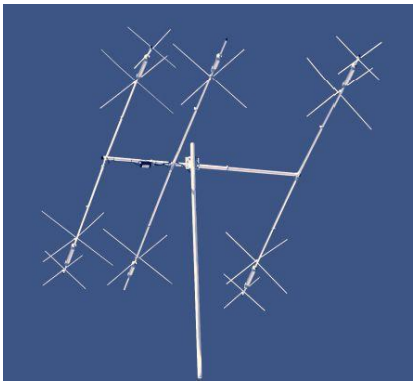
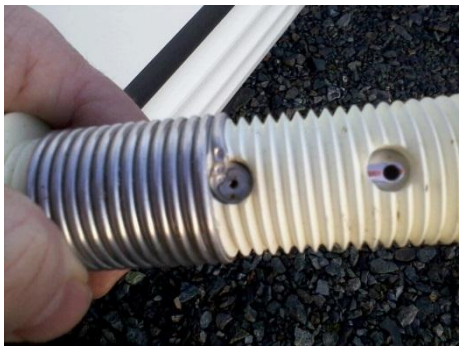


Our Cushcraft MA5B —Project Ham: Gary VE7AS

One of our donated antennas was this 5-band 3-element 'short' yagi. Covering 10-12-15-17 and 20 metres this yagi has been well received by most Hams on the Internet review sites. As with most of our pre-owned antennas that arrive at the project for "free"—it didn't work on all the bands.

Initial testing after assembly indicated a problem with the 17 and 20 metre element. After contacting Cushcraft, they suggested checking the traps for a loose coil screws a common issue, apparently. We did, and found them all tight. So I decided to take the traps apart, just to have a look. Sure enough the problem was quite obvious. The first trap tube I disassembled was filled with insect bodies and cocoon remnants, but as soon as I extracted the coils, you couldn't help but notice a missing one inch piece of the aluminum wire on the larger coil, and on the small coil, it had melted away from the rivet. Inspection of its twin on the other half of the dipole, showed no damage at all and it was totally clean inside the tube.



Interesting observation—I didn't find the missing piece of aluminum wiring. After cleaning all the pieces, I drilled out the rivets and removed the damaged coils.

Dave, VE7DPE who was on his way to the project was diverted to the electronics store to pick up some #10AWG enamel-coated solid copper wire—aluminum wire being next to impossible to obtain, especially on a weekend. The copper wire was ½ a millimetre larger in diameter, but it sat in the coil form well enough.

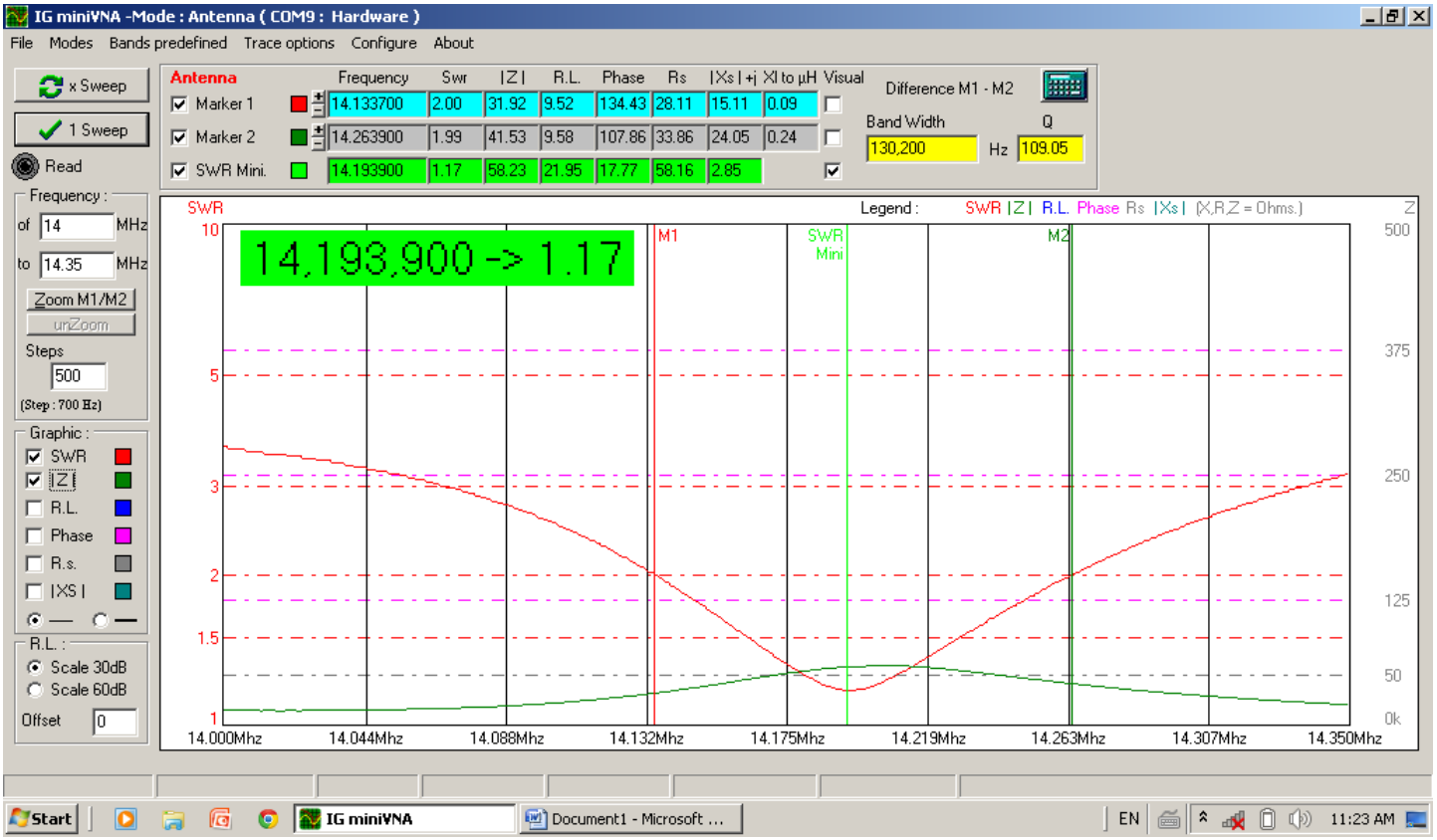
We rewound the two coils and since a rivet gun wasn't in anyone's tool kit, I simply tapped the hole and secured the coil ends with a stainless steel machine screw. Unfortunately we were so impatient to test our repair, I didn't take any photos of the restored coils.

After the traps were installed back on the antenna, we attached 100 feet of RG-8x coax and hoisted it up our 20ft. test mast.

Attaching my MiniVNA at Bill's station, I recorded the following results:

The first band checked was of course 20 metres and we were extremely happy to see that our rewound copper coils worked—at least with the MiniVNA attached. The screen prints from the analyser shows the SWR sweep [in red] and the Impedance [the green line] to be exactly what I expected. We knew the MA5B is narrow on this band—the only real annoyance Hams complained about in the eHam reviews.

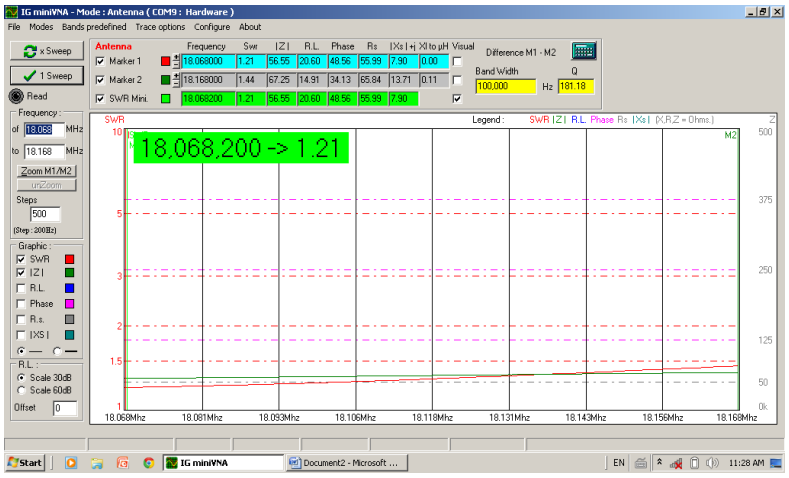
The 2:1 bandwidth is 130.2 KHz. wide, which isn't bad for a shortened dipole utilizing high Q coils. Centred on 14.1939 MHz at a SWR of 1.17:1, this is quite useable from 14.1337 to 14.2639 MHz.

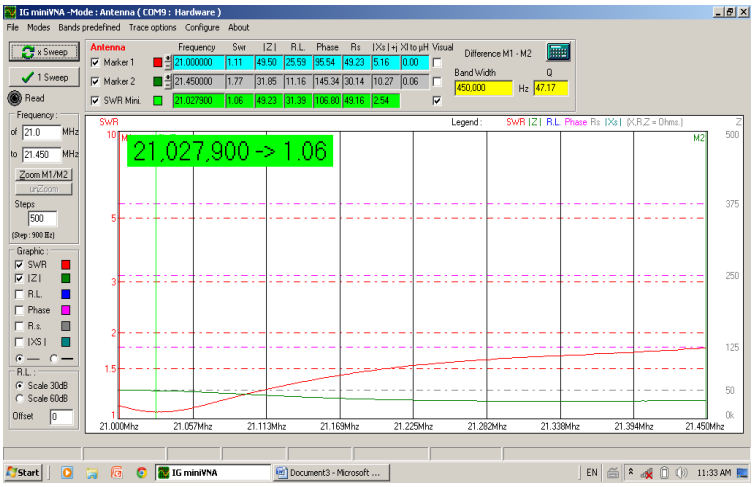


I tried it on a 100 watt rig, immediately made a contact in Colorado, then Japan—got a great signal report and then went back to testing with my MiniVNA. So it worked with 100 watts—it's supposed to take 1000 watts, but I wasn't going to test that. I'm thinking that might have been why the coil vaporized in the first place—insects, moisture, bad SWR, high power, and being too long winded—all creating that "perfect storm."

I recommended a test to 500 watts, which Bill can do when he feels it's time. The coils are a tiny bit closer together due to the thickness of the copper used, and even though it's coated [the aluminum wire was not] there still might be arcing issues if too much power was used, especially toward the edges of the 2:1 bandwidth or if used with a tuner at the band edges.

The next band tested was the 17 metre band. It revealed an SWR of less than 1.44:1 across the entire 18.068 to 18.168 band. Favouring the lower end of the band [with a 1.21:1 SWR], we were totally happy with this result.



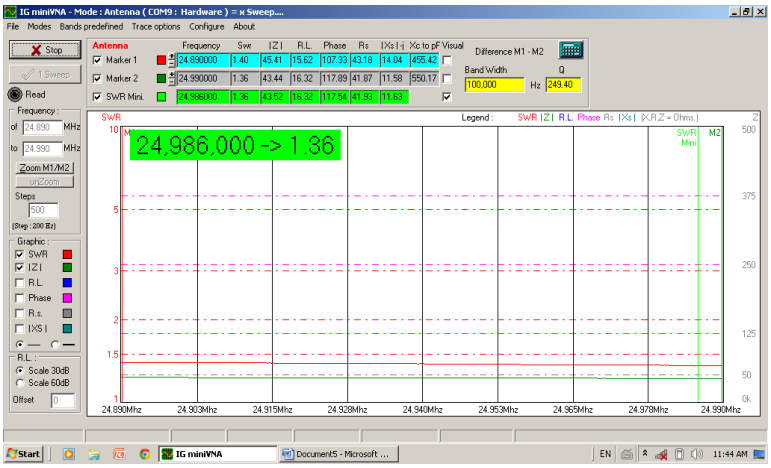


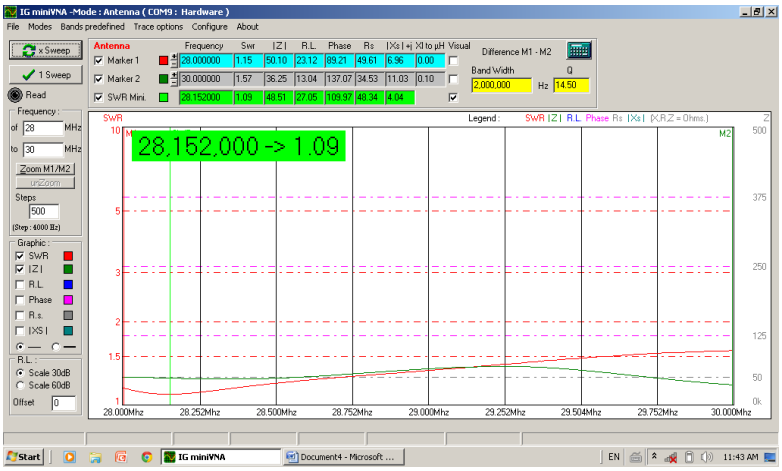
Next, the 15 metre band. As you can see, it was under 1.77:1 across the entire 21.0 to 21.450 MHz. band. Interesting to see that it favoured the CW portion as well, with a resonant dip at 21.0279 and SWR of 1.06:1.

Not a whole heck-of-a-lot one can do to adjust this, because if you "play" too much with the dipole lengths, you'll detune the other band [or bands] it's paired with.

The 12 metre band followed. From 24.800 to 24.990 MHz. the SWR never rose above 1.44:1. It was basically flat across the entire band, showing the best SWR of 1.36:1 at the top end.

Again, we were pleased with these measurements.





The last band to check was the 10 metre band.

From 28 all the way up to 30 MHz. it only rose slightly above 1.5:1 near the top of the rarely used FM portion.

It's resonant dip was measured a 1.09:1 SWR at 28.152 MHz. Acceptable and workable without a tuner.

The antenna presently sits up at 20 feet off the ground, on its test pole attached to Bill's FT-897. It will go up on one of towers at the next work party. In the meantime with the antenna fixed at ESE to SE, my on-air test of its performance was good [IMO]. I worked everyone I could hear on my all-band test. Getting S5 to S8 reports on each band from South Florida, to a contact in Japan. One station, N5ANF, Gary in Colorado was running a kilowatt with a dipole on 18.160 MHz. He was 30db over S9 to me and I was an S7 to him with my 100 watts. I did get a better report from the Tokyo QSO on 24.8 megs. Both 12 & 17 are just rotatable dipoles on the MA5B but I was impressed enough with both contacts, never having been on those bands before today.

20-15-10 are the 2-element bands on this antenna with a little bit of gain—3dbd on 10, 2.65dbd on 15 and 1.45dbd gain on 20 metres. Not great, but I had no problem working anyone. On 12 & 17, the specs say 1 dbi on each band—this translates to a loss of 1.15dbd but it's not noticeable as the signals at the time of testing were good anyway and after all, we are dealing with a trapped, shortened yagi.

Operators who work this station at the project need to know that although is suggests 1000 watts is ok, that's PEP on voice with no 1 hour ragchews—600w max with CW and only 350 watts for all the other modes. We don't want to melt anymore coils!

Sam, VE7SAM, who came by with his father VE7GRK to witness the MA5B test, asked why all the capacity hats? I got distracted and didn't finish explaining why. The MA5B is an antenna that utilizes high Q coils (inductors or traps) to physically add electrical length to a design that is made up of dipoles that are too short to resonate naturally—like a proper ½ wave wire dipole. This design creates smaller antennas [a smaller footprint] but also results in yagis that are too narrow in bandwidth to be of any practical use. So, capacity hats [all those aluminum rods] are placed near each end of the trap coils to increase the bandwidth on each of the 5 bands it was designed to cover. As with all antennas, inductance [or inductive reactance] and capacitance [capacitive reactance] are the key components in resonance. The complex relationship of these factors, along with the electrical characteristics of the dimensions of the aluminum rod, its spacing between elements and it's designed length all algebraically add up to a reasonably efficient, physically smaller-than-normal antenna with good bandwidths. All this engineering, for those of us you cannot have full-sized, 5-6-element, mono-band antennas for each of these 5 bands our MA5B covers.

This antenna offers the project a chance to have a rotatable antenna for 12 and 17 metres with a backup for 20-15-10. I was impressed enough with this antenna to buy a new one for myself—it's a great size for the average suburban lot. Heinz VA7AQ and Gordon VE7GRK also bought one for their home stations and it will be interesting to compare QSO notes between the four of us. Bill's zero noise floor notwithstanding.

If you want one for yourself, go to https://www.hamcity.com/store/pc/viewPrd.asp?idcategory=0&idproduct=621 for the best price on-line. Ham City sells it for only $399.95 which is $100US less than if you bought it straight from Cushcraft themselves or MFJ, the new owner of this USA antenna manufacturer.