DEMONSTRATION 1
Ted W5QJR

Many persons do not understand the EH Antenna concept, so I looked for a way to change that. I concluded the best way to explain the concept was through a series of demonstrations to allow each reader to build a very simple and very inexpensive EH Antenna and experience the performance parameters of this new concept in antenna theory.

This document is the first in a series. It is designed to show that the EH Antenna develops a large radiation resistance. Demonstration 2 will address radiation from an EH Antenna. Other demonstrations will follow to complete the antenna and allow you to use the antenna on the air. We will guide you through the construction and test of this antenna.

DEMONSTRATION 1 - - This first demonstration presents the radiation resistance of the antenna. This is done as the initial step to show that this small antenna does indeed exhibit a high value of radiation resistance, which indicates that radiation does occur.

A very small “conventional” dipole has a very low value of radiation resistance, only a fraction of one (1) ohm. On the other hand, the radiation resistance of the EH Antenna can be in the range of 60 or more ohms.

CONSTRUCTION - To construct a demonstration antenna, obtain a form on which to build the antenna elements. It can be cardboard or some form of plastic or other insulating material. I used a piece of plastic water pipe with an outside diameter of 3.25 inches. This is not a critical value. I also tested the antenna at a frequency near 40 Meters. The frequency is not critical, so get close and you will see the large radiation resistance. If this is too large to suit you, build it ½ scale and test it on 20 meters. Not big enough? Build a larger one on 80 meters – use the same physical size, just add more turns.

Each element of the dipole can be made of any conductive non-ferrous material. We prefer copper, but for this demonstration we suggest the use of aluminum foil from the kitchen. Remember, this is a demonstration, not an antenna designed to withstand the elements of weather. The length of each element should be 1.5 times the diameter (not a critical dimension), and the spacing between dipole elements should be the same as the diameter. Solder wires to the dipole elements as shown in Figure 1. If you use aluminum foil, you can either wrap a turn around the cylinder and twist the ends or lay the wires under the foil when you create the dipole elements. In either case scrape off the insulation where the wire contacts the cylinder.

The next step is to wind a coil. Begin one (1) diameter below the lower cylinder and wind in a direction that will take you further from the dipole elements. Hold the wires with tape or the use of holes in the form. We prefer #14 magnet wire for the coil, which is copper wire covered with enamel paint. This wire is commonly used to wind motors. You can also use wire as small as #22 with plastic insulation. However, in a later step we will connect the antenna to your radio. If you use plastic covered wire, you can be assured the insulation will melt at a transmitter power much less than 100 watts. Use 19 turns of #14 gauge wire close spaced on the coil for a frequency near 40 meters.

TEST - Figure 1 is a combined physical/electrical schematic diagram. To reduce the undesired capacity between the top cylinder and ground, space the wire between the top cylinder and the coil away from the lower cylinder by ½ inch or more. The ground wire can be run next to the lower cylinder if it is insulated. For this test you need a short piece of coax (a few inches) to connect the antenna to test equipment. The test equipment must have the capability to independently measure the components of antenna impedance, which are radiation resistance and reactance. If you do not own such equipment, have a discussion with other local Hams. Many of them have antenna analyzers. For those with equipment and experience, this is an excellent program for you to present to your local Ham club.

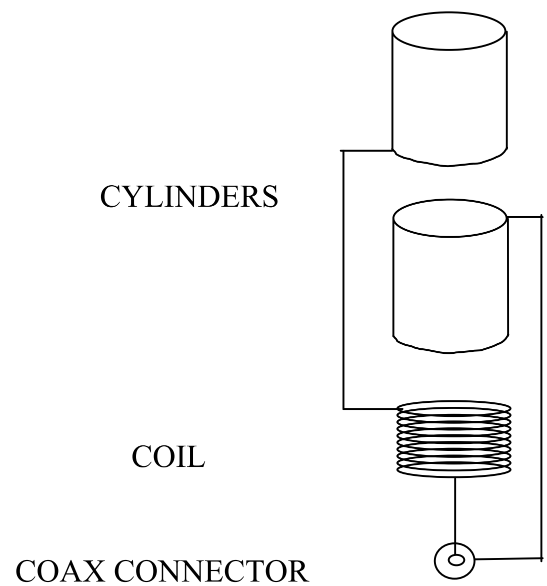

FIGURE 1 – PHYSICAL AND ELECTRICAL SCHEMATIC

Figure 2 presents the measured values of resistance and reactance for the antenna described. Note that the maximum value of resistance is about 260 ohms and occurs at a frequency close to 7.4 MHz. Also note that the maximum value of resistance does not occur at the same frequency as the self resonant frequency, which is where the reactance is equal to zero. Note that this occurs at 7.230 and also at 7.380 MHz. The value of radiation resistance and reactance is controlled by the physical implementation of the antenna. The frequency can be readily changed by adding or subtracting turns from the coil, or altering the coil by spreading turns.

Note that Figure 2 also contains a curve of VSWR versus frequency. This is included only to show that when the reactance is close to zero and the radiation resistance is close to 50 ohms, a relatively low value of VSWR will occur. Therefore, if you only observe VSWR for this antenna you could be easily misled.

Demonstration 2 will present a network for matching the antenna impedance to coax, but more importantly we will look at the radiation from this simple antenna. We will also explain how this antenna develops radiation. July – 2003

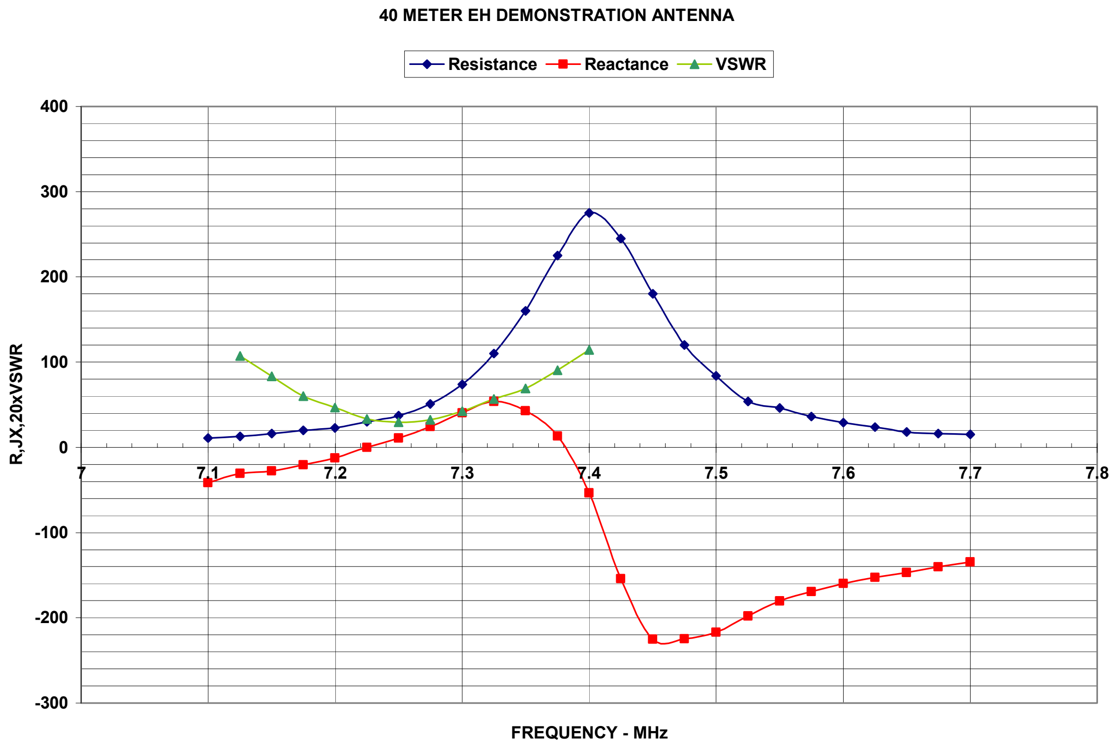

FIGURE 2 –RESISTANCE, REACTANCE AND VSWR