Distinctive Calls For FM As Directed By The FCC

TO PROVIDE distinctive calls for FM (frequency modulation) broadcast stations, the Federal Communications Commission has adopted a new system of call letters with interposed numbers for this now commercially recognized broadcast service.

Under international agreement, to which the United States is a party, the first letter (in some cases the first two letters) of a call signal indicates the nationality of a station. The United States is assigned the use of three letters—N, K, and W. Hence the present domestic assignment of combinations beginning with these letters. Call letters beginning with N are reserved for the exclusive use of the Navy and Coast Guard. Call letters beginning with K are assigned to broadcast stations located west of the Mississippi River and in the territories. Call letters beginning with W are assigned to stations east of the Mississippi River. Any existing call letters not in accordance with this procedure is due to the fact that the station was licensed before the allocation plan was adopted.

Consequently, the first call letter of an FM station must be K or W, depending on its geographical location.

Alphabetical Order

A second letter for an FM station will be assigned in alphabetical order (with exception of E, which will be reserved for non-commercial educational stations using frequency modulation) to each station on a given frequency as licensed, thus providing 25 stations in each area for a given frequency. If more than 25 stations are assigned on a given frequency, an additional letter will be necessary.

However, between the initial letter and supplemental letter (or letters) two numbers will be utilized. These numbers will indicate the frequency assignment. This is possible because all FM stations are in the 42,500-50,000 kilocycle band, and because all FM frequencies are assigned on the odd hundreds in kilocycles. Thus, the first figure and the last two figures of the frequency assignment can be dropped.

City Indication

In addition, and where possible, the city or area will be indicated by the second letter or a combination of second and third letters. Letter combinations of this mnemonic character have been assigned to each of the metropolitan trading centers. Thus, stations in Boston will terminate with the letter B, while stations in New York City will terminate with NY. Similarly, stations in the District of Columbia wll be identified with the suffix DC.

In brief, here is how the system works: W41B would indicate an FM station in the eastern section of the country (Boston) operating on the frequency of 44,100 kilocycles. By the same token, K43SF would apply to an FM station in the western part of the United States (San Francisco) on the 44,300 kilocycle frequency.

The letter E in the alphabetical arrangement will identify non-commercial educational broadcast stations employing FM on the new high frequency broadcast band. Five channels (42,000 to 43,000 kilocycles) are available to these educational stations.

There is no international regulation to bar the use of this FM identifying system. In fact, a like principle is followed by Chile in assigning calls to standard broadcast stations in that country. The arrangement provides ample source of calls for future FM stations. It is about the only source of new call combinations which can be adapted, inasmuch as other types of calls are assigned by treaty to stations and services other than broadcast. It has the additional advantage of permitting identification of the frequency actually used, and for that reason should be popular with listeners as well as broadcasters.

Further, it will not disturb the approximately 15,000 remaining four-letter call combinations which are being assigned to the older services at the rate of between 40 and 50 a week. Even if this average does not increase, such a reservoir will not last more than six years. Under treaty, ship stations have priority in the assignments of radio call letters from the four-letter group.

FREQUENCY MODULATION

By LT. COL. GUSTAVUS REINIGER
Radio Engineering Laboratories, Inc.

IN 1940 Frequency Modulation (F.M.) has climbed dramatically out of the experimental classification to win the F.C.C. stamp of approval as a full fledged commercial broadcasting service. Three years ago Radio Engineering Laboratories, Inc., co-operating closely with the inventor, Major Edwin H. Armstrong, was the only manufacturer devoting an important part of its attention to F.M. transmitter equipment. Today there are three other large companies in this field: Western Electric, General Electric and R.C.A.; while Westinghouse is reported to be also planning to come into the field.

Three years ago no one was manufacturing F.M. receiving sets in quantity—today there are more than twenty-five thousand sets in use, most of these sold in the past six months. Ten or more manufacturers are making F.M. receivers and combinations. Radio dealers generally, where F.M. programs can be heard, are reporting increases in sales volume of 40 per cent or more because of F.M. interest. A very good all-use combination (shortwave, standard radio, 10-record changer, and F.M.) has sold a record volume in a New York department store priced at $139.50. A good table model set with standard radio and F.M. sells for $70.00. A considerable number of F.M. tuners which are designed to add F.M. to present radio sets have been bought by the public.

Frequency Modulation development seems to be following in the footsteps of its predecessor A.M. A year and a half ago anyone could have applied for a one-kilowatt experimental F.M. transmitter and got on the air promptly. In metropolitan centers such as New York City, Chicago and Philadelphia it is already doubtful whether there will be enough frequencies for all those who wish to enter this new method of broadcasting. Besides leaders in the present broadcasting industry, leaders in other industries are applying for and getting construction permits for F.M. stations, notably newspapers and department stores in New York City, Baltimore and Los Angeles. At time of going to press, due to limitations by the FCC and its regulations regarding F.M. Broadcast stations, New York City has a greater number of applications than there are available frequencies.

F. M. and the War

The participation of the United States in a major war is an item of uncertainty to some prospective F.M. broadcasters. It is likely however, that the vagaries of a modern war will only make the superiority of F.M. show up with greater clarity, just as this super-mechanized war has made all other kinds of excellence in technical equipment much more pronounced.

Besides its peace time excellence, F.M. is almost impossible to jam. Long distance aerial raiders would not be able to use F.M. stations to ride into the United States on their guiding signals, but all A.M. stations will have to be shut down whenever an air-raid is imminent, as is now done in Germany.

F. M. Networks

What about F.M. networks? During the past year repeated successful demonstrations have been given of relaying F.M. programs through four to seven stations, without the slightest impairment of the program. This ability to relay programs through dozens of stations is one of the greatest powers of F.M. It makes for an elasticity of combination quite impossible with the A.M. system of broadcasting. Several F.M. networks have been under discussion for some months. During the coming year one or more of these will probably take definite commercial form.

Will F.M. pay? There are already thousands of enthusiastic listeners. The next year will make this number millions. F.M. is ideal for automobile radio. It eliminates all the noise, but it is still so young that this important phase has had almost no discussion.

Major Armstrong recalls the time some years ago when he expressed the opinion that a superhetrodyne A.M. receiving set could not be manufactured for less than $100.00. He invented the Superhetrodyne just as he did F.M. We are now all familiar with the thousands of Superhetrodyne A.M. sets that sell for $9.00 to $15.00. So Major Armstrong now says, "If the public wants F.M., ways will be found to meet every man's pocketbook."

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.
Baton Rouge, La.	W45RG	Baton Rouge Broadcasting Co.	44500	8100
Binghamton, N. Y.	W49BN	Howitt-Wood Radio Co.	44900	6500
Boston, Mass.	W39B	The Yankee Network, Inc.	43900	31000
Brooklyn, N. Y.	W59NY	Frequency Broadcasting Corp.	45900	8500
Chicago, Ill.	W67C	Columbia Broadcasting System, Inc.	46700	10800
Chicago, Ill.	W63C	National Broadcasting Co.	46300	10800
Chicago, Ill.	W59C	WGN, Inc.	45900	10800
Chicago, Ill.	W47C	WJJD, Inc.	44700	10800
Chicago, Ill.	W51C	Zenith Radio Corp.	45100	10760
Columbus, Ohio	W45CM	WBNS, Inc.	44500	12400
Detroit, Mich.	W45D	The Evening News Association	44500	6820
Evansville, Ind.	W45V	Evansville On the Air, Inc.	44500	8397
Hartford, Conn.	W53H	Travelers Broadcasting Service Corp.	45300	6100
Hartford, Conn.	W65H	WDRC, Inc.	46500	6100
Los Angeles, Calif.	K45LA	Don Lee Broadcasting System	44500	6944
Nashville, Tenn.	W47NV	National Life & Accident Insurance Co.	44700	16000
Milwaukee, Wisc.	W55M	The Journal Co.	44500	8540
New York, N. Y.	W71NY	Bamberger Broadcasting Service, Inc.	47100	8500
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.	W63NY	Marcus Loew Booking Agency	46300	8500
New York, N. Y.	W75NY	Metropolitan Television, Inc.	47500	8500
New York, N. Y.	W51NY	National Broadcasting Co.	45100	8500
Philadelphia, Pa.	W69PH	WCAU Broadcasting Co.	46900	9300
Philadelphia, Pa.	W53PH	WFIL Broadcasting Co.	45300	9300
Pittsburgh, Pa.	W47P	Walker & Downing Radio Corp.	44700	8400
Pittsburgh, Pa.	W75P	Westinghouse Radio Stations, Inc.	47500	8400
Schenectady, N. Y.	W47A	Capitol Broadcasting Co.	44700	6589
Schenectady, N. Y.	W57A	General Electric Co.	45700	6600
Salt Lake City, Utah	K47SL	Radio Service Corp. of Utah	44700	623
South Bend, Ind.	W71SB	South Bend Tribune	47100	4300

Pending Applications

LOCATION	*Licensee*	*Frequency Kilocycles*	*Service Area Sq. Mi.*
Albany, N. Y.	WOKO, Inc.	45100	7164
Amarillo, Texas	Amarillo Broadcasting Co.	45100	6503.89
Ashland, Ky.	Ashland Broadcasting Co.	46100	5119.5
Baltimore, Md.	The A. S. Abell Co.	44300	15489
Battle Creek, Mich.	Federated Publications, Inc.	48100	4100
Boston, Mass.	Columbia Broadcasting System, Inc.	44100	16230
Boston, Mass.	Westinghouse Radio Stations, Inc.	46500	6652
Boston, Mass.	The Yankee Network, Inc.	44300	19230
Cedar Rapids, Ia.	The Gazette Company	44700	7400
Chicago, Ill.	The Moody Bible Institute of Chicago	43900	15300
Cicero, Ill.	WHFC, Inc.	47500	2885
Detroit, Mich.	John Lord Booth	44100	4400
Detroit, Mich.	James F. Hopkins, Inc.	46500	2130
Detroit, Mich.	WJR, The Goodwill Station	43700	14144
Duluth, Minn.	Head of Lakes Broadcasting Co.	44500	2754
Ft. Lauderdale, Fla.	Tom M. Bryan	44500	2150
Ft. Wayne, Ind.	Westinghouse Radio Stations, Inc.	44900	6150
Grand Rapids, Mich.	Federated Publications, Inc.	46100	5300
Kansas City, Mo.	Commercial Radio Equipment Co.	44900	2995
Lansing, Mich.	Federated Publications, Inc.	47100	3820
Lexington, Ky.	American Broadcasting Corp. of Kentucky	45100	7290
Los Angeles, Calif.	Earle C. Anthony, Inc.	44900	1371
Los Angeles, Calif.	Echo Park Evangelistic Assn.	45500	1344
Los Angeles, Calif.	Standard Broadcasting Co.	45100	1427.97
New York, N. Y.	Bremer Broadcasting Corp.	47100	8500
New York, N. Y.	FM Radio Broadcasting Co.	48300	8600
New York, N. Y.	New Jersey Broadcasting Corp.	47900	8500
New York, N. Y.	Wodaam Corp.	45300	8500
Philadelphia, Pa.	Pennsylvania Broadcasting Co.	44700	9585
Philadelphia, Pa.	Seaboard Radio Broadcast Corp.	48300	9600
Philadelphia, Pa.	Westinghouse Radio Stations, Inc.	45500	11492
Pittsburgh, Pa.	Pittsburgh Radio Supply House	43900	11488
Portland, Ore.	KOIN, Inc.	44500	8175
Providence, R. I.	Cherry & Webb Broadcasting Co.	47500	6207
Providence, R. I.	The Outlet Co.	44300	16370
Rochester, N. Y.	Stromberg-Carlson Telephone Mfg. Co.	45100	2240
Rockford, Ill.	Rockford Broadcasters, Inc.	45100	6000
St. Louis, Mo.	The Pulitzer Publishing Co.	43500	6564
St. Louis, Mo.	St. Louis University	44300	13500
St. Louis, Mo.	Star-Times Publishing Co.	44700	12480
Springfield, Mass.	Westinghouse Radio Stations, Inc.	48100	2022
San Francisco, Calif.	Don Lee Broadcasting System	43500	3080
South Bend, Ind.	South Bend Tribune	47100	4330
Syracuse, N. Y.	Central New York Broadcasting Corp.	46300	6800
Trenton, N. J.	Mercer Broadcasting Co.	44700	3700
Winston-Salem, N. C.	Gordon Gray	44100	69400
Winston-Salem, N. C.	Piedmont Publishing Co.	46700	4600
Worcester, Mass.	Worcester Telegram Publishing Co.	43100	19230
Youngstown, Ohio	William F. Maag, Jr.	43500	12304

F. M. HEADLINES
Of 1940—From Radio Daily

JANUARY

Jan. 8—FM Interests Organize; Will Coordinate Setup For FCC And Make Future Studies.

Jan. 12—New Armstrong System To Be Shown In Capital.
FM Group To Ask FCC To Delay Television Decision.

Jan. 16—Stewart Warner Readying FM Receivers.

Jan. 25—Western Eelectric To Build New FM Transmitters.

Jan. 26—Quick Universal Use Of FM Seen By Zenith's McDonald.
Armstrong Licenses Pilot Radio Corp.

Jan. 29—FM Sets On Sale At Macy's.

FEBRUARY

Feb. 2—Stromberg Carlson Drive To Sell FM Receivers.
More Stations Expected To Start FM Tests Soon.

Feb. 16—FM Gathers Momentum; 12 Experimental Transmitters In Use With 5 Manufacturers Making Receivers; Investment Now $1,500,000.

Feb. 20—Seek "Junior" Union Talent For Experimental Television And FM.

Feb. 23—Big FM Watter Sought By Brooklyn Concern.
General Electric To Push FM Sets: Sees Expanding Market.

Feb. 29—Four-Way FM Hookup Does Its Stuff Tonight.

MARCH

Mar. 4—FM Hookup Schedule To Start This Summer.
Two Web Schedules Available For Owners Of FM Sets.

Mar. 6—FM Group's Strong Front; Will Battle For Commercial Status At March 18th Hearing Before FCC; Big Delegation Readied.
All WHN Programs Set For Finch FM Station.

Mar. 8—Marshall FM Witnesses; Some 29 Individuals And Organizations Signify Intention Of Appearance At FCC Hearing On March 18.
Experimental FM Relay Started Today By WOR.
Four New York Stations Testing FM Operation.

Mar. 11—FCC Allots Six Hours To Hear FM Broadcasters Story.

Mar. 13—Big Chicago Delegation To Attend FM Hearing.

Mar. 14—Set Makers Prepared For Larger FM Sales.

Mar. 15—FCC Allotting More Time To FM Hearing Schedule.

Mar. 18—FCC Opens FM Hearing; Strong Attendance On Tap Including Networks, Stations, Manufacturers, Et Al; To Last Through Thursday.

Mar. 19—Armstrong Fires First FM Gun; Inventor Presents Case As Opening Witness In FCC Hearing; Sees Television Use For Higher Frequency.

Mar. 20—Explain FM Advantages; Major Armstrong Again Heads Witnesses Informing FCC Of Various Angles; Universal Adoption Far Off.

Mar. 21—Shepard Makes Plea For FM Green Light.

Mar. 22—Allocation Crops Up; FM Hearings Adjourn.

Mar. 25—RCA-NBC Covers On FM; Application In For Five Such Stations In Key Cities Across The Country; Also Files Television CPs.

Mar. 28—RCA Gives Stand On FM; No 100 Percent Adoption Possible, It Believes, But Urges Approval; Cites Own Experiments.

APRIL

Apr. 3—WDRC Makes Application For 50,000-Watt FM Construction Permit.
Stromberg-Carlson Optimistic On Television-FM Activity.

Apr. 5—Newspapers And Stores Rush To Get FM Licenses.
Scott Labs Readying FM Receivers.

Apr. 10—FM Radio Men Meet To Discuss Policies.

Apr. 12—FCC Extends Time Limit For Filing Briefs On FM.
FM Tries Mobile Transmitter.

Apr. 24—RMA Opens Studies Anent FM Standards.

Apr. 26—FM "Limited" Tube Developed.

Apr. 29—Philco Financing To Cover Television And FM.

MAY

May 1—CBS Asks FCC Permit To Build FM Stations.

May 2—Sees 116 FM Applications Filed With FCC.

May 10—FM Manufacturers See Boom After FCC Action.
Facsimile-FM Showing By Finch Laboratories.

May 17—Western Eelectric Introduces First FM Transmitter.

May 20—FM Gets Commercial Okay; Goes Into Effect Forthwith As FCC Sees Full Industry Accord; Other Activity By Commission.

May 21—Tremendous FM Activity; Progress On All Fronts As Stations And Manufacturers, Et Al, Rush To Benefit By Commercial Status.
May 23—FM Potential Sales Up For RMA Studies.
May 24—FM Broadcasters, Inc. Call Confab To Discuss FM Moves.
May 27—FM Gathers Momentum; Wide Activity Among Receiver Manufacturers While FCC Paves Way For Filing New Station Permits.
May 28—All Possible Speed Is Keynote Of FM Broadcasters, Inc., Meeting.
May 31—NAB To Consider Expansion of Membership, Such As FM.

JUNE

June 7—Yankee Network Uses FM To Transmit Pictures.
Westinghouse Stations Readied for FM On January 1.
June 13—Farnsworth's Spot Advertising Campaign In Behalf Of FM.
June 24—WOR's FM Transmitter Takes Skyscraper Site.
June 25—FM Gets Green Light As FCC Sets Up Rules.
June 26—General Electric Readies FM Line.
June 27—Worcester's FM Station On Full Time Schedule.
June 28—Institute Of Radio Engineers' Members See FM At Boston Gathering.

JULY

July 8—General Electric Sells Four FM Transmitters To Civil Aeronautics Authority.
July 11—FCC Readies New Forms For FM Applicants.
July 12—RCA's FM Transmitter To Be Offered On August 1.
July 22—FCC Simplifies Plan For FM Applications.
July 25—New FM Outlet Debuts In New York On August 1.
July 26—WGN Makes Application For 50 Kw. FM Station.

AUGUST

Aug. 2—WOR's FM Transmitter Makes Formal Debut.
Freed-Eisemann In FM Field.
Aug. 5—Miller Request FCC To Simplify FM Form.
Aug. 7—NIB Discusses BMI-AFM-FM; Sets Chicago And New York Meetings.
Aug. 8—FM Gets Complete Once-Over At NAB Convention.
Aug. 9—Western Electric Sees FM Creating New Replacement Sales.
U. S. Army Tests FM.
Aug. 16—First FM Educational Use Planned By San Francisco Schools.
Aug. 21—Huge FM Audience Seen; Station Operators Plan Coverage of 15,000 Square Miles; Fifty New Stations Expected by January 1.
Aug. 28—Special FM Meeting Explores Web Plans.
Aug. 29—FM Station Costs $20,000.

SEPTEMBER

Sept. 3—FM Reports Headway As NBC Sets Activity.
WDRC Begins Exclusive FM Program Service.
Sept. 6—FM Network To Start In 1941 With 42 Outlets.
Sept. 13—WIP To Woo Advertisers To FM With Special Show.
Educators Hop On FM Bandwagon.
Sept. 18—Two Daily FM Programs Via General Electric And WOR At New York World's Fair.
Sept. 26—See FM Development Air By Newspapers.
Sept. 30—FM Inventor Wins Additional Patent. General Electric And Other Utilities Buy FM Units.

OCTOBER

Oct. 2—Chicago FM Outlet For NBC.
Oct. 3—FCC Further Defines Rules For FM Area.
Oct. 4—W. R. G. Baker Sees Gradual Advances For FM.
Oct. 7—FM Programs In New York Area Heard 60 Hours Weekly.
Oct. 11—Cleveland Schools To FM.
Oct. 24—A. T. & T. Says It Can Handle Wire Transmissions Of FM.
Oct. 29—Will Rush FM Says Fly; FCC Meeting Called For Next Friday To Expedite Station Applications; Television Committee Reports Soon.

NOVEMBER

Nov. 1—FM Goes Commercial; FCC Working Fast Gives 15 Outlets Okay To Sell Time Immediately They Find It Feasible.
FM Applicants Reduce Station Coverage Claims.
Nov. 4—Mull FM Call Letters; Coverage Area Issued.
Nov. 7—Nashville Goes For FM As City Emergency Setup.
Nov. 8—FCC Explains Unusual FM Coverage Problems.
DeMars Sees FM Web As No. 1 Network.
Nov. 14—FM And Color Television Talk Closes Institute Of Radio Engineers' Meeting.
Nov. 15—General Eelectric Readies FM Schedule; First Program November 20.
Nov. 19—CBS Files Request For Chicago FM Station.
Nov. 22—FCC Grants 2 FM Commercial Licenses. George Henry Payne Lauds FM At General Electric Company's Inauguration.
Nov. 29—FM Product Okay Despite War Orders.

DECEMBER

Dec. 2—General Electric Makes Arrangements To Handle Opera Via FM.
Dec. 10—First FM Commercial; WOR Sells Longine Co.
Dec. 11—Big Television-FM Agenda For Engineer Confab.
Dec. 17—Commission Releases New FM Applications; Sets Simplified Procedure.
Dec. 18—Yankee Network's FM Station On Air Soon.
Dec. 20—FCC Extending Time For FM Adjustments.
Dec. 27—Two New York Firms File For FM Permits.
Yankee Network's FM Station Set For Maine And New Hampshire.

F. C. C. Regulations Regarding High Frequency Broadcast Stations

As of January 1, 1941

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 frequency 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.

Allocation of Facilities[1]

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

[1] The 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.

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 for government data[2]. 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.

(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.

(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. The application shall be accompanied by a full analysis of the basis upon which the area as set forth in the application was determined. No application for construction permit for a new station or change of service area will be accepted unless a definite

[2] There 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.

site, full details of the proposed antenna, and a suitable map showing the expected service area are furnished with the application.

(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 adapated 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	47900	46700
44700	45900	48100	46900
44900	46100	48300	47100
45100	46300	48500	47300
45300	46500	48700	47500
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	

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 control[1]) 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, 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 concentral 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 issued for a normal license period of one year, expiring as follows:

(a) For stations operating on the frequencies 48900, 49100, 49300, 49500, 49700, and 49900, April 1.

(b) For stations operating on the frequencies 44500, 44700, 44900, 45100, 45,300, 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.

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

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 application[2] 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 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, the 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.

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

EXPERIMENTAL FACSIMILE BROADCAST STATIONS

Licensee and Location	*Call Letters*	*Frequency Kilocycles*	*Power Watts*	*Emission*
Bamberger Broadcasting Service New York, N. Y.	W2XUP	25250	100	A3 & A4
Courier-Journal & Louisville Times Co. N. E. of Eastwood, Ky.	W9XWT	25250	500	A3 & A4
The Crosley Corporation Cincinnati, Ohio	W8XUJ	25025	1000	A3 & A4
The National Life & Accident Insurance Co. Nashville, Tenn.	W4XIH	25250	1000	A4
The Pulitzer Publishing Co. St. Louis, Mo.	W9XZY	25100	100	A4
Symons Broadcasting Co. Spokane, Wash.	W7XSW	25150	100	A4 (C.P. only)
WBNS, Inc. Columbus, Ohio	W8XUM	25200	100	A4
WOKO, Inc. Albany, N. Y.	W2XWE	25050	500	A3 & A4

BROADCAST STATIONS LICENSED FOR EXPERIMENTAL TRANSMISSION OF FACSIMILE SIGNALS

Call Letters	*Licensee and Location*	*Frequency Kilocycles*	*Power Authorized Watts*
WGN	WGN, Inc. Chicago, Ill.	720	50000
WHK	United Broadcasting Co. Cleveland, Ohio	1390	1000
WLW	Crosley Corp. Cincinnati, Ohio	700	50000
WOR	Bamberger Broadcasting Service, Inc. Newark, N. J.	710	50000