

FM MAKING RAPID PROGRESS

By Dick Dorrance, General Manager, FM Broadcasters, Inc.

IT is doubtful whether any single medium in the history of radio has ever made quite so much progress in the space of one year as frequency modulation (FM) broadcasting did during 1941. And yet, when analyzed, there is nothing unduly surprising about it. FM has had the ingredients of success which appeal to both broadcasters and public. It can provide improved and expanded service beyond the technical limitations of ordinary broadcasting; it has the enthusiastic support of some of the biggest broadcasters and engineering groups in the country.

When 1941 started there were, according to the most optimistic estimates, about 15,000 receivers in the nation equipped for FM reception. By the end of the year, the FM listening audience had grown to approximately a quarter of a million sets, with close to 50,000 being sold each month. These figures, accurately compiled by FM Broadcasters, Inc., with the cooperation of manufacturers, indicate an increase of 1400 per cent during the twelve-month period.

Commercial FM

Officially, FM assumed its commercial status on January 1, 1941, but it was not until March 1 that the first commercial FM station actually began operating. By the end of 1941, the Federal Communications Commission had authorized the construction of 62 such transmitters, 24 of which had already gone on the air. The rest are pushing installation of equipment as fast as war-time exigencies will permit.

The increased coverage of FM stations now on the air contrasts sharply with the limited reception available from the handful of low-power experimental stations operating at the close of 1940. Although these had an average range of about 30 miles, it is not uncommon to find commercial outlets serving a radius of 70 to 100 miles and more. Some 40,000,000 persons live within the assigned service areas of the 24 transmitters on the air at the end of 1941.

Another interesting development of the past year has been the organization of The American Network, Inc., FM's first chain with coast-to-coast ambitions. Ultimate plans call for outlets in the 42 largest U. S. markets, providing maximum coverage with a pre-planned network.

Time Sales

Time sales over FM stations in 1941, while not epochal, have at least been promising. There was great variation from city to city in the amount of business secured, but local accounts far out-totaled national business. Toward the close of the year agency interest appeared to be growing as the FM audience reached appreciable proportions. Many stations began to set up special FM sales staffs.

The public today has a selection of over 125 different set models to pick from, produced by 20 manufacturers. The year brought noticeable reductions in price, with table receivers capable of both FM and AM reception selling for as little as \$67.50. Practically all sets now on the market are of the FM-AM type, and extensive improvements in circuit design have taken place in the 1942 models.

Future

It cannot be denied that the war will place formidable obstacles in the path of FM development in the coming year—a situation now being faced by almost every civilian industry. Curtailment of set production, however, is expected proportionately to wreak no more havoc on FM than on ordinary broadcasting, with the likelihood that manufacturers, confronted by shortages of raw material, will use their limited allotments to make FM-AM sets, thus compensating with quality for revenue normally brought in by the sale of low-priced AM midget receivers.

There can be no question that further FM development during 1941 was held up by the FCC investigation of newspaper-controlled radio stations. Some three dozen of the ungranted FM applications pending have been filed by newspapers, anxious to enter the FM field. These, however, have been kept in abeyance by the Commission until definite policies with respect to such ownership are determined.

Active throughout the year, and an important factor in coordinating the growth of FM, has been FM Broadcasters, Inc., the young industry's trade association to which all leading FM groups belong. Its promotional work, public education, liaison with manufacturers, and trade representation has served FM well, and will continue to do so in 1942.

HIGH FREQUENCY—FREQUENCY MODULATION BROADCAST STATIONS

The term "high frequency broadcast station" means a station licensed primarily for the transmission of radiotelephone emissions, intended to be received by the general public and operated on a channel in the high frequency broadcast band. Commercial high frequency broadcast stations must use frequency modulation.

LOCATION	Call Letters	Licensee	Frequency Kilocycles	Service Area Sq. Mi
COMMERCIAL				
Alpine, N. J.	W31NY	Edwin H. Armstrong	43100	15600
Baltimore, Md.	W59BM	Baltimore Radio Show, Inc.	45900	5500
Baton Rouge, La.	W45RG	Baton Rouge Broadcasting Co.	44500	8100
Binghamton, N. Y.	W49BN	Wylie B. Jones Advertising Agency	44900	6500
Boston, Mass.	W67B	Westinghouse Radio Stations, Inc.	46700	6700
Boston, Mass.	W39B	The Yankee Network, Inc.	43900	31000
Chicago, Ill.	W67C	Columbia Broadcasting System, Inc.	46700	10800
Chicago, Ill.	W75C	Moody Bible Institute of Chicago	47500	10800
Chicago, Ill.	W63C	National Broadcasting Co.	46300	10800
Chicago, Ill.	W79C	Oak Park Realty & Amusement Co.	47900	10800
Chicago, Ill.	W59C	WGN, Inc.	45900	10800
Chicago, Ill.	W47C	WJJD, Inc.	44700	10800
Chicago, Ill.	W51C	Zenith Radio Corp.	45100	10800
Columbus, Ohio	W45CM	WBNS, Inc.	44500	12400
Detroit, Mich.	W49D	John Lord Booth	44900	6800
Detroit, Mich.	W45D	The Evening News Association	44500	6800
Detroit, Mich.	W73D	King-Trendle Broadcasting Corp.	47300	6800
Detroit, Mich.	W53D	WJR, The Goodwill Station	45300	6800
Evansville, Ind.	W45V	Evansville On the Air, Inc.	44500	8400
Fort Wayne, Ind.	W49FW	Westinghouse Radio Stations, Inc.	44900	6100
Hartford, Conn.	W53H	Travelers Broadcasting Service Corp.	45300	6100
Hartford, Conn.	W65H	WDRG, Inc.	46500	6100
Hollywood, Calif.	K31LA	Columbia Broadcasting System	43100	38000
Kansas City, Mo.	K49KC	Everett L. Dillard, d/b as Commercial Radio Equipment Co.	44900	4400
Lansing, Mich.	W77XL	WJIM, Inc.	47700	3800
Lexington, Ky.	W51SL	American Broadcasting Corp. of Kentucky	45100	6300
Los Angeles, Calif.	K37LA	Earle C. Anthony, Inc.	43700	28000
Los Angeles, Calif.	K45LA	Don Lee Broadcasting System	44500	7000
Los Angeles, Calif.	K49LA	Hughes Tool Co.	44900	7000
Los Angeles, Calif.	K61LA	Metro-Goldwyn-Mayer Studios, Inc.	46100	7000
Los Angeles, Calif.	K53LA	Standard Broadcasting Co.	45300	7000
Milwaukee, Wisc.	W55M	The Journal Co.	44500	8500
Nashville, Tenn.	W47NV	National Life & Accident Insurance Co.	44700	16000
New York, N. Y.	W71NY	Bamberger Broadcasting Service, Inc.	47100	8500

<i>LOCATION</i>	<i>Letters Call</i>	<i>Licensee</i>	<i>Frequency Kilocycles</i>	<i>Service Area Sq. Mi.</i>
New York, N. Y.....	W39NY	City of New York Municipal Broadcasting System	43900	3900
New York, N. Y.....	W67NY	Columbia Broadcasting System, Inc.	46700	8500
New York, N. Y.....	W55NY	William G. H. Finch.....	45500	8500
New York, N. Y.....	W59NY	Interstate Broadcasting Co.....	45900	8500
New York, N. Y.....	W63NY	Marcus Loew Booking Agency.....	46300	8500
New York, N. Y.....	W75NY	Metropolitan Television, Inc.....	47500	8500
New York, N. Y.....	W47NY	Muzak Corp.	44700	8500
New York, N. Y.....	W51NY	National Broadcasting Co.....	45100	8500
Paxton, Mass.	W43B	The Yankee Network, Inc.....	44300
Philadelphia, Pa.	W49PH	Pennsylvania Broadcasting Co.....	44900	9300
Philadelphia, Pa.	W81PH	Seaboard Radio Broadcasting Corp..	48100	9300
Philadelphia, Pa.	W69PH	WCAU Broadcasting Co.....	46900	9300
Philadelphia, Pa.	W53PH	WFIL Broadcasting Co.....	45300	9300
Philadelphia, Pa.	W57PH	Westinghouse Radio Stations, Inc...	45700	9300
Philadelphia, Pa.	W73PH	William Penn Broadcasting Co....	47300	9300
Pittsburgh, Pa.	W47P	Walker & Downing Radio Corp....	44700	8400
Pittsburgh, Pa.	W75P	Westinghouse Radio Stations, Inc...	47500	8400
Rochester, N. Y.	W51R	Stromberg Carlson Telephone Mfg. Co.	45100	3200
Rockford, Ill.	W71RF	Rockford Broadcasters, Inc.....	47100	3900
St. Louis, Mo.	K59L	Columbia Broadcasting System.....	45900	13000
St. Louis, Mo.	K51L	St. Louis University	45100	13000
Salt Lake City, Utah.....	K47SL	Radio Service Corp. of Utah.....	44700	700
San Francisco, Calif.....	K45SF	Hughes Tool Company	44500	10800
Schenectady, N. Y.....	W47A	Capitol Broadcasting Co.....	44700	6600
Schenectady, N. Y.....	W57A	General Electric Co.....	45700	6600
South Bend, Ind.....	W71SB	South Bend Tribune.....	47100	7100
Springfield, Mass.	W81SP	Westinghouse Radio Stations, Inc...	48100	2500
Syracuse, N. Y.....	W63SY	Central New York Broadcasting Corp.	46300	6800
Winston-Salem, N. C.....	W41MM	Gordon Gray	44100	69400

EXPERIMENTAL

<i>Licensee and Location</i>	<i>Call Letters</i>	<i>Frequency Kilocycles</i>	<i>Power Watts</i>
Edwin H. Armstrong, Alpine, N. J.....	W2XMN	42800, 43000, 117430	40000
City of New York Municipal Broadcasting System, New York, N. Y.....	W2XVP	26100	1000
General Electric Co., New Scotland, N. Y.....	W2XOY	43200	2500
Head of Lakes Broadcasting Co., Superior, Wisc....	W9XYH	43000	1000
John V. L. Hogan, Long Island City, N. Y.....	W2XQR	48700	1000
C. M. Jansky, Jr. and Stuart L. Bailey, d/b as Jansky & Bailey, Georgetown, D. C.....	W3XO	43200	1000
KLZ Broadcasting Co., Denver, Colo.....	W9XLA	25400	100
National Broadcasting Co., New York, N. Y.....	W2XWG	45100	1000
Carman R. Runyon, Jr., Yonkers, N. Y.....	W2XAG	117190	5000
WBNS, Inc., Columbus, Ohio.....	W8XVH	43000	250
Westinghouse Radio Stations, Inc., Hull, Mass....	W1XK	42600	1000
Westinghouse Radio Stations, Inc., East Springfield, Mass.....	W1XSN	42600	1000
WHEC, Inc., Rochester, N. Y.....	W8XAD	42600	1000
WKY Radiophone Co., Oklahoma City, Okla.....	W5XAU	26125	100
Worcester Telegram Publishing Co., Worcester, Mass.	W1XTG	43400	1000

Pending Applications

LOCATION	Licensee	Frequency Kilocycles	Service Area Sq. Mi.
Albany, N. Y.	WOKO, Inc.	45100	7164
Amarillo, Texas	Amarillo Broadcasting Co.	45100	5628
Ashland, Ky.	Ashland Broadcasting Co.	46100	4160
Baltimore, Md.	The A. S. Abell Co.	46300	6040
Battle Creek, Mich.	Federated Publications, Inc.	48100	4100
Boston, Mass.	Columbia Broadcasting System, Inc.	43500	20200
Boston, Mass.	Boston Edison Co.	44700	6930
Boston, Mass.	The Yankee Network, Inc.	44300	19230
Cedar Rapids, Ia.	The Gazette Company	44700	7400
Chicago, Ill.	Chicago Federation of Labor	47900	10800
Cicero, Ill.	WHFC, Inc.	48300	10800
Cicero, Ill.	WHFC, Inc.	44700	3200
Cleveland, Ohio	United Broadcasting Co.	48500	8420
Detroit, Mich.	James F. Hopkins, Inc.	46500	6790
Detroit, Mich.	James F. Hopkins, Inc.	46500	6790
Duluth, Minn.	Head of Lakes Broadcasting Co.	44500	2754
Duluth, Minn.	Head of Lakes Broadcasting Co.	44500	2754
Grand Rapids, Mich.	Federated Publications, Inc.	46100	5300
Indianapolis, Ind.	Associated Broadcasters, Inc.	47300	6665
Indianapolis, Ind.	Indianapolis Broadcasting Co.	45300	13640
LaCrosse, Wisc.	The LaCrosse Tribune Co.	46500	7040
Lansing, Mich.	Federated Publications, Inc.	47100	3820
Los Angeles, Calif.	Don Lee Broadcasting Co.	43500	18050
Louisville, Ky.	Courier Journal & Louisville Times Co.	45700	13200
Manchester, N. H.	The Radio Voice of New Hampshire, Inc.	43500	20290
New Bedford, Mass.	E. Anthony & Sons, Inc.	45700	1787
New York, N. Y.	Debs Memorial Radio Fund, Inc.	48700	8600
New York, N. Y.	FM Radio Broadcasting Co.	48300	8600
New York, N. Y.	Greater New York Broadcasting Corp.	48700	8500
New York, N. Y.	Knickerbocker Broadcasting Co.	48300	6800
New York, N. Y.	News Syndicate Co.	47900	8500
New York, N. Y.	Woodaam Corp.	46700	8500
New York, N. Y.	WBNX Broadcasting Co.	48300	8730
Oakland, Calif.	Tribune Building Co.	46500	1216
Philadelphia, Pa.	Gibraltar Service Corp.	46100	9318
Pittsburgh, Pa.	Pittsburgh Radio Supply House	43900	11488
Portland, Maine	Portland Broadcasting System	47100	3980
Providence, R. I.	Cherry & Webb Broadcasting Co.	47500	6207
Providence, R. I.	The Outlet Co.	48500	4840
Rochester, N. Y.	WHEC, Inc.	44700	3200
St. Louis, Mo.	Globe Democrat Publishing Co.	44700	13083
St. Louis, Mo.	The Pulitzer Publishing Co.	45550	13391
St. Louis, Mo.	Star-Times Publishing Co.	44700	12480
San Bernardino, Calif.	The Sun Co. of San Bernardino, Calif.	44100	17101
Trenton, N. J.	Mercer Broadcasting Co.	44700	3200
Washington, D. C.	M. A. Leese Radio Corp.	47100	5600
Winston-Salem, N. C.	Piedmont Publishing Co.	46700	4600
Worcester, Mass.	Worcester Telegram Publishing Co.	46100	10000

F. C. C. Regulations

Regarding High Frequency Broadcast Stations

As of January 1, 1942

The term "high frequency broadcast station" means a station licensed primarily for the transmission of radiotelephone emissions intended to be received by the general public and operated on a channel in the High Frequency broadcast band. High frequency broadcast stations must use frequency modulation.

Definitions

High Frequency Broadcast Band. The term "high frequency broadcast band" means the band of frequencies extending from 43,000 to 50,000 kilocycles, both inclusive.

Frequency Modulation. The term "frequency modulation" means a system of modulation of a radio signal in which the frequency of the carrier wave is varied in accordance with the signal to be transmitted while the amplitude of the carrier remains constant.

Center Frequency. The term "center frequency" means the frequency of the carrier wave with no modulation. (With modulation the instantaneous operating frequency swings above and below the center frequency. The operating frequency with no modulation shall be the center frequency within the frequency tolerance).

High Frequency Broadcast Channel. The term "high frequency broadcast channel" means a band of frequencies 200 kilocycles wide and is designated by its center frequency. Channels for high frequency broadcast stations begin at 43,100 kilocycles and continue in successive steps of 200 kilocycles to and including the frequency of 49,900 kilocycles.

Service Area. The term "service area" of a high frequency broadcast station means the area in which the signal is not subject to objectionable interference or objectionable fading. (High frequency broadcast stations are considered to have only one service area; for determination of such area see *Standards of Good Engineering Practice for High Frequency Broadcast Stations.*)

Antenna Field Gain. The term "antenna field gain" of a high frequency broadcast antenna means the ratio of the effective free space field intensity produced at one mile in the horizontal plane expressed in millivolts per meter for 1 kilowatt antenna input power to 137.6.

Free Space Field Intensity. The term "free space field intensity" means the field intensity that would exist at a point in the absence of waves reflected from the earth or from reflecting objects.

Frequency Swing. The term "frequency swing" is used only with respect to frequency modulation and means the instantaneous departure of the carrier frequency from the center frequency resulting from modulation.

Multiplex Transmission. The term "multiplex transmission" means the simultaneous transmission of two or more signals by means of a common carrier wave. (Multiplex transmission as applied to high frequency broadcast stations means the transmission of facsimile or other aural signals in addition to the regular broadcast signals.)

Percentage Modulation. The term "percentage modulation" with respect to frequency modulation means the ratio of the actual frequency swing to the frequency swing required for 100 per cent modulation expressed in percentage. (For high frequency broadcast stations, a frequency swing of 75 kilocycles is standard for 100 per cent modulation.)

Experimental Period. The term "experimental period" means that period of time between 12 midnight and sunrise. This period may be used for experimental purposes in testing and maintaining apparatus by the licensee of any high fre-

quency broadcast station, on its assigned frequency and with its authorized power, provided no interference is caused to other stations maintaining a regular operating schedule within such period.

Main Studio. The term "main studio" means, as to any station, the studio from which the majority of its local programs originate and/or from which a majority of its station announcements are made programs originating at remote points.

Allocation of Facilities¹

Basis of Licensing High Frequency Broadcast Stations. High frequency broadcast stations shall be licensed to serve a specified area in square miles. The contour bounding the service area and the radii of the contour shall be determined in accordance with the *Standards of Good Engineering Practice for High Frequency Broadcast Stations.*

Service Areas (Definitions)

For the purpose of determining the areas to be served by high frequency broadcast stations, the following definitions apply:

(a) "Basic trade areas" and "limited trade areas" consist of areas the boundaries of which are determined by the Commission on the basis of showings made in applications as to retail trading areas or consumer trading areas and from government data². Each basic trade area includes one "principal city." The boundaries of the basic trade areas are adjoining and the aggregate of all such areas is the total area of the United States. Each "limited trade area" includes one city. The boundaries of limited trade areas are not necessarily adjoining. Such areas may include portions of other limited trade areas and may extend into more than one basic trade area.

(b) "Principal city" means the largest city or the city or cities designated as "principal city" by the Commission, within a basic trade area. "City" means any city, town, or borough in a basic trade area except the principal city. Each "city" has a limited trade area.

¹The rules relating to allocation of facilities are intended primarily for the information of applicants. Nothing contained in said rules shall be regarded as any recognition of any legal right on behalf of any person to a grant or denial of any application.

²There are several current and recognized authorities on retail trading areas or consumer trading areas from which the applicant may prepare its showing and to which the Commission will give consideration in making its determination.

(c) "Rural area" means all land area outside incorporated towns or cities with population greater than 2500 and where the density of population is less than 150 per square mile. Incorporated towns or cities with population from 2500 to 5000 without a high frequency broadcast station and not adjacent to larger cities may be considered rural area.

Service Areas—Established

The Commission in considering applications for high frequency broadcast stations will establish service areas. Such stations will be licensed to serve areas having the following characteristics:

(a) An area comprising a limited trade area and a city. The station shall render good service to the city and its service area shall conform generally with the limited trade area.

(b) An area comprising a basic trade area and a principal city. The station shall render good service to the principal city and its service area shall conform generally with the basic trade area; *Provided, however,* That the station may be licensed to serve temporarily an area less than the basic trade area, subject to the following conditions: (1) that an applicant for authority to serve temporarily less than the basic trade area show substantial reason for relaxation of the requirement to serve the basic trade area and for specification of the proposed service area; (2) that the area to be served include as much of the basic trade area as reasonably may be required in the public interest to be served and in no event less than the principal city and the metropolitan district in which it is located; (3) that such an applicant show compliance with the section of these rules regarding similarity of service areas for all stations in the same established area except that such sections shall apply only in relation to other stations established under this proviso; (4) that the Commission may condition the granting of any application for renewal of license of such station upon the rendering of service by such station to an area conforming generally with the basic trade area.

(c) An area of at least 15,000 square miles comprising primarily a large rural area, and particularly that part of basic trade areas which cannot be served by stations assigned basic trade areas due to economical and technical limitations.

The service area may include one or more principal city or cities, provided that in rendering service to such cities, the service to rural areas which the station is designated to serve is not impaired. The transmitter of such a station shall be located in such a manner that the service area, (1) shall extend into two or more basic trade areas, (2) shall not conform generally with a basic trade area, and (3) shall not merely extend beyond a basic trade area.

(d) An area having substantially different characteristics (social, cultural, or economic) from those areas specified in subsections (a), (b) and (c) of this section where, by reason of special conditions, it is shown that a need (which cannot be supplied by a station serving areas under subsections (a), (b) or (c) of this section) for the proposed service both program and technical exists which makes the establishment of the service area in the public interest, convenience or necessity. The Commission will give particular consideration in this connection to competitive advantages which such stations would have over other stations established under other provisions.

(e) In case it is not economically and technically feasible for a station assigned a basic or limited trade area to serve substantially all such area, the Commission will establish the service area on the basis of conditions which obtain in the trade area.

(f) In case an applicant proposes a change in an established service area, the applicant shall make a full showing as to need for such change and the effect on other stations serving the area.

Time of Operation. All high frequency broadcast stations shall be licensed for unlimited time operation.

Showing Required. Authorization for a new high frequency broadcast station or increase in facilities of an existing station will be issued only after a satisfactory showing has been made in regard to the following matters:

(a) That the area which the applicant proposes to serve has the characteristics of an area described in subparagraphs (a), (b), or (c) of the section on *Service Areas* stated above.

(b) Where a service area has been established in which one or more existing high frequency broadcast stations are in operation, that the contours of any new

station proposed to serve such area will compare with those of the existing station or stations as nearly as possible, or that the service area already established should be modified.

(c) That objectionable interference will not be caused to existing stations or that if interference will be caused the need for the proposed service outweigh the need for the service which will be lost by reason of such interference.

(d) That the proposed station will not suffer interference to such an extent that its service would be reduced to an unsatisfactory degree.

(e) That the technical equipment proposed, the location of the transmitter, and other technical phases of operation comply with the regulations governing the same, and the requirements of good engineering practice.

(f) That the applicant is financially qualified to construct and operate the proposed station; and, if the proposed station is to serve substantially the same area as an existing station, that applicant will be able to compete effectively with the existing station or stations.

(g) That the program service will include a portion of programs particularly adapted to a service utilizing the full fidelity capability of the system, as set forth in the Standards of Good Engineering Practice for High Frequency Broadcast Stations.

(h) That the proposed assignment will tend to effect a fair, efficient, and equitable distribution of radio service among the several states and communities.

(i) That the applicant is legally qualified, is of good character, and possesses other qualifications sufficient to provide a satisfactory public service.

(j) That the facilities sought are subject to assignment as requested under existing international agreements and the Rules and Regulations of the Commission.

(k) That the public interest, convenience, and necessity will be served through the operation under the proposed assignment.

Channel Assignments

The channels set forth below with the indicated center frequencies are available

for assignment to high frequency broadcast stations to serve the areas provided in the section on *Service Areas Established* stated above:

(a) An applicant for a station to serve an area specified in paragraphs (a) or (b) of that section to be located in a principal city or city which has a population less than 25,000 (city only) shall apply for one of the following channels:

48900	49300	49500	49700
49100			49900

(b) An applicant for a station to serve an area specified in paragraph (a) or (b) of that section to be located in a principal city or city which has a population greater than 25,000 (city only) shall apply for one of the following channels:

44500	45700	46700	47900
44700	45900	46900	48100
44900	46100	47100	48300
45100	46300	47300	48500
45300	46500	47500	48700
45500		47700	

(c) An applicant for a station to serve primarily a large rural area, specified in paragraph (c) or an area specified in paragraph (d) of that section shall apply for one of the following channels:

43100	43500	43900	44300
43300	43700	44100	

(d) Notwithstanding the provisions of subsection (a) of this section, an applicant for a station to serve an area specified in section of these rules defining the establishment of "an area comprising a limited trade area and city," to be located in a city having a population greater than 25,000, in or adjacent to any metropolitan district having a population greater than 1,000,000, may apply for one of the following channels:

49100	49500	49900
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Special Provisions Concerning Assignments

(a) Stations located in the same city shall have substantially the same service area.

(b) High frequency broadcast stations shall use frequency modulation exclusively.

(c) Stations serving a substantial part of the same area shall not be assigned adjacent channels.

(d) One channel only will be assigned to a station.

Multiple Transmission

Facsimile Broadcasting and Multiplex Transmission. The Commission may grant authority to a high frequency broadcast station for the multiplex transmission of facsimile and aural broadcast programs provided the facsimile transmission is incidental to the aural broadcast and does not either reduce the quality of or the frequency swing required for the transmission of the aural program. The frequency swing for the modulation of the aural program should be maintained at 75 kc and the facsimile signal added thereto. No transmission outside the authorized band of 200 kc shall result from such multiplex operation nor shall interference be caused to other stations operating on adjacent channels. The transmission of multiplex signals may also be authorized on an experimental basis in accordance with standard broadcast station rule on special experimental authorizations.

Proof of Performance Required. Within one year of the date of first regular operation of a high frequency broadcast station, continuous field intensity records along several radials shall be submitted to the Commission which will establish the actual field contours, and from which operating constants required to deliver service to the area specified in the license are determined. The Commission may grant extensions of time upon showing of reasonable need therefor.

Multiple Ownership. (a) No person (including all persons under common control¹) shall, directly or indirectly, own, operate, or control more than one high frequency broadcast station that would serve substantially the same service area as another high frequency broadcast station owned, operated, or controlled by such person.

(b) No person (including all persons under common control) shall, directly or indirectly, own, operate, or control more than one high frequency broadcast station, except upon a showing (1) that such ownership, operation, or control would foster competition among high frequency broadcast stations or provide a high frequency broadcasting service distinct and separate from existing services; and (2) that such ownership, operation, or control would not result in the concentration of control of high frequency broadcasting facilities in a manner inconsistent with public interest,

¹The word "control" as used herein is not limited to majority stock ownership but includes actual working control in whatever manner exercised.

convenience, or necessity; *provided, however*, that the Commission will consider the ownership, operation, or control of more than six high frequency broadcast stations to constitute the concentration of control of high frequency broadcasting facilities in a manner inconsistent with public interest, convenience, or necessity.

Normal License Period. All high frequency broadcast station licenses will be issued so as to expire at the hour of 3 a.m., Eastern Standard Time, and will be

(a) For stations operating on the frequency issued for a normal license period of one year, expiring as follows:

frequencies 48900, 49100, 49300, 49500, 49700, and 49900, April 1.

(b) For stations operating on the frequencies 44500, 44700, 44900, 45100, 45300, 45500, 45700, 45900, 46100, 46300, and 46500, May 1.

(c) For stations operating on the frequencies 46700, 46900, 47100, 47300, 47500, 47700, 47900, 48100, 48300, 48500, and 48700, June 1.

(d) For stations operating on the frequencies 43100, 43300, 43500, 43700, 43900, 44100, and 44300, July 1.

Equipment

Maximum Power Rating. The Commission will not authorize the installation of a transmitter having a maximum rated power more than twice the operating power of the station.

Maximum Rated Carrier Power; How Determined. (a) The maximum rated carrier power of a standard transmitter shall be determined by the manufacturer's rating of the equipment.

(b) The maximum rated carried power of a composite transmitter shall be determined by the sum of the applicable commercial ratings of the vacuum tubes employed in the last radio stage.

Frequency Monitor. The licensee of each high frequency broadcast station shall have in operation at the transmitter a frequency monitor independent of the frequency control of the transmitter. It shall have a stability of 20 parts per million.

Modulation Monitor. The licensee of each high frequency broadcast station shall have in operation at the transmitter an approved modulation monitor.

Required Transmitter Performance. (a) The external performance of high frequency broadcast transmitters shall be within the minimum requirement prescribed by the Commission contained in the Standards of Good Engineering Practice for High Frequency Broadcast Stations.

(b) The transmitter center frequency shall be controlled directly by automatic means which do not depend on inductances and capacities for inherent stability.

(c) The transmitter shall be wired and shielded in accordance with good engineering practice and shall be provided with safety features in accordance with the specifications of article 810 of the current National Electrical Code as approved by the American Standards Association.

Indicating Instruments. The direct plate circuit current and voltage shall be measured by instruments having an acceptable accuracy.

Changes in Equipment and Antenna System. Licensees of high frequency broadcast stations shall observe the following provisions with regard to change in equipment and antenna system:

(a) No changes in equipment shall be made:

1. That would result in the emission of signals outside of the authorized channel.

2. That would result in the external performance of the transmitter being in disagreement with that prescribed in the Standards of Good Engineering Practice for High Frequency Broadcast Stations.

(b) Specific authority, upon filing formal application¹ therefor, is required for a change in service area or for any of the following changes:

1. Changes involving an increase in the maximum power rating of the transmitter.

2. A replacement of the transmitter as a whole.

3. Change in the location of the transmitter antenna.

4. Change in antenna system, including transmission line, which would result in a measurable change in service

¹See Standards of Good Engineering Practice for High Frequency Broadcast Stations for specific application form required.

or which would affect the determination of the operating power by direct method. If any change is made in the antenna system or any change made which may affect the antenna system, the method of determining operating power shall be changed immediately to the indirect method.

5. Change in location of main studio to outside of the borders of the city, state, district, territory, or possession.

6. Change in the power delivered to the antenna.

(c) Specific authority, upon filing *informal* request therefor, is required for the following change in equipment and antenna:

1. Change in the indicating instruments installed to measure the antenna current or transmission line, direct place circuit voltage and the direct current of the last radio stage, except by instruments of the same type, maximum scale reading and accuracy.

2. Minor changes in the antenna system and/or transmission line which would not result in an increase of service area.

3. Changes in the location of the main studio except as provided for in subsection (b) 5.

(d) Other changes, except as above provided for in this section or in Standards of Good Engineering Practice for High Frequency Broadcast Stations prescribed by the Commission may be made at any time without the authority of the Commission, provided that the Commission shall be promptly notified thereof, and such changes shall be shown in the next application for renewal of license.

Operating Power; How Determined. The operating power, and the requirements for maintenance thereof, of each high frequency broadcast station shall be determined by the Standards of Good Engineering Practice for High Frequency Broadcast Stations.

Modulation. (a) The percentage of modulation of all stations shall be maintained as high as possible consistent with good quality transmission and good broadcast practice and in no case less than 85 per cent on peaks of frequent recurrence during any selection which normally is transmitted at the highest level of the program under consideration.

Frequency Tolerance. The operating

frequency without modulation of each broadcast station shall be maintained within 2000 cycles of the assigned center frequency.

Operation

Minimum Operating Schedule; Service.

(a) Except Sundays, the licensee of each high frequency broadcast station shall maintain a regular daily operating schedule which shall consist of at least three hours of operation during the period 6 a.m. to 6 p.m., local standard time, and three hours of operation during the period 6 p.m. to midnight, local standard time. In an emergency, however, when due to causes beyond the control of the licensee, it becomes impossible to continue operating, the station may cease operation for a period not to exceed ten days, provided that the Commission and the Inspector in Charge of the radio district in which the station is located shall be notified in writing immediately after the emergency develops.

(b) Such stations shall devote a minimum of one hour each day during the period 6 a.m. to 6 p.m., and one hour each day during the period 6 p.m. to midnight, to programs not duplicated simultaneously as primary service in the same area by an standard broadcast station or by any high frequency broadcast station. During said one hour periods, a service utilizing the full fidelity capability of the system, as set forth in the Standards of Good Engineering Practice for High Frequency Broadcast Stations, shall be rendered. However, the Commission may, upon request accompanied by a showing of reasons therefor, grant exemption from the foregoing requirements, in whole or in part, for periods not in excess of three months.

(c) In addition to the foregoing minimum requirements, the Commission will consider, in determining whether public interest, convenience, and necessity has been or will be served by the operation of the station, the extent to which the station has made or will make use of the facility to develop a distinct and separate service from that otherwise available in the service area.

DEVELOPMENTAL BROADCAST STATIONS

The term "developmental broadcast station" means a station licensed to carry on development and research for the advancement of broadcast services along lines other than those prescribed by other broadcast rules or a combination of closely related developments that can be better carried on under one license.

Licensee and Location	Call Letters	Frequency (kc)	Power	Emission
Bell Telephone Labs., Inc. Whippany, N. J.....	W3XDD	560, 900, 1340	50000 w	A3
Bell Telephone Labs., Inc. Whippany, N. J.....	W3XPY	43500, 49100	5000 w	Special
Central Broadcasting Co. Mitchellville, Iowa	W9XC	1040	150 w	A3 (C.P. only)
The Crosley Corp. Near Mason, Ohio.....	W8XO	700	100 kw-500-kw	A3
Midland Broadcasting Co., Kansas City, Mo.....	W9XER	46500	1500 w	Special
Muzak Corporation New York, N. Y.....	W2XMC	117650	1000 w	Special (C.P. only)

Pending Developmental Stations

McNary & Chambers Washington, D. C. (portable)	W10XMC	550 to 1600	100 w	A-0
Natl. Broadcasting Co., Inc. Area of New York, N. Y....	W10XF	1614, 2398, 3492.5, 4797.5, 6425, 9135, 12862.5, 17310, 23100, 30660, 31020, 31140, 31180, 31540, 33340, 33460, 33620, 35060, 35460, 37060, 37140, 37540, 39140, 39460, 39540, 116050, 116250, 116450, 116850, 117050, 117250, 117650, 118050, 118250, 118450, 118650, 118850, 156525, 156975, 157425, 157725, 158175, 159075, 160425, 161325, 161775, 162000-168000, 210000-216000, 264000-270000, 300000-400000, 401000 and above	25 w	A1, A-2, A3, A4, A5 & Special A5 on frequencies above 162000 kcs.
Natl. Broadcasting Co., Inc. Area of New York, N. Y....	W10XR	Same as above	100 w	A1, A2, A3, A4, A5 & Special A5 on frequencies above 162000 kcs.

— F. C. C. REGULATIONS REGARDING — DEVELOPMENTAL BROADCAST STATIONS

The term "developmental broadcast station" means a station licensed to carry on development and research for the advancement of broadcast services along lines other than those prescribed by other broadcast rules or a combination of closely related developments that can be better carried on under one license.

Licenses for developmental broadcast stations 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 development which cannot be successfully carried on under any of the classes of broadcast stations already allocated, or is distinctive from those classes, or combination of closely related developments that involve different phases of broadcasting which can be pursued better under one license.

(2) That the program of research has reasonable promise of substantial contribution to the development of broadcasting, or is along lines not already thoroughly investigated.

(3) That the program of research and experimentation will be conducted by qualified persons.

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

(5) That the public interest, convenience, and necessity will be served through the operation of the proposed station.

A separate developmental broadcast station license will be issued for each major development proposed to be carried forward. When it is desired to carry on several independent developments, it will be necessary to make satisfactory showing and obtain a license for each.

A licensee of developmental broadcast stations shall broadcast programs when they are necessary to the experiments being conducted. No regular program service shall be broadcast unless specifically authorized by the license.

A licensee of a developmental broadcast station shall not make any charge, directly or indirectly, for the transmission of programs, but may transmit the programs of a standard broadcast station or network including commercial programs, if the call letter designation when identifying the developmental broadcast station is given on its assigned frequency only and the statement is made

over the developmental broadcast station that the program of a broadcast station or network (identify by call letters or name of network) is being broadcast in connection with the developmental work. In case of the rebroadcast of the program of any broadcast station, the FCC Regulation on rebroadcasting holds.

Frequency Allotted

The following frequencies are allocated for assignment to developmental broadcast stations*:

	1,614					
2,396	}	2,398	12,855	}	12,862.5	37,140
2,400		12,870	12,870		37,540	
3,490	}	3,492.5	17,300	}	17,310	39,140
3,495			17,320			17,320
4,795	}	4,797.5	23,100	}		116,050
4,800			30,660			30,660
6,420	}	6,425	31,020	}		116,450
6,430			31,140			31,140
9,130	}	9,135	31,180	}		117,050
9,140			31,540			31,540
			33,340			117,650
			33,460			118,050
			33,460			118,250
			33,620			118,450
			35,060			118,650
			35,460			118,850
			37,060			156,525
						156,975
						157,425
						157,725
						158,175
						159,075
						160,425
						161,325
						161,775
						162,000-168,000
						210,000-216,000
						264,000-270,000
						300,000-400,000
						401,000 and above

A license will be issued for more than one of these frequencies upon a satisfactory showing that there is need therefor.

The frequencies suited to the purpose and in which there appears to be the least or no interference to established stations shall be selected.

In cases of important experimentation which cannot be conducted successfully on the frequencies allocated herein, the Commission may authorize developmental broadcast stations to operate on any frequency allocated for broadcast stations or any frequencies allocated for other services under the jurisdiction of the Commission upon satisfactory showing that such frequencies can be used without causing interference to established services.

The operating frequency of a developmental broadcast station shall be main-

* Also available for assignment to all other stations in the experimental service.

tained in accordance with the frequency tolerance of 0.05 per cent or less as required, provided, however, where lesser tolerance is necessary to prevent interference, the Commission will specify the tolerance.

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

Supplemental Report

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

1. The number of hours operated.
2. Comprehensive report on research and experiments conducted.
3. Conclusions and program for further development of the broadcast service.
4. Any other pertinent developments.

A developmental 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 operating regularly thereon which are applicable to developmental broadcast and are not in conflict with rules of the Commission for stations in general or for rules for developmental broadcast stations.

ST BROADCAST STATIONS

The term "ST broadcast station" means a station used to transmit programs from the main studio to the transmitter of a high frequency or an international broadcast station.

Licensee and Location	Call Letters	Frequency Kilocycles	Power Watts	Emission
Capitol Broadcasting Co. Schenectady, N. Y.....	W2XEO	331000	50	Special (CP only)
Columbia Broadcasting System, Inc. New York, N. Y.....	W2XYN	330400, 333400, 336400	25	Special (CP only)
Columbia Broadcasting System, Inc. New York, N. Y.....	W2XYO	330400, 333400 336400	25	Special (CP only)
Columbia Broadcasting System, Inc. New York, N. Y.....	W2XYP	330400, 333400 336400	25	Special (CP only)
Gordon Gray Winston-Salem, N. C.....	—	337000	25	Special (CP only)
The Journal Co. Milwaukee, Wisc.	W9XJC	331000	50	Special (CP only)
The Moody Bible Institute of Chicago Chicago, Ill.	W9XMB	333400	25	Special (CP only)
Standard Broadcasting Co. Los Angeles, Calif.....	—	333400	25	Special (CP only)

Pending ST Stations

Boston Edison Co. Boston, Mass.	—	330400	25	Special
Radio Service Corp. of Utah Salt Lake City, Utah.....	—	331000	25	Special
WOKO, Inc. Albany, N. Y.....	—	337000	25	Special