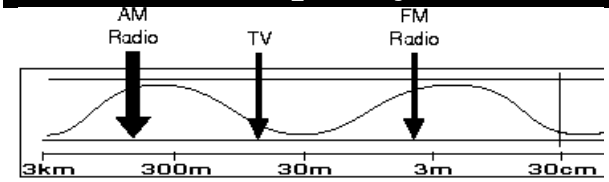
Frequency versus Wavelength.



Radio Wave Region of the Electromagnetic Spectrum

There are different ways to indicate where to find a certain station on a radio dial. For example, we could say that a station is operating on 9680 kilohertz (kHz), 9.68 megahertz (MHz), or on 31 meters. And all three ways would be correct!

Radio waves are transmitted as a series of cycles, one after the other. The hertz (abbreviated Hz) is equal to one cycle per second. You may have noticed that the electric power supplied to your home is rated at 50 Hz. Electric power is distributed as alternating current (AC), meaning it goes through a cycle of changing directions of flow. When we say that electric power is "50 Hz," we mean it changes its direction of flow 50 times in one second.

Radio waves go through far more cycles in a second than electric current, and we need to use bigger units to measure them. One is the kilohertz (kHz), which is equal to 1000 cycles per second. Another common one is the megahertz (MHz), which is equal to 1,000,000 cycles per second----or 1000 kHz. The relationship between these units is like this:

1,000,000 Hertz = 1000 kilohertz = 1 megahertz

Radio is usually thought of as "beginning" at frequencies of approximately 5 kHz, although most available receivers can only tune down to about 150 kHz.

The term "wavelength" is left over from the early days of radio. Back then, frequencies were measured in terms of the distance between the peaks of two consecutive cycles of a radio wave instead of the number of cycles per second. Even though radio waves are invisible, there is a measurable distance between the cycles of electromagnetic fields making up a radio wave. The distance between the peaks of two consecutive cycles is measured in meters. The relationship between a radio signal's frequency and its wavelength can be found by the following formula:

Wavelength = 300 / frequency in MHz

According to this formula, a frequency of 9680 kHz would be equivalent to a wavelength of 30.99 meters, which we would round to 31 meters. Thus, 9680 kHz, 9.68 MHz, and 31 meters all refer to the same operating frequency!

As the formula indicates, the wavelength of a radio signal decreases as its frequency increases. This is important because the length or height of various types of antennas must often be a fraction (usually one-quarter or one-half) of the wavelength of thesignal to be transmitted or received.

This means that most antennas designed for frequencies near 4000 kHz will be physically much larger than antennas designed for frequencies near 30 MHz.

Frequencies are seldom given in terms of wavelength anymore. However, certain segments of the shortwave bands are referred to in terms of "meter bands" as a convenient form of shorthand. For example, the term "10-meter band" is used to refer to the ham radio band that extends from 28000 to 29700 kHz. Shortwave or more commonly known "HF DXérs" tend to you Khz, where as Amateur Radio Opertors us the Mhz.

eg. A HF DX Listener would log the International Rescue Frequency as 5680Khz. Where as an Amateur Operator would log it as as 5.6800Mhz. It is similar to saying 5600 gram instead of 5.600Kg. The following is a table of the most common ham radio and shortwave broadcasting "meter bands" found on frequencies below 30 MHz:

Meter Band Frequency Range and Use
160 meters 1800-2000 kHz ham radio
120 meters 2300-2498 kHz broadcasting
90 meters 3200 to 3400 kHz broadcasting
80 meters 3500 to 4000 kHz ham radio
60 meters 4750 to 4995 kHz broadcasting
49 meters 5950 to 6250 kHz broadcasting
41 meters 7100 to 7300 kHz broadcasting
40 meters 7000 to 7300 kHz ham radio
31 meters 9500 to 9900 kHz broadcasting
30 meters 10100 to 10150 kHz ham radio
25 meters 11650 to 11975 kHz broadcasting
22 meters 13600 to 13800 kHz broadcasting
20 meters 14000 to 14350 kHz ham radio
19 meters 15100 to 15600 kHz broadcasting
17 meters 18068 to 18168 kHz ham radio
16 meters 17550 to 17900 kHz broadcasting
15 meters 21000 to 21450 kHz ham radio
13 meters 21450 to 21850 kHz broadcasting
12 meters 24890 to 24990 ham radio
11 meters 25670 to 26100 kHz broadcasting
10 meters 28000 to 29700 kHz ham radio

You'll notice some inconsistencies in the table above. For example, the 17-meter ham radio band is actually higher in frequency than the 16-meter broadcasting band. These inconsistencies have come about from years of use (misuse?) of a particular "meter band" to refer to a certain range of frequencies.