QRX I'll just tune for a lower SWR!

by Tony Bailey G3WPO

SWR — this little abbreviation seems to have developed into a cult over the years, worshipped almost as a God! Achieving a low SWR of 1:1 is given a priority almost equal to that of breathing, on the assumption that as the reflectometer shows the reflected signal must be increasing by the amount of power shown on the reflected power scale. This is unfortunately (or fortunately, depending on how you look at it,) a load of rubbish.

As we will show — there is no reason why you cannot radiate just as good a signal with an indicated SWR ratio on your feeder of 2 or 3:1 as at 1:1!

Without delving into complex equations, or using Smith charts, there are a number of other common misconceptions that can be dispelled, and SWR can be put into the context into which it truly belongs. We will have to assume that you know some of the basics behind the term, otherwise the article could take up the whole of this issue.

A point to start from

Let us assume that we have a transmitter connected via a piece of coaxial cable with a characteristic impedance of 50 ohms, and that a dummy load of resistance 50 ohms is connected across the far, or load, end. Also assume that the cable is lossless (ie. it doesn't have any resistance or introduce dielectric losses), and that there is a perfect lossless reflectometer/power meter inserted in the line. When you apply power to this set-up, and adjust the transmitter for maximum power transfer (as shown by the power meter,) current will flow along the feedline and end up being dissipated as heat in the load resistor.

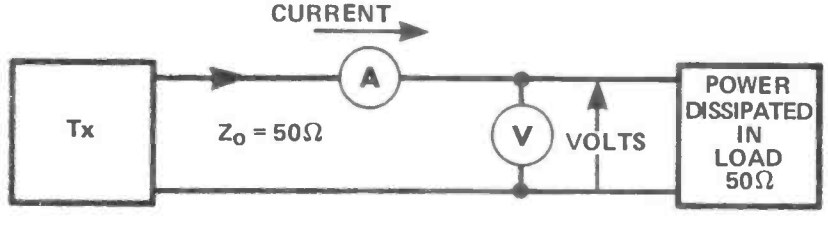

Fig. 1 Perfect matching: Power in load = VxI

It is important to realise that it is *current* that is flowing along the line, not power. The definition of power is the 'rate of expenditure of energy'. In our case energy can only be used up when the current meets some resistance — in this example the only resistance is that of the load resistor. Hence in our perfect transmission line, no energy is wasted and all the energy generated by the transmitter ends up as heat in the load.

If we assume that our power output is 100 watts, and we now replace the 50 ohm resistor with another, such that the SWR will be 3:1, what happens if we don't (or can't) adjust the transmitter? If you look at the reflectometer under these conditions, it will be indicating an SWR of 3:1. From the standard formula you can calculate that this represents an apparent reflected power of 25%, or if the meter is calibrated to 100 watts full scale deflection, it will be saying there are 25 watts of power being reflected. The question is, what has happened to this 25 watts? The common answer is that it is being absorbed by the transmitter (and that this is likely to cause damage). It isn't — what has happened is that the transmitter, because we didn't readjust it, isn't properly tuned to deliver full