

Field Day Antenna

by
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This past Field Day the club tried to use a folded loop that just didn't work. All contacts were made on my portable antenna. The club asked me to make something for them that would work on 75, 40, and 20 meters.

Let's skip right to the conclusion. I used this antenna to check in with my favorite regional net on 75 meters with my Icom IC-718 operating at 100 w SSB from a RBC-6 sealed lead acid ("gel cell") battery. Net control and assistant net controls reported that I sounded good, one giving a signal report of "10 over" from nearly 400 miles away.

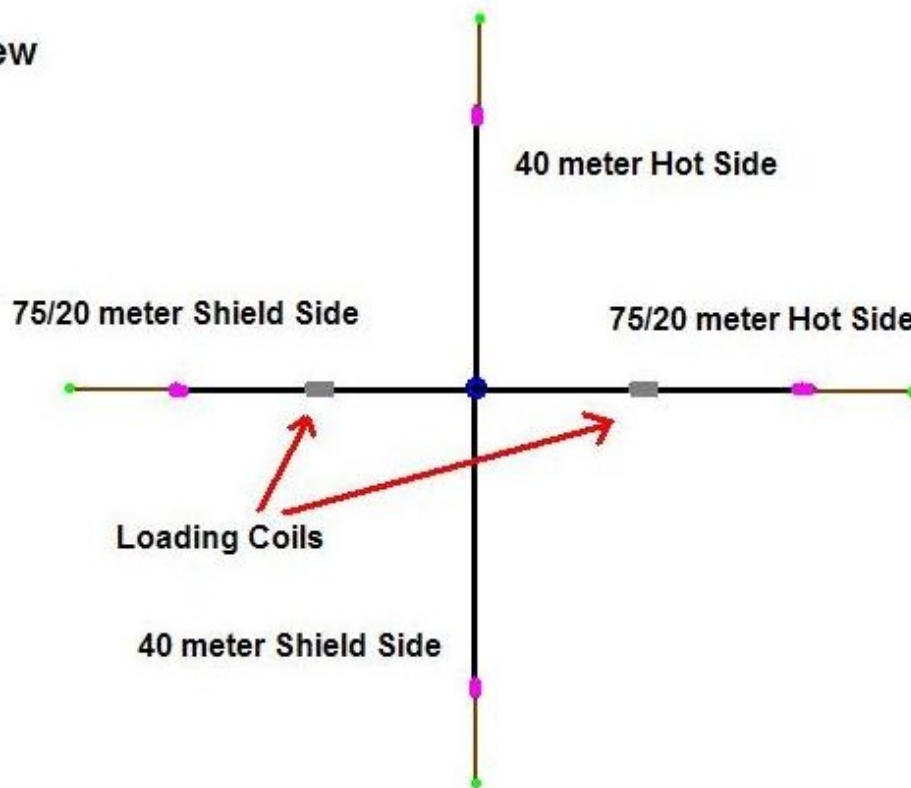
This antenna will work on 40 and 20 meters without tuner, and with a little assist from a tuner will work on 17 and 15 meters, too.

Here it is:

This is a Field Day / Portable / Emergency antenna I just finished trimming. An antenna analyzer made for easy trimming.



Top View



This is a multiband inverted V dipole. The club president and I had discussed bands that needed to be covered, so it was decided that 20 meters, 40 meters, and 75 meters were most important. Anything else is extra.

I made my calculations, cut my wire to length, etc. Left a few feet on the ends so that it could be let out.

The 4 legs are all about the same overall length. 40 meter legs go one way, and the 75/20 meter legs are at right angles. The wires double as the guys, with insulators out at the ends, and then 550 parachute cord going on out to tent stakes... or anything else you can find to tie to.

The 75/20 legs have coils in the middle of each leg. These are placed at about where the ends would be if the wires were cut for 20 meters only... traps or chokes. They also act as loading coils so that the overall length will work for 75 meters.

When dipoles are this low (about 22'), proximity to the ground lowers the antenna's impedance, which causes havoc with SWR. To counter this, like the Buddipole, the feedpoint is just off center, enough to bring up the impedance a bit

closer to 50 ohms. The legs connected to the "hot side" of the coax are a little longer, and the coil on the 75/20 meters leg has a few more turns on the coil than calculated. The legs connected to the "shield side" of the coax are a little shorter, and the coil on that shield side 75/20 meters leg has a few fewer turns than calculated. This off center feed allowed for a minimum SWR of 1.3 to 1.4:1, which could not have been achieved otherwise.

Let's see if this theory works out...

20 meters resonated too high, needed lengthening.

Due to the way this antenna is made it was decided to lengthen the 20 meters segments first by unwinding a turn from the inner side of one coil. The coil former, 2" pvc pipe, has J-slots cut in each end so that wire may be let out or taken in.

Letting out one turn, lengthening that side by about 7", brought resonance down some, but not enough. Letting out one more turn on that same side resulted in these figures:

14.000 mhz 1.6
14.100 mhz 1.5
14.200 mhz 1.4
14.300 mhz 1.5
14.350 mhz 1.5

Next I tackled the 75 meters segments, which were tuned by cutting off the ends of the wire on these same segments. I took off about 2' on one end, and about 18" on the other to give:

3.900 mhz 2.3
3.910 mhz 1.7
3.920 mhz 1.4
3.925 mhz 1.4
3.930 mhz 1.5
3.935 mhz 1.6
3.943 mhz 2.0

There are some emergency nets on 3.925 - 3.935 mhz.

20 meters was rechecked, and remained unchanged.

40 meters was adjusted by removing about 10" from each end to give

7.000 mhz 2.9
7.100 mhz 2.3

7.150 mhz 1.8
7.200 mhz 1.5
7.250 mhz 1.4
7.300 mhz 1.5

After these changes all three bands were checked again to make sure nothing else needed to be fine tuned.

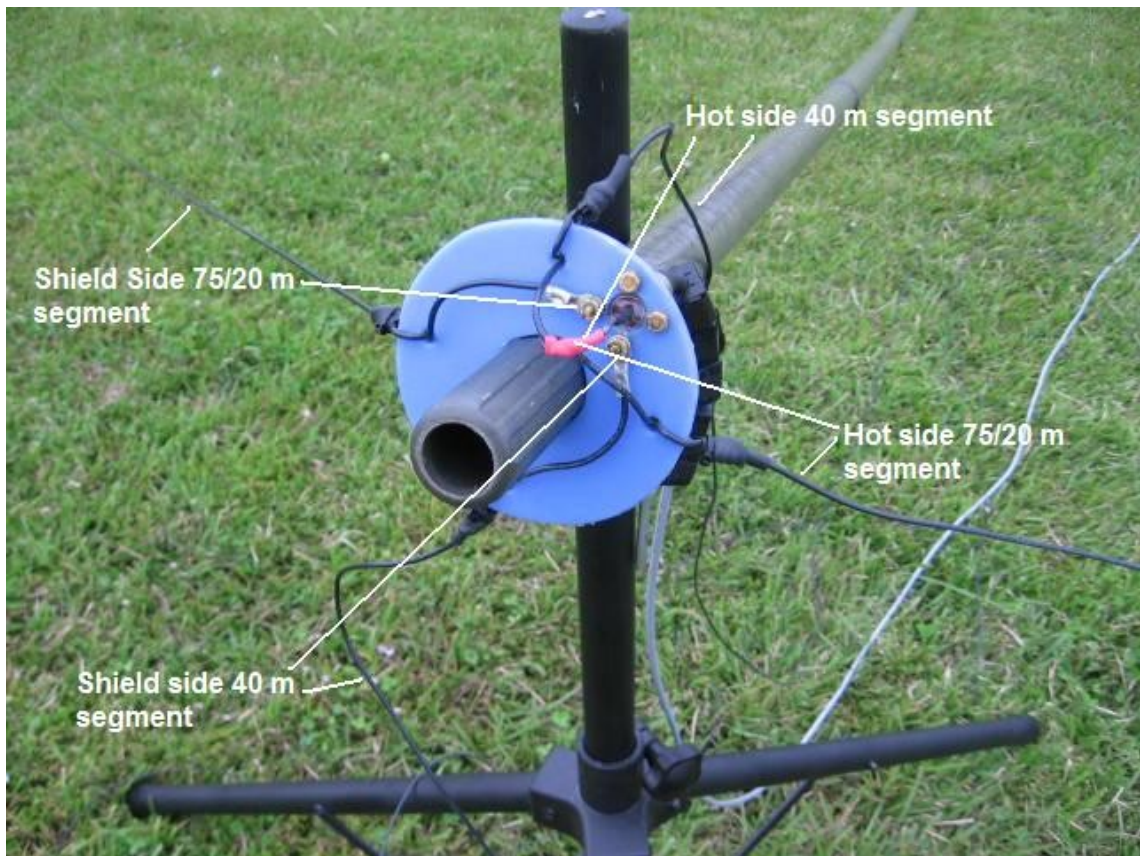
15 meters was found to be in the 3.5:1 to 3.0:1 range. A tuner can take care of that quite easily.

Photos:



Loading coil. These coils are close wound on 2" ID pvc with 14 ga insulated wire. There are J slots on each end to allow adding or subtracting turns of wire.

Once the coil tuning was settled it was wrapped with 3M Electrical Tape.





Center insulator made from cheap Wallyworld kitchen cutting board.

100' of RG-8X coax was used, which is approximately $1/2$ wavelength at 80 meters. Also, there are five Palomar Engineers FSB-1/4 ferrite snap on beads on the coax up by the feedpoint. These act as a "choke balun".



Base, PA Speaker tripod. The mast is 5 sections of fiberglass pole sections. These are military surplus camo net poles, an Ebay item.



End insulators. Ordinary ceramic dogbone type. “550 Parachute Cord” extending out to tent stakes.

The recipe:

Wire used is 14 ga stranded insulated wire, the 500' roll for \$25 from Home Depot.

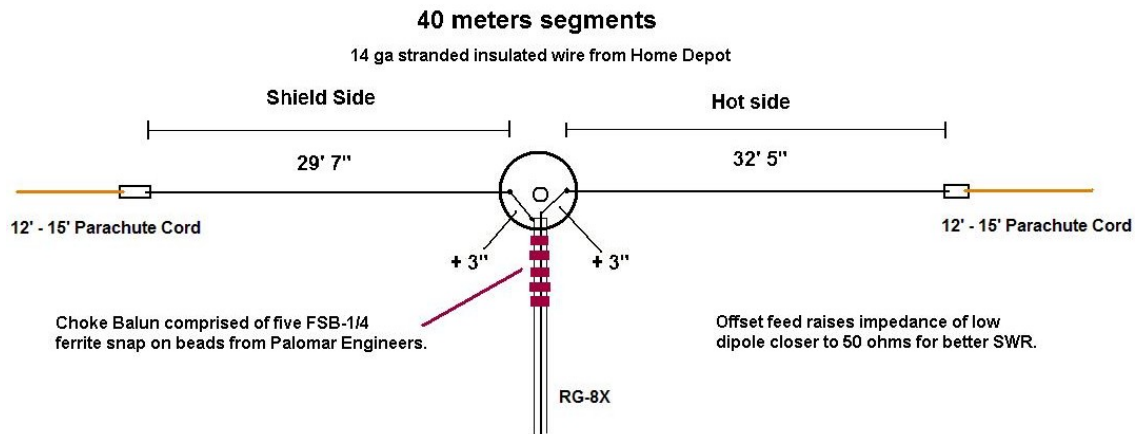
I had a lot of black parachute cord, but will buy some more orange for the end rope on this. Also, my plastic tent stakes are green. Difficult to see in the dark. I'm going to get some bright yellow tent stakes.

The center insulator is cut from a cheap plastic kitchen cutting board from Walmart. A half inch dia hole was drilled in it, and a SO-239 socket screwed to it. The top of the socket was sealed with Aleene's 7800 adhesive.

There is approximately 3" of wire from the socket to each of the four holes, or tie points for the wire legs.

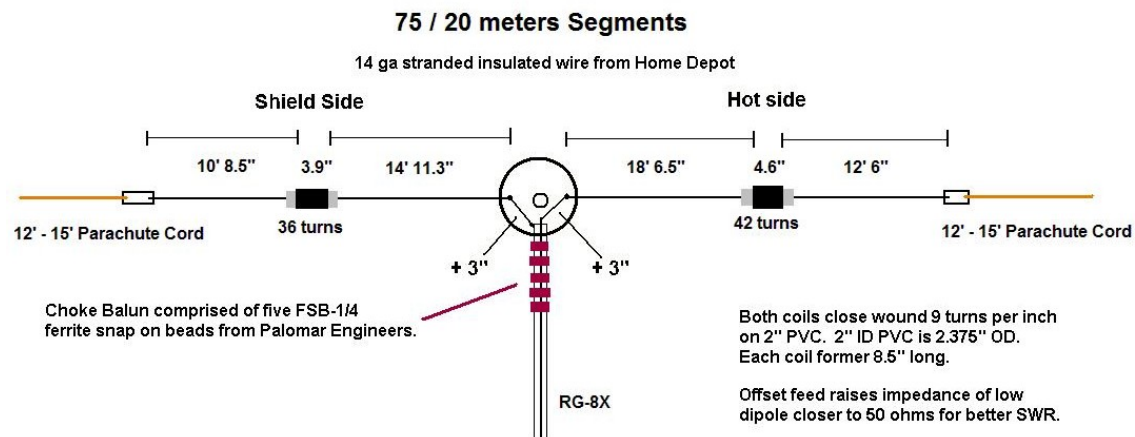
The two 40 meters segments go one way, and the two 75/20 meters segments are perpendicular to the 40 m.

40 meters segments:



Measurements are from the holes, or tie points on the center insulator out to the hole in the ceramic "dog bone" insulators on the ends.

75 and 20 meters segments:



This 75 / 20 meters section is wired parallel to the 40 meters section, only these legs are stretched out at right angles to the 40 meters legs.

Measurements for the inner 20 meters segments are from the tie points on the center insulator out to the first turn on the coils. The measurements for the outer wire segments are from the last turn of the coil on out to the hole in the ceramic "dog bone" insulators on the ends.

The coil formers are 2" ID PVC pipe, which is 2.375" OD. I have holes drilled in the pipe to secure the ends of the coils with ty-wraps. After tuning was deemed finished, the coils were wrapped with Scotch 3M electrical tape. I find Scotch electrical tape does not turn gummy and fall off with age. Good quality tape is worth the money. I made the coil formers with "J-slots" on the ends, to allow more turns to be taken off or added for tuning. Now that I have the final measurements that will not be necessary when making future copies of this antenna.

Due to the diameter of the 14 ga insulated wire, I was able to get right at 9 turns per inch, close wound, that is, turns touching each other. I used this 9 turns per inch figure in an online coil design calculator. This gave a nice repeatable build on the coils, and a length to diameter ratio of about 1.75:1, which is right in the middle of the suggested design ratios of 1.5:1 and 2:1.

Other notes:

There are five Palomar Engineers FSB-1/4 ferrite snap on beads placed on the RG-8X coax near the feedpoint. This forms a "choke balun" to stop RF on the shield. Similar snap on beads may be purchased from Ham City listed with the coax.

The apex of the antenna is at approximately 22'. This includes the tripod base and 5 fiberglass mast pieces. These are the common military surplus fiberglass camo net poles sold at hamfests and on eBay for use as antenna masts.

The only drawback of the coils is that the 75 meters bandwidth is narrower than if the antenna were full length. However, the antenna still covers the desired portion of the band with good SWR, and a little more using the tuner. * (see note at bottom of this post)

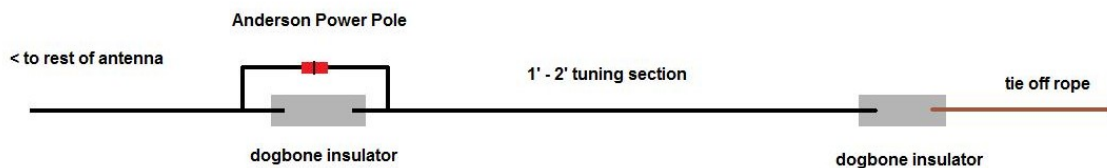
But the use of coil loading and the overall length of this 75 meter antenna (appx 50% of full size) causes no noticeable drop in signal. I still got good signal reports from others I regularly talk to, so they know what I usually sound like with my full size dipole.

While this is not a permanent antenna for me, this might possibly help others fit 75 or 80 meters into a small yard.

One added note: While many say coax length does not matter, during initial testing with an analyzer I was getting good, consistent readings on 40 and 20 meters, but the 75 meters SWR readings were squirrely. Then it dawned on my... 50' of coax. Considering velocity factor, that is very close to 1/4 wavelength at 80 meters. The next time I tested it I used 100' of coax, and that works out to approximately 1/2 wavelength at 80 meters. SWR readings were consistent and stable.

Lesson learned: The old "conventional wisdom" to use 1/2 wavelength of coax got to be "conventional wisdom" for a good reason. I related this to one of our old club gurus and he just smiled and said, "Toljaso." Length does matter, so use 93' - 100' of coax with this antenna.

* **So, a thought occurred to me...** What if you do want to go lower in the 75 meter band? Why not put some sort of connector near the ends, down by the insulators? Then clip on some added pieces of wire, 1' long each, or 2' long each, and string them on past the insulator, perhaps securing them to the parachute cord end ropes with tie wraps? That would drop the resonant frequency to a lower portion of that band.



Want to go lower in the 75 meter band? Why not add a "tuning section" to the end of the 75 meter segments? Bridging around the insulator with a connector adds on another 1' - 2' section on each end, lowering the resonance of the antenna.

New Mod to Field Day Antenna



1" split rings (like for car keys) and snap hooks:

