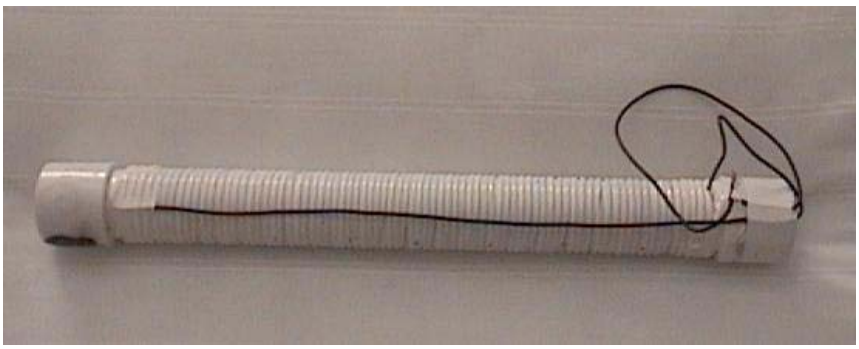
A185 kHz Ferrite Core Antenna
Paul Jorgenson KE7HR

I recently had the chance to do some experiments with some small ferrite core antennas for 185 kHz. It was a ¾ inch ferrite rod, 12 inches long (yes, expensive), with full windings along the length and appropriate tuning capacitors. They performed surprisingly well, being able to transmit and receive through several hundred feet of rock using a HF to LF transverter. There are commercially available versions of this antenna that have been available online for some years now. This inspired me to see what could be done with easily obtained materials.

I saw some ferrite rods on eBay and bought them, cheaply. They are 3 ½ inches long and about 3/8 inch in diameter. (The seller had no idea of what material they were make of or what the permeability was. I am guessing that they are 125 material.) I glued three of the rods together side by side in a kind of triangle to increase the effective cross section. Three of those units were then stacked end to end inside a piece of ¾ inch PVC pipe to produce a rod that is 10 ½ inches long. The pipe had to be 'relieved' a bit with a round file to accommodate the triangles. The extra space in the pipe was filled with a kitchen and bath adhesive caulk to keep the pieces from moving around if the glue holding the rods together fails or if a shock were to break the rod. End caps were installed on this assembly.

The coil winding was done with #22 insulated hook up wire. I was shooting for an inductance value of about 300 uH. More inductance than I wanted was found by close winding the coil. By separating the turns by about one wire space, the desired 300 uH value was achieved. The inductance values were measured with my B&H LC meter. Electrical tape was used to keep the windings from moving on the PVC form.

The complete wound core was placed inside a 1 ½ inch PVC pipe using a closed cell foam packing material to keep the core centered in the outer pipe and provide a rugged exterior package. One end of the outer pipe was solidly capped and the other has a screw off cap and Teflon tape to keep the threads from sticking. Inside the screw off cap, a barrier strip connects the ends of the coil, the resonating capacitors (about 2000 pF), and the coax to a BNC connector. More packing foam keeps everything stable inside the pipe. The outside of the large pipe was flattened to accommodate the nut for the BNC connector.



I chose to use the matching method of a series variable capacitor (a mica compression unit)

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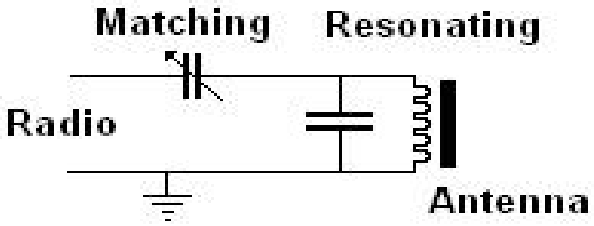

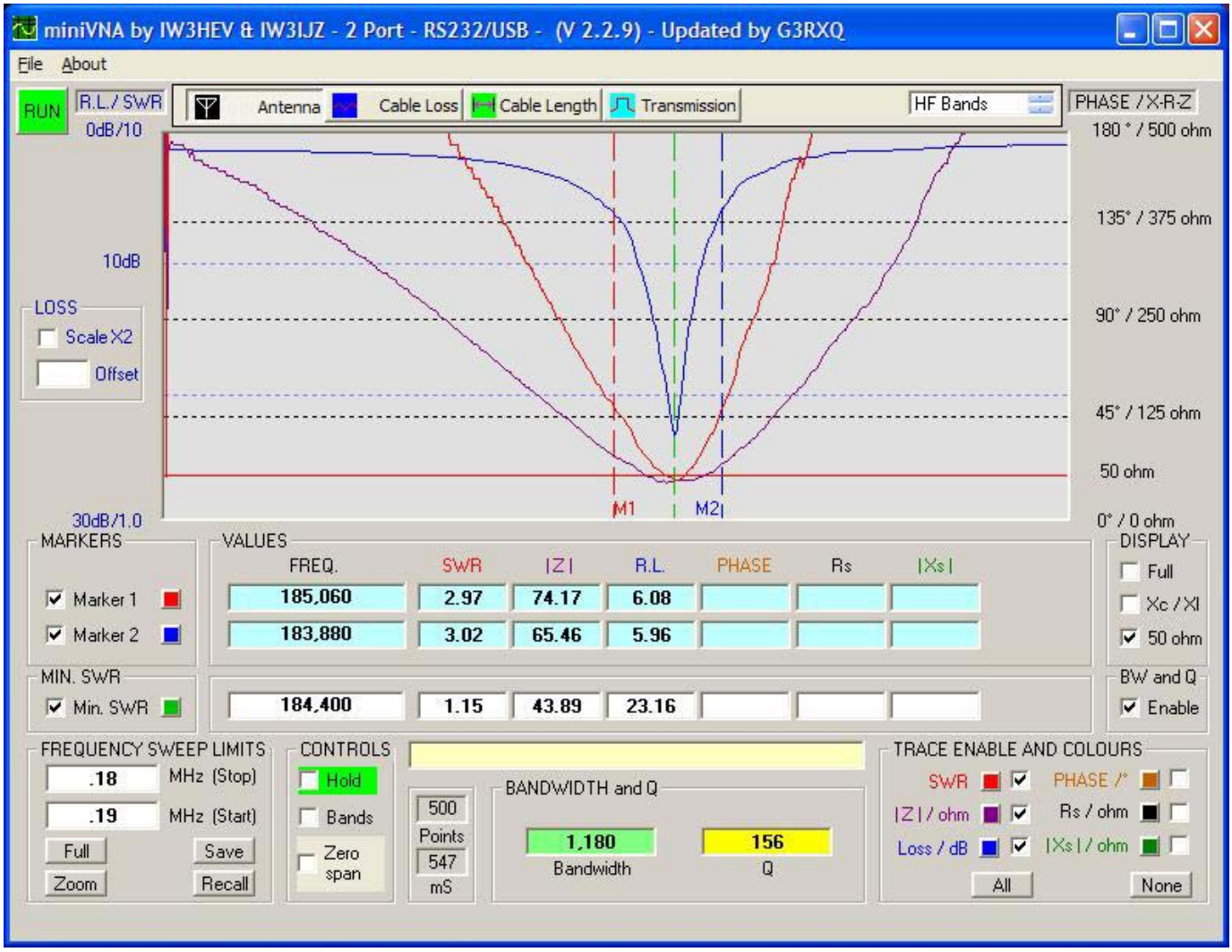

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rather than a matching transformer or inductive link of one or more turns over the main coil. I think that this is a more efficient way of transferring the power to the antenna (but I may be wrong). With the proper equipment is has been easy to adjust to resonance. An analysis with my Mini VNA network analyzer shows that the resonant point is quite sharp and can be moved up and down the band by adjusting the matching variable capacitor. The antenna easily reaches resonance and a match to 50 ohm coax and has acceptable bandwidth for the purpose for which it will be used. The sharp tuning should keep out of band signals and noise to a minimum. This is important at LF where there is lots of noise!