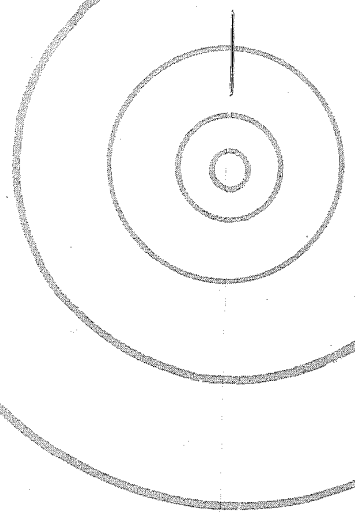


CLEAR CHANNEL RADIO SERVICE IN U.S.A.

- How Radio Signals Reach You
- Skywave/Groundwave Service
- Plans to Add More Stations
- Your Comments Are Invited
- Maps: Where People Get Only Skywave Service at Night

  The 25 Class I-A Clear Channel Radio Stations
- Technical Terms Illustrated

Public Service
Pamphlet 79-4

WCCO RADIO 8·3·0
625 SECOND AVENUE SOUTH ■ MINNEAPOLIS, MINNESOTA 55402

WCCO RADIO 8·3·0
MINNEAPOLIS • ST. PAUL

Clear Channel Broadcasting in U.S.A.

A principal duty of Federal Communications Commission is to see that all people in United States get good radio service. It does this by assigning stations to various channels and by fixing the power of their transmitters and directions in which they radiate signals from various locations. FCC has fitted more than 8,800 stations onto the channels to provide this service with minimum interference among them, designed so people can get clear reception and the channels are most fully used. A summary of USA broadcast facilities is shown in the table on the next page.

There are proposals to change the use of the radio channels. One major proposal would add more stations on existing channels to provide more opportunities for minorities to own stations. Minorities have a very small percentage of American licenses. Most of these new stations would be on channels now kept clear to serve people by their skywaves.

Another proposal is to increase the number of channels at one end of the dial by getting international agreement at the World Administrative Radio Conference (WARC) in Geneva, in September 1979. WARC allocates places in the spectrum for all radio uses each 20 years.

Another plan would add stations by squeezing USA stations from 10 KiloHertz (kHz) separation to 9 kHz, the spacing used in many other countries. And some persons would do all three things . . . put more stations on existing channels, add more channels and narrow the spacing between stations.

These pages are designed to describe simply some characteristics of radio broadcasting. They will help you evaluate the effects of various proposals on radio service. Any technical terms already used become clear as you read on. And some are illustrated on the last page.

HOW RADIO REACHES YOU

To appreciate the problem of serving all parts of USA by radio, you need to know how radio waves travel. *In daytime,* you get a signal by the ground route from the transmitting antenna to your set. At 50,000 Watts (50 kW) power and with average ground conductivity, this

U.S.A. Stations: On Air and Authorized[1]

	Licensed	On air STA[2]	CP's on air[3]	Total on air	CP's not on air	Total authorized[4]
Commercial AM	4,506	5	38	4,549	50	4,599
Commercial FM	3,022	2	80	3,104	147	3,251
Educational FM	947	0	38	985	74	1,059
Total Radio	8,475	7	156	8,638	271	8,909
Commercial TV						
VHF[5]	514	1	1	516	8	524
UHF	214	0	2	216	49	265
Educational TV						
VHF	94	1	7	102	6	108
UHF	151	2	5	158	4	162
Total TV	973	4	15	992	67	1,059
FM Translators	254	0	0	254	86	340
TV Translators						
UHF	1,151	0	0	1,151	260	1,411
VHF	2,408	0	0	2,408	205	2,613

1 FCC Tabulation 1/31/79

2 Special Temporary Authorization

3 Construction Permit

4 Includes off-air authorization

5 UHF = Ch.2-13
VHF = Ch.14-83

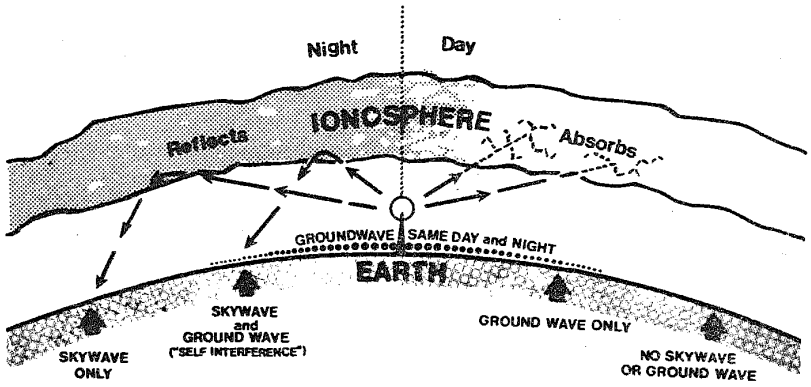
groundwave signal is strong enough to be useful in open areas about 100 to 150 miles away. This is the primary service of a station. The energy radiating skyward from the antenna is absorbed in the ionosphere where ions are excited by solar radiation.

In the *hours of darkness,* however, the ionosphere acts like an "electronic mirror" activity in the ionosphere changes with less sun. So at night, the skyward energy, instead of being wasted, is reflected back down to earth from this "mirror." This reflected energy from an AM radio station is the *skywave,* its secondary service to listeners. While it is spoken of as nighttime service, the mirror effect occurs from two hours before sunset until about two hours after sunrise. That means that for more than two-thirds of the day in winter there is skywave broadcasting, including those morning and early evening hours of greatest listener interest. (FM and TV signals travel line-of-sight. That is why those broadcast stations put their antennas on tall structures to reach to the horizon. They do not have significant skywaves.)

The skywave AM signal fades in and out and varies in range, sometimes within a few hours, as the ionosphere changes height and characteristics. The skywave from a typical 50 kW station is at useful strength in open spaces as far away as 650 to 750 miles about half the time it occurs. At night, therefore, you get two signals from a station — the primary groundwave, which continues the same distance as in daytime, and the secondary skywave, which reflects back to earth from the ionosphere.

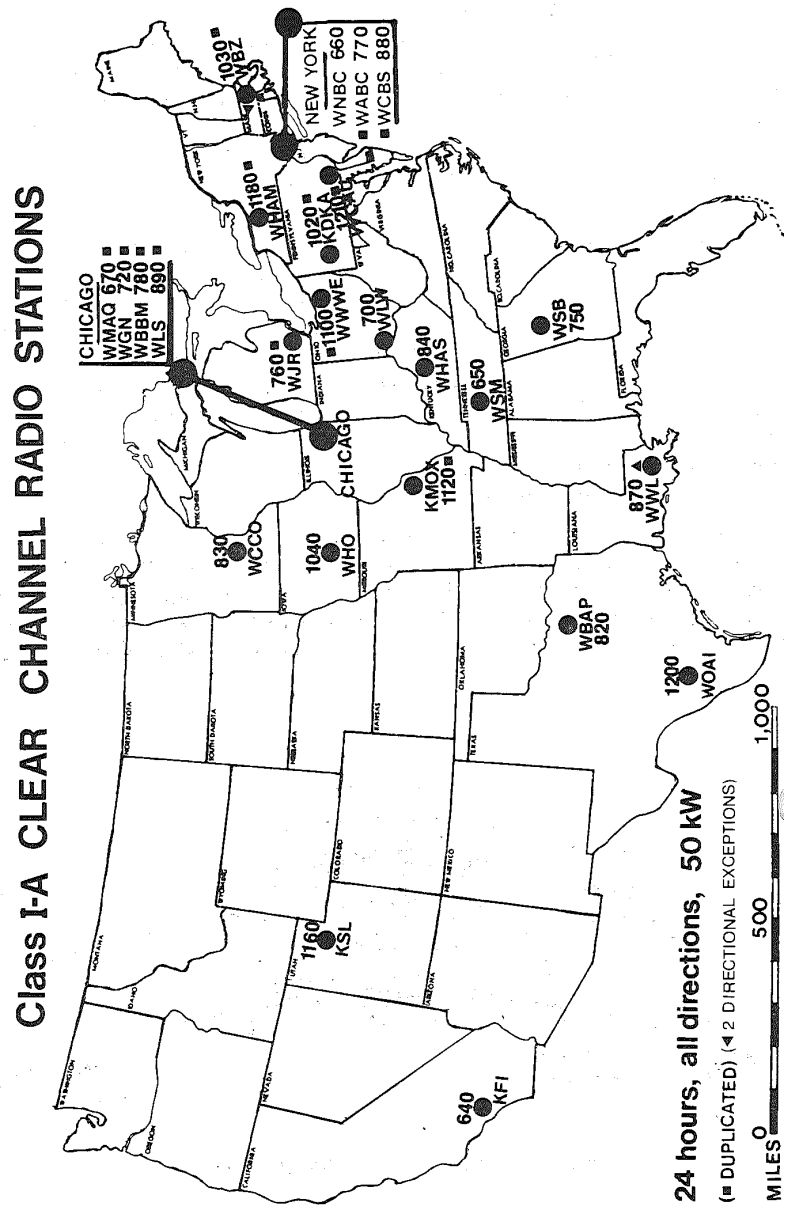
Sometimes the skywave returns to earth within the area of the groundwave. This causes fading in the primary service area by self-interference of the station's two waves. When the two waves arrive in perfect phase, they reinforce each other. When they arrive exactly out of phase, you hear nothing in the null. This doughnut-shaped fading zone around a station varies in width and in distance from the station as the ionosphere changes. Beyond it, the groundwave may be so weak that even a weak skywave will carry the programs. This is the beginning of the interference-free secondary service area. People from there on out get good nighttime service.

But within the primary groundwave area, people in the fading zone may not be getting any satisfactory reception. When they are in a complete null, for instance, their radios may pick up signals from adjacent channels. Tuned to WCCO from Minneapolis-St. Paul at 830 kHz, their radios may get a program from WBAP, Dallas-Fort Worth,



HOW RADIO SIGNALS REACH YOU

WCCO RADIO SPECIAL PROJECTS



at 820 kHz or WHAS, Louisville at 840 kHz. These distant skywaves also may fade and vary in usefulness.

There are antenna designs that correct self-interference. WCCO has applied for permission to build such an antenna to give good reception throughout its primary service area. This is a "Franklin antenna," named for a recent inventor. He found a way to shape the skywave so not enough lands within the primary service area to spoil reception there.

U.S.A. SOLUTION FOR NIGHT SERVICE

The solution has been to establish typically four kinds of stations: Class I stations on clear channels, usually at 50,000 W, to serve remote rural areas as well as cities; Class II stations on the clear channels with 250 W to 50,000 W which serve a city and adjacent rural areas without hurting the service to Class I listeners; Class III regional stations of 500 W to 5,000 W to serve a city and adjacent areas and Class IV stations on local channels at 1,000 W days and 250 W nights.

Federal Communications Commission designated 25 channels many years ago for Class I-A clear channel broadcasting service. One dominant station on each I-A clear channel was to transmit all directions day and night at the 50,000 Watt power limit set by the Commission. No other station was to transmit during darkness on the I-A channels. That way the channel would serve areas by skywave where no local stations could be assigned because they would interfere with one another.

STATIONS INTERFERE ON SKYWAVES

The problem of serving all areas of the United States is complicated by this skywave phenomenon. In daytime, you can have many stations on the same channel, each serving its area by groundwave without interfering with any other. If they were to transmit at night, their skywaves could reflect back into each other's service area. Then you would hear no station clearly because they would interfere with each other. The channel would be wasted. As a general principle, for each square mile that a station serves with local groundwave, its skywave signal spoils reception on the same channel in 100 square miles at distant points.

DIRECTIONAL STATIONS

Some stations were assigned to transmit all directions by day and concentrate their beams in a narrow angle at night. Several may use the same channel without skywave interference. The beam is focused by feeding power to several towers. Some soak up energy and feed it to others. When you see several radio towers for the same station, you see a directional array. When you see only one tower (antenna) it is sending its signal all directions equally.

A 25 kW directional station may deliver a stronger signal in its beam than a 50 kW station whose power is spread evenly in all directions. From Minneapolis-St. Paul, WDGY on 1130 kHz is a directional 25 kW whose night beam to the north is as strong as a 250 kW non-directional would be. KSTP on 1500 kHz is a 50 kW station whose directional night beam to the north, west and south equals a 100 kW non-directional. WDGY protects KWKH in Shreveport, Louisiana, WNEW in New York and a Canadian station to the west. KSTP protects WTOP, Washington, D.C., and other stations.

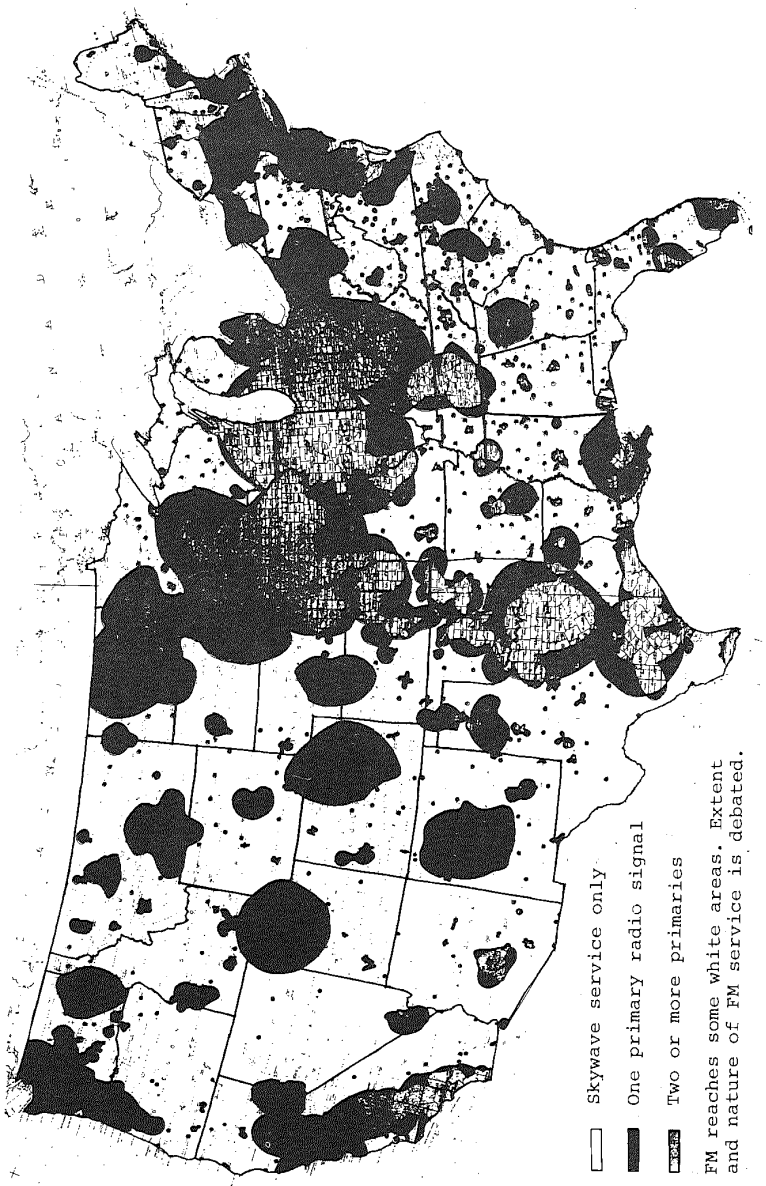
MILLIONS GET ONLY SKYWAVES

This need to keep stations from interfering with each other leaves areas of the country with only skywave service at night. There is no way by the laws of physics to use radio channels so every acre gets primary groundwave service at night without having skywaves interfere with distant local stations on the same channel.

Areas served at night by only skywave are known as "white areas" on the basic coverage map. In the 1960s, about 25 million people lived in these areas, across one-third of the country. Though they lived in the secondary service area of stations, the skywave was their only nighttime service.

In 1961 the Commission tried to reduce white areas, to give people reliable groundwave service day and night. It designated 13 of the 25 clear channels for use by 13 new Class II A stations. It said it would consider increasing power of the other clears to better serve the remaining white areas by skywave.

After 11 years, the Commission reported they had added reliable primary AM service for about 300,000 of the 25,000,000 persons in the white areas. More than half these people (158,000) are served by one station, KRVN at Lexington, Neb., 50 kW at 880 kHz.



WHITE AREAS: Only Night AM Radio Is by Skywave

1975 INQUIRY

The gain in service was so minimal that the Commission started in December, 1975 (Docket 20642) to look at the whole question again. It received numerous recommendations. WCCO Radio proposed that all USA stations, including the clears, be allowed higher powers. This would (1) help overcome local electrical interference, which was increased in all station service areas, (2) provide reliable nighttime service in white areas, (3) provide a choice of programs in local monopoly markets, and (4) help protect USA from foreign interference and from the one- and two-million Watt transmitters used in foregin countries. (A small station next to 830 kHz in Belize [old British Honduras] on the Mexican peninsula, for instance, creates a whistle and whine more than 2,000 miles away in Minnesota some nights. Cuba's station on 830 kHz similarly hurts listeners in the WCCO Radio area at times.)

1979 FCC PROPOSALS

The Commission reported December 19, 1978, that it now plans to reject the idea of higher power. It said FM stations had greatly reduced the numbers of people without solid primary AM radio service day and night. The staff said its conclusion was based on data that it agreed obviously was subject to question as to the extent of FM coverage. However, further study, staff said, would not increase its estimate of people without reliable AM or FM nighttime service much beyond 4,000,000 as compared with the 1975 estimate of 25,000,000 when only AM radio was considered.

FCC said it was considering duplicating all clear channel stations to add stations for minorities. That means that other stations would broadcast at night on 830 kHz. The degree of their proposed interference with WCCO listeners is up for consideration.

Commission Chairman Charles Ferris said his staff estimated that 600 applications would be made for a possible 100 new stations. The Communications Act requires FCC to hold comparative hearings on the merits to determine which applicant for a new station would best serve the "public interest." Those hearings would be long and expensive. To avoid 100 hearings, Ferris said he would ask Congress for a law to grant new licenses by either lottery or auction, with provisions to give minority applicants a preferential advantage.

WHAT MAY HAPPEN NEXT

New stations may be added that would interfere with programs people get from clear channel stations. This might reduce the ability of those clears to provide the service they now give, leaving people to get their night radio programs from smaller stations. This is increasingly possible because of actions outside the FCC clear channel study.

Some Congressmen would require that all daytime stations be allowed to broadcast 24 hours a day, creating new skywave problems. That is sponsored by Rep. Paul Finley (R.-IL) in H.R. 1850.

There is a proposal on the opposite side, H.R. 1913, by Rep. William Boner (D.-TN). He would forbid FCC to make any changes that would reduce clear channel service. Senator Barry Goldwater (R.-AZ), himself an amateur radio operator with broadcasting knowledge, also has come out firmly in favor of clear channel service. He and Senator Larry Pressler (R.-SD) sponsor S.622. They would forbid new stations on the clear channels or any increase in interference.

The proposed 1979 rewrite of the Communications Act would say it is the purpose to give every community a radio station, another conflict with the laws of physics. That is before the House Communications Subcommittee chaired by Rep. Lionel Van Deerlin (D.-CA).

PUBLIC COMMENT REQUESTED

FCC asks for comment by broadcasters and the public. Congressmen are interested in hearing from the public, too.

Information to FCC may be addressed to the Commission Secretary, William J. Tricarico. It should be marked "Docket 20642," the number of the inquiry.

Federal Communications Commission
Washington, D.C. 20554

Messages to Senators and Congressmen may be addressed to their nearby home offices or to Washington.

WCCO RADIO VIEWS

WCCO Radio will oppose duplicating Class I-A clear channels. It will show again the benefits of higher power, noting the need to protect U.S.A. spectrum as the World Administrative Radio Conference (WARC) meets in Geneva in September, 1979.

WCCO also will show the fallacy of assuming that the need for radio programs is measured by the number of persons who sleep (Census

population) in an area. WCCO believes the number of persons who occupy an area, including travelers far from home, truckers and visitors, determines the need for service.

The station also will report how people depend on WCCO early morning programs of farm and severe weather information. These would be disrupted by skywave interference from afar. The need for WCCO service throughout the Ninth Federal Reserve District will be related. Particular needs of rural and farm/ranch communities will be noted and the services to them by clear channel stations will be reported. Mention will be made of emergency information services that only a full-sized 24-hour radio station can be expected to provide.

FCC will be reminded that adding stations does not guarantee more information sources. Smaller stations generally can not cover news in major centers with their own radio staffs. They broadcast the same information they all get on news service wires, news originally gathered by newspapers. The benefits of having independent clear channel news service reach monopoly broadcast communities will be mentioned.

Help for Minorities

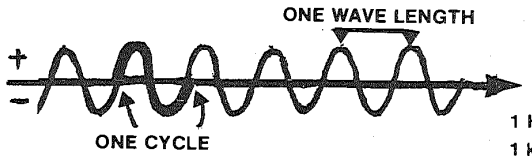
WCCO Radio will speak to the major reason given for adding more stations on clear channels, the statement that more are needed to give minorities more ownerships.

New ownerships (1) could be given when licenses change hands with existing tax incentives for sales to minorities and subsidized loans, (2) by adding more channels at one end of the band, (3) by using 12 new channels that might be created by 9 kHz spacing and (4) by opening FM opportunities.

Any of these four things could be done without destroying AM radio service to people who count on clear channel stations.

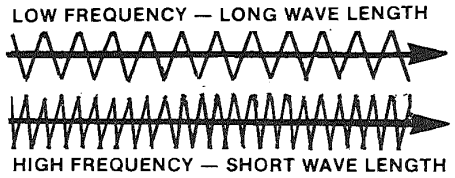
Technical Information

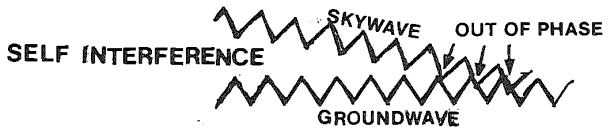
RADIO WAVES



Radio energy travels with the speed of light, about 299,792 kilometres a second or 186,282 statute miles. A radio signal that vibrates with a frequency of 830,000 times a second (830 kHz) therefore has a wave length of 361.44 metres (distance divided by frequency), or 1186 feet. A radio wave at 1600 kHz, at top of the broadcast band, would be about half that long.

FREQUENCIES





ANTENNAS

AM radio antennas are designed to send their waves along the surface of the earth and put most of the transmitters' power into their groundwaves. The most efficient antennas are five-eighths, half or a quarter wave length long (tall). The longer, or taller, the antenna, the longer the wave length being transmitted.

You can see how antenna lengths are related to frequency. Notice the short antennas used to send Citizen Band signals in the 29 megaHertz band or the very short antennas police use for very high frequency bands.

TV signals are broadcast on Very High Frequency (Ch. 2-13) and Ultra High Frequency (Ch. 14-83) bands. FM stations use frequencies between Channels 6 and 7. Those short waves travel line-of-sight through space, not along the curved earth. Antennas for them are only a few feet long.

So TV and FM stations put short antennas on tall towers to reach far. Putting an AM antenna higher or making it longer (taller) would not increase its reach because its groundwave signals follow the curved earth ... and over the horizon if the power is great enough.

CLASS I-A CLEAR CHANNEL STATIONS

KFI		640 kHz	Los Angeles
WSM		650	Nashville
WNBC		660	New York City
WMAQ	■	670	Chicago
WLW		700	Cincinnati
WGN	■	720	Chicago
WSB		750	Atlanta
WJR	■	760	Detroit
WABC	■	770	New York City
WBBM	■	780	Chicago
WBAP		820	Dallas/Fort Worth
WCCO		830	Minneapolis/St. Paul
WHAS		840	Louisville
WWL	◀	870	New Orleans
WCBS	■	880	New York City
WLS	■	890	Chicago
KDKA	■	1020	Pittsburgh
WBZ	◀■	1030	Boston
WHO		1040	Des Moines
WWWE	■	1100	Cleveland
KMOX	■	1120	St. Louis
KSL		1160	Salt Lake City
WHAM	■	1180	Rochester
WOAI		1200	San Antonio
WCAU	■	1210	Philadelphia

■ Duplicated
◀ Directional