2 METER EH ANTENNA EXPERIMENT
APRIL/2007
Ted

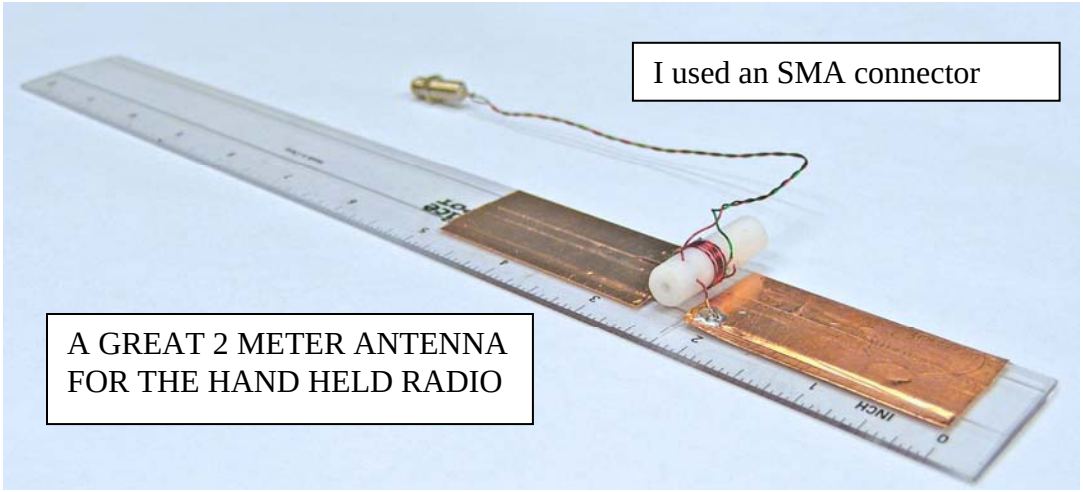
This document describes a 2 meter antenna the reader may build and test to validate the performance, and to learn more about the EH Antenna. To make life really simple, a flat antenna was chosen. Tests in an anechoic chamber indicate that it has close to the same performance characteristics as a round antenna. A round one this size would have a diameter of 3/8 inch. I chose that size to make it easier to build than a smaller one and it has more bandwidth, so it will be less critical.

On the last page I have included the calculations for the antenna. The only difference is that the diameter should be multiplied by π to give the width (effective circumference) for the flat antenna. It will work if the copper is glued to a piece of paper, but it is preferable if you glue the copper to a piece of clear plastic. For the test antenna I used a plastic ruler. Run the feed line out to the side of the antenna and down to the radio. This is illustrated in the photograph below. For testing tape the ruler to the radio

I suggest that the tuning coil and the twisted pair feed line be made of #24 or smaller enamel covered wire because that is readily available at Radio Shack, or at a local motor rewind shop. Tap the tuning coil at about 1 turn from the cold end. Spread the wires as needed for tuning and matching.

The twisted pair is simply a pair of wires twisted together. The amount of twist is not critical, but I use about **3** complete turns per inch because that is easy when using an electric drill. To prevent distortion of the radiation pattern be sure to use an ohm meter to validate that the ground end of the tuning coil is the same as the ground on the radio.

The test results from the example antenna are documented in the attached analysis. I hope you will install the antenna on your handheld radio and compare the communication range against the standard antenna. Please share the results of your experiment on the forum.



As a general comment, tuning and matching the antenna takes only a few minutes if you have the proper test equipment, i.e., a network analyzer. If you only have a field strength meter it takes longer to change frequency on the radio to verify the frequency of maximum radiation and to adjust the tap for best match.

FOLLOWING IS A DESIGN PROGRAM FOR AN EH ANTENNA
SPECIFY THE PARAMETERS IN THE BLUE CELLS

Frequency =	146	MHz	flat
Cylinder Diameter =	0.375	Inches	1.17825
L/D ratio =	6		
Total Length =	4.88	Inches	
Total Length =	0.41	Feet	
Capacity =	2.0	pFd	LINE A
Inductance needed	0.6	uHy	
Coil Capacity	0.86	pFd	LINE B
Total Capacity	2.9	add lines A AND B	
Modified inductance	0.4	uHy	
Reactance	545.1	Ohms	
Coil Diameter =	0.375	Inches	
Wire Spacing =	0.013	Inches	#28 wire
# Turns=	6.5	turns	
Coil Length=	0.1	Inches	
Wire Length	0.6	Feet	

USE THE ABOVE TO BUILD AND RESONATE THE ANTENNA AND TO MATCH IT TO 50 OHMS. INSERT THE MEASURED BANDWIDTH AFTER MATCHING.

Measued +/- 3 dB BW=	19400	KHz
Measured 2:1 VSWR bandwidth	6000	KHz
Radiation Resistance	72.4	Ohms
Antenna Q	7.5	

CALCULATE ANTENNA EFICIENCY

Assume coil Q =	200	
RF Resistance in coil=	2.7	ohms
Antenna Efficiency =	96.4	%
Antenna Efficiency =	-0.16	dB

ANTENNA POWER PARAMETERS

Transmitter Power	5	Watts
Transmission line Z	50	Ohms
		Volts
Transmission Line Voltage	15.8	RMS
Transmission Line Current	0.3	Amps RMS
Current between Cylinders	0.3	Amps RMS
		Volts
Voltage between Cylinders	143.2	RMS
Voltage between Cylinders	401.0	Volts P-P