The Amateur in You

What have you been pondering?

How to tune an antenna

As mentioned in the last issue of *UVARC Shack* (*Brass Tacks*, p. 9), ***tuning*** an antenna means adjusting your antenna **physically** so that it resonates **electrically**, to offer the optimum effectiveness **electromagnetically**. But how would you know whether you need to tune your antenna? And how does one go about actually performing such a thing?

How to tell it needs tuning

Often, there are clues that might tell you that you have an antenna that needs to be tuned, but not always. If you install an HF antenna and your transceiver reports that your SWR is too high when you transmit, that's a good clue. In the same antenna situation, if your transceiver displays an output power of 10 watts, even though you have the power level set to 100 watts, that's another good clue. One more is that other hams report your signal is quite poor when you believe it should be strong and clear, a rather hit-and-miss but possibly usable clue.

The most reliable way (within your price range) to know whether your antenna requires tuning is by using an *antenna analyzer*. A good analyzer can be pricey, but is almost a necessity if you're in the habit of making your own antennas. Its purpose is threefold: to show you a) whether your antenna is reasonably resonant, b) whether your antenna has an acceptable bandwidth, and c) whether that bandwidth falls within an acceptable frequency range.

What you can do about it

When you set out to DIY an antenna from scratch, you might use an online antenna calculator to help you, and that's wise. Understand, however, that the purpose of the calculator is help you measure your element sizes and lengths *close* to what they should actually be. You'll find that cutting your wires or rods to within ¼″ or even ½″ of the prescribed measurements will not be very useful. It might be a lot more helpful to exceed the calculator suggestions by three to five percent, then cut the lengths back to ideal when you start measuring it. You can use your analyzer to help show you how close your antenna is to the best SWR and bandwidth the online calculator claims it can present.

Even many store-bought VHF antenna makers expect you to adjust it for resonance within your band of interest because, for example, the antenna is made for both commercial and amateur use. These are often accompanied by a set screw to lengthen or shorten the main element. Some expect you to actually cut the element to length. Once again, your analyzer can show whether your antenna is as resonant as you had hoped, and then you can often modify your antenna to bring it within an acceptable range if it isn't. Still, some store-bought antennas are very difficult to modify, if they can be modified at all, and you might have to live with a poor antenna or resort to purchasing a better one.

Finally, antennas, especially HF antennas, often don't work independently of their surroundings. This is because the electromagnetic fields your antenna creates can *couple* with surrounding conductive objects, such as gutters, trees, vehicles, and its mast. This doesn't mean your analyzer is defective, just because it shows a 1.2:1 SWR on 7.202 MHz in your garage, but now 2.2:1 after you install it on your roof. If you see this happen, you might need to make further adjustments to your antenna elements once you place your antenna in its final operating location.

— Noji Ratzlaff, KNØJI (kn0ji@arrl.net)