 2.11.2 Effect on conventional NTSC receivers.
- 2.11.3 Effect on comb-filtered NTSC receivers.
- 2.11.4 Effect on IDTV receivers.

6.7.4 Use of present diplexer.

5. Collocation/Non-collocation contours: WP1 agreed to add a new section 6.12 to the Attributes Matrix as follows:

6.12 Effect of two-channel systems on A and B contours:
- 6.12.1 When co-located
- 6.12.2 When non-co-located

6. Other Business

6.1 B.Dickens raised the issue of the PS/WP1 mailing list. It was agreed that the Secretariat would construct an "official" mailing list consisting of the active participants plus the FCC ACATS subcommittee and working party chairs. The list would be appended to the minutes but mailed to a wider audience with a note that any other individuals desiring to be added to the mailing list so inform the Secretariat.

6.2 R.McMann briefly described his report at the Planning Subcommittee meeting in Washington on 19 September 1989. The report summarized the prior meeting.

6.3.1 R.McMann provided additional possible attributes for discussion. These attributes were either discussed at the Planning Subcommittee or can be found in PS-042 (PS/WP1-056). The attributes and the results of the discussions by WP1 are as follows:

6.3.2 Sync Ruggedness: WP1 agreed to make the following additions to the Attributes Matrix:

(Under existing section 6.2)
- 6.2.1 Video
- 6.2.2 Sync

6.13 Sync recovery time

8.5 Reaquisition of sync

6.3.3 Digital Audio: The question was raised as to whether the attributes provided in Section 3, ATV Audio, properly addresses the issue of digital audio. After some discussion WP1 agreed to add the following:

after attribute 3.3 on page 2 of the Attributes Matrix the following note: "(with digital audio systems, performance is measured after reconversion to analog)", and

a new attribute, 3.8.1 Level vs frequency response.

6.3.4 Non-flat transmission paths: WP1 added to the Attributes Matrix:

6.14 Non-flat transmission frequency response.

6.3.5 Video "cuts": WP1 added to the Attributes Matrix:

1.5 Particular attention should be given to video "cuts" in which the image contains high-frequency components.

6.3.6 WP1 reviewed the question as to whether the current attributes list adequately covered the vaious temporal resolution issues. WP1 agreed that the current listing was adequate in light of notes 1.4 and 1.5 on page 5 of section B. Those seeking additional clarification should be directed to those notes.

6.3.7 Camera steadiness: WP1 added to the notes for section 1.1 (section B, page 4, bottom of page), the following:

"The effect of pixel or subpixel movement by the gathering imager (i.e. live or film camera small motion) should be investigated."

6.4 J.Storey requested that attributes be added concerning bit and symbol errors for the data channel. WP1 agreed to add the following:

5.3 Bit and Symbol Errors

5.3.1 Error rate
5.3.2 Error distribution
5.3.3 Effects of multi-level coding, frequency, phase and group delay
5.3.4 Other characteristics

6.5 J.Storey requested that the question of baseband format compatibility should be addressed. WP1 agreed to add the following:

7.5 Is the same baseband format signal used for all media?

6.6 The Chair stated that he and the Vice-chairs would prepare the Chair report for the next interim report and submit the same to the Chair of the Planning Subcommittee.

6.7 It was agreed that there was no need to have additional meetings of WP1 before the beginning of next year unless additional attributes needed to be addressed.

Advisory Committee on Advanced Television (ATV) Service

Doc. No. PS-042

Date August 14, 1989

Dear Chairman,

In preparation for the Planning Subcommittees Steering Committee meeting on September 18, 1989, I attach for your review a work statement for this 3rd period of activity by the Planning Subcommittee. This has been updated from the work statement previously issued (PS-032), in the light of your various comments and those further reports which you have submitted.

This new work statement will be reviewed and amended as necessary at the forthcoming Planning Subcommittees Steering Committee meeting. In this regard, it is important to hold at least one meeting of your Working Party prior to September 18, 1989.

Yours Sincerely,

J

Joseph A. Flaherty
Chairman, Planning Subcommittee

Distribution: Renville H. McMann, Chairman WP-1; Richard Green, Chairman WP-2; Dale Hatfield, Chairman WP-3; Ed Horowitz, Chairman WP-4; Michael Tyler, Chairman WP-5; Bronwen Jones, Chairman WP-6; Richard Ducey, Chairman WP-7; James Hindman, Chairman AG-1; Robert Crandall, Chairman AG-2; Wendell Bailey, Vice Chairman, PS; Greg DePriest, Vice Chairman, PS; Richard Wiley, Chairman, Advisory Committee on ATV Service; Irwin Dorros, Chairman, SS; William Hassinger, FCC

Advisory Committee on
Advanced Television (ATV) Service

Doc. No. PS-C43

Date August 14, 1989

PLANNING SUBCOMMITTEE WORK STATEMENT FOR THE 3RD PERIOD OF ACTIVITY

PLANNING SUBCOMMITTEE WORKING PARTY 1

Following the inability of WP-1 to reach a consensus on the minimum number of audio channels which proponents should provide in ATV systems, the FCC has declined to make such a determination, but, in a letter to the chairman of the Advisory Committee dated 7/18/89, has made the following statement.

> "In examining the quality improvements presented by the various ATV transmission schemes, the Commission will likely assess both video and audio performance. The Committee should assist us in this regard by ensuring that tests of these systems will develop data on audio performance, including cross talk between analog and digital channels. Thus, system proponents would be well advised to emphasize the audio component of their systems sufficiently so as to both maintain service to NTSC receivers and deliver the high quality we anticipate from ATV systems.
>
> Beyond the basic requirement that the quality of the ATV system ultimately selected by the Commission be higher than that of an NTSC system, the Commission does not specify any minimum number of audio channels at this juncture. Because the testing process is fundamentally a comparison of competing ATV systems, the number and quality of each system's audio channels will likely be among the significant comparative factors that will help in ranking these systems. This likelihood should motivate proponents to provide a high quality digital audio signal in their systems even in the absence of standards for minimum numbers of audio channels."

WP-1 should consider what further action should be taken in the matter, beyond the obvious need to make all proponents aware of the significance that the FCC attaches to the number and quality of audio channels provided by proponents in the course of the comparative assessment of ATV systems submitted.

WP-1 should further define the attributes of an ATV system required for ghost elimination, a feature to be introduced in future NTSC receivers, and one which should be available also in ATV system. The parameters involved should be defined.

PLANNING SUBCOMMITTEE WORKING PARTY 2

In coordination with the work of PSWP-1, PSWP-2 should develop the test procedures necessary to assess the effectiveness of ghost elimination systems provided by proponents.

Secondly, the test parameters plan submitted to the Systems Subcommittee and to Chairman Wiley should be reviewed and updated or amplified as necessary, in coordination with PS WP-4

PLANNING SUBCOMMITTEE WORKING PARTY 3

The on-going spectrum-availability studies should continue with special attention given to the impact of the following parameters/conditions on the availability of spectrum for ATV:

(i) Protecting IF-related and/or inter-modulation related taboos.

(ii) Protecting existing vacant allotments.

(iii) The need to protect the channels proposed for land mobile.

(iv) Allowing transmitter co-location (and near co-location) for adjacent, IF-related and Inter-modulation related taboos.

(v) Consider the possible deletion of protection for existing land mobile channels.

In addition, the working party should undertake the following studies:

(i) Develop a channel assignment plan based on inputs from the System Subcommittee and your working party's agreed upon technical planning factors for ATV.

(ii) Review the results of the ATTC propagation and channel characterization tests at VHF/UHF, 2.5 and 12 GHz, and complete the work relating to the availability of spectrum above 1 GHz, including the possibility of using government spectrum.

(iii) Determine the spectrum requirements for ATV terrestrial and satellite distribution systems. (ENG, ICR, STL, etc.).

(iv) Develop the necessary software programs to illustrate the effect of interference on existing NTSC and new ATV services.

(v) Develop technical guidelines for sharing of the VHF and UHF spectrum for ATV along the U.S./Canadian border.

In summary, Working Party 3 should:

(i) Further refine the effects to be expected from the elimination of "taboos".

(ii) Determine the interference reducing characteristics which proponents systems should have in order that they may operate at closer than present spacings to existing NTSC stations and to each other.

(iii) Study the problems associated with 2 channel ATV systems, where the channels are separated by plus or minus 2 channels. The scenario developed for a co-channel spacing of 160 Km and 30 dB reduction of the effect of an interfering ATV signal is based on the goal of providing an additional 6 MHz channel to 99.7% of all present TV stations. While this 30 dB reduction in co-channel interference is a goal, anything less than a 30 dB reduction of the interfering signal is likely to result in a major reduction in the number of existing stations which can have an additional 6 MHz channel, particularly in major metropolitan areas.

PLANNING SUBCOMMITTEE WORKING PARTY 4

Continuing studies are required to determine the practicality of the multiport receiver approach to a universal display interface, leading to the specification of parameters and values required.

These activities should be conducted in close coordination with PSWP-2 and the Systems Subcommittee as necessary.

PLANNING SUBCOMMITTEE WORKING PARTY 5

It is of critical importance that PSWP-5 continue to respond to the needs of SS WP-3, as defined by the memoranda from the Chairman of SS WP-3, (Larry Thorpe).

Because ATV is defined to include IDTV, EDTV, and HDTV, which represent a rising scale of technical excellence, and because the cost of the consumer is different for each of these categories, WP-5 should now reassess the assumptions which led to their first estimate of the rate of penetration of ATV service.

In fact, given the difference in consumer appeal and the consumer cost for each category of ATV, projections of market penetration for each category should now be developed.

PLANNING SUBCOMMITTEE WORKING PARTY 6

WP-6 has now defined 32 test scenes to be used in the subjective assessment program, and a draft of a subjective test procedures manual has been prepared.

Future work will include:

(i) Conduct a detailed evaluation of the test of 2 approaches being considered for the production of subjective test material, i.e. parallel shooting or serial shooting of test scenes, using a number of pickup devices, and standards conversion from a single HDTV source. WP-6 will recommend the preferred approach.

(ii) Evaluate any new proposals for the preparation of test material that may be put forward

(iii) Coordinate the production of the specified and selected set of test materials.

Because the preparation of test material is likely to become the pacing activity for the entire test program of the Advisory Committee, it is critical to conduct the comparative assessment of the two approaches at the earliest possible date.

PLANNING SUBCOMMITTEE WORKING PARTY 7

(i) WP-7 should complete the detailed planning of the proposed audience research program and the estimate of the costs involved.

(ii) Consider and define a first test to determining the acceptability of the use of a letter box display as compared with the normal full screen display, and prepare a cost estimate and schedule for such a test. Coordinate this work with the ATTC and the Cable Laboratories.

PLANNING SUBCOMMITTEE ADVISORY GROUP 1

Aspect Ratio:

One of the fundamental features of an ATV system is the wide screen 16:9 aspect ratio now accepted throughout Western Europe, Asia, Canada, and Mexico.

Despite this general acceptance, the maintenance of a 4:3 aspect ratio has been urged by some in the production community.

AG-1 should investigate the views on this and report to the Planning Subcommittee. Consider the short term (1-5 years) and the long term (5 years and beyond) implications of the decision on aspect ratio.

PLANNING SUBCOMMITTEE ADVISORY GROUP 2

Following the numerous reports submitted in response to Representative Markey's request, a careful study of the data there presented should be made, and a report prepared which will be submitted to the Advisory Committee. This report should contain conclusions concerning:

(i) The prospects for US employment in the manufacture of HDTV receivers

(ii) The prospects for increasing US ownership of TV set manufacture and HDTV set manufacture

(iii) The prospects for US-owned companies in the development and manufacture of transmission systems and professional high definition equipment for program production and recording

(iv) If the above prospects are poor, what is the likely macro-economic impact on the U.S. economy and the international trade balance of payments in particular?

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FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE (ATS)
PLANNING SUBCOMMITTEE
WORKING PARTY 1 (PS/WP1)
ON ATS TECHNOLOGY ATTRIBUTES AND ASSESSMENTS

List of Attendees

[Meeting of 6 July and 20 September 1989]

R. McMann, Chairman
S. Baron, Vice-Chairman
T. Keller, Vice-Chairman
R. Niles, Vice-Chairman
B. Dickens (CBS)
J. Ennis (Fletcher, Heald, & Hildreth)
J. Gaspar (CBS)
A. Godber (NBC)
T. Gurley (Consultant)
C. Heuer (Zenith)
B. Lechner (Consultant)
J. Pender (Fletcher, Heald, & Hildrith)
B. Sidran (ABC)
J. Storey (CABSC/CRC)
E. Torick (BTP)
J. Watson (Group W)