The Radio Hotel – The Antenna - Part 8 by W5RH

Getting All Choked up about Feeding and Matching

Resonance – when there is no reactive element in a measured impedance. In antennas, it can be also when the antenna reactive component is minimal, as it will never be an absolute zero.

Matched—when the impedance of one circuit element equals that of another circuit element. In Antennas it is when the varying antenna feedpoint impedance matches the fixed TL (transmission line) characteristic impedance.

Truth be told: when an antenna is resonant it does not mean it is matched, and when an antenna is matched (to the feedline) it is not necessarily resonant. They are 2 different conditions. But our preference is that our standing wave antennas be resonant AND matched.

Most Hams find that using a resonant antenna that is matched to the TL is the easiest way to make things work. A resonant half wavelength dipole has a current loop (physical midpoint) feed impedance of approximately 50 to 70 ohms depending on height above ground and the surroundings. So connecting 52 ohm coax to the nominal 60 ohm feed point would be fairly closely matched at about a 1.15:1 SWR…good enough for using our solid state finals. Now, as soon as we turn our VFO knob that highly sought out resonant/matched condition goes slightly out of favor, but in most bands, remains in the range of SWR that our solid state finals can handle (SWR under 2:1), so no power reduction.

Some antennas, Yagi-Uda's for instance, have a feed impedance that is lower than our coax's impedance. Feed Z is down around 12 ohms, due to the parasitic element interaction. Matching to the coax's 50 ohms can be accomplished by using Gamma Matches, Hairpins, Half folded dipoles or LFA- Loop Fed Arrays. (Google all of them) For higher impedances above 50 ohms and even into the K's of ohms, you can use coaxial transformers, un-uns or bal-uns of varying Z transform ratios, etc. (Google them too). Most of these are single band devices, so for feeding and matching a single antenna on multiple bands you should resort to antenna couplers and variable antenna matching networks/ antenna tuning units (ATU's). (Google SGC Couplers and ATU's). These provide an automatic matching condition utilizing a *u-processor* controlled L-network of switchable lumped C's and L's.

Once you have a matched condition and are feeding your antenna with maximum power, it is time to get a bit choked up about your success……no, I don't mean that you start sobbing with relief because you actually got it to work, but choking in the "stopping CM/common mode RF" sense. The signals from/to our transceiver flow quite nicely within the coax because of our good work in getting it matched, etc. RF is our friend, but RF can also spoil your party by getting into everything electronic. One thing RF will do is ride along on the outside of the coax shield (due to the "skin effect" - Google that). If these CM antenna currents or noise currents are not stopped they will cause havoc in your shack, on your radio or on your ancillary gear. Chokes should be placed at the antenna feedpoint and at the shack entry point. Your feedline should run from the antenna to the ground and along the ground, if at all possible. Even then, chokes are desirable to eliminate any CM/receive garbage noise. (Google: Common Mode Chokes by W1HIS). Chuck's article is a great start in understanding the ins and outs of chokes and eliminating shack noise potential. And with that, I will stop and eliminate this noise HI. Enjoy and 73….W5RH

Next time…. The Antenna Series: C'est tout! – Guidelines for Learning More

*The purpose of **The Radio Hotel** is to give you a practical kickstart into exploring the workings of antenna systems. It is a series, so go back and read the previous columns to get the whole picture, as one month relies on the previous month's information. Google the buzz words and find out what they mean. Read up on antenna system theory to see how it all works together. You will be glad you did.*