Incidentally, when the prefix *K* (for *kilo,* or 1,000), *M* (for *mega,* 1 million), or *G* (for *giga,* 1 billion) is added to the front of Hz, the *H* is still capitalized. Thus, 2.4 MHz is correct (not 2.4 Mhz).

So the beauty of radio frequencies is that transmitters can be tuned to broadcast radio waves at a precise frequency. Likewise, receivers can be tuned to receive radio waves at a precise frequency, ignoring waves at other frequencies. That's why you can tune the radio in your car to listen to dozens of radio stations: Each station broadcasts at its own frequency.

Wavelength and antennas

A term related to frequency is *wavelength.* Radio waves travel at the speed of light, and *wavelength* refers to how far the radio signal travels with each cycle. Or, put another way, *wavelength* refers to the physical distance between the crest of each wave. Because the speed of light is roughly 182,282 miles per second, for example, the wavelength of a 1 Hz radio wave is about 182,282 miles. The wavelength of a 2 Hz signal is about half that: a mere 91,141 miles.

As you can see, the wavelength decreases as the frequency increases. The wavelength of a typical AM radio station broadcasting at 580 KHz is about 522 yards. For a TV station broadcasting at 100 MHz, it's about 3 yards. For a wireless network broadcasting at 2.4 GHz, the wavelength is just shorter than 5 inches.

And the shorter the wavelength, the smaller the antenna needs to be to adequately receive the signal. As a result, higher-frequency transmissions need smaller antennas. You may have noticed that AM radio stations usually have huge antennas mounted on top of tall towers, but cellphone transmitters are much smaller, and their towers aren't nearly as tall because cellphones operate on a higher frequency than AM radio stations do. So who decides what type of radio gets to use specific frequencies? That's where spectrums and the FCC come in.

Spectrums and the FCC

Spectrum refers to a continuous range of frequencies on which radio can operate. In the United States, the Federal Communications Commission (FCC) regulates not only how much of Janet Jackson can be shown at the Super Bowl, but also how various portions of the radio spectrum can be used. Essentially, the FCC has divided the radio spectrum into dozens of small ranges — *bands* — and restricted certain uses to certain bands. AM radio, for example, operates in the band from 535 KHz to 1,700 KHz.