The Radio Hotel - Analyzing with Antenna Analyzers

by Rick Hiller -- W5RH

The Radio Hotel series over the past 2 years has talked about the Antenna and the Transmission Line "system" and the many characteristics and attributes that exist within the system. Most of this information has come from books, web sites and Ham to Ham discussion, but how do we know these attributes exist and how do you measure them, empirically, to build or troubleshoot an antenna?

These days, empirical antenna system measurements are easier than ever. Maybe "easier" is not the correct word; so how about "more convenient". One smallish hand-held device puts many measurements, literally, in the palm of your hand. The generic term for these devices is "antenna analyzer", but they do so much more. Simple tasks, such as SWR measurements or resonance/impedance measurements (giving you both R and j) are probably the two measurements that handle 90% of the Ham's need when working with antennas.

For that remaining 10% of a Ham's need, these antenna analyzers can also give you RL-return loss, S-plots, Xl and L, Xc and C, provide a Time Domain Reflectometer for locating a cable breakage point, etc. As you learn and understand more about antenna "systems" you will see what these other measurement are and what benefit they provide. Also, as you improve your antenna and transmission line knowledge, ensure that you know how these attributes are measured with that fairly expensive "analyzer" sitting in your closet.

Some analyzers provide an analog meter indication, some give you the actual measured values (so you better know what you are looking at) and others give a graph of frequency versus quantity, etc. Very nice indeed. But don't use the graphics as a crutch; know what is happening within the system, etc. This way you will use the data (numerical or graphical) provided as part of your knowledgeable troubleshooting procedure.

What analyzers are available today? Looking at the just published December 2016 QST, I found the following units advertised:

Comet CAA-500 Mk II -- Page 3	AIM 4300 Array Solutions Ad -- Page 18
MFJ-226 Product Review -- Page 39 and 137	MFJ analyzer assortment -- Page 139
Rig Expert -- Page 107 and 157	SARK-110 Page 132

Of course, there are others, like the Telepost LP-100A watt meter and associate software, which is actually a VNA based operating impedance bridge that will work in an environment of high RF, as the signal source is your 100 watt transceiver. (Ref: "Blame it on IZO" BVARC Tech articles web page)

Finally, let me give you some links to use or Google search:

--"SARK-110 and Rig Expert AA-600 Comparison" -- http://www.gofrc.org/frctest/node/133
Then go to the August 2016 Newsletter--Frankford Radio Club

--QST September 2006, Technical Correspondence – "On Tuning, Matching and Measuring Antenna System Impedance using a Hand Held SWR Analyzer" – Dr. John Belrose – VE2CV

--"Understanding Your Antenna Analyzer" – Joel Hallas, W1ZR - ARRL Books

Recommendations: Talk to your Elmer about your requirements and your budget. Which one will give you the best informational graphics or numbers? What are the limitations, etc? Between you and your Elmer you should be able to pick the analyzer that is just right for now and in the future.

GL ES 73 DE W5RH Enjoy your hobby.

Next time…. Hooking Up with RF Connectors

*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.*