

**ADVISORY COMMITTEE
FINAL REPORT AND RECOMMENDATION**

**FEDERAL COMMUNICATIONS COMMISSION
ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE**

November 28, 1995

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I. INTRODUCTION

This is the final report and recommendation of the FCC's Advisory Committee on Advanced Television Service. It was adopted by the Advisory Committee at its ninth and final meeting, held in Washington, DC, on November 28, 1995.

This year is the 100th anniversary of radio broadcasting. Television is only half as old; it was introduced in 1941 when the FCC adopted the current NTSC standard.¹ Subsequently, TV was improved in 1953 when the Commission approved the NTSC color standard. Only a few minor improvements (most notably, the addition of stereo audio in 1986) have been made in the ensuing four decades. This report heralds the greatest advance in broadcast television technology since its inception over fifty years ago. The possibilities for the future include dazzling pictures, CD-quality sound, the flexibility for multiple programs and data streams, and interoperability with alternative media and systems including computers.

In 1987, the FCC and Advisory Committee began to study the potentially great technical improvements that might be possible with advanced television ("ATV").² At the time, new transmission systems were being developed for direct broadcasting satellite and other media. It was not certain, however, whether a complete ATV system could work in 6 MHz over-the-air channels. Now, eight years later, after countless public meetings involving hundreds of industry

¹ The NTSC standard, which is named after the National Television Systems Committee which developed and modified it, is embodied in Part 73 of the Commission's Rules, *See* 47 C.F.R. § 73.682 (1994).

² The FCC defines ATV to "include any system that results in improved television audio and video quality . . ." *Tentative Decision and Further Notice of Inquiry* in MM Docket No. 87-268, 3 F.C.C. Rcd 6520, 6521 note 1 (1988). High definition television ("HDTV"), a subset of ATV, generally refers to systems that provide quality approaching that of 35 mm film. *Id.* HDTV "has a resolution of approximately twice that of conventional television in both the horizontal (H) and vertical (V) dimensions and a picture aspect ratio (HxV) of 16:9." ATSC Digital Television Standard at 5.

volunteers and a rigorous program of testing and analysis conducted on seven prototype ATV systems at three futuristic laboratories, the Advisory Committee on Advanced Television Service herein recommends that the Federal Communications Commission adopt the “ATSC Digital Television Standard” as the U.S. standard for ATV broadcasting.

This standard represents truly world-leading technology. It will allow American television broadcasters and viewers to participate in the digital age and is equally available for cable TV providers and subscribers. In addition, more than any other ATV system in the world, the technology is interoperable with other imaging media and systems.

The present document has two principal sections. First, the Advisory Committee reports on its history, progress and results, including the final tests on a prototype advanced television system from a consortium of companies known as the Digital HDTV Grand Alliance. Second, the Committee sets forth the details of its recommendation.

II. REPORT OF THE ADVISORY COMMITTEE

A. Purpose of the Committee

In early 1987, the Federal Communications Commission (“FCC” or “Commission”) initiated a rule making proceeding on advanced television (“ATV”) service “to consider the technical and public policy issues surrounding the use of advanced television technologies by television broadcast licensees.”³ Later that year, and in order to assist the FCC “in gathering and

³ *Notice of Inquiry* in MM Docket No. 87-268, 2 F.C.C. Rcd 5125, 5126 (1987).

processing much of the necessary information” on ATV,⁴ the Commission established the Advisory Committee on Advanced Television Service (“Advisory Committee” or “ACATS”).⁵

In its Charter, the Advisory Committee was given the broad mandate to “advise the Federal Communications Commission on the facts and circumstances regarding advanced television systems for Commission consideration of the technical and public policy issue[s].”⁶

The Committee’s Charter also directed that

In the event that the Commission decides that adoption of some form of advanced broadcast television is in the public interest the Committee would also recommend policies, standards and regulations that would facilitate the orderly and timely introduction of advanced television services in the United States.⁷

The Advisory Committee’s work became more specifically directed on advising the FCC on a technical standard for ATV broadcasting when, in late 1990, it entered a Memorandum of Understanding (“MOU”) with the Commission and two ATV test laboratories.⁸ This narrowed focus was articulated by the Committee a few months later: “Ultimately, it is the Advisory

⁴ *Id.*

⁵ *Formation of Advisory Committee on Advanced Television Service and Announcement of First Meeting*, 52 Fed. Reg. 38523 (October 16, 1987). ACATS was formally established under the provisions of the Federal Advisory Committee Act (“FACA”), *codified at* 5 U.S.C. App. II (1988). The Committee has operated in accordance with the provisions of the FACA and GSA’s Federal Property Management Regulations. 41 C.F.R. § 101-6.10 (1994).

⁶ *Id.* at p. 38523. The Advisory Committee Charter is attached at Appendix A.

⁷ *Id.*

⁸ A copy of the MOU is attached at Appendix B. In accordance with the Charter, the Committee on occasion also has received direction from the Chairman of the FCC.

Committee's goal to agree on an ATV technical description that can be recommended to the FCC for consideration as the next generation television transmission standard."⁹

B. Committee Structure and Participants

The FCC appointed the twenty five members of the Advisory Committee and selected Richard E. Wiley to be its Chairman. Described in the Charter as the "Parent Committee," the membership of this private-sector body was selected to achieve balanced representation from among the broadcasting, cable, consumer electronics, satellite broadcasting, program production, film, and telephone industries. At the time, these were the major industries thought to be involved in advanced television. Due largely to the state of technology in 1987, the FCC did not then perceive the computer industry as being significantly affected by ATV broadcasting. However, subsequent technological advances, particularly the introduction of digital transmission technology that enhances interoperability with computers and other media and systems, generated significant interest within that industry. Thereafter, computer company officials participated actively and effectively in ACATS activities. Additionally, the Chairman of the FCC recently appointed two industry members to the Parent Committee to replace other members who had resigned.¹⁰

This Parent Committee has met roughly once per year since its inception and, as enumerated below, has presented several interim reports to the Commission. The work of the

⁹ Fourth Interim Report of the Advisory Committee on Advanced Television Service ("ACATS Fourth Interim Report") at pp. 18-19 (April 1, 1991). Obviously, the Commission, not the Advisory Committee has the authority to establish a broadcasting standard. *See* 47 U.S.C. § 303 (e), (f) (1988).

¹⁰ A current membership list of the Parent Committee is attached at Appendix C.

Advisory Committee, however, was achieved primarily by volunteers organized in various groups under the Parent Committee. Part of this staff organization was described in the Charter, which listed the Planning, Systems, and Implementation Subcommittees. The Advisory Committee also formed a “Special Panel” in early 1992,¹¹ and a “Technical Subgroup” later that year.¹² Both of these bodies were comprised of leading technical experts and were structured with constituent subgroups.¹³ As with all Advisory Committee bodies, the leadership of these groups was selected to balance the interests of the various affected industries.

By some estimates, over 1000 individuals have participated in the Advisory Committee’s work during its eight year history. Participants have come from the broadcasting, cable, consumer electronics, computer, program production, film, telephone, and other industries -- many of them recognized experts in their fields. Representatives of labor, academia, and public interest groups also have taken part. Moreover, because all Committee meetings have been open to the public, interested citizens and the press also have attended meetings of the Parent Committee and its many subgroups.

To the great benefit of the Advisory Committee, members of the FCC’s staff often have observed and participated in Committee meetings. The Commission’s guidance, expressed formally in rule making proceedings and informally in myriad interactions with Advisory Committee officials, has been invaluable to our work. However, the Committee has received no

¹¹ Minutes, Advisory Committee Meeting p. 3 (March 24, 1992).

¹² Letter, Richard E. Wiley to ATV System Proponents (August 21, 1992).

¹³ A list of the Advisory Committee staff structure is attached at Appendix D.

funding from the Commission or other government bodies. Its operating costs (*e.g.*, postage, photocopying, and telephone) have been underwritten solely by small donations from Committee members.¹⁴

C. Relationship with Other Bodies

Several organizations not directly part of the Advisory Committee were critical to its mission and success. Key among these were the three laboratories that tested ATV hardware from several system proponents including the Digital HDTV Grand Alliance. The largest of the three was the Advanced Television Test Center (“ATTC”), a private, non-profit organization established in 1988 and developed by American broadcasting and electronic industry entities. Using over \$15 million in contributions from its sponsors, and \$7.5 million in fees from system proponents, the ATTC -- under the expert leadership of its President, Peter Fannon -- constructed a state of the art radio frequency testing facility in Alexandria, Virginia, and conducted the broadcasting laboratory-based tests for the Advisory Committee. Collocated with the ATTC was the ATV facility of the Cable Laboratories, Inc. (“CableLabs”), a research and development consortium of American cable television system operators. CableLabs carried out the cable portions of the Committee’s lab and field testing programs. Finally, the Advanced Television Evaluation Laboratory (“ATEL”), an Ottawa-based facility of Canada’s Department of

¹⁴ See Letter, Richard E. Wiley to Advisory Committee Members (May 4, 1993). Early in the Advisory Committee’s history, nineteen members contributed \$5,000 each, for a sum of \$95,000 and, in the summer of 1993, thirteen members contributed \$3,000 each, for a grand total of \$134,000. Parent Committee members from small organizations or providing special services were not asked to contribute to this operating fund. A small balance remains.

Communications managed by the Canadian Communications Research Centre, conducted subjective tests using non-expert viewers from both Canada and the United States.¹⁵

Another organization which made highly valuable contributions to the Advisory Committee's report was the Advanced Television Systems Committee ("ATSC"), a standards organization formed in 1983 by the Joint Committee on Intersociety Cooperation ("JCIC").¹⁶ With the approval of the FCC, the ATSC has done vital work in documenting the ATV broadcasting standard recommended herein.¹⁷ The ATSC is ably chaired by James C. McKinney, a member of the Advisory Committee.

D. Advisory Committee Accomplishments

Over its eight year history, and in the course of making numerous decisions, the Advisory Committee produced thousands of public documents, among which are five Interim Reports to the FCC, and ATV System Recommendation dated February 24, 1993, and a report to Congress in 1989.

Given its primary mandate to advise the FCC on a standard for ATV broadcasting, one of the most critical early determinations was that the Committee would evaluate and recommend a

¹⁵ In addition, the Association for Maximum Service Television ("MSTV") and the Public Broadcasting Service ("PBS") played key roles in the Advisory Committee's field testing process in Charlotte, North Carolina.

¹⁶ The JCIC itself was formed by the Electronic Industries Association, the Institute of Electrical and Electronics Engineers, the National Association of Broadcasters, the National Cable Television Association, and the Society of Motion Picture and Television Engineers.

¹⁷ *Memorandum Opinion and Order / Third Further Notice of Proposed Rule Making* in MM 87-268, 7 F.C.C. Rcd 6924, 6982-6983 (1992).

system to the Commission only if it had been tested in hardware form.¹⁸ Thereafter, work was focused on preparing for, conducting, and analyzing ATV hardware tests.

Initially, some 23 different concepts for an ATV broadcasting system were submitted to the Committee. All of them employed analog video transmission techniques. Some proposals were for enhanced definition television (“EDTV”) systems, which would augment, either within the existing channel or with additional spectrum, the quality of NTSC broadcasts. Other entities proposed so-called “simulcast” HDTV systems, which would operate on different channels and in a manner unrelated to NTSC broadcasts. Through proponent mergers and attrition, the 23 proposals soon were reduced to a handful.

In 1990, the FCC made a key decision to “select a 'simulcast' high definition television (HDTV) system -- that is, a system that employs design principles independent of the existing NTSC technology for ATV service.”¹⁹ That same year, one of the remaining system proponents, General Instrument Corporation, submitted a new proposal incorporating all-digital transmission. Three of the other four remaining HDTV systems thereafter adopted this technological advance; only NHK retained its original analog transmission design. Although the introduction of digital eventually resulted in at least two years’ delay in the Advisory Committee schedule, the advance was well worth the wait. Indeed, after much more time and money spent with analog ATV proposals, both Japan and Europe now are pursuing digital solutions.

¹⁸ See *Operating Procedures* of the Committee's Systems Subcommittee (approved April 29, 1988): “[o]nly candidate ATV systems which have been reduced to hardware will be evaluated and tested by [Systems Subcommittee] Working Party 2.”

¹⁹ *Report and Order* in MM Docket No. 87-268, 5 F.C.C. Rcd 5627 (adopted August 24, 1990).

From mid-1991 through the end of 1992, the one remaining EDTV system and all five HDTV systems were subjected to an exacting program of laboratory tests at the ATTC, CableLabs, and ATEL.²⁰ As described above, these laboratories are designed to emulate the broadcast and cable transmission environments, as well as the home viewing environment. The test procedures were exhaustively developed by the Advisory Committee, with the objective of determining which of the competing systems should be recommended to the FCC as the basis for a new transmission standard. For a variety of reasons, not the least of which was the limited availability of test equipment and space, the systems were tested serially rather than in head-to-head comparisons, and video subjective testing was conducted by comparing pictures produced by each system to a single studio reference picture rather than to each other.

There were innumerable tasks and countless meetings involved in preparing for and conducting the test program. For example, detailed test plans, sometimes specific to the particular system under test, had to be developed. Then, after testing procedures for the analog systems had been developed, the Committee was required to redesign many of them with the advent of digital transmission systems. Moreover, new pieces of hardware had to be constructed solely for use in testing, and great care and precision was required to create video and audio test sequences in order to make certain that the systems were completely tested.

All of these efforts took time. On some occasions, implementation errors in the proposed ATV systems caused additional delays in testing. Further, considerable effort was invested in

²⁰ At the request of its proponents, the Advisory Committee did not report or consider the test results on the EDTV system. Letter, James E. Carnes to Richard E. Wiley (March 2, 1992); Letter Richard E. Wiley to James E. Carnes (March 5, 1992).

fashioning evaluation methods and criteria to allow the Advisory Committee to assess all of the test results. These criteria included video/audio quality, interoperability, spectrum issues, and cost issues.²¹

Chaired by Dr. Robert Hopkins, the Special Panel convened for four days in early 1993 to consider the test results. Under the rigorous technical criteria established by the Committee, the four digital HDTV systems proved superior to the analog proposal which, accordingly, was eliminated from further consideration. Although the Panel explicitly found that “digital HDTV is achievable for the United States,”²² it also concluded that each of the digital entries had shortcomings that required further technical refinements. Indeed, in presentations at a November 1992 meeting of the Technical Subgroup formed for this purpose,²³ the remaining proponents had suggested a number of significant improvements to their respective systems.

In February 1993, and based on the Special Panel Report, the Advisory Committee offered the proponents two options: either undergo a second, expensive and time-consuming testing process or, alternatively, combine their efforts into a single “best of the best” (or so-called “grand alliance”) system²⁴. There were three key advantages to the latter option: first, because

²¹ Letter, Richard E. Wiley to FCC Chairman Alfred C. Sikes (January 10, 1992). This letter forwarded to the Commission the Advisory Committee’s proposed ATV System Recommendation Process.

²² ATV System Recommendation at p. 1-1 (February 24, 1993).

²³ Letters, Richard E. Wiley to Advisory Committee Members and ATV System Proponents (August 21, 1992). The Technical Subgroup was co-chaired by Joseph A. Flaherty of CBS and Irwin Dorros, formerly of Bellcore.

²⁴ Press Release, FCC Advisory Committee on Advanced Television Service (February 24, 1993). The Committee already was aware that such an alliance might be formed. *See* Letter, Richard E. Wiley to Advisory Committee Members (January 18, 1993).

the systems were becoming more alike as their proponents learned from each other's technical advances, the Advisory Committee's eventual task of selecting between them was becoming more problematic; second, the retesting process was certain to be expensive and time-consuming for all concerned; and third, and most importantly, a single system -- encompassing the best features of various proposals -- might lead to the development of a truly superior technology. This option of combining the systems had been discussed by the Committee two years earlier.²⁵

After many months of arduous business and technical negotiations, the proponents chose the latter course. In late May, 1993, a consortium called the Digital HDTV Grand Alliance was formed with a number of major American and European entities: AT&T, the David Sarnoff Research Center, General Instrument, the Massachusetts Institute of Technology, North American Philips, Thomson Consumer Electronics, and Zenith Electronics.²⁶

At the time, the Advisory Committee made clear to the Grand Alliance members that they should not present the Committee with an inflexible, technical *fait accompli*; the Committee's work had been, and must remain, a public process.²⁷ Accordingly, the Committee directed the Technical Subgroup to work with the Alliance, optimize its proposal, and generate agreement on specifications for a prototype system.²⁸ Thereafter, the Subgroup would supervise construction

²⁵ See ACATS Fourth Interim Report at p. 19 (April 1, 1991): “[I]n the unlikely event that each system proves to be inadequate, a new design could be composed of elements drawn from the different systems. If so, the Advisory Committee would encourage the establishment of voluntary agreements among proponents to synthesize their designs.”

²⁶ ACATS Press Release (May 24, 1993). Attached at Appendix E.

²⁷ Letter, Richard E. Wiley to ATV System Proponents (May 11, 1993).

²⁸ Letter, Richard E. Wiley to Advisory Committee Members (May 24, 1993).

and testing of the system and, if all went well, the Advisory Committee would recommend it to the Commission.

Six so-called "Expert Groups" were formed within the Technical Subgroup, each to focus on selected aspects of the Grand Alliance proposal. After detailed discussions between these Groups and the Alliance extending over many months, a modified and considerably enhanced system proposal was developed. In October 1993 and February 1994, the Advisory Committee approved for prototype construction all the elements of this proposal.²⁹

The Grand Alliance system was tested at the ATTC, CableLabs, and ATEL facilities from March through August, 1995. The complete Alliance system also was evaluated in the field, by PBS, MSTV, and CableLabs, at the Advisory Committee broadcasting facilities in Charlotte, in July and August 1995.³⁰ Detailed test reports were prepared by each organization.³¹ Based on these reports, the Technical Subgroup prepared the Committee's Final Technical Report.³²

In early 1995, the Chairman of the FCC asked the Advisory Committee to investigate specific scanning formats for so-called standard definition television ("SDTV").³³ Several

²⁹ Press Releases, Advisory Committee on Advanced Television Service (October 21, 1993, and February 24, 1994).

³⁰ Field tests on the Grand Alliance VSB modem alone already had shown it to perform "significantly better" than NTSC. Press Release, Advisory Committee on Advanced Television Service (September 19, 1994).

³¹ The test reports are attached at the Annex "Record of Test Results."

³² Attached at Appendix F.

³³ This term is used to signify a digital television system in which the quality is approximately equivalent to that of NTSC. ATSC Digital Television Standard at 8.

months earlier, the Technical Subgroup had prepared a “White Paper,”³⁴ which described how the Grand Alliance system could carry multiple streams of data that, for example, could each be an SDTV program. The Technical Subgroup considered the merits of various proposed SDTV scanning formats and, on July 19, 1995, based on the recommendation of its Expert Group, adopted two such formats for inclusion in the ATV standard.³⁵

E. Description of the Grand Alliance System

As indicated above, the Advisory Committee approved system specifications premised on the ATV proposal from the Digital HDTV Grand Alliance. From these specifications, which were also used by the Alliance to construct its prototype system, the ATSC Digital Television Standard was derived.³⁶ In essence, the ATSC standard describes five subsystems: scanning, video and audio compression, transport, and transmission.³⁷

For scanning, the standard includes two HDTV formats: a 720 lines x 1280 pixels per line format at 24, 30, and 60 frames per second progressively scanned, and a 1080 lines x 1920 pixels per line format at 24 and 30 frames per second progressively scanned and 60 fields per

³⁴ Attached at Appendix G.

³⁵ See Report on SDTV Video Formats, Expert Group on Scanning Formats / Compression at p. 1 (July 19, 1995). Attached at Appendix H.

³⁶ ATV technological developments have occurred since the Grand Alliance prototype system was designed and constructed, and will continue to occur in the future. It would be appropriate to perform hardware demonstrations of such developments (including SDTV) that are documented in the ATSC standard.

³⁷ The Advisory Committee approved the Grand Alliance system specifications and herein recommends FCC adoption of the ATSC standard specifically taking into account a wide variety of issues, including the Nation’s future technological needs and the embedded investments of American consumers and industries (investments that the Committee believes should not be unduly diminished).

second interlaced scanned. Two SDTV formats also are described: 480 lines by 704 pixels per line in both 4:3 and 16:9 aspect ratios, and 480 lines by 640 pixels per line in 4:3 aspect ratio. Each SDTV format offers progressive scanning modes.

This balance of scanning formats -- designed to accommodate the interests of various industries operating within the Advisory Committee -- was reached only after considerable deliberation in the Advisory Committee's subgroups. Proponents of various formats argued vigorously for their respective positions but, ultimately, agreed on one point: that an over 1000-line 60 Hz progressive scanning format would be preferable. Unfortunately, this format is not possible with current state-of-the-art compression technology. The Committee foresees, however, that improvements in compression will allow the ATV standard to "migrate" to incorporate it in the coming years.³⁸ The Committee also believes that including the interlace scanned 1080-line, 60 Hz format will provide such a migration path.

For digital video compression, the Alliance system incorporates MPEG-2 parameters, including "B-frames." Audio compression employs 5.1-channel Dolby AC-3 techniques. The packetized data transport system incorporates features and services of MPEG-2 that are applicable to ATV and provided for in the MPEG-2 transport layer. Finally, the transmission subsystem is based on 8- and 16-VSB technology for broadcasting and cable, respectively.

³⁸ The Information Technology Industry Council, an association of information technology product and service providers, has endorsed this rapid migration approach in order to "best achieve the maximum benefits to consumers." Letter, Rhett Dawson, ITI President, to Richard E. Wiley (October 31, 1995).

F. Interoperability with Alternative Media and Systems

Since its inception, the Advisory Committee has emphasized the need for U.S. ATV broadcasting technology to be interoperable with alternative media, particularly cable television systems. The Committee believes interoperability also takes on critical importance given the future needs for high resolution digital imagery in American homes and the development of a National Information Infrastructure (“NII”). Indeed, entertainment-based HDTV receivers will introduce digital video transmissions into many residences.

As noted above, interoperability was one of the selection criteria adopted by the Committee. Over four years ago, the working party tasked to study interoperability was asked to reexamine this issue following introduction of the digital HDTV systems. It developed recommendations that led to agreement on so-called "headers and descriptors." This method of data identification, combined with advanced data packetization techniques, acts as a kind of translator to tell all digital devices what type of data is being transmitted.

The working party and an “interoperability review panel” also adopted a list of eleven characteristics critical to interoperability.³⁹ The Advisory Committee believes the Grand Alliance system adequately addresses all of these factors. For example, compliance with the MPEG-2 standard was emphasized by the Technical Subgroup and adopted by the Grand

³⁹ The list of characteristics is attached at Appendix I. These “were based on the needs and desires exhibited by alternative media advocates, not only for the delivery of terrestrial broadcast programming, but also for other delivery approaches and applications relating to computing, communications, motion pictures, and imaging.” ATV System Recommendation at pp. 4-4, 4-5 (February 24, 1993).

Alliance to increase international compatibility and, more importantly, interoperability among a variety of digital devices.

A critical aspect of the scanning format scheme, unanimously recommended by the Technical Subgroup, is the availability of progressive scanning and square pixels. These attributes are preferable for some -- particularly computer -- applications. However, interlaced scanning also is important: it is a video data compression technique in which although only half the amount of data is transmitted, the bulk of the video picture remains. In particular, the test results on the Grand Alliance system demonstrate that there are advantages to both higher line number interlaced, and lower line number progressive scanning formats, and that there is no evidence in the Advisory Committee's record that would justify dropping either format at this time.

In all, the Advisory Committee believes that the Grand Alliance plan strikes the best balance between various technical considerations and needs of different industries. It is a balance that has been endorsed by, among others, a subgroup of the Federal Government's Information Infrastructure Task Force, the 1994 NIST/ARPA Workshop on Advanced Digital Video, and the Information Technology Industry Council. In this regard, it is noteworthy that all other ATV broadcasting systems being developed in the world do not include *any* progressive scanning format. The U.S. approach wisely incorporates the best of *both* scanning techniques.

G. Other Technologies

As required by the 1990 MOU with the FCC and test laboratories, the Advisory Committee has reviewed

new technical advancements in the state of the art, not already provided by the ATV systems pre-certified by the Advisory Committee, that appear to offer important benefits to the public and are sufficiently concrete so as to be tested contemporaneously with the pre-certified systems.⁴⁰

In early 1992, the Advisory Committee found, based on a review of current technology, that there were no new concepts "sufficiently concrete so as to be tested contemporaneously with the pre-certified systems," and that the five HDTV proponent systems then under consideration represented the state of available technology.⁴¹ Later that year, another meeting concluded that a few recently-proposed systems were not sufficiently developed to be considered further by the Advisory Committee. This assessment that was ratified by the Special Panel.⁴²

In 1994-95, at the request of an industry consortium eventually known as the COFDM-Limited Liability Corporation ("COFDM-LLC"), the Committee reviewed a proposal for an ATV modem that would operate using coded orthogonal frequency division multiplexing ("COFDM") techniques.⁴³ The Technical Subgroup established a Certification Experts Group, and tasked it to review the COFDM-LLC proposal which, if it were shown to be "demonstrably superior" to the VSB-based modem already approved as part of the Grand Alliance system, would be recommended for further evaluation and testing by the Advisory Committee. The Experts Group found, however, "based on the claimed benefits of COFDM techniques and,

⁴⁰ MOU at p. 3. *See* Appendix B.

⁴¹ Fifth Interim Report of the Advisory Committee on Advanced Television Service (March 24, 1992).

⁴² Special Panel Document No. SP-019 (February 8, 1993).

⁴³ Letters, Richard E. Wiley to Advisory Committee Members (February 18, 1994), and to Michael J. Sherlock (April 21, 1994, and September 15, 1994).

specifically, of the COFDM modem proposed by the COFDM-LLC, as well as the shortcomings discussed [in the report]”, that “[t]he modem presented by the COFDM-LLC is not ready for test at this time,” and “[t]he COFDM-LLC did not demonstrate the superiority of COFDM over VSB for the majority of markets.”⁴⁴

H. Final Technical Report

As noted above, the Advisory Committee’s Technical Subgroup adopted a Final Technical Report for the Advisory Committee on October 31, 1995.⁴⁵ Based on Advisory Committee-approved specifications and thorough laboratory and field testing of the prototype ATV system as designed and constructed by the Digital HDTV Grand Alliance, the Technical Subgroup found that: (1) the Grand Alliance system meets the Committee’s performance objectives and is better than any of the four original digital ATV systems; (2) the Grand Alliance system is superior to any known alternative system; and (3) the ATSC Digital Television Standard,⁴⁶ based on the Advisory Committee design specifications and Grand Alliance system, fulfills the requirements for the U.S. ATV broadcasting standard. Thus, the Subgroup recommended that the ATSC standard be adopted as the U.S. ATV broadcasting standard.

⁴⁴ Report of the Certification Experts Group at p. 4 (August 8, 1995). Attached at Appendix J. COFDM technology continues to be developed for use in Europe and Asia.

⁴⁵ Attached at Appendix F.

⁴⁶ Attached at Appendix K.

III. RECOMMENDATIONS OF THE ADVISORY COMMITTEE

The Advisory Committee hereby adopts the findings of the Technical Subgroup. Specifically, the Grand Alliance system meets the Committee's performance objectives and is better than any of the four original digital ATV systems; the Grand Alliance system is superior to any known alternative system; and the ATSC Digital Television Standard, based on the Advisory Committee design specifications and Grand Alliance system, fulfills the requirements for the U.S. ATV broadcasting standard.

Accordingly, the Advisory Committee on Advanced Television Service recommends that the Federal Communications Commission adopt the ATSC Digital Television Standard as the U.S. standard for ATV broadcasting.

Although this standard, in accordance with the limited mandate of the Advisory Committee, is recommended for terrestrial ATV broadcasting, the Committee believes that it is suitably interoperable with other video delivery media and imaging systems, including cable television, direct broadcast satellite, and computer systems. The extent to which various features and applications of the standard are allowed or required to be applied to alternative media must be left to the discretion of the FCC as part of its deliberations in the ongoing rulemaking proceeding.

In addition, other ATV regulatory issues, including some previously addressed by the Advisory Committee (*e.g.*, broadcasting allotment and assignment planning), are also being addressed directly by the FCC. For example, the Committee worked at length on broadcasting allotment and assignment planning issues but, more recently, the FCC requested that the Committee discontinue its efforts in deference to the rule making proceeding. Additionally, the

Technical Subgroup has recommended that the Commission require that receivers (and set-top boxes designed to receive ATV broadcasts for display on NTSC sets) be able to receive adequately all ATV formats. This issue now is being addressed in the FCC's rule making.⁴⁷

IV. CONCLUDING REMARKS

The Advisory Committee is indebted to the hundreds of companies, entities, and individuals which have been involved in this entire project. Their cooperative and productive efforts have made a great contribution to the advancement of the video medium in this country and the rest of the world. The Committee also is grateful for the continuous oversight, guidance and support provided by the FCC, particularly the four Chairmen with which the Committee has been honored to work, and the staffs of the Mass Media Bureau, Office of Engineering and Technology, and Office of Plans and Policy.

Respectfully submitted,

FCC ADVISORY COMMITTEE ON
ADVANCED TELEVISION SERVICE

By: _____
Richard E. Wiley, Chairman

November 28, 1995

⁴⁷ *Fourth Further Notice of Proposed Rule Making and Third Notice of Inquiry* in MM Docket No. 87-268, FCC 95-315, 60 Fed. Reg. 42,130 (August 15, 1995).

Appendix A.

Charter of the
Advisory Committee on Advanced Television Service

For copies of the full report, including this Appendix, contact:

*International Transcription Service (ITS)
2100 M Street NW
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202-857-3800*

Appendix B.

Memorandum of Understanding

For copies of the full report, including this Appendix, contact:

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Appendix C.

Parent Advisory Committee

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Appendix D.

Advisory Committee Staff Structure

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Appendix E.

ACATS Press Release (May 24, 1993)

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Appendix F.

Final Technical Report

For copies of the full report, including this Appendix, contact:

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Appendix G.

White Paper
on
Multiple Service Transmission
Via the Grand Alliance System

For copies of the full report, including this Appendix, contact:

*International Transcription Service (ITS)
2100 M Street NW
Suite 140
Washington, DC 20037
202-857-3800*

Appendix H.

Report on SDTV Video Formats

For copies of the full report, including this Appendix, contact:

International Transcription Service (ITS)

2100 M Street NW

Suite 140

Washington, DC 20037

202-857-3800

Appendix I.

Interoperability Characteristics

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2100 M Street NW
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Appendix J.

Report of the Experts Group on Certification

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Appendix K.

ATSC Digital Television Standard

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ANNEX

Record of Test Results October 1995

For copies of the Record of Test Results, contact:

Advanced Television Test Center
1330 Braddock Place
Suite 200
Alexandria, VA 22314-1650
703-739-3850