FM Radio Brings Out Delicate Overtones

For nearly 15 years millions of Americans have heard increasing references to FM — but few know what FM is.

Almost everyone knows FM is "some kind of radio", and most informed readers know that it "means better music."

FM is an abbreviation for "frequency modulation." Regular radio is known technically as AM, meaning amplitude modulation.

How do the two differ, and why is one able to broadcast with much higher fidelity than the other?

Here is a basic explanation of FM:

All radio transmission is based on the generation and interception of electromagnetic waves. In electrical terms, such waves are represented thusly:

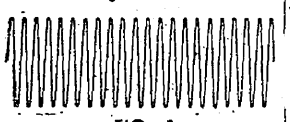

FIG. 1

The frequency of a radio signal is determined by the number of successive crests passing a designated point in a second, and is the figure that determines the correct setting of your radio dial. For example, a station having a dial setting of 550 (or abbreviated as 55) on your AM dial, would mean a basic transmission of 550,000 cycles or 550 kilocycles. In FM, a dial setting of 92.3 would mean a basic transmission of 92,300,000 cycles or 92.3 megacycles. This basic wave is known as the carrier wave.

IN ORDER to transmit different sounds, each with its own particular frequency, we must add to or subtract from the otherwise uniform waves of the carrier. This is called modulation, and herein lies the fundamental difference between AM (amplitude modulation) and FM (frequency modulation) signals.

Successive crests or peaks of a carrier wave are uniform in height (amplitude) and spacing (frequency). To impress sound waves on the carrier, either the amplitude or the frequency must be correspondingly altered, that alteration is converted back into equivalent sounds by your home receiver.

In AM transmission the amplitude is modulated, but the frequency remains uniform, providing the electrical pattern shown here:

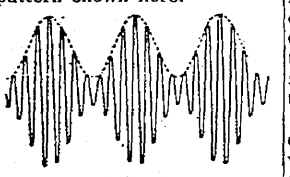

FIG. 2

In FM transmission, only the frequency is modulated and the amplitude remains uniform, thus:

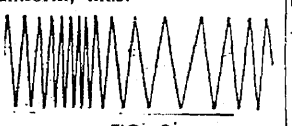

FIG. 3

SOUND IS transmitted through the air in a manner similar to that of radio waves. When a sound is made, waves are generated. These waves act on the human ear in such a way as to allow the sound to be "heard" or made intelligible to the listener.

Sound waves also have amplitude and frequency. Amplitude determines loudness, frequency determines pitch. The human ear is limited to hearing sounds in a frequency range of 20 to 16,000 cycles.

Musical instruments produce sound waves of greater or less frequency range. Although the frequency range of most instruments does not exceed 5,000 cycles, certain multiples of the basic frequency are generated, so that a basic wave of say 4,000 cycles may have multiples or harmonics of 8,000, 12,000 and 16,000 cycles which enter into the hearing, even if subconsciously.

These multiples or harmonics are called overtones, and these are the portions of sound that distinguish one instrument from another.

OVERTONES normally cannot be heard on usual AM broadcasts, since AM is limited to sounds no higher than 5,000 cycles. However, on FM the full range of audible sound from 20 to 20,000 cycles may be transmitted. Thus the delicate overtones are received on FM, enabling the listener to obtain that full and rich sound exactly as picked up in the studio.

Lightning, motors, street cars, X-ray, ultra-violet devices, oil burners and other electrical equipment generate waves of the same general nature as AM radio transmission. Therefore, such waves can increase or decrease the amplitude of the AM carrier wave, acting in much the same manner as the transmitted, modulated sound wave. The result is "static" or background noise from your AM radio set.

SUCH interference is nonexistent in FM reception, since the frequency of the carrier remains unchanged by static interference. FM broadcasts are completely free from unwanted noise.

In addition, FM signals do not have to be as powerful as AM signals to provide good reception. On AM the desired signal must be almost 100 times stronger than the ever-present background noise, for satisfactory reception. By contrast, a signal only twice the strength of noise interference, provides good FM reception.

Very common in many sections of our country is the annoyance of distant stations interfering with local broadcasts. The reasons are:

First, a large number of stations are crowded into the 1100-kilocycle AM broadcast band.

Second, the fact that occasionally an AM signal will cover a great distance, fading in and out of another broadcast with annoying "cross-talk," or again causing a whistle on a local program.

SUCH INTERFERENCE cannot occur on FM. Signals transmitted by an FM station travel in an almost straight line and usually no farther than twice the distance from transmitting antenna to horizon.

In addition, each FM station is assigned a channel 200 kilocycles (as against 10 kilocycles for AM) wide. Stations are allocated in each area so that no FM station is right next to another's frequency. This prevents adjacent channel interference, which is commonplace with AM.

All in all, FM offers superlative radio listening. It opens up an entirely new world of radio pleasure previously unknown. It makes your radio more enjoyable, more relaxing, more worth while than ever before.

ON THE ROAD:

Auto Reception Good; Car Sets Available

Many FM listeners are having sets installed in their automobiles. FM's line-of-sight signal can be effectively picked up in a moving automobile even in a hilly city such as Seattle.

The Standard Service & Tire Co., Seattle, reports that they are installing the FM receivers daily and have received favorable reports.

KLSN-FM cites letters from listeners with comments such as "I listened to your station from Seattle to Vancouver and return and the reception was excellent during the entire trip."

A DRIVER reports good reception of the station's signal "well south of Chehalis, while en route to Portland."

Three manufacturers are marketing equipment for FM automobile reception, adaptable to both American and imported cars. Blaupunkt offers two models capable of FM, AM and marine band reception "all in one." Motorola recently introduced their FM-only car radio, and Granco manufactures an FM tuner that adapts to an automobile radio, operating off the existing amplifier and speaker system.

THE BLAUPUNKT receivers adapt to either 6-volt or 12-volt battery systems. The Motorola requires a 12-volt system.

Several manufacturers have indicated that automobile stereo systems soon will be offered.

FM receivers in automobiles will cost more than conventional car radios, because it requires a special installation kit with tuners to suppress the ignition noise and interference. A special antenna also is advised. Installation kits generally cost about $25 to $35.

A complete FM automobile unit, such as the Blaupunkt FM-AM-marine band combination, can be installed for less than $200. The Granco FM tuner and the Motorola FM-only radio system are less expensive.