Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems and Their Impact on the Existing Television Broadcast Service	)	MM Docket No. 87-268
	)	
Review of Technical and Operational Requirements: Part 73-E, Television Broadcast Stations	)	
	)	
Re-evaluation of the UHF Television Channel and Distance Separation Requirements of Part 73 of the Commission's Rules	)	

COMMENTS OF NATIONAL CABLE TELEVISION ASSOCIATION, INC.

Wendell H. Bailey
Vice President
Science and Technology

R. Brian James
Director of Engineering
Science and Technology

Brenda L. Fox
Loretta P. Polk
1724 Massachusetts Ave., N.W.
Washington, D.C. 20036
(202)775-3664

Counsel for National Cable Television Association, Inc.

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TABLE OF CONTENTS

		Page
SUMMARY		i
INTRODUCTION		2
I.	THE PRIMARY BENCHMARK IN THE ADOPTION OF ATV STANDARDS SHOULD BE THE COMPLETION OF RIGOROUS FIELD TESTING OF THE MOST VIABLE ATV SYSTEMS OVER BROADCAST, CABLE AND OTHER MEDIA	4
II.	THE BROADCAST ATV STANDARD MUST BE CAPABLE OF BEING EFFECTIVELY RETRANSMITTED OVER CABLE	8
III.	THE POSSIBILITY OF MULTIPLE ATV TRANSMISSION STANDARDS SHOULD REMAIN OPEN AT THIS TIME	10
IV.	THE COMMON INTERESTS OF THE VIDEO DISTRIBUTION MEDIA SHOULD LEAD TO THE DEVELOPMENT OF COMPATIBILITY STANDARDS WITH MINIMUM GOVERNMENT INVOLVEMENT	12
	A. Open Architecture Receiver	13
	B. Multi-port Interface Connector	15
V.	AT THIS STAGE IN ATV DEVELOPMENT, THE OPTIONS PROPOSED FOR BROADCAST SPECTRUM ALLOCATION PRESENT BOTH KNOWN AND UNKNOWN ADVANTAGES AND DISADVANTAGES FOR CABLE TRANSMISSION OF ATV	16
	A. 6 MHz Option	19
	B. Additional 3 MHz Augmentation Option	20
	C. Additional 6 MHz Option For Either An Augmentation Signal Or For A Dual Non-Compatible ATV Signal	21
VI.	ATV SYSTEMS WHICH REQUIRE MORE THAN 6 MHz OF SPECTRUM WILL PUT SIGNIFICANT PRESSURE ON CABLE RELAY OPERATIONS, PARTICULARLY IN CONGESTED URBAN AREAS	23
CONCLUSION		26

SUMMARY

As NCTA has endeavored to point out, both in this proceeding and in connection with the work of the Commission's Advisory Committee on Advanced Television Service, the technical and public policy issues surrounding the development of advanced television must be considered not only in the context of terrestrial broadcasting, but also in the context of cable and other video distribution media. In its Tentative Decision and Further Notice, the Commission, acknowledging our concerns, has indicated that it is the agency's intention not to adopt policies and/or regulations which will interfere with the introduction of ATV by nonbroadcast media. NCTA applauds this aspect of the Commission's decision and urges the Commission to proceed in a manner that will ensure that any ATV standard ultimately adopted for terrestrial broadcasting use be designed to function effectively on media, such as cable, that deliver broadcast programming to the viewer.

First, and foremost, NCTA submits that the Commission should not rush ahead with the standards-setting process until the various ATV proposals have been adequately tested over broadcast, cable and other media. Indeed, the primary benchmark in the adoption of an ATV standard should be the conclusion of rigorous field testing and evaluation. In this regard, the work of various intra- and inter-industry groups is significant. For example, NCTA's Blue Ribbon Committee on HDTV has prepared comprehensive ATV test procedures for cable. In addition, the NCTA Engineering Committee and the recently-established Cable

Laboratories are contributing to the information available for the ATV evaluation process.

Second, with over one-half of all homes receiving broadcast signals by means of cable, it is critical that any assessment of a broadcast ATV transmission standard weigh cable-related considerations. For example, some ATV systems utilize techniques that produce a signal that may not withstand the cable retransmission process without significant impairment. The capability of a particular ATV format to handle encryption is another important element for cable retransmission that must not be neglected in the search for a broadcast ATV standard.

Third, while a single standard for all media may be ideal, the Commission should leave open the possibility of multiple standards at the present time. Only by taking this approach can the Commission ensure that each video medium will be able to deliver ATV in a format that is optimal for that medium. In allowing for multiple standards, the Commission need not fear that the public will be saddled with a confusing array of incompatible ATV systems and equipment. There are sufficient incentives for the interested industries to work together to achieve some consensus on compatibility.

Fourth, it appears that the apparent drawbacks of the full "open architecture" approach to resolving compatibility, such as cost and complexity, may weigh in favor of the "multi-port" interface connector concept. The multi-port provides an efficient and practical approach and is likely be less costly and more consumer-friendly. It is imperative, however, that a

standard baseband component video signal be specified for all media in order for this option to work effectively.

Fifth, while each of the three spectrum allocation options identified by the Commission have advantages and disadvantages, for cable it is too early to provide more than preliminary observations about the comparative merits of these options. Therefore, NCTA recommends that the spectrum allocation decisions await the availability of information on the performance of ATV systems under each option.

Sixth, and finally, the Further Notice requests information on the capability of cable relay stations (CARS) to handle wider bandwidth ATV signals. In the long term, fiber optic technology may provide the solution to the capacity problems that ATV service may create for cable. For the time being, however, some modification in the CARS allocation scheme will be necessary to accommodate a wideband ATV format. The optimal solution for the cable industry would be the expansion of available frequencies within the 12 GHz band.

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COMMENTS OF NATIONAL CABLE TELEVISION ASSOCIATION, INC.

The National Cable Television Association, Inc. ("NCTA"), by its attorneys, hereby submits its comments in response to the Commission's Tentative Decision and Further Notice of Inquiry ("Further Notice") in the above-captioned proceeding. NCTA is the principal trade association of the cable television industry in the United States, representing owners and operators of cable television systems serving over 75 percent of the nation's 45 million cable households. Its members also include cable programmers, cable equipment manufacturers and others interested in or affiliated with the cable television industry.

INTRODUCTION

In its comments in the initial Notice of Inquiry in this proceeding, filed one year ago, NCTA commended the Commission's recognition of the enormous importance of advanced television (ATV) technology for the American public. Indeed, by initiating this proceeding and by establishing an ATV advisory group, the Commission took a major step toward identifying ATV standards for broadcast licensees. However, as NCTA and other industry participants have pointed out, the technical and public policy issues surrounding the introduction of ATV have equally broad implications for other media.

Thus, NCTA has sought to imbue this proceeding and the work of the FCC Advisory Committee on Advanced Television Service, with an appreciation of the importance of cable television and other video distribution media in the delivery of television to the home. Indeed, with today's video marketplace comprising not only terrestrial broadcast, but cable, video cassettes, home satellite dishes and microwave, an analytical framework geared primarily to broadcast licensees could be detrimental to other media and ultimately to consumers. Therefore, NCTA urged the Commission, in considering ATV policies and standards for broadcast licensees, not to overlook the impact on other equally important and potentially more capable television delivery media.

In its Further Notice, the Commission has acknowledged the pervasiveness of alternative media and indicated its intention to evaluate the various broadcast ATV scenarios with this in mind. NCTA hopes the Commission will go a step further by requiring the

ATV standard adopted for terrestrial broadcast to function effectively on those media which retransmit or relay broadcast stations to the home. Cable television, in particular, has a special relationship with broadcast television in that the majority of American viewers receive their broadcast signals via cable transmission. This simple, inescapable fact makes it critical that cable technology be treated as more than a mere afterthought in defining appropriate broadcast ATV standards. Clearly, the Commission's tentative conclusion that the provision of broadcast ATV service would serve the public interest, will be best achieved if cable has the ability to deliver high quality broadcast signals.

Apart from their role as conduits for the delivery of broadcast signals, cable and other media have certain characteristics and capabilities that may enable them to provide unique ATV services. The Commission has implicitly recognized this in the Further Notice by stating its intention "not to retard the introduction of advanced television systems by non-broadcast media."[1/] Toward this end, the Commission also has indicated that it will not mandate compatibility standards for these media at this time. Given the tremendous innovation and ongoing development of ATV technologies for a variety of video media, we are encouraged by the Commission's apparent desire not to impede

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1/ Tentative Decision and Further Notice of Inquiry, MM Docket No. 87-268, September 1, 1988, p. 57. This theme echoed the Interim Report of the FCC Advisory Committee on Advanced Television Service, issued June 16, 1988.

this process through regulatory measures. At the same time, we are concerned that the Commission's intent "to proceed rapidly" on spectrum decisions could prejudge this process with premature standards.[2/]

Therefore, NCTA would urge the Commission: to permit the most viable ATV systems to be field tested before adopting standards; to require that the broadcast ATV standard be compatible with cable; to refrain from setting standards that would foreclose the possibility of alternative ATV systems; and to allow the inter-industry organizations to reach agreement on compatibility standards. In particular, spectrum allocation decisions for broadcast transmission of ATV should await the availability of information on the performance of ATV systems under each option. Finally, NCTA would also point out that the initiation of ATV service may require some modification of the allocation scheme for cable relay operations.

I. THE PRIMARY BENCHMARK IN THE ADOPTION OF ATV STANDARDS SHOULD BE THE COMPLETION OF RIGOROUS FIELD TESTING OF THE MOST VIABLE ATV SYSTEMS OVER BROADCAST, CABLE AND OTHER MEDIA.

Over the past year, the television industry has witnessed a virtual explosion in attention to and development of ATV systems. Yet, despite all this activity, it is safe to say that we are still far from reaching a decision on how ATV should be implemented by any medium. Substantial progress has been made in

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2/ Further Notice, p.

understanding the technical parameters of the various ATV proposals, but the reality is that our ability to assess the potential strengths and weaknesses of these systems is still limited largely to theoretical evaluations. Of the twenty-odd ATV proposals, only the NHK MUSE-E system is available in actual operating hardware.[3/] Other systems, such as the North American Philips HDS-NA system and the New York Institute of Technology Vista system, are in various stages of prototype development, but they are not ready for actual field testing. Still others have not gone significantly beyond computer simulation. Thus, although many ATV developers optimistically projected late 1988 for hardware availability, it appears that it will be at least another six to eight months before many of the systems are ready for testing over broadcast, cable or other media.

Framing the issues and proposing the options is important at this stage in ATV development, but decisions on standards must await actual test results. The Commission is encouraging this process, indeed hastening the development work, through the activities of the various working parties of its ATV Advisory Committee. Moreover, the industry-wide technical organizations and research consortiums, such as the Advanced Technology Test Center and Cable Laboratories, are rapidly preparing for anticipated testing of the systems in the coming months. Since the

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3/ Moreover, the Commission's tentative conclusion to limit the amount of additional broadcast spectrum to 6 MHz has effectively eliminated the NHK MUSE-E system from consideration for broadcast use.

communications industry is now poised to make some real inroads in the evaluation of the various ATV proposals, the Commission should not make any final decisions or set any standards until this process is completed.

The cable industry is committed to conducting the necessary tests and to analyzing the options for ATV transmission from the cable perspective. In fact, the NCTA Blue Ribbon Committee on High Definition Television (HDTV), which is comprised of chief executives of major cable companies, cable programmers and cable and consumer electronic equipment manufacturers, has endeavored during the past eleven months to outline the parameters of cable transmission of HDTV technology. Assisted by a technical advisory group and the NCTA Engineering Committee, the Committee has compiled information, for example, on the particular technical attributes that need to be present in any new cable transmission format. The Committee has also begun to evaluate alternative transition scenarios, the economic ramifications for the industry and other policy matters. Most importantly, the Committee has prepared comprehensive ATV test procedures for cable. The test plan, which was submitted to the Advisory Committee, covers testing by computer simulation of a cable system, by transmission through a laboratory constructed cable system, and by transmission through an actual operating cable system.

In conjunction with the Blue Ribbon panel and major cable companies, the NCTA Engineering Committee's HDTV Subcommittee has been studying the transmission characteristics of each segment of

the cable distribution network in order to lay the foundation for the upcoming tests. In particular, the HDTV Subcommittee has undertaken characterization studies of typical cable channels on a variety of systems. This characterization work will provide the baseline needed to make meaningful interpretations of the actual HDTV test results on cable systems. By knowing what pre-existing artifacts or limitations affect NTSC channels, the cable industry can more accurately understand the impact on ATV signals.

The Subcommittee has also conducted investigations into phenomena that affect existing cable systems but in ways that are not well understood. Such areas as microreflections and phase noise, whose effects on NTSC signals are little known, are now becoming the subject of engineering analysis. The Subcommittee is, in fact, documenting the mechanisms by which these phenomena are produced. With the higher performance levels that are likely to be needed for ATV, gaining new knowledge about these areas is important. All of this work is in direct support of the further refinement of the cable ATV test plan.

In addition to the NCTA Engineering Committee and the Blue Ribbon panel, Cable Labs is also forging ahead in this field. Created in May of 1988 by several major cable system operators, Cable Labs' mission is to identify and study the application of new technologies to cable television. ATV will be one of its top priorities. With an annual budget of $8 million, this organization will play a critical role in the testing of ATV systems and

will work closely with manufacturers in carrying out joint venture research and development projects.

In conclusion, at some point in the ongoing efforts to improve and enhance television pictures, the development process must give way to the adoption of some minimum standards or industry guidelines. This is necessary in order to facilitate the next phase in ATV development -- the production process. In NCTA's view, the point at which we freeze development, at least for a generation of television receivers, is not reached until there has been rigorous field testing of the transmission options over the various video delivery media.

II. THE BROADCAST ATV STANDARD MUST BE CAPABLE OF BEING EFFECTIVELY RETRANSMITTED OVER CABLE.

As NCTA has previously pointed out, the cable industry and the broadcast industry have a symbiotic relationship in the provision of broadcast television to the public. Indeed, cable technology is the means by which 53 percent of American households receive broadcast television programming. In recognition of that fact, the industries are working together to define an advanced television system that will achieve both high quality broadcast transmission and cable retransmission. Thus, technical and other considerations that do not appear to be broadcast-related, but instead relate to cable, become important to the

successful outcome of this process.[4/]

For example, from the cable perspective, the most important technical attribute of any ATV transmission system will be the "robustness" of the signal. In other words, its ability to pass through a cable system's amplifiers and processing equipment without distortion or significant impairment. As more and more information is compressed into the signal, it becomes more sensitive to the imperfections in any transmission media. The selection of an appropriate ATV system for broadcast transmission will depend, in part, on the system's immunity to such cable transmission impairments as noise, distortions, and reflections. It appears, even at this still relatively early stage in ATV development, that some ATV systems employ techniques that are more susceptible to these impairments. Thus, if cable is to continue its traditional role as a retransmitter of broadcast programming, careful attention needs to be given to minimizing the technical imperfections inherent to the cable transmission facility.

Protecting cable programming, including the retransmission of broadcast stations, from unauthorized reception is also essential to cable transmission of ATV. It appears that several ATV formats are rather fragile and have the potential to be more susceptible to degradation when scrambling and descrambling

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4/ In a separate statement submitted to the FCC Advisory Committee on Advanced Television Service in conjunction with its Interim Report, NCTA expressed concern that proposed procedures addressed only broadcast-related testing.

techniques are introduced. Moreover, in their quest to squeeze as much video and audio information into the narrowest bandwidth, some ATV system designers are neglecting to provide space within the signal for carrying addressing codes and commands. With the industry move toward developing more addressable cable systems, the ATV system should be capable of incorporating an encryption and addressing process, while maintaining a high quality picture.[5/]

Beyond signal robustness and encryption capability, the broadcast industry and the cable industry also share concerns about a variety of other elements in the ATV equation, including aspect ratio, video resolution, audio quality and spectrum efficiency. The industries will continue to exchange information and to coordinate their efforts on these matters as well.

III. THE POSSIBILITY OF MULTIPLE ATV TRANSMISSION STANDARDS SHOULD REMAIN OPEN AT THIS TIME.

Since the inception of the HDTV policy debate, the cable industry has consistently taken the position that consumers will be best served if every video medium is allowed to deliver ATV in a format that is optimal for that medium. In this manner, the American public will not only be able to enjoy the full benefits of this new technological innovation, but the video delivery media will be able to compete based on their inherent capabilities, rather than on the limits of one medium. Thus, while the

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5/ See Paul Kagan Associates, Cable TV Technology, October 25, 1988, p. 4.

adoption of a single standard for all media -- broadcast, cable, DBS and others -- may be ideal, the possibility of multiple standards should remain open at this time.

For example, as noted above, cable technology and broadcast technology are quite different. The testing of ATV systems that are primarily optimized for broadcast television may reveal that the broadcast ATV standard limits cable's ability to provide its subscribers with a superior quality ATV signal. In that event, cable should have the opportunity to select an alternative standard that is optimized for the unique characteristics of cable technology.

The essential point is that the broadcast ATV standard should not dictate the maximum performance level of all other media nor inhibit their ability to tailor ATV to their particular needs. The Commission's intention to maintain flexibility in the standards-setting process is a good sign that, if warranted, cable-specific ATV systems will be able to develop. As noted earlier, however, NCTA is merely concerned that in its desire to move quickly in the adoption of broadcast ATV standards, the Commission will inadvertently hinder the development of alternative systems. Therefore, the Commission should not take any action that would close the door on multiple standards at this time.

Of course, allowing multiple transmission standards to develop should not mean that consumers are left with a confusing array of incompatible ATV systems and equipment. Indeed, since the ability to reach viewers drives the interested industries,

they have every incentive to work together to reach a consensus on compatibility matters. The cable industry appreciates this concern given past problems with integrating subscriber equipment with cable-ready television receivers. As will be discussed below, compatibility between alternative media can be achieved economically through the cooperative efforts of inter-industry technical organizations and through the establishment of some minimum standards.

IV. THE COMMON INTERESTS OF THE VIDEO DISTRIBUTION MEDIA SHOULD LEAD TO THE DEVELOPMENT OF COMPATIBILITY STANDARDS WITH MINIMUM GOVERNMENT INVOLVEMENT.

At this stage in ATV development, the Commission has accurately determined that there is a "commonality of interests" among all industry participants to achieve "inter-operability" among alternative video distribution media without government involvement. Thus, NCTA supports the Commission's intention at this time not "to require compatibility among the various media or set specific signal or equipment standards for this purpose." This will allow the industry-wide technical organizations and advisory groups to devise appropriate interfaces and compatibility standards.[6/]

6/ See Further Notice, pp. 57-58. In its Interim Report, the FCC ATV Advisory Committee, an industry-wide body, concluded that "expeditious consideration should be given to the achievement of effective and inexpensive ATV interfaces between broadcast and nonbroadcast media." Interim Report, p. 9. The Committee clearly contemplated that techniques for accommodating different reception standards could be achieved through industry consensus.

Since the display standard, to a great extent, is independent of the transmission format, ATV television sets can be designed to accommodate different standards. In the event that multiple transmission standards evolve, there are several avenues available to the communications industry to achieve compatibility. The options currently under consideration are an "open architecture" receiver or an external "multi-port" interface connector device.

A. Open Architecture Receiver

In the Further Notice, the Commission raises the option of achieving compatibility through the development of an "open architecture" receiver. This type of receiver, which encompasses several different approaches, has been the subject of significant debate among the participants in the ATV process. The term typically is used to refer to a "smart" receiver, that is a television set that is capable of identifying and receiving different transmission formats. This is accomplished by a computer-like bus and monitor with built-in circuitry that utilizes plug-in cards containing software programming to perform signal reception and processing.[7/] The consumer electronics industry and others have strongly objected to this "all-inclusive" approach to ATV standards-setting on the grounds that

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7/ Another type of "open architecture" approach is component television, in which a separate monitor, receiver, tape player, and signal processor/decoder performs each function. Historically, component television has had low appeal since many consumers have little desire to operate a complex web of separate equipment to view a program.

open architecture sets will be too costly and too complex. They also have asserted that open architecture will reduce production economies, delay ATV introduction and raise consumer safety concerns.

NCTA is concerned that there may be significant drawbacks to an all-inclusive open architecture approach to ATV. In particular, the cost of an ATV set with integrated signal processing circuitry capable of translating different standards would apparently be quite high. This high cost, added to an already expensive ATV receiver, could have a negative impact on rapid consumer acceptance of ATV technology. Moreover, consumers may not want the task of having to sort out various receiver cards or to physically install them.[8/]

These perceived shortcomings to a fully open architecture receiver may tilt the scales in favor of other methods of accommodating various transmission formats. As discussed below, conversion capability could be achieved by incorporating an external device on the back of the receiver, such as a "multi-port" connector or a baseband circuit board (i.e., an RGB and digital audio input).[9/] With advancements in interface capabil-

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8/ Some engineers have suggested that in-home installations could risk exposing consumers to potential harm by electric shock.

9/ Another factor that could effectively reduce the cost of multi-standard TV sets is the selection of multiple standards that are interrelated, i.e., a 6 MHz version of the HDTV format for broadcasters and a 9 or 12 MHZ version for other media.

ity, it is feasible for television sets to be capable of displaying different signal formats at reasonable cost.

B. Multi-port Interface Connector

As the Commission recognizes in the Further Notice, there are various voluntary industry proposals under consideration that would facilitate multi-standard capability in advanced television receivers. For example, a "multi-port" connector, similar to the EIA IS-15 standard, could be readily adapted to convert multiple ATV transmission formats to a display picture.[10/] In fact, the FCC Advisory Committee's Planning Subcommittee Working Party on Alternative Media Technology and Broadcast Interface is currently developing the specifications for an ATV multi-port connection standard. The cable industry is very involved in that effort.

In order for the multi-port alternative to be effective, it is imperative that a baseband component video (BCV) signal be specified for all media. This minimum standard should define the

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10/ The EIA Interim Standard No. 15 (IS-15) is an video/audio interface in which the receiver (or VCR) contains baseband video and wideband audio capability and provides inputs for stereo audio, baseband video and optional R/G/B video. In addition, there are control signals that are passed between the receiver and the multi-port peripheral that are intended to support its use as a cable decoder. The interface, which has already been implemented by several set manufacturers, is currently being updated from an interim standard to a full EIA standard. The new version will replace the R/G/B video by Y/C and color difference video inputs. Any video sources providing R/G/B can still be accommodated by matrixing them to color difference signals. An additional feature that is being incorporated into the revised standard is a communications link between the receiver and the peripheral. Among the potential applications for this feature, is to enable cable systems to conduct pay-per-view transactions via the interface connector.

number of scan lines, the field rate, and the aspect ratio for all ATV transmissions. As the lowest common denominator signal, the BCV signal would provide an economical and practical means to interconnect ATV signals from various feeder and distribution systems. Without this minimum amount of standardization, the television receiver would have to incorporate built-in circuitry to convert between different systems.

The multi-port concept seems to provide an efficient, practical approach to accommodating multiple transmission formats. NCTA would therefore recommend that this approach be given adequate time to develop in the context of advanced television.

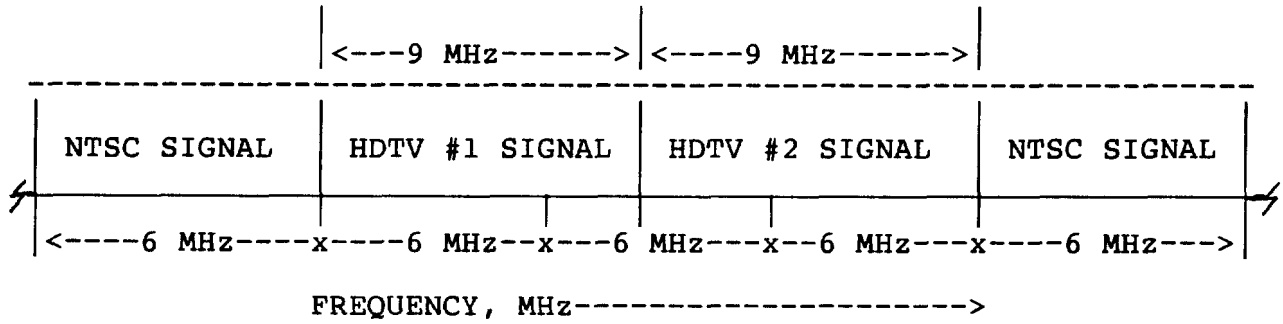
V. AT THIS STAGE IN ATV DEVELOPMENT, THE OPTIONS PROPOSED FOR BROADCAST SPECTRUM ALLOCATION PRESENT BOTH KNOWN AND UNKNOWN ADVANTAGES AND DISADVANTAGES FOR CABLE TRANSMISSION OF ATV.

In the Further Notice, the Commission has proposed essentially three spectrum allocation options for broadcast transmission of advanced television: (1) provide ATV within 6 MHz; (2) provide an additional 3 MHz augmentation signal; and (3) provide an additional 6 MHz for either an augmentation signal or for a dual non-compatible ATV signal. While there are obvious advantages and disadvantages for cable systems under each scenario, there are many more unknowns given the limited information available on the systems that fall within each category. Thus, the cable industry can only offer preliminary observations and judgments on the impact of these options on cable television.

In evaluating spectrum options, we wish to point out that while the cable industry is theoretically not constrained by

spectrum limitations, developing a spectrum-efficient ATV system is important to the industry. This is because channel availability for increasing numbers of made-for-cable services, in many instances, requires upgrading and rebuilding of cable systems. And while the industry will continue to invest in plant improvement and to experiment with fiber optics and other technologies to increase channel capacity, excessive cable spectrum need not be consumed by an inefficient ATV system.

Currently, there is ongoing debate both within the cable industry and within the communications industry generally as to whether a high quality ATV signal can be delivered effectively in the standard 6 MHz channel, whether or not it is NTSC-compatible. If actual tests were to reveal the inadequacies of the various 6 MHz proposals, current studies suggest that the most optimal transmission format for cable would utilize three concatenated 6 MHz spectrum slots to create two ATV channels. Alternatively, a 6 MHz ATV signal could be augmented by either a 3 MHz or a 6 MHz channel. The following chart illustrates these two approaches:



As a practical matter, some cable systems may be able to adapt to one or another of these approaches more readily than other systems. Clearly, a state-of-the-art cable system with 550

MHz, and a 70-plus channel conduit with excellent transmission performance, can accommodate ATV more readily than cable systems now limited to 30 or 40 channels. However, given the likely time frame for the development of ATV program services (3 to 4 years), it is likely that many cable systems with limited bandwidth will have been upgraded to higher capacity before these services are introduced. Moreover, it is likely that only a few ATV services will appear at the outset and that they will grow at a gradual rate for the first several years. Thereafter, assuming the technology takes off, ATV programming should develop quite rapidly. This growth trend seems to coincide with normal system rebuilds driven by plant depreciation and other factors. Furthermore, the technology to upgrade cable systems to 600 or more MHz should be commonplace in the future and other technologies such as fiber optics could be widely in place to provide substantially more capacity.[11/]

Therefore, although a 6 MHz solution would ease the transition to ATV, an increase to 9 or even 12 MHz could be accommodated by the time the new technology becomes a reality in the marketplace. In the meantime, the cable industry will continue its efforts to identify the most spectrum-efficient ATV system.

Now we turn to a discussion of our preliminary views on the proposed spectrum allocation options.

11/ At present, 12 of the 15 largest multiple system operators are experimenting with fiber applications to cable. TCI, the largest cable system operator, just announced that it will phase in fiber optic technology. See Broadcasting, November 28, 1988, p. 56.

A. 6 MHz Option

As reflected above, in a "perfect world", ATV service would be provided in the current 6 MHz channel allotment. This has obvious immediate advantages for broadcasters who must rely on scarce spectrum and for cable operators whose systems are divided into 6 MHz spectrum slots. However, it appears that designing a high quality ATV system that can be transmitted without significant degradation or impairment may require more than 6 MHz of bandwidth.

As a result of its initial studies of various ATV proposals, the NCTA Engineering Committee has determined, at least preliminarily, that NTSC-compatible ATV systems that utilize unusual modulation techniques to fit the signal into 6 MHz may not be rugged enough to pass through cable television head end processors and converters without resulting in a significantly degraded picture. As alluded to earlier, this is largely because as more and more of the ATV information is compressed, the more sensitive the signal becomes to noise and other distortions in the cable distribution network. In addition, prematurely limiting the broadcast ATV standard to 6 MHz at this time may result in significant compromises in picture quality that could be avoided with further development, testing and redesign of particular systems.

Therefore, given the already apparent disadvantages with highly compressed signals, NCTA would recommend against adopting a 6 MHz option until adequate testing is done both over-the-air and over cable.

B. Additional 3 MHz Augmentation Option

Providing broadcasters with an additional 3 MHz for an ATV system increases the likelihood that the system will produce a high quality picture and compact disc-like sound. Another major advantage is that the augmentation option may require less modification to the NTSC portion of the signal than is required of systems which utilize modulation techniques to confine the ATV signal to 6 MHz. Keeping the NTSC signal largely intact may have the added benefit of resulting in less interference to reception on existing TV sets. The possible downside is that ATV receivers using augmentation channels would need two tuners with the capability of being programmed to track together. Additional circuitry would be required to "stitch" the two signals together and to dynamically correct for propagation differences between the NTSC and augmentation signals.

The 3 MHz augmentation option also shows promise of producing a signal that is rugged enough for terrestrial broadcast and cable transmission. Preliminary tests of the North American Philips system, for example, indicates that even simple analog transmission of the 3 MHz augmentation signal through cable produces good results.

Although it provides lower resolution than wider ATV signals, the 3 MHz augmentation approach is arguably more spectrum-efficient than a 6 MHz incompatible signal that would have to be simulcast with an NTSC signal. However, as the Commission has noted, under the simulcast approach the NTSC