The Radio Hotel – Measuring SWR Rick – W5RH

Measuring an antenna system's operational Standing Wave Ratio is quite easy in today's world. Not only can you measure SWR, but you can conveniently measure much more.

Typically, measurements are done with power/watt meters like the Bird 43 Wattmeter, a calibrated industry standard. It measures Forward Power and Reflected Power. That is all. From there, a forward power versus reflected power chart provides the SWR value. Some watt meters like the Diawa or MFJ meters have a crossed needle set-up – 2 independent D'Arsonval movements -- one for forward power and one for reflected power (using a Bruene-type sampling circuit). These 2 orthogonally oriented needles, with a nomograph between them, provides an easy read of the SWR value.

Recently, VNA (Vector Network Analyzer) based power meters have come into wide spread use and at a fairly low price point (thank goodness). They sample the TL (transmission line) voltage and current and then use microprocessors to perform calculations in real time and display all of the information you require: Power forward, power reflected, SWR, Return Loss (Google it), phase, impedance – vector amplitude and phase angle, plus R and +/- jx. These are perfect for analyzing not only SWR, but TL to Antenna matching, and TL characteristics (loss vs. freq or velocity factor, etc.). A bit higher in price level than a basic power SWR meter, the typical VNA based watt meter is a treasure-trove of information. [Google: Telepost LP-100A]

Whatever method of measurement you choose, there is an important point to keep in mind -- measure the SWR as close to the antenna feed point as possible to get a true reading of SWR. Of course, by knowing the TL characteristics and using a TL calculation program such as TL Details or TLW(ARRL Antenna Handbook), you can 'see' the feedpoint VSWR without leaving the ground. Measuring SWR at your transmitter output will show you what the transmitter will see, but that can be a false indictor of TL to Load match, as described in TRH May 2014.

The Ham's typical goal is to get the antenna system to have an SWR of, close to, 1:1 -- meaning maximum power into the antenna for maximum radiation (and reception strength). This can be obtained with proper antenna adjustment, TL matching, low loss coax, etc. At HF frequencies SWR concern is less critical, as the inherent system losses are not so high (they certainly can be though). But, at VHF and UHF frequencies is it best to be as close to 1:1 and even then you have significant "matched loses" that will occur if best practices on TL choice are not followed. One last bit of warning: be wary of antenna systems that require you to use a longer than necessary length of coax (in order to get the SWR down, at the transmitter). This requirement screams "LOSS".

Next time "Antenna Bandwidth and SWR"

*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.*