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Federal Communications Commission
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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	)	
Review of Technical and Operational Requirements: Part 73-E, Television Broadcast Stations	)	MM Docket No. 87-268,
Reevaluation of the UHF Television Channel and Distance Separation Requirements of Part 73 of the Commission's Rules	)	

TO: The Commission

COMMENTS OF FUTURE IMAGES TODAY

Respectfully submitted,

FUTURE IMAGES TODAY

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December 20, 1991

EXECUTIVE SUMMARY

Future Images Today (FIT) is a proponent of a patented advanced television (ATV) transmission system that enables broadcasting of non-compressed high definition images within a 6 MHz channel. In one configuration, the system transmits 1050-line ATV signals in a manner compatible with existing NTSC receivers. The system embodies proven television transmission technology, and is also capable of being incorporated in and enhancing the performance of other proposed ATV systems.

FIT supports a patent procedure whereby patent holders are encouraged to file with the Commission all of their relevant ATV patents, with the identity of such patents being made available to the public.

Compatibility of ATV signals with existing NTSC receivers and home computer equipment, at least during an initial consumer "ATV acceptance" period, is encouraged by FIT. Any regulatory plan by which consumers would be forced to purchase new ATV receivers in order to maintain their reception of ongoing television programming is opposed. FIT proposes that broadcasters should not be compelled to switch to ATV unless a 65% home viewer penetration rate is obtained within 5 years from adoption of a new transmission standard.

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COMMENTS OF FUTURE IMAGES TODAY

Future Images Today, through its counsel and pursuant to Section 1.415(a) of the FCC's Rules, submits the following comments in the above-captioned proceeding and in response to the Notice of Proposed Rule Making released November 8, 1991.

I. Interest of FIT in This Proceeding

1. Future Images Today ("FIT") is a proponent of an advanced television (ATV) terrestrial transmission system ("the FIT system") that enables broadcasting of non-compressed 1050-line high definition images within a current 6 MHz channel and, in one proposed configuration, allows for compatibility with existing NTSC home television receivers. A patent[1] was recently awarded for the FIT system on November 19, 1991.

2. The FIT system is also capable of being incorporated in and enhancing the performance of other currently proposed HDTV "simulcast" or EDTV systems, all of which embody image compression techniques and must therefore compromise picture quality when the televised images move or when scenes

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[1] U.S. Patent 5,067,017, issued November 19, 1991, for Compatible and Spectrum Efficient High Definition Television. Pursuant to the Revised Patent Procedures of the Federal Communications Commission, 3 FCC 2d 26 (1961), copies of the patent are being furnished to the OET concurrently with the present filing. See paragraphs 7 to 12 of Comments, infra.

change in order to stay within a 6 MHz channel bandwidth. All proposed ATV systems are required to satisfy the 6 MHz bandwidth limit for their ATV signals pursuant to the Commission's First Report and Order, MM Docket 87-268, FCC 90-295 (September 21, 1990) ("First Report").

3. The FIT system was conceived by an attorney/radio experimenter who also holds a M.S.E.E. degree, worked full time in the electronics and RF communications fields, and is an FCC licensed Amateur Extra Class Radio Operator (call sign K2LZ). Initial over-the-air transmission experiments with the FIT system were conducted successfully in the 70 cm (UHF) amateur radio frequency band as authorized under 47 C.F.R. § 97.305(c).

4. The FIT system embodies the concept of orthogonality in wave polarizations, a viable concept that has already been adopted for downlink transponders in the satellite TV service[2]. There, 24 channels each with a 36 MHz wide active video bandwidth (a total active video bandwidth of 864 MHz) are contained within a 500 MHz wide spectrum band by assigning mutually orthogonal polarizations to consecutive overlapping channels.[3]

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[2] J.E. Traister, Guide to Satellite Television Installation, Prentice-Hall (1987), at 2-4.

[3] Adjacent 36 MHz wide channels are spaced only 20 MHz apart from one another so that the channels overlap or share common frequency spectrum. Odd-numbered channels are vertically polarized, and even-numbered channels are horizontally polarized.

5. The FIT system enables compatible and high definition (1050-line) broadcasting of a given program from a common transmitting site and on the same 6 MHz wide channel.[4] No separate 6 MHz ATV channel would need to be secured from another portion of the spectrum for purposes of simulcasting as presently contemplated by the Commission. Specifically, existing UHF channel assignments and availability would not be affected.[5]

Adjacent channel interference is eliminated by assigning orthogonal polarizations to the adjacent channels. "The vertical and horizontal polarizations, much like polarized sunglasses, allow only signals polarized in the same sense to be received, and if there are two polarization senses, twice as many signals can be sent." J.E. Traister, supra, at 4.

[4] In the FIT system, a 1050-line high definition image produced at the studio is translated into two 525-line image frames. One frame is composed of all the odd-numbered lines of the original image and the other frame is composed of all the even-numbered lines. The two frames are then transmitted without compression in a conventional 2-field interlaced format using separate transmitters operating at the same video carrier frequency, but are radiated from orthogonally polarized antennas, one horizontal and the other vertical. Conventional NTSC receivers will reproduce 525-line images using their existing antennas. The proposed ATV receiver simply uses a dual polarization antenna, and has appropriate circuitry to reproduce the simultaneously received 1050-line images in the proper sequence on a high definition display screen.

[5] The FIT system was submitted as a proponent ATV system to the Advisory Committee on Advanced Television Systems (the "Committee"). Because the transmission approach taken by the FIT system was not foreseen by the Committee and can best be evaluated by over-the-air testing, the system was not assigned to the Committee's local test laboratory (ATTC/Cable Labs) which simulates over-the-air broadcasting by using closed circuit cables.

In the past, proposed terrestrial television systems were subjected to lengthy over-the-air testing schedules. Several different television transmission systems vying for acceptance as a U.S. standard during the 1930's were regularly broadcasting various program material under experimental license authorizations

6. The FIT system is one that may permit an ATV service to begin in the United States without the need for extensive regulatory action. In an initial configuration, the FIT system provides compatibility with existing NTSC television receivers and does not require new spectrum allocations. Yet, the system is extensible and can accommodate analog or digital image processing techniques that are available now or in the future.[6]

II. Patent Licensing

7. The present Notice seeks comment on patent licensing issues, and on the extent to which a proponent's licensing practices should be considered during the ATV

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from cities nationwide, to allow the public to "preview" what might lie ahead. See excerpts from the 1939 Radio Annual (Exhibit A), particularly pages 477-81. The various forerunner systems to the current standard were themselves referred to as "high definition" systems in contrast to the previous 30-line images transmitted by AM radio stations in the 1920's using a scanning (Nipkow) disk. Exhibit A, pages 472, 473.

American consumers should again be allowed the right to see for themselves and comment on the picture quality of all proposed ATV systems when broadcast over-the-air within a 6 MHz wide spectrum channel, before any final decisions are made by the Commission regarding a change to a new television standard.

[6] Consumer acceptance of ATV would be assured by initially providing for compatibility with the many existing NTSC receivers now in use, and by offering a basic ATV receiver that can reproduce "first generation" compatible ATV signals. The receiver can be constructed so that it could be upgraded at some future time to receive and reproduce non-compatible ATV signals as well.

transmission system selection process.

8. FIT believes that a proponent's patent licensing practices should be considered by the Commission during the system selection process. The imposition of unreasonably high royalty rates or other prohibitive restrictions on licensees tending to impede consumer acceptance of ATV would defeat the primary goal of this proceeding, viz., to assure a technically excellent ATV service that will above all else most efficiently meet the needs of consumers. First Report, paragraph 6.

9. FIT supports in principle the Revised Patent Procedures of the Federal Communications Commission, 3 FCC 2d 26 (1961), as well as the patent policy of the American National Standards Institute (ANSI) as stated in the ANSI Procedures for the Development and Coordination of American National Standards (approved September 9, 1987).

10. Clearly, an important object of the ATV patents held by FIT is to facilitate an early introduction of ATV terrestrial service for American consumers, with an ample supply of ATV receivers available at reasonable cost to ensure consumer acceptance of the new service.

11. FIT proposes that the Commission henceforth require the submission to it of all patents issued to current and

future ATV proponents which patents cover technology used in the proposed systems, together with a disclosure of all entities to whom an interest in the patent right has been assigned. The identity of any proponent's ATV patents and patent assignees should also be made readily available to the public by the Commission.

12. As an incentive to filing of all relevant ATV patents with the Commission, FIT proposes that the Commission adopt a rule to the effect that failure to file a particular patent will be deemed an admission by the owner and its assignees that the patent will not be asserted to cover an ATV system, whether proposed or adopted as part of a United States standard.

III. Compatibility With Other Media

13. An ATV system's overall ability to interconnect with other widely used video delivery systems and equipment is essential in order for the new system to gain acceptance in the marketplace. To that end, FIT agrees fully with the desires of the Committee for Open High Resolution Systems (COHRS) that an ATV standard should be inter-operative, extensible, and harmonious with standards for other applications. For example, if owners of home computers with high resolution VGA monitors can view broadcast high definition television merely by interconnecting a low cost ATV tuner module or circuit board to

their computer, such persons would benefit immediately from a new ATV standard without having to incur the expense of a completely new ATV receiver.[7]

14. FIT believes that the new ATV receivers for the American consumer should be extensible by allowing for future upgrades in ATV signal quality, much like a home computer user is permitted to enhance the performance of his or her computer by adding new circuit boards into existing slots. Such an ATV receiver configuration would also permit harmonization, i.e., enabling the viewer to use his or her display monitor to view video formats from a variety of different sources depending on the number of circuit board options incorporated in the viewer's receiving unit.

IV. Conversion To ATV

15. FIT opposes any regulatory plan by which consumers would in effect be forced to purchase new ATV receivers if they want to continue to watch broadcast television in their homes. If the cost of the new ATV receivers is out of reach of the majority of the American public, consumers will turn to alternative video entertainment sources such as pre-recorded

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[7] The FIT system is consistent with the aims of COHRS by providing, in a "first generation" ATV signal scenario, compatible NTSC signals that can be readily processed with existing hardware for display on high-definition VGA monitors.

tapes and local movie theaters rather than embrace a costly new form of television broadcasting. Compatibility with then existing broadcast systems was crucial to the successful implementation of color television and stereophonic FM multiplex broadcasting standards in the United States. FIT therefore submits that ATV likewise should be compatible with NTSC broadcasting at least during an initial "ATV acceptance" period.

16. FIT opposes in principle any regulatory scheme by which current NTSC broadcasters must surrender their frequencies and convert entirely to ATV by a preset deadline date. The result of such action would be the discontinuance of broadcast television service to millions of viewers owning only NTSC type receivers, and sounding of the death knell of American broadcast television if only a select number of consumers acquire ATV receivers by the critical date.

17. The Commission refers to studies undertaken to determine projected ATV penetration rates. Without the benefit of consumer surveys during which typical purchasers were afforded an opportunity to observe over-the-air 6 MHz ATV transmissions, it is not understood how any reliable market study could have been implemented.

18. FIT suggests that the Commission, through an independent market survey firm unconnected with the consumer

television equipment industry, monitor for at least a 65% per cent nationwide penetration rate as the triggering event for broadcaster ATV conversion. Existing broadcast stations may then be required to convert to ATV within a reasonable time after the minimum 65% penetration rate is achieved.

19. FIT also proposes a time limit of 5 years from the adoption of any new ATV standard within which the 65% penetration rate must be achieved, failing which broadcaster conversion to ATV would not become mandatory.

V. Simulcasting

20. FIT agrees that simulcasting any ATV non-compatible programming is in the best interest of the consuming public. Consumers would not be compelled to purchase new television receivers in order to enjoy an ongoing over-the-air television broadcast service. FIT submits, however, that a better approach is to adopt first a fully compatible standard that would enable all ATV programming to be received and reproduced by existing consumer television equipment, albeit with conventional resolution. Such a plan would leave it up to the viewer, rather than the Commission, to decide when a new ATV receiver should be purchased in order to enjoy the increased clarity of ATV broadcasting.

21. Viewers have a right to continue to receive broadcast television without being compelled to acquire a new receiver because of a hasty conversion to a non-compatible transmission format. That right should be paramount to those of others in this proceeding. Cf., Red Lion Broadcasting V. FCC, 395 U.S. 367,390 (1969) (viewers have a right to ensure that the broadcasting medium functions consistently with the ends and purposes of the First Amendment).

VI. Conclusion

22. Due consideration by the Commission of the foregoing comments by FIT and a ruling consistent therewith are respectfully requested.

[redacted]

RADIO DAILY

Presents

THE 1939 RADIO ANNUAL

Jack Alicoate, Editor

Compiled by the Staff of Radio Daily

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TELEVISION

Stations

Personnel Facilities

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F.C.C. Regulations

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Research

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History

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Facsimile Standards

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Television Progress in

England Germany

France Italy

Japan Russia

TELEVISION
BROADCASTING STATIONS

The term "television broadcast station" means a station licensed for the transmission of transient visual images of moving or fixed objects for simultaneous reception and reproduction by the general public.

Group A—2000 to 2100 kc.; *Group B*—42000 to 56000 kc.; *Group C*—60000 to 86000 kc.; *Group D*—Any 6000 kc. frequency band above 110000 kc. excluding 400000 to 401000 kc.

Licensee and Location	*Call Letters*	*Frequency (kc) or Group*	*POWER Visual*	*POWER Aural*
Columbia Broadcasting System New York, N. Y.	W2XAX	B, C	50 w	(CP only)
Don Lee Broadcasting System Los Angeles, Calif.	W6XAO	B, C	1000 w	150 w
Allen B. DuMont Laboratories, Inc. Passaic, N. J.	W2XVT	B	50 w	50 w
Farnsworth Television, Inc., of Pa. Springfield, Pa.	W3XPF	B, C	250 w	1 kw
First National Television, Inc. Kansas City, Mo.	W9XAL	B, C	300 w	150 w
General Electric Co. Albany, N. Y.	W2XB	C	100 w	3000 w
General Electric Co. Bridgeport, Conn.	W1XA	C	100 w	3000 w
General Electric Co. Schenectady, N. Y.	W2XD	B	40 w	.....
General Electric Co. Schenectady, N. Y.	W2XH	B	40 w	.....
General Television Corp. Boston, Mass.	W1XG	B, C	500 w	
Kansas State College of A. & A. S. Manhattan, Kansas	W9XAK	A	125 w	125 w
National Broadcasting Co., Inc. New York, N. Y.	W2XBS	B, C	12 kw	15 kw
National Broadcasting Co., Inc. Portable—Camden, N. J. New York, N. Y.	W2XBT	D (92000, 175000-180000)	400 w	100 w
Philco Radio & Television Corp. Philadelphia, Pa.	W3XE	B, C	10 kw	10 kw
Philco Radio & Television Corp. Philadelphia, Pa.	W3XP	D (204000-210000)	15 w	.....
Purdue University West Lafayette, Ind.	W9XG	A	1500 w	
Radio Pictures, Inc. Long Island City, N. Y.	W2XDR	B, C	1 kw	500 w
RCA Mfg. Co., Inc. (Portable) Bldg. No. 8 of Camden Plant	W3XAD	D (124000 to 130000)	500 w	500 w
RCA Mfg. Co., Inc. Camden, N. J.	W3XEP	B, C	30 kw	30 kw
RCA Mfg. Co., Inc. Portable—Mobile	W10XX	B, C	50 w	
University of Iowa Iowa City, Iowa	W9XK	A	100 w	
University of Iowa Iowa City, Iowa	W9XUI	B, C	100 w	
Zenith Radio Corp. Chicago, Ill.	W9XZV	B, C	1000 w	1000 w

(*For additional information on television stations see page 477*)

F. C. C. REGULATIONS

Applicable to Television

and

Facsimile Broadcasting Stations

As of January 1st, 1939

The term "visual broadcast service" means a service rendered by stations broadcasting images for general public reception. There are two classes of stations recognized in the visual broadcast service, namely: Television broadcast stations and Facsimile broadcast stations.

Television Broadcast Stations

The term "television broadcast station" means a station licensed for the transmission of transient visual images of moving or fixed objects for simultaneous reception and reproduction by the general public. The transmission of the synchronized sound (aural broadcast) is considered an essential phase of television broadcasting and one license will be issued for both visual and aural broadcast as hereinafter set out.

A license for a television broadcast station will be issued only after a satisfactory showing has been made in regard to the following, among others:

1. That the applicant has a program of research and experimentation which indicates reasonable promise of substantial contribution to the development of the television broadcast art.

2. That the program of research and experimentation will be conducted by qualified engineers.

3. That the applicant is legally and financially qualified and possesses adequate technical facilities to carry forward the program.

4. That the public interest, convenience and/or necessity will be served through the operation of the proposed station.

Conditions of Licensing

(a) A licensee of a television broadcast station shall not make any charge, directly or indirectly, for the transmission of either aural or visual programs.

(b) In the case of experimental televising of the production of a commercial broadcast program, all commercial announcements not a part of the entertainment continuity shall be eliminated from the television broadcast except the mere statement of the name of the sponsor or product or the televising of the trade-mark, symbol, slogan or product of the sponsor; provided, however, that when the program transmission is incidental to the experiments being conducted and not featured, and subject to interruptions as the experiments may require, the commercial announcements may be broadcast aurally.

(b) No licensee of any other broadcast station or network shall make any additional charge, directly or indirectly, for the simultaneous transmission of the aural or visual program by a television broadcast station, nor shall commercial accounts be solicited by the licensee of another broadcast station or network, or by others acting in their behalf upon the representation that the commercial program will also be transmitted by a television broadcast station.

(d) The synchronized sound (aural) program of a television broadcast station may be broadcast by a regular broadcast station, provided:

1. That no announcements or references shall be made over the regular broadcast station regarding the operation of the television broadcast station,

except the mere statement that the program being transmitted is the sound or aural program of a television broadcast station (identify by call letters).

2. That the call letter designation when identifying the television broadcast station shall be given on its assigned frequency only.

Frequencies Allotted

(a) The following groups of frequencies are allocated by bands for assignment to television broadcast stations on an experimental basis:

Group A 2000 to 2100 kc	*Group B* 42,000 to 56,000 kc
Group C 60,000 to 86,000 kc	*Group D* Any 6,000 kc frequency band above 110,000 kc excluding 400,000 to 401,000 kc.

(b) A licensee of a television station for Group A shall carry forward a comprehensive program of experimentation to determine the secondary or rural coverage of the station, and shall suitably locate receiving equipment and other apparatus, and shall make the necessary measurements to determine the quality and characteristics of the secondary or sky-wave service area. Television transmission only will be authorized in this band, and each license will authorize the entire band. No aural broadcast will be authorized therein.

(c) A license for a television broadcast station in groups B, C or D will specify a frequency band wherein two adjacent carrier frequencies shall be selected, one for the visual and one for the aural broadcast. The lower carrier frequency shall be for visual broadcast and the higher carrier frequency for the aural broadcast.

(d) A licensee will be granted only one station in each frequency group for operation in the same service area.

(e) An application may be made for one frequency band (to include the visual and the aural carriers) in groups B, C and D. However, if it is desired to operate in more than one group, it will be necessary to make separate applications for a station in each group.

(f) Applicants shall specify the band width of the emissions required for the proposed transmission.

(g) Carrier frequencies shall be so selected and emissions controlled that no emission from any cause will result outside the frequency band authorized by the license.

(h) An aplicant shall select a frequency band in the group which is believed best suited for the experiments to be conducted and will cause the least or no interference to established stations.

Power Limitations

The power output rating of a television broadcast station shall not be in excess of that necessary to carry forward the program of research. The operating power may be maintained at the maximum rating or less, as the conditions of operation may require.

A supplemental report shall be filed with and made a part of each application for renewal of license and shall include statements of the following:

1. Number of hours operated for transmission of television programs.

2. Comprehensive report of research and experimntation conducted.

3. Conclusions and program for further developments of the television broadcast service.

4. All developments and major changes in equipment.

5. Any other pertinent developments.

Facsimile Broadcast Stations

The term "facsimile broadcast station" means a station licensed to transmit images of still objects for record reception by the general public.

A license for a facsimile broadcast station will be issued only after a satisfactory showing has been made in regard to the following, among others:

1. That the applicant has a program of research and experimentation which indicates reasonable promise of substantial contribution to the development of the facsimile broadcast service.

2. That the program of research and experimentation will be conducted by qualified engineers.

3. That the applicant is legally and financially qualified and possesses adequate technical facilities to carry forward the program.

4. That the public interest, convenience and/or necessity will be served through the operation of the proposed station.

Conditions of Licensing

(a) A licensee of a facsimile broadcast station shall not make any charge, directly or indirectly, for the transmission of programs.

(b) No licensee of any other broadcast station or network shall make any additional charge, directly or indirectly, for the transmission of programs by a facsimile broadcast station, nor shall commercial accounts be solicited by any licensee of another broadcast station or network, or others acting in their behalf, upon representation that images concerning that commercial program will be transmitted by a facsimile station.

Frequencies Allotted

(a) The following frequencies are allocated for assigneent to facsimile broadcast stations on an experimental basis provided no interference is caused to the television stations operating in the band 2000-2100 kilocycles:

2012 kc 2016 kc 2096 kc

(b) If the facsimile program of research and experimentation cannot be properly carried forward on the frequencies in subsection (a) of this rule due to the characteristics of these frequencies, applicants may request and be assigned any frequency specified in Rule 1073. on an experimental basis.

(c) Other frequencies under the jurisdiction of the Commission may be assigned for experimental operation of facsimile broadcast stations on an experimental basis provided a sufficient need therefor is shown and no interference will be caused to established radio stations.

(d) Each facsimile broadcast station will be licensed for only one frequency except in subsection (b) of this rule more than one frequency may be licensed to one station if need therefor is shown.

(e) Each applicant shall specify the frequency or frequencies desired and the maximum modulating frequencies proposed to be employed.

(f) The operating frequency of a facsimile broadcast station shall be maintained in accordance with the frequency assignments as shown by Rule 980, provided, however, where a more strict adherence to the assigned frequency is necessary to prevent interference, the Commission will specify the tolerance.

(g) A facsimile broadcast station authorized to operate on frequencies regularly allocated to other stations or services shall be required to abide by all rules governing the stations regularly operating thereon, which are applicable to facsimile broadcast stations and are not in conflict with Rules 980 to 986, inclusive, and Rules 1030 to 1039, inclusive, excluding Rule 1035.

Power Limitations

The power output rating of a facsimile broadcast station shall not be in excess of that necessary to carry forward the program of research. The operating power may be maintained at the maximum rating or less, as the conditions of operation may require.

A supplemental report shall be filed with and made a part of each application for renewal of license and shall include statements of the following:

1. Number of hours operated for transmission of facsimile programs.

2. Comprehensive report of research and experimentation conducted.

3. Conclusions and program for further developments of the facsimile broadcast service.

4. All developments and major changes in equipment.

5. Any other pertinent developments.

FINCH
FACSIMILE SYSTEM
PATENTED & PAT'S PEND'G.

ADOPTED BY LEADING BROADCASTERS OF THE NATION

See demonstration of FINCH FACSIMILE at our laboratories.

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TELECOMMUNICATIONS LABS., Inc.

New York Office
Manufacturers Trust Bldg. 1819 B'way
Circle 6-8080
Plant and Aircraft Laboratory, Bendix, N.J.

TELEVISION, 1938-39

By

E. W. ENGSTROM

RCA Research Engineer

WHILE considerable progress was made in the television field during 1938 in all phases of television research and development, it is hoped that even greater strides will be made during the current year. Work will be continued along the same comprehensive lines in 1939 as in the past year. It is desirable to not only improve the efficiency of the present television system but also increase the knowledge of the propagation characteristics of ultra-short waves.

Advanced work in television research and development has been, and will continue to be, directed toward a more complete understanding of the higher radio frequencies. The procedure is to study the propagation of ultra-short waves so that, as more knowledge of their characteristics becomes available, their usefulness may be determined. At the same time, research in the field of electronics is conducted for the purpose of finding principles which can be applied in devices that will put to work the newly discovered frequencies.

One of the more important objectives in 1939 will be the further development of a system of radio relay utilizing centimeter waves, which might eventually be used in the establishment of networks of television stations. The RCA has made progress in this field of development, and believes that further advances will be made this year.

In the following review of television activities during 1938 will be found the complete workings of engineers and concerns who may this year see the many years' work culminated in success.

Television in 1938

The past year was marked by refinement of all parts of the system in a steady advance toward commercial television. Late in the year it was announced that a limited program service would be inaugurated in New York City with the opening of the 1939 World's Fair in that city, and that receivers would be offered for sale to the public at that time. Apparatus is available for sale to broadcasters for studio and transmitter service. Splendid progress was made through industry cooperation in establishing operating standards for a television system. Emphasis was placed on comprehensive field tests.

Studio Pickup Equipment

Steady progress has been made in the electrical and mechanical design of pickup equipment for studio use. The frequency bandwidth passed by the entire system has been widened and the circuit operation made more stable. The camera preamplifier and Iconoscope coupling circuits have been improved so that the signal to noise ratio has been increased.

Operating technique has constantly improved so that more consistent performance is obtained. Much attention was given to the problems of program production.

Mobile Pickup Equipment

Mobile pickup equipment mounted in trucks has been put in experimental operation and has given satisfactory performance for preliminary tests. The equipment includes an ultra high frequency transmitter for relaying the picture signal to the television transmitter for broadcasting. Location pickups have been successfully accomplished over moderate distances and in one instance up to 27 miles.

Transmitters

Considerable improvement has been made in television transmitters. The modulating frequency characteristic has been widened. Circuits for inserting the direct current component in the transmitted signal have developed which, in addition to that function improve the overall stability of the transmitter. Experimental advances have been made in higher powers at the higher frequency television channels. A transmitter of nominal power output has been developed suitable for broadcast service.

In order to fully utilize a television frequency channel, it is desirable to attenuate most of one picture side band at the transmitter. A method for doing this was evolved and tested in laboratory and field with satisfactory results. This was suitable for carrier frequency operation at high power and included constant resistance circuits and phase correcting networks. Experimental work was also done on obtaining the same characteristic at a low level in combination with low level modulation.

Improvements were made in the mechanical designs and electrical characteristics of transmitting antennas. Antennas suitable for installation on the small space available on top of tall buildings have been designed. The directivity pattern has been improved for horizontally polarized antennas so that they have a circular pattern in the horizontal plane and directivity toward the horizon in the vertical plane, resulting in a substantial power gain. The selectivity of these structures has been improved so that they have uniform impedance over more than one 6 megacycle television channel.

Signal Propagation

Study was given to propagation characteristics of ultra short waves in the region of 40 megacycles to several hundred megacycles. Comparisons fo polarization of the radiated wave have been made indicating that a better signal to ignition interference ratio and less multipath interference is obtained with horizontal than vertical polarization.

Receivers

Advances were made in television receiver design resulting in improved performance and simplification of operation. Circuits permitting pre-set station selection have been developed, and the number of operating controls has been reduced. The frequency band width passed by the receivers has been increased to correspond with the increased effective frequency band made available by suppressing one side band at the transmitter. This results in more picture detail. Amplifier tubes of higher transconductance have been made available so that more gain and improved signal to noise ratios can be had, even with the increased band width. Screen material for Kinescopes has been developed so that pictures are bright and black and white.

Large Screen Pictures

Progress has been made in circuits and cathode ray tubes for producing large pictures by projection. Experimental apparatus of this type has been demonstrated to large groups with success.

Conclusion

Thus television entered in 1939, with hopes high. The entire world is anxiously awaiting the new phenomenon that is television. Will they be satisfied during 1939? We can only guess, but the fact remains that the work in research and development of television will continue until the correct answer is found.

TELEVISION

a brief history

(Compiled by the National Broadcasting Company)

TELEVISION, like radio, began in the nineteenth century. Not only were its scientific foundations laid, but numerous attempts were actually made to transmit pictures by electrical means.

Television demanded, first of all, some means of translating light values into corresponding electrical values. Selenium was isolated by Berzelius, a Swedish chemist, in 1817, but the photo-electric property of this element was not discovered until fifty-six years later, and then quite by accident. A telegraph operator at the Valentia Cable Station in southwestern Ireland observed that some selenium resistances he was using became better conductors of electricity when exposed to bright sunlight. His observations were given scientific confirmation a short time later.

First Tele

To scientists this discovery revealed the possibility of converting light waves into electrical impulses. A picture—that is, a pattern of lights and shadows—might be converted into an electrical pattern. The electrical impulses might thereupon be transmitted over considerable distances and then reconverted to light values which would be assembled into a reproduction of the original image. Ayrton and Perry made one of the earliest proposals (1880) for transmitting pictures by electricity. G. R. Carey advanced another scheme the same year. Shelford Bidwell actually demonstrated the sending of outlines by wire in 1881 before the Physical Society in England.

The possibility of translating light values into their electrical counterparts, however, did not constitute a complete foundation for television. Maurice Leblanc, a Frenchman, in 1880 laid down the art's fundamental necessities. To send a moving picture, he held, it would be necessary to break it into elements and transmit these one at a time in a definite order. These would be joined together at the receiver in the same order.

Scanning Disk

Four years later, in 1884, Paul Nipkow patented the famous scanning disc which bears his name. The German physicist's invention was simply a circular sheet of metal near the edge of which was a series of small holes in the form of a spiral. The arrangement was such that if the disc revolved, the outermost hole would afford a view of a strip across the top of the subject. The second hole would give a view of the strip immediately under the first, and so on until the entire subject had been scanned in a series of lines.

Leblanc advanced the idea of using two mirrors for scanning, one to vibrate at a comparatively low speed for vertical scanning, the other to vibrate at a high-frequency for the horizontal scanning of each line. Weiller proposed the use of a mirror drum in still another method of scanning. These were the fundamentals of a few of the many schemes for "seeing by telegraphy" publicized in the 1880's. In each case the light from the televised subject was to be registered by a selenium cell.

About the turn of the century Karl Braun introduced the oscilloscope, a vacuum tube showing visually the variations of an alternating current. It was demonstrated that a magnetic field from a coil placed around the tube improved the sharpness of the fluorescent spot. Obviously, the cathode ray which produced the spot of light at the end of the tube could also be deflected by the same means, since the ray itself was an electric current. This led to the next important advance in television.

Braun Tube

In 1907 Boris Rosing, a Russian, patented a system in which the Braun tube was to be the instrument for reconstructing the image at the receiver. The tube's cathode-ray beam, composed of electrons, was to be modulated by the impulses sent

from the transmitter. The modulated beam was to be made to scan the fluorescent surface placed at the end of the tube and thereby create a reproduction of the original image. Speaking before the Roentgen Society in 1911, A. A. Campbell Swinton outlined a method, publicized in a very rough form three years earlier, for television without the aid of a single moving mechanical part. Cathode ray tubes of suitable design were to be used at both transmitter and receiver.

Today all the most important television systems employ cathode ray tubes, in one form or another, at both receiver and transmitter and every moving mechanical part has been eliminated. In these respects, Campbell Swinton's scheme may be said to have been essentially the same as today's all-electronic television systems. With him, however, the method was purely theoretical. At the time neither he nor any of his contemporaries could realize their ambitions. The Braun tube was very imperfect. Besides, no means were available for strengthening the very weak impulses generated in the instrument used for registering and scanning the televised subject. A few more years and the World War put a temporary halt to experiment in television.

Mechanical Scanning

When scientists again took up the task of perfecting television in the early 1920's, radio contributed comparatively efficient amplifiers based on the three-electrode vacuum tube invented by Lee de Forest. Improvements had been made in the photo-electric cell and the scientific world was in the process of discovering photo-electric materials far more sensitive than selenium. This period—in which C. F. Jenkins, an American, John Logie Baird, an Englishman, and Denes von Mihaly, a Hungarian, played leading parts—was characterized by attempts to solve the problems of television by mechanical scanning. Jenkins gave a demonstration of his method in Washington in 1925. Baird showed his apparatus publicly in London the same year. On January 27, 1926, Baird transmitted better images in the presence of forty members of the Royal Institution in London. His television images were in 30 lines at the rate of 12½ complete pictures a second. There was, therefore, a decided flicker in the crude image. A year later the engineers of the Bell Telephone Laboratories gave a demonstration in which both sound and sight were transmitted synchronously by wire from Washington to New York. They also transmitted images by radio over a much shorter distance. Early in 1928 Baird successfully transmitted a low-definition picture across the Atlantic.

The time was one of intense activity in television experiment and confident predictions were made that the problems of the new art would soon be solved so that all might shortly see the events they were hearing about over radio. Picture definition gradually increased from 30 lines to 240 lines. Although steady advances were made in image clarity, observers still felt that none contained sufficient detail. Greater detail, of course, meant higher speeds in scanning. Reduction of the annoying flicker meant increasing the number of complete pictures per second.

In the laboratories, however, work was progressing on a new scanning method. In 1933 Dr. Vladimir K. Zworykin, of the Radio Corporation of America, announced his Iconoscope, a vacuum tube for translating a light image into electrical charges which were to be scanned by a suitably deflected cathode ray beam. About the same time Philo T. Farnsworth brought forward another scanning tube which he called the "image dissector." One or the other of these two tubes, both American in origin, is the basis of every all-electronic television system in use at the present time.

Tele Now

At the time of writing, television has reached a relatively high state of technical development and improvements are being made at a very rapid rate. Tentative standards proposed for American television stipulate an image of 441 lines at the rate of 30 complete pictures a second. Images are gaining in brilliance and, although they are still comparatively small as viewed in the home model receiver, experimenters in the field have hopes of increasing their dimensions. Dr. Zworykin and his associate, Dr. R. R. Law, last year demonstrated a tube which projected a television image approximately eight feet by ten in size.

Television broadcasting is still, in 1938, in its infancy. In the United States eighteen stations are licensed to broadcast on an experimental basis. The most important of these stations is operated in New York by the National Broadcasting Company, which maintains a small but complete staff to work on all phases of the new art. In Great Britain television has been established as a daily service to several thousand viewers in the London area by the British Broadcasting Corporation. Germany has announced a government service to begin before the end of 1938. The P. T. T. in France has newly completed a powerful transmitter in the Eiffel Tower.

—Courtesy of the World Almanac.

Proposed Television Transmission Standards Submitted to the FCC for Approval by the Radio Manufacturers' Association

THE long-heralded proposed television transmission standards were submitted to the Federal Communications Commission by the Radio Manufacturers Association on September 12, 1938. They were submitted to the FCC with the approval of the RMA Board of Directors and also of the special RMA Television Committee of which A. F. Murray of Philadelphia (Philco) is chairman and were approved also by the RMA membership.

The proposed standards were presented to the FCC for approval in the present experimental development of television and the RMA is prepared to demonstrate that they are practical and in the public interest. Besides RMA engineering and executive facilities, a few television interests which are not technically among RMA membership participated in the preparation of the proposed standards.

The immediate action of the FCC engineering department before presenting the proposals to the Commission in session was to ask the RMA to answer three questions concerning them:

1. The names of all the members of the RMA who are actively engaged in the development of television and the extent of their activity, including, in addition, the names of any other interests, not members of the RMA, who have participated in the formulation of the standards.

2. Why it would be in the public interest to adopt the standards proposed by the RMA at this particular time, including a statement as to whether television stations, even though licensed on an experimental basis, should be required to abide by such standards.

3. Whether or not the RMA believed that the development of television has reached the stage where the Commission might call formal hearings with respect to the adoption of standards, in which event the RMA would be expected to present evidence showing that such standards are required at this particular time.

There have been many reasons put forth from various sources concerning the need for adoption of set standards of television transmission. Such adoption would assure the industry of two results: (1) a certain amount of stability on which not only the industry but also the potential owners of television receiving sets could rely; (2) a more definite yardstick for the future activities of those engaged in television experimentation and research.

The proposed television transmission standards as presented to the FCC are as follows:

T-101 Television Channel Width

The standard television channel shall not be less than 6 megacycles in width.

T-102 Television and Sound Carrier Spacing

It shall be standard to separate the sound and picture carriers by approximately 4.5 Mc. This standard shall go into effect just as soon as "single side band" operation at the transmitter is practicable. (The previous standard of approximately 3.25 Mc. shall be superseded.)

T-103 Sound Carrier and Television Carrier Relation

It shall be standard in a television channel to place the sound carrier at a higher frequency than the television carrier.

T-104 Position of Sound Carrier

It shall be standard to locate the sound carrier for a television channel 0.25 Mc. lower than the upper frequency limit of the channel.

T-105 Polarity of Transmission

It shall be standard for a decrease in