N2MH Information for Rovers

Normal Mode Helix Antennas for HF Mobile

Background

In addition to roving in the VHF/UHF contests, I've taken up mobile hf operation, specifically county hunting on 14.336 MHz. At work, I park in an indoor garage that only allows about 12 inches of clearance over the roof of my car. Whilst shortened antennas for VHF and UHF are readily available, shortened antennas for HF simply do not exist. Thus, the idea for this antenna was born.

Initially, I thought that a shortened antenna for 10 meters would take up all of that 12", let alone what a 20 meter antenna would need. However, I did some research and found something called a "Normal mode helix" antenna in the **RSGB VHF UHF Manual**, fourth edition. Their interest in this type of antenna is in the context of a rubber duck antenna for vhf HT's. They indicated that an antenna of this type is usually 1/4 or 3/4 wavelength of wire wound on some sort of coil form. In addition, the diameter of the helix must be much less than a wavelength at the frequency of interest.

I proceeded to wind a length of wire on a coil form and found that there were two resonances, neither of which were where I thought they would be. However, one of them was indeed 3 times the frequency of the other one. So, maybe the RSGB was on to something. I made a couple of coils using various lengths of wire, measured the resulting resonant frequencies and established the relationship between number of turns and resonant frequency. Based on this, I wound an antenna first for 10 meters and then one for 20 meters. I really didn't think either antenna would work but after working the E-skip on 10 meters and running counties on 20 meters, I would have to say they do indeed work.

Of course, being shortened antennas, they don't have the punch of even a Hamstick. But, for my purposes, it is exactly what I need. This antenna lets me leave it in place all the time without having to remove it or fold it over when I go into or out of the garage at work.

Description and Photos

Figure 1

Overall shot of the 20 meter helix antenna. The antenna is approximately 65 turns of #14 AWG THHN stranded wire wound on a 1 1/2" cpvc coil form. The bottom of the coil form is slipped over a 1 1/4" copper pipe end cap and secured with four 10-24 brass screws with washers. In the middle of the flat part of the end cap is a 3/8 x 24 screw 1" long held in place with a flat washer, split washer, and a nut (all 3/8 x 24 hardware is stainless steel). Surrounding the mounting screw, I drilled 4 1/16" holes in the copper end cap for drainage. (Before I drilled those holes, the antenna did fill up water whenever it rained.)

The whole assembly is screwed into a standard antenna mount fastened to the ski rack of a 2000 Subaru Ouback Legacy. The bottom of the mount is grounded via a 2" wide copper strap soldered to the roof of the car and painted to match the color of the car. Shunting the mount is a 50 pf capacitor to improve the match. (The value is not the correct value - it's just something I had in the junque box and it worked better than no capacitor.)

(Click on thumbnail for full size picture.)

Figure 2

Size comparison to a Comet B-10 dual band VHF/UHF antenna. You will notice that the dual band antenna is actually longer!

(Click on thumbnail for full size picture.)

Figure 3

Measurement of the length of the antenna. (Ok, so the antenna is actually 10" long, not 8" as advertised, but the winding is 7" long.)

(Click on thumbnail for full size picture.)

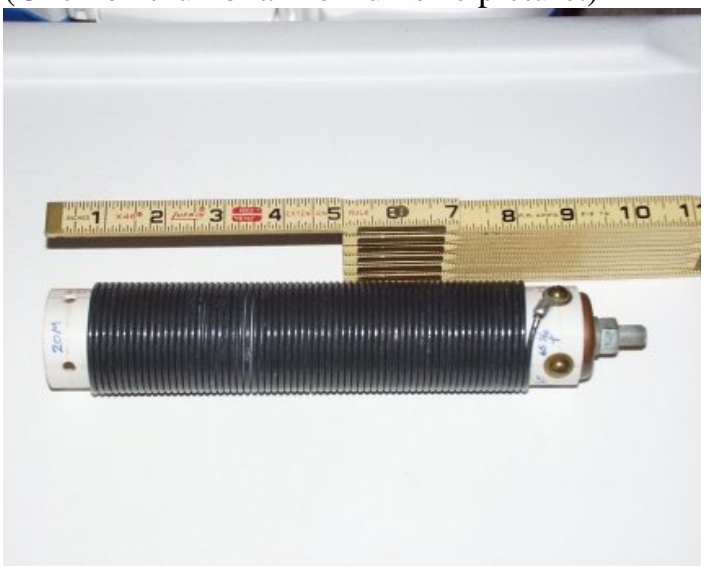
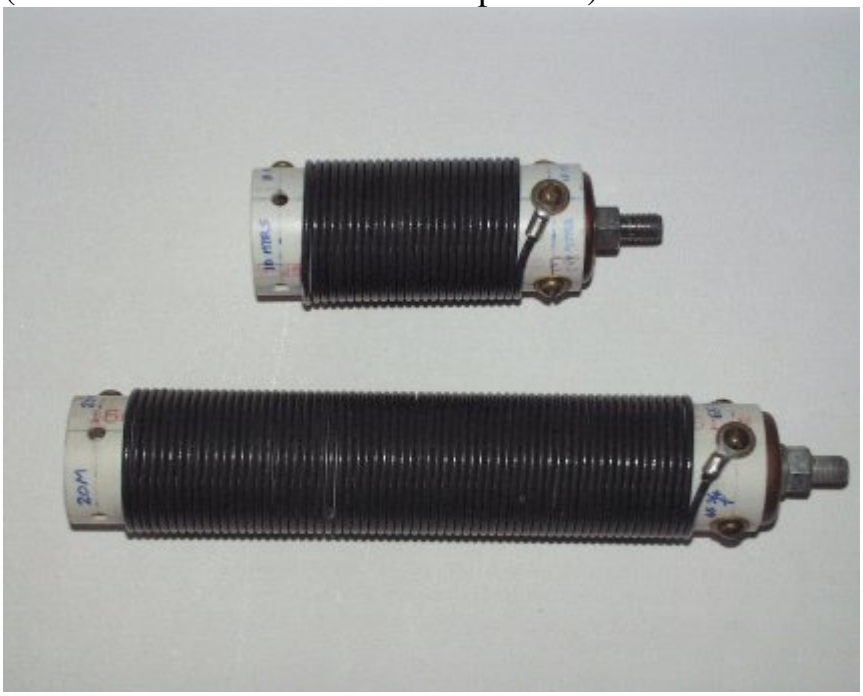


Figure 4

A pair of helix antennas - one for 20 meters and one for 10 meters.

(Click on thumbnail for full size picture.)



Do they work? The answer is a resounding yes!

On 20 meters during one county run in North Carolina, I worked KL1V in Alaska. On 10 meters, just after completing that unit, I caught some E-skip and from northern NJ I worked Montreal and Illinois.

Coil Data

The following table summarizes the data for the various coils I built. All resonant frequencies were measured with an MFJ-259a antenna analyzer and do not include a shunt capacitor to ground (as shown in the picture above). The results I or you will obtain are very much dependant on the ground from the antenna mount back to the chassis of the car. In my case, the ground is a 2" copper strap approximately 3" long from the mount directly to the roof of the

car where it is sweat-soldered right to the roof. (No screws were needed by doing it this way.) Since your ground will be different, your results will be different. Thus, this table is to be used only as a starting point. You would be well advised to add turns to what is indicated on this table and take off turns 1/4 turn at a time until you reach resonance at the desired frequency.

Frequency (MHz.)	**Number of Turns**
10.114	105.0
11.503	87.5
14.209	65.5
16.164	55.75
27.021	27.25
28.082	25.75