What's Happened to AM Radio?

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AM radio is seeing hard times.

MOLLY WOULD CRY OUT, "NO, NO, McGee—not the front closet!" But Fibber McGee would open the door anyway, and there'd follow several seconds of crashes, bangs, thumps, and thuds as Fibber's famous overstuffed closet emptied out. The radio audience loved that, as well as the show and its characters.

Fibber McGee and Molly were part of the "Golden Age" of radio in the 1930's, 1940's, and early 1950's, when amplitude modulation (AM) was king, and Jack Armstrong, Gangbusters, Gabreal Heater, the Lux Radio Theater, Edward R. Murrow, and hundreds of other shows and personalities ruled the airways. It was even bigger then than TV is now, because there was really no competition except movies and newspapers. Now, those days are gone and AM is seeing hard times. The present AM is a far cry from a decade ago.

The trouble with AM

Surprisingly, AM's problems are only partially due to TV. When TV skyrocketed in the 1950's, AM radio actually prospered, despite a period when it took some blows. Once the Top 40 arose, with repetitive song cycles, energetic disc jockeys, time, temperature, and contests, AM found its fortunes again. Actually, most of AM's troubles come from frequency modulation (FM) competition. AM and FM may both be radio, but there are some important differences in the way information is transmitted.

Both AM and FM transmitters radiate "carrier" wave RF, modulated to contain transmitted information. In AM, the carrier wave amplitude is proportional to the audio amplitude, but the carrier *frequency* is constant. Figure 1 shows the components of an amplitude modulated waveform; (*a*) is the carrier RF signal, (*b*) is the audio-modulation signal and (*c*) shows the amplitude-modulated carrier signal. In FM, the carrier *amplitude* is constant, while the carrier frequency varies in proportion to the audio signal rate. Figure 2-*a* shows an FM audio signal, and Fig. 2-*b* is the frequency-modulated carrier.

The AM band is much lower in the RF spectrum than FM; AM spans 535–1605 kHz, while FM spans 88–108 MHz. AM channels are 10 kHz wide and FM channels are 200 kHz wide, so you would be able to squeeze only about 5.5 FM channels onto the entire AM band. There are 107 AM channels presently available, and 100 on FM.

FM signals normally don't propagate beyond 75 miles, which is considered the line-of-sight limit and is within the Very-High Frequency (VHF) range. The VHF range used by broadcasters is subject to signal scattering from obstructions such as building edges or hills and is prone to fading in and out under certain conditions. In contrast, AM signals often travel very great distances. The difference between AM and FM signal propagation is due to the great difference in their carrier frequencies, not their modulation differences.

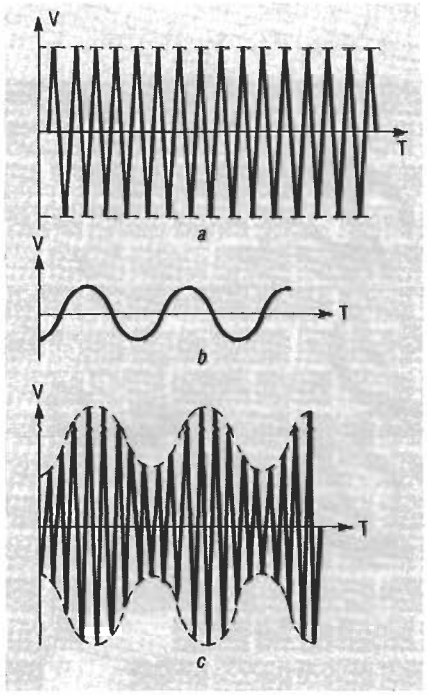


FIG. 1—AM SIGNAL COMPONENTS; (*a*) is the carrier signal, (*b*) is the modulating signal, and (*c*) is the amplitude modulated signal at a constant frequency.

Two characteristics of FM operation are responsible for its high fidelity response: wide bandwidth transmission and constant carrier amplitude. The wide bandwidth allows a wider range of audio frequencies to be processed, up to 15 kHz for FM, compared to only 5 kHz for AM. The source of most noise in AM transmission and reception is from atmospheric or static noise resulting from lightning, fluorescent device radiation, and electronic machinery, especially during hot weather. AM transmission is, therefore, amplitude-sensitive. By maintaining a constant carrier amplitude in FM, static noise can virtually be eliminated. FM was originally used for stereo because of its high fidelity.

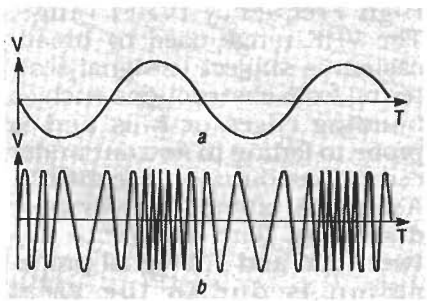


FIG. 2—HERE IS AN FM SIGNAL; (*a*) is the audio modulating signal and (*b*) is the frequency modulated carrier signal at a constant amplitude.

FM popularity

After World War II, AM stations began adding FM. There weren't many FM stations back then, so FM programming consisted primarily of classical music to take advantage of the high fidelity; otherwise they just duplicated AM programming. FM grew slowly, because consumer-electronics manufacturers and the public were mesmerized by TV. Some AM stations gave up on FM, relinquishing their FCC FM station licenses. They regretted it later, when FM became prominent but, by then, most FM frequency allocations were gone.

Several factors contributed to the prominence of FM. Stereo arrived in the early 1960's, becoming the foundation of further success. The availability of FM stereo receivers, component systems, AM/FM portables, and AM/FM car stereos followed. The FCC eventually ruled that most combined AM/FM stations had to program AM and FM broadcasts separately, forcing broadcasters to create competitive FM programming. There then arose a couple of generations of listeners who used radio mainly for music, not comedy, drama, or news.

The growth of FM over AM in the last 16 years has been dramatic. In 1972, AM had 75% of the radio audience; that was reversed by 1988. FM is considered *the* stereo music medium, which is what most listeners want. However, not all AM is in trouble; large markets capable of developing major audience shares command sale prices of tens of millions of dollars. However, the average AM station is far less glamorous.

AM's battle against FM

Most mid-size markets have a couple of AM stations at the bottom of the ratings. The top two or three in a market get by on community service, creative programming, good management, and poor competition. Most AM stations that are considered to be on shaky-grounds are those that broadcast daytime-only stations, especially those that have no FM companion station, and aren't part of a broadcasting group under one owner. They sink or swim on their own and most drown; about 65% lose money.

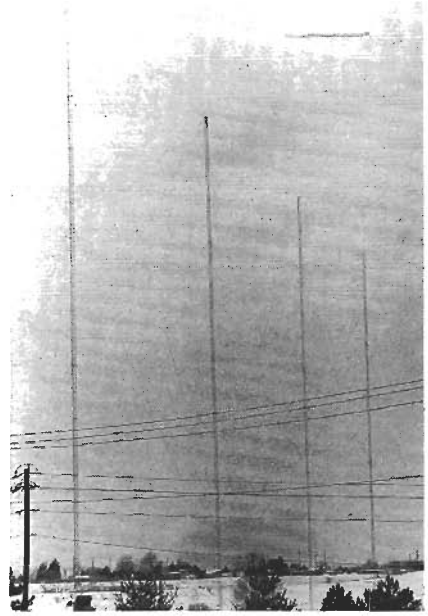


FIG. 3—AM RADIO TRANSMITTING TOWERS aren't the beacons of comedy and drama they were in the good old days.

The FCC helped by giving most daytime stations post-sunset broadcast authorizations, but the rules often dictate transmitter powers as low as 1–50 watts! Even for a small-town station, that's not enough power to provide the needed coverage, especially if there's competition. AM's crowded frequencies are another problem, especially for night listening when signals propagate farther. Interference obviously turns listeners away. Many AM channels are a jumble of noise at night, with half a dozen stations fighting to be heard and none succeeding.

In the 1960's and most of the 1970's, AM rode high, and many broadcasters and investors wanted part of the market. Hundreds of new stations began during that period, crowding the AM dial. Many towns of 20,000 people have two or three AM stations competing for large FM audiences. The economic downturn of the late 1970's and early 80's hurt many AM stations, especially those in rust and farm belts, which suffered most from the sluggish economy.

AM radio generally gets a small slice of local advertising, with the larger chunk going to FM. TV, cable, newspaper, shopping, and billboard competition is very heavy. Falling revenues mean less money for promotional or inno-

vative program changes, or high-quality air personalities that might hold an audience. In 1988, AM and FM each had about 5,000 commercial stations; AM stations did $1.7–$1.9 billion of business, while FM stations did $4.8–$5 billion. FM's early lack of commercial success helped draw listeners because of fewer commercials. And, while FM stations do air more commercials today, they still air about half as many as AM stations—they just charge more.

AM solutions

AM station managers know the problems, and try to find solutions. They know audiences don't see AM as a music medium. A National Association of Broadcasters survey on public attitudes toward AM found that 75% of respondents want good programming with good technical sound. The survey showed both a strong preference for news-talk-information on AM, and an older audience. Some stations try drastic cures. "Narrowcasting" or "niche programming" describes programming aimed at very specific audiences:

- In New York, WFAN (once WNBC, flagship station of the NBC network) runs an all-sports format; play-by-play, sports talk, and news.
- In Los Angeles, with 100 competing stations, KMNY devotes itself to money, and how to have more of it, syndicating some programs to other stations.
- All-kiddie radio by KPAL, Little Rock, Arkansas, includes children's music, stories, and school news reported by children.
- In Florida, WWNN broadcasts self-help and positive-thinking radio programs.
- Several stations now use single-theme approaches to music. There are all-Elvis stations, and at least one playing only Beatles music.

Whether these formats will last is yet to be seen. For example, all-weather and traffic formats have been tried and abandoned in Los Angeles and Minneapolis. AM stations can also inexpensively subscribe to satellite program services. Services with a "big city" feel have proven successful for smaller stations, especially when such services can mean savings through staff cutbacks, or when staff can be freed to develop more local and major news programming. It's easy to insert local news, sports, weather, and other features.

Not long ago, AM operators thought the answer was AM stereo, but it's been a disappointing panacea. Most broadcast experts feel that the FCC ruined things by refusing to pick a specific AM

BETTER RECEIVERS FOR BETTER SOUND

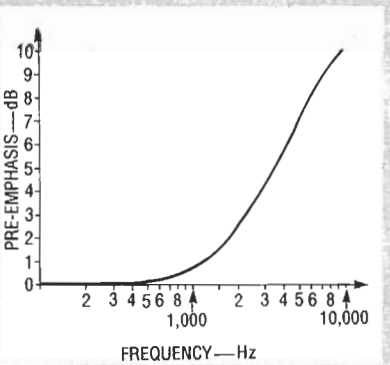
One of the main reasons why AM has taken a back seat to FM is because of AM's inherently poor fidelity. The National Association of Broadcasters (NAB) is trying to do something about that. Specifically, the NAB is trying to convince electronic manufacturers to incorporate three design improvements into their AM receivers. Those improvements, which are in accordance with the National Radio Systems Committee (NRSC) suggested guidelines are: the ability to receive frequencies within the expanded band, AM stereo compatibility and, de-emphasis circuitry.

Manufacturers will be able to make units that receive transmitted signals in the expanded bandwidth fairly easily and inexpensively. However, they are much more reluctant to jump into mass production of AM stereo receivers—adapting current product designs to incorporate stereo reception can be an expensive proposition.

Another stumbling block that manufacturers face is that there are two mutually incompatible systems on the market. Motorola's C-Quam and Kahn Communications are two AM stereo systems that are currently in use by broadcasters today. C-Quam is used by approximately 500 broadcasters, while only about 100 broadcasters use the Kahn System. The only commercially available AM stereo receivers on the market are compatible with Motorola's C-Quam transmitter design. Sony, Sanyo and Sansui previously made IC stereo detectors that were compatible with both the C-Quam and Kahn transmission systems, and about 20 such receiver models were once produced by those companies. However, those chips and receivers are no longer in production because of various legal battles between Kahn and Motorola. We may again see some Kahn-compatible receivers after the legal dispute is over.

There are still many varied opinions in the broadcasting field about which system is better. Broadcast engineers profess the advantages of each system, and may choose one system over another because of their specific transmission needs, or personal preferences. When AM stereo was first introduced years ago, FCC's "let the marketplace decide" attitude sealed the fate of AM stereo by causing a relentless battle between various competing systems. Now, more than eight years after the introduction of AM stereo, the two survivors, Kahn and Motorola, are still battling it out. The FCC's lack of direction during the early stages has hindered the acceptance of AM stereo, and has hurt not only electronic manufacturers, but consumers, too.

Frequency boosting, or pre-emphasis is a design modification that the NRSC is recommending to reduce noise transmission for higher fidelity. Within the time interval that an AM signal carrier is transmitted and received, the carrier signal may be affected by noise. The greatest impact that noise has on the carrier is changing the amplitude. FM is much less subject to that type of noise distortion because it is transmitted at a constant amplitude. The sound volume of an AM detector is proportional to deviation of the carrier amplitude. If the audio signals cause a much larger amplitude change than the unwanted noise amplitude deviations, during transmission and reception, then the noise will not be very noticeable. That relationship is called the signal-to-noise ratio—the higher the value, the better the sound quality.



PRE-EMPHASIS CHARACTERISTIC suggested by the NRSC for AM transmission.

In a pre-emphasis circuit, a portion of the transmitted signal is boosted, or pre-emphasized, causing a larger carrier amplitude deviation. The receiver conversely de-emphasizes, or attenuates that signal. The overall effect is to increase the signal-to noise-ratio. The accompanying figure shows the 75 μs pre-emphasis characteristic suggested for use.

The NAB is working closely with the electronic industry to develop a certification for improved AM receiver designs which follow NRSC guidelines. One idea is to authorize the use of a quality mark that will identify receivers that comply with NRSC standards. Broadcasters are also receptive to the idea of promoting the new design standards in AM receivers. Clearly, AM stereo compatibility and the efforts to improve AM sound quality are complicated issues which are still being worked out. Perhaps with the cooperation of the electronic industry, broadcasters, and the FCC, AM will continue as a viable communications medium.

FIG. 4—TALK SHOWS, OFTEN WITH LIVE GUESTS, are a programming staple of stations of all sizes.

FIG. 5—WELL-RUN SMALL-TOWN STATIONS with a solid history are likely to continue a successful tradition.

stereo approach from the half-dozen stations competing for FCC approval. Instead, the FCC let the market decide, and so far it hasn't. In the last seven years, AM stereo has barely affected the minds of broadcasters or the public.

Two AM stereo systems are still competing: Motorola's C-Quam, and the system developed by Kahn Communications. Broadcasters haven't reached a consensus on which should be standard. Only 10% of AM stations now have stereo. The audience percentage that use AM stereo gear is still low, and there's no real impetus to switch, which can cost up to $100,000—half a year's income or more for some small stations.

AM's expanded band

An important change affecting AM broadcasters as well as radio receiver manufacturers is that of AM frequency band expansion, or "AM improvement." In 1988, the World Administrative Radio Conference agreed to expand the AM radio upper bound from 1600 kHz to 1700 kHz, effective July 1, 1990. Ten additional channel slots will be available as a result of the expansion. With 20 to 30 stations per channel, a total of approximately 200 to 300 new AM stations in the U.S. could conceivably occupy the expanded band.

The primary objective of the FCC in authorizing transmission in the upper range is to unclutter the existing band and reduce the overall levels of broadcast interference. Stations who are considered as causing the most interference will be given highest priority by the FCC for transmission in the upper band. Some night-time broadcasters are considered to be the "worst offenders," and the FCC is hoping that most of those stations will voluntarily migrate into the upper band. The advantage of changing into the upper band is that the adjacent stations will experience less interference, and the listener will receive a much clearer broadcast.

After a transition period, the FCC will make new AM stations available for new licensees, so that broadcasters can make full use of the entire expanded band. Stations who are licensed to broadcast within the new upper range will be able to transmit full-time, with power restrictions of minimum 1 kilowatts after sunset and 10 kilowatts during daylight hours.

Many problems, however, still need to be solved. Existing services, such as the Traveler's Information Stations (TIS) will need to move or—because the TIS are considered by the FCC to be secondary broadcasters—may have to relinquish their transmitting rights.

So, can we see the future of AM? Clearly, it'll hardly vanish from your dial. Most stations will likely solve problems by new programming, promotion, management, and technology. Some may not have their prior success, having to live with less. But those with bleak futures may die out due to survival of the fittest. That sort of periodic adjustment befalls most industries, when change creates a new operating climate, killing off and weeding out the weak, leaving what's left leaner and meaner. Meanwhile, those who live and work in the world of AM radio today can only echo Molly's long ago words: "Taint funny McGee!" **R-E**