THE AMATEUR

Utah Valley Amateur Radio Club
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The Amateur in You, Part 1

What have you been pondering?

Frequencies and bands

Those of us who live in the US feel right at home when we hear feet, miles, and pounds, but mention meters, liters, and kilograms, and many of us find we're suddenly outside our comfort zone. The world of amateur radio can catch Americans off-guard because many amateur measurements are based on the metric system. Typically, the trouble starts with frequency, wavelength, and bands.

Frequency

Frequency is number of times something happens a second, or a minute, or an hour. For example, you know it irritates people to hear you say “uh” while you're giving a speech. So, you ask a friend to listen and count for the number of times you say “uh” during a trial run. Your friend reports, “fourteen times a minute.” That's your “uh” frequency.

Your radio sends electricity up and down your antenna, and as it does, the electricity disturbs the space around the antenna by generating a certain radiation, known as ***radio waves***, outside the antenna. The rate at which these radio waves pulsate is known as its ***frequency***, measured in ***hertz*** (meaning “times a second”), and is the same rate as the up-and-down travel of the electricity.

Wavelength

When you toss a pebble into a still pond, ripples (small waves) start forming around the spot where your object entered and disturbed the water, and move outward, away from the spot. The ripples appear very regular, at a fairly constant width between each of them. This width is called ***wavelength***, because it's the length of space between the tops of each wave. Radio waves are invisible, but act much the same way, only without water.

It just so happens that frequency and wavelength are related to each other. That is, if the up-and-down wave motions occur more often, then more of the waves travel out from the point of disturbance for the same amount of time, and therefore the width between each wave becomes shorter. In radio, the waves always travel the ***speed of light***, but the width between the waves depend on that up-and-down frequency of the electricity. In fact, we find that ***the wave frequency times the wave length is equal to the speed of light***, which is 300 million meters a second.

Radio waves occur at a variety of frequencies, measured in millions of hertz, or megahertz (MHz, or million times a second). So, a radio signal of 150 megahertz has a wavelength of 300 million meters ÷ 150 million hertz = 2 meters. We can simplify this, because both of the “millions” cancel. So 300 meters ÷ 150 = 2 meters, the width between waves.

Band

Many radio waves with frequencies that are somewhat close to each other, like the range, or ***band***, of frequencies between 144 MHz and 148 MHz, behave alike, yet the radio waves with frequencies in that range behave somewhat differently from those between, say, 7.0 MHz and 7.3 MHz. But if we want to distinguish the two ranges, saying "144 MHz through 148 MHz range" or "7.0 MHz through 7.3 MHz range" gets old pretty quickly.

It turns out that the 144 MHz through 148 MHz range of frequencies has a wavelength of 300 ÷ 144 ≈ (equals about) 2 meters, and the 7.0 MHz through 7.3 MHz range of frequencies has a wavelength of 300 ÷ 7.0 ≈ 40 meters. So today, it's more convenient to refer to them by their band names, which are named for their approximate wavelengths, as in the "2-meter band" and "40-meter band" instead. And that's where we get the names of our amateur radio bands.