

Homebrewing 2 Meter Antennas

Easy do-it-yourself antennas that work.
how to's, what if's, and so whats

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My Messages

- Making antennas is easy
- Don't need fancy skills or expensive parts
- Not hard to make antennas as good as or better than commercial ones
- Some things work better than others, and weird stuff works too
- It's fun!

Why am I giving this talk?



- To relate my adventures with antennas
- To pass on lessons learned
- To encourage some of you to try this
- To provide some entertainment (more about that later)

My old antenna collection

(much bigger than my radio collection)

1. rubber duck that came with my radio
2. Maple Leaf tri-bander ladder line J-pole
3. Measuring tape Yagi for fox hunts
4. Tim Spicers differential RDF antenna
5. mini-mag mount – works like a charm

My new antennas — (up to 10 days old)

The weather wand

-to receive continuous 162.476 broadcasts

The 26'er

-26 AWG wire, sized for 2 meter band

The shotgun

-'12 gauge' wire

The copper cactus

- 1/2 inch copper pipe

The T-bone

-my own design based on Conn Director

Common Features

- cheap. only thing I bought was copper pipe
- low skill requirements. never soldered pipe before, but it seemed to work OK
- low experience requirements. First time
- omni-directional – don't want to rotate
- indoor attic as target – could weather proof
- ended up all being J-pole variations

Stuff I used

Materials

- telephone, electrical wire
- old RG58 computer coax cables
- 1 inch nails, a 1 inch bolt
- copper pipe, T's, elbows and caps
- hose clamps
- duct tape, twist ties, solder
- 6 inches of wood dowel
- wood scraps
- 1 Conn Director

Tools

- soldering iron
- soldering torch
- pipe cutter
- hand tools
- Eric's SWR meter
- an RF amplifier
- jumper cables, adapters

The Weather Wand

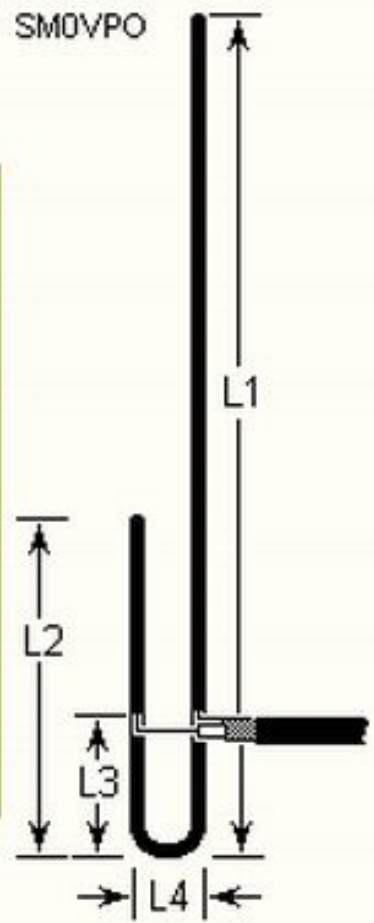
(from Harry's Homebrew Homepage)

L1 = 3/4-wave
L2 = 1/4-wave

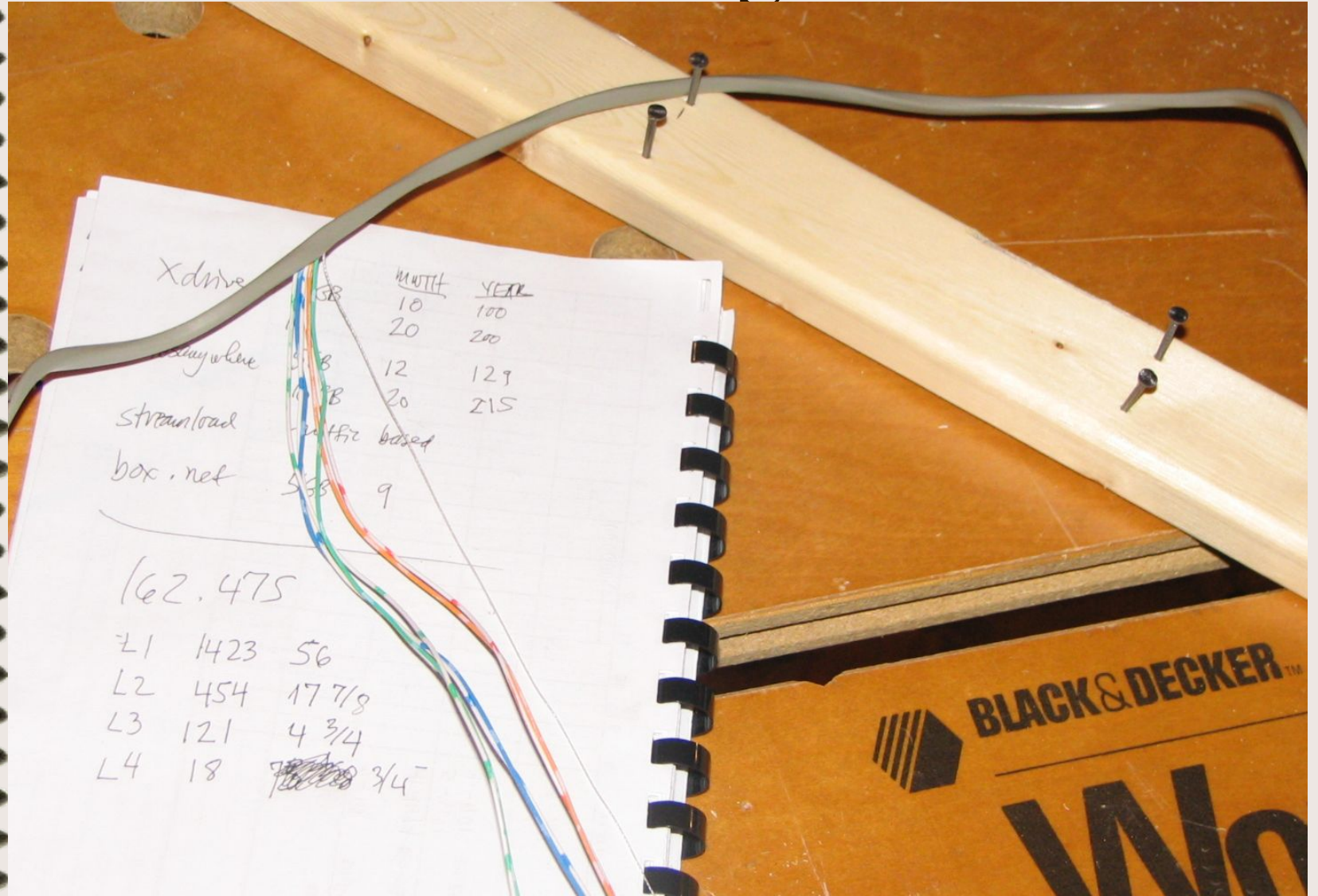
L3 = Feed point
L4 = Element space

SM0VPO

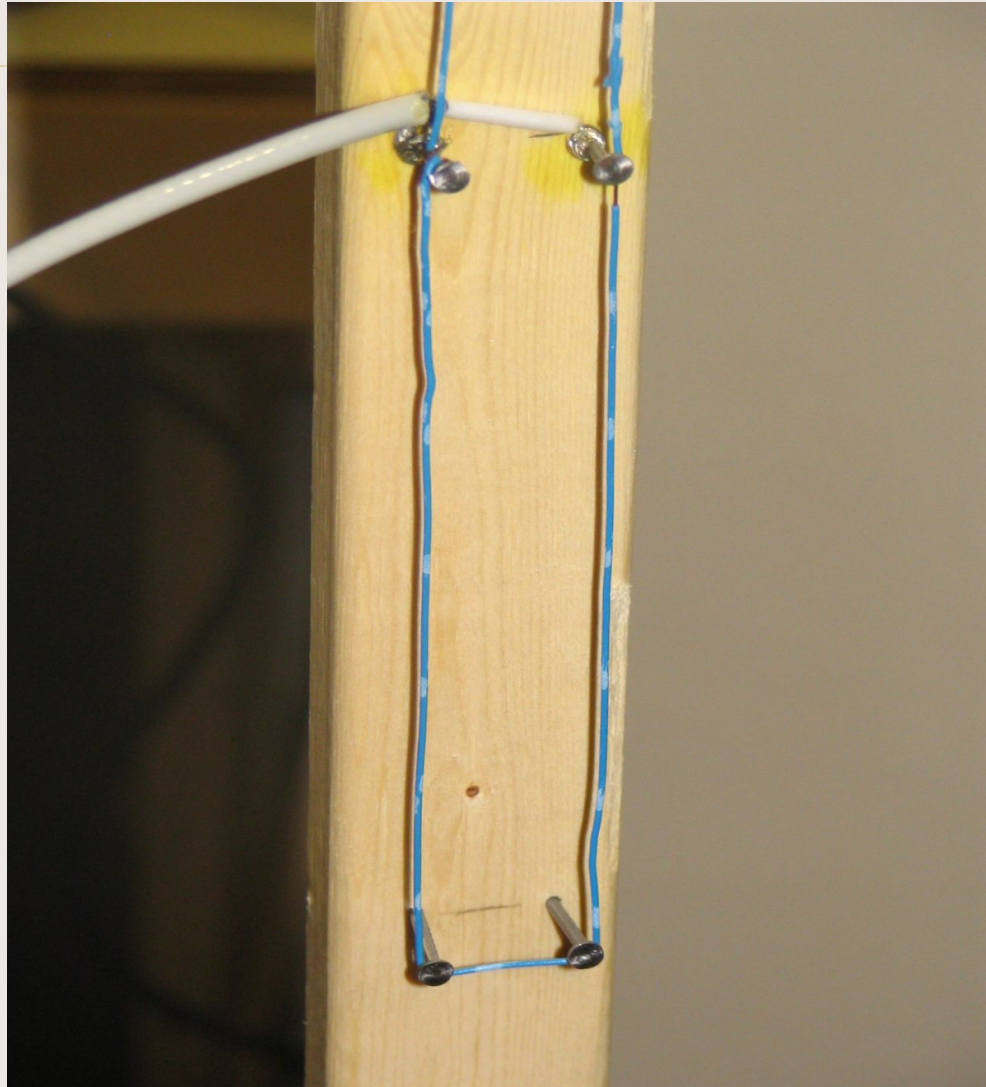
Enter Frequency (MHz) <input type="text"/>	Show lengths
3/4-wave (mm) (L1) <input type="text"/>	1/4-wave (mm) (L2) <input type="text"/>
Feed point (mm) (L3) <input type="text"/>	Element space (mm) (L4) <input type="text"/>
Total wire length needed (mm) <input type="text"/>	



Building it



The feed point



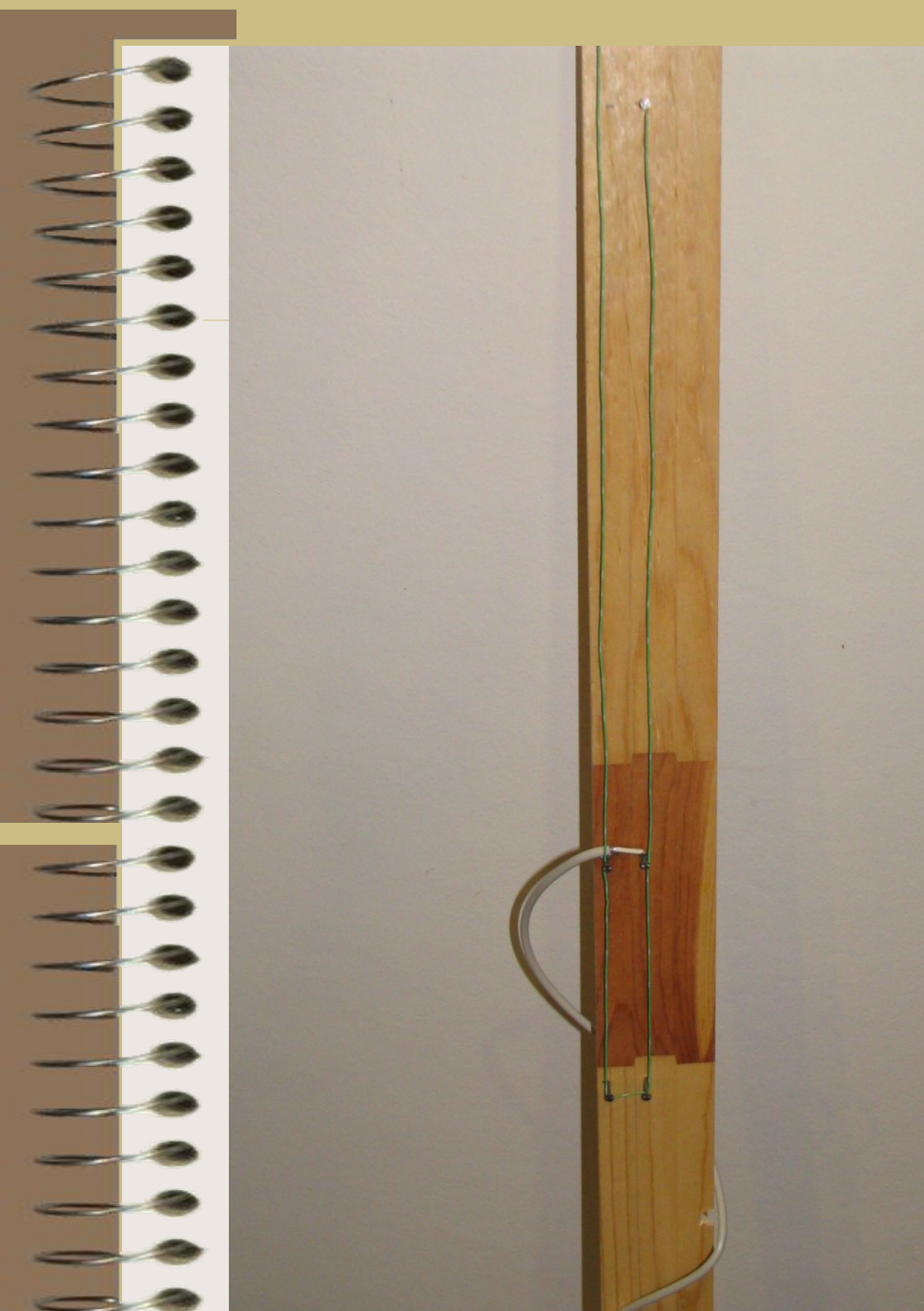
Trying it

- middle of backyard
- weather broadcast loud and clear
- able to trip LON, OME, MGI and TTT
- QSO with Pat, WDD
- huge relief – will have something to talk about for LARC
- neighbour seems concerned

The 26'er

- same thing, scaled for 2 Meters instead of 162.475
- same 26 AWG telephone wire
- used a piece of baseboard molding to mount it
- worked about the same

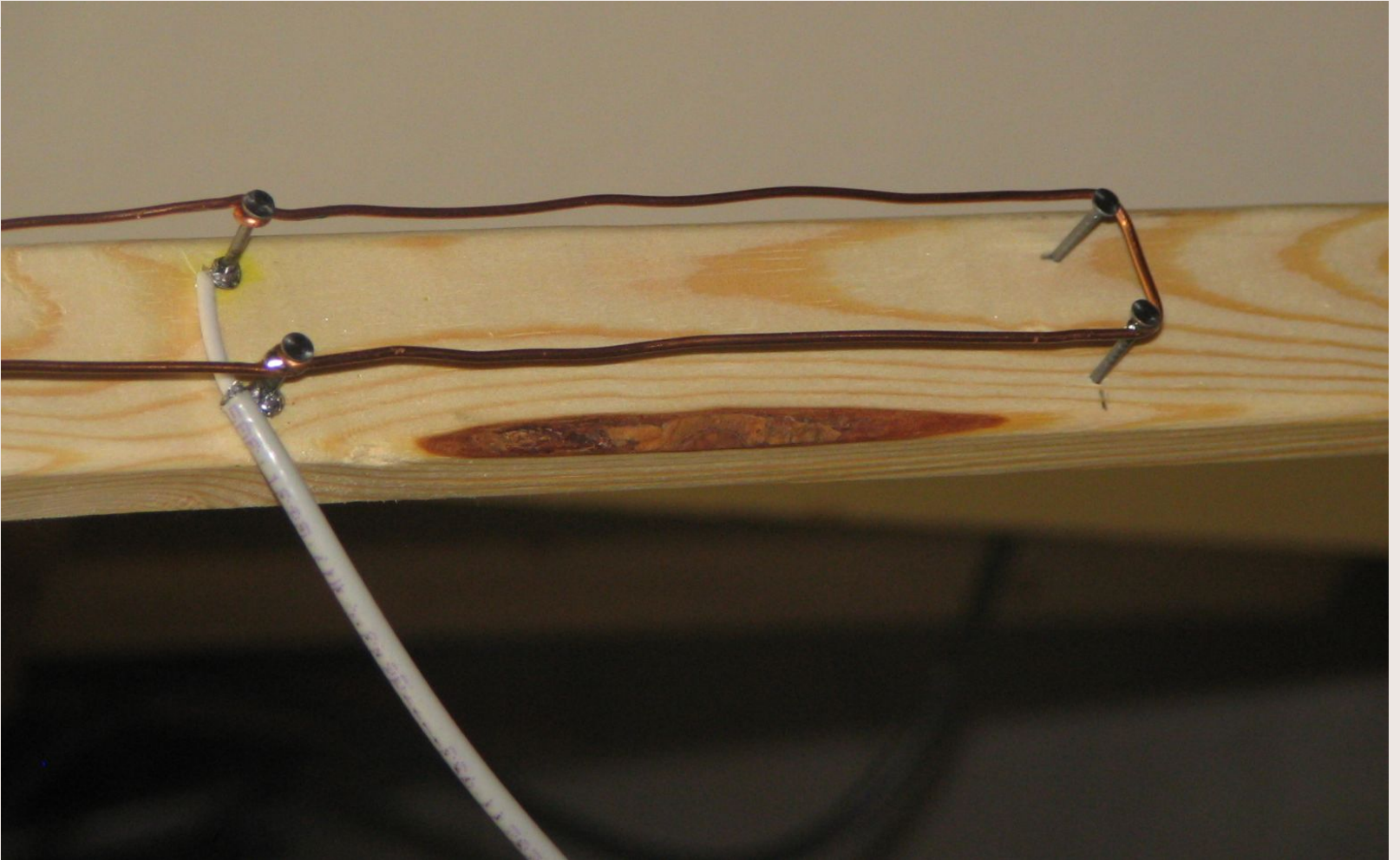
Same technique,
different size



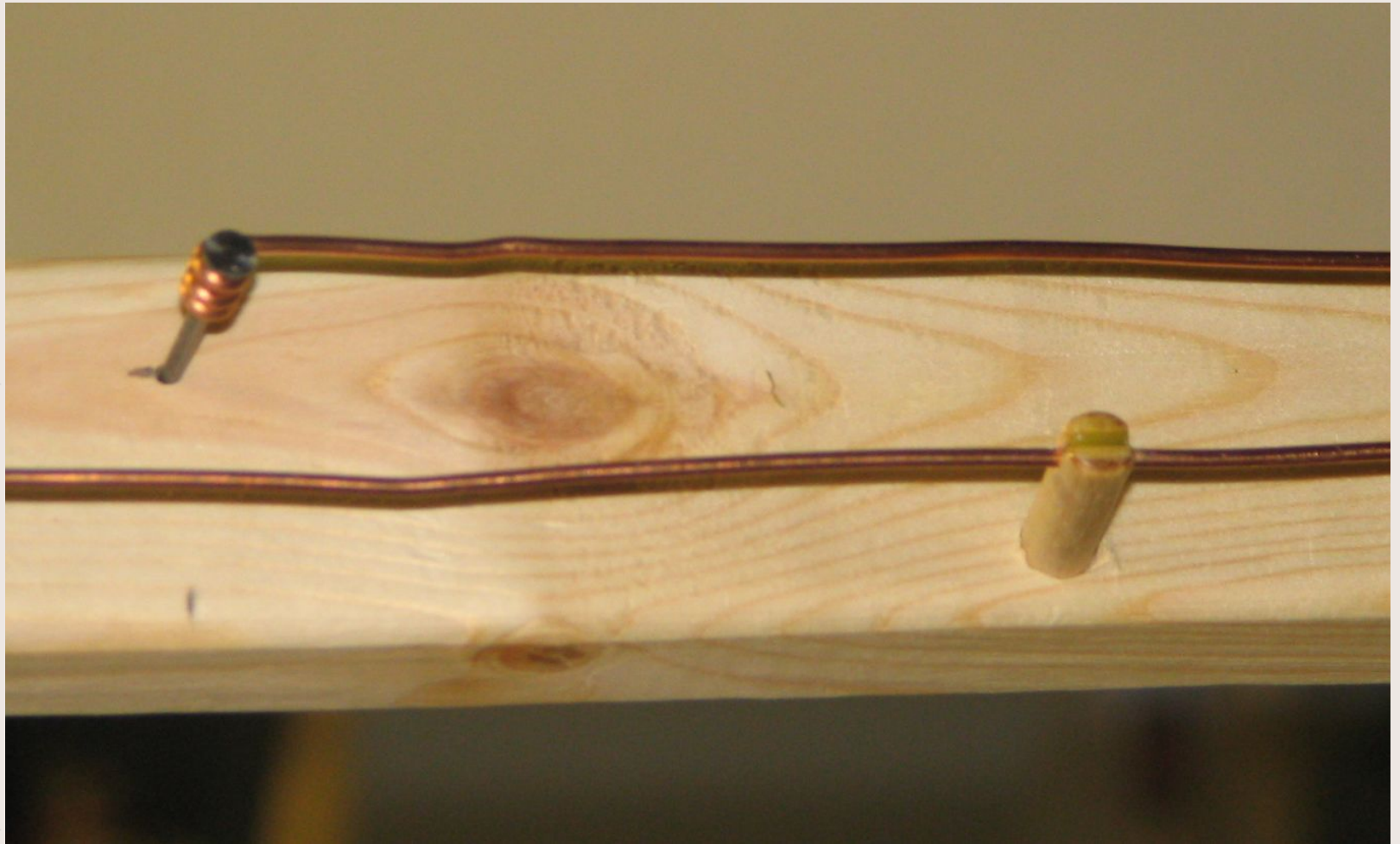
The Shotgun – 12 Gauge

- sized for 2 meters, but using 12 AWG household wiring ground wire
- found another 1 x 2 for this one
- wire has a mind of its own, and memory
- dowels to keep wire aligned
- yup – it works on all repeaters too

Shotgun



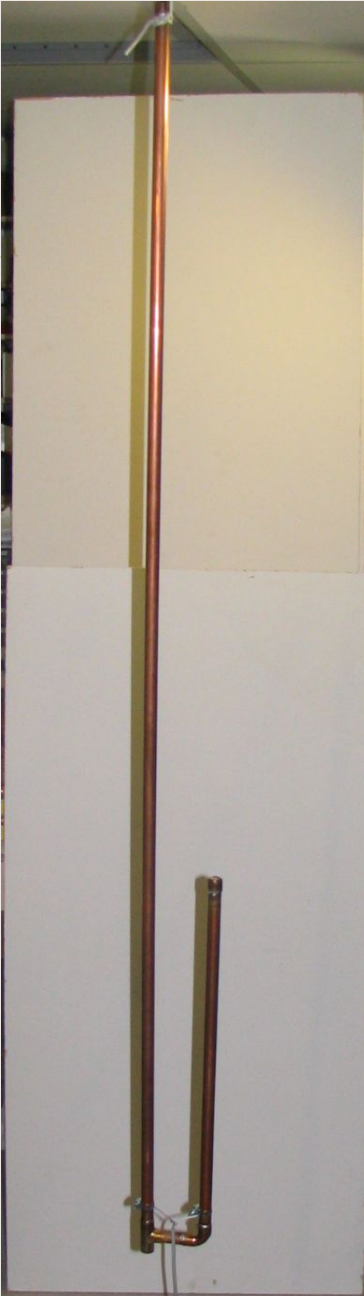
Positioning Dowels



Copper Cactus

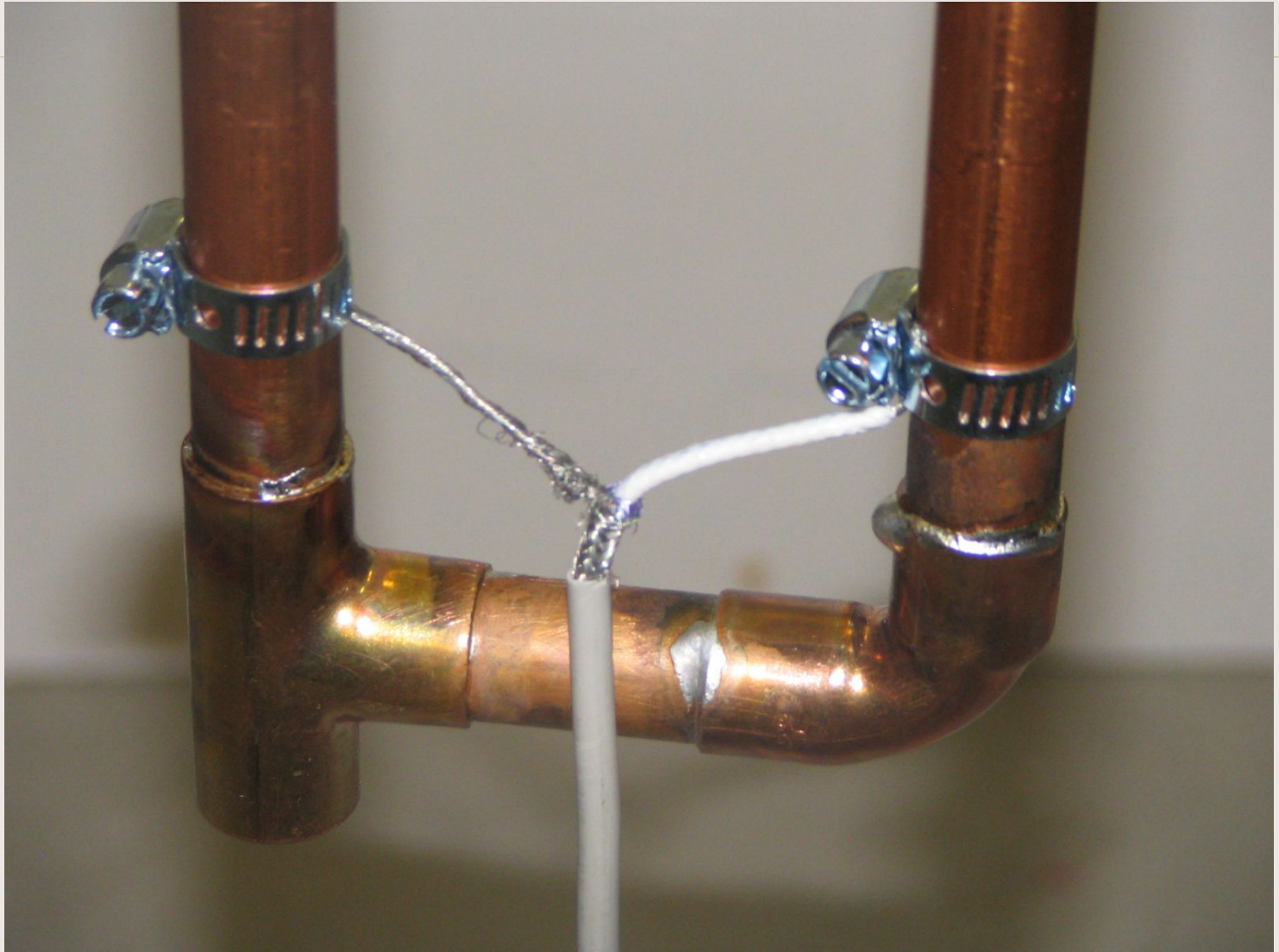
- made from 1/2" copper pipe – type M
- websites galore, ARRL antenna book
- hardest part was keeping the torch going
- soldering isn't pretty, but it's holding
- tried to use adjustment bolt, but nut fell off
- hose clamps for easily adjusted feed point
- measurements usually are pipe centerlines
- not really a cactus – could be multi-band

Copper Cactus



- followed Buxcomm webpage
- some designs use $\frac{3}{4}$ and $\frac{1}{2}$ inch pipe
- Type M pipe is thinner, cheaper than L (but not as cheap as I am)
- need to account for T's, elbows and endcaps in measurements
- doesn't matter what's below the horizontal piece
- helps to keep feed line away from pipe

Pipes, joints and getting wired



T-Bone

- my own variation on a J-pole
- uses a Conn Director I already had

Assembly Demonstration Here

T-Bone

- Start with your basic tenor trombone, preferably with tarnished finish and owner's OK.
- remove main and tuning slides, and mount vertically
- connect feedline core 5 ½ inches below bell via rubber band
- attach braid 1 inch higher on slide, using rubber band or duct tape
- measured SWR is 1.2



Feedpoint

If you remove the mouthpiece, it won't fall out on your foot during a transmission

The hose clamp is a leftover from earlier tests before the feed point migrated North

(no trombones were harmed in the making of this presentation)



T-Bone Testing

- once again, able to trip all local repeaters
- initial sessions: Bob AQU & Kevin EAR from backyard Muskoka chair mount
- neighbour really worried now.
- duct tape does not improve the slide action on a trombone
- Trombone with F attachment could be dual bander (as well as a marching-bander)

Analysis



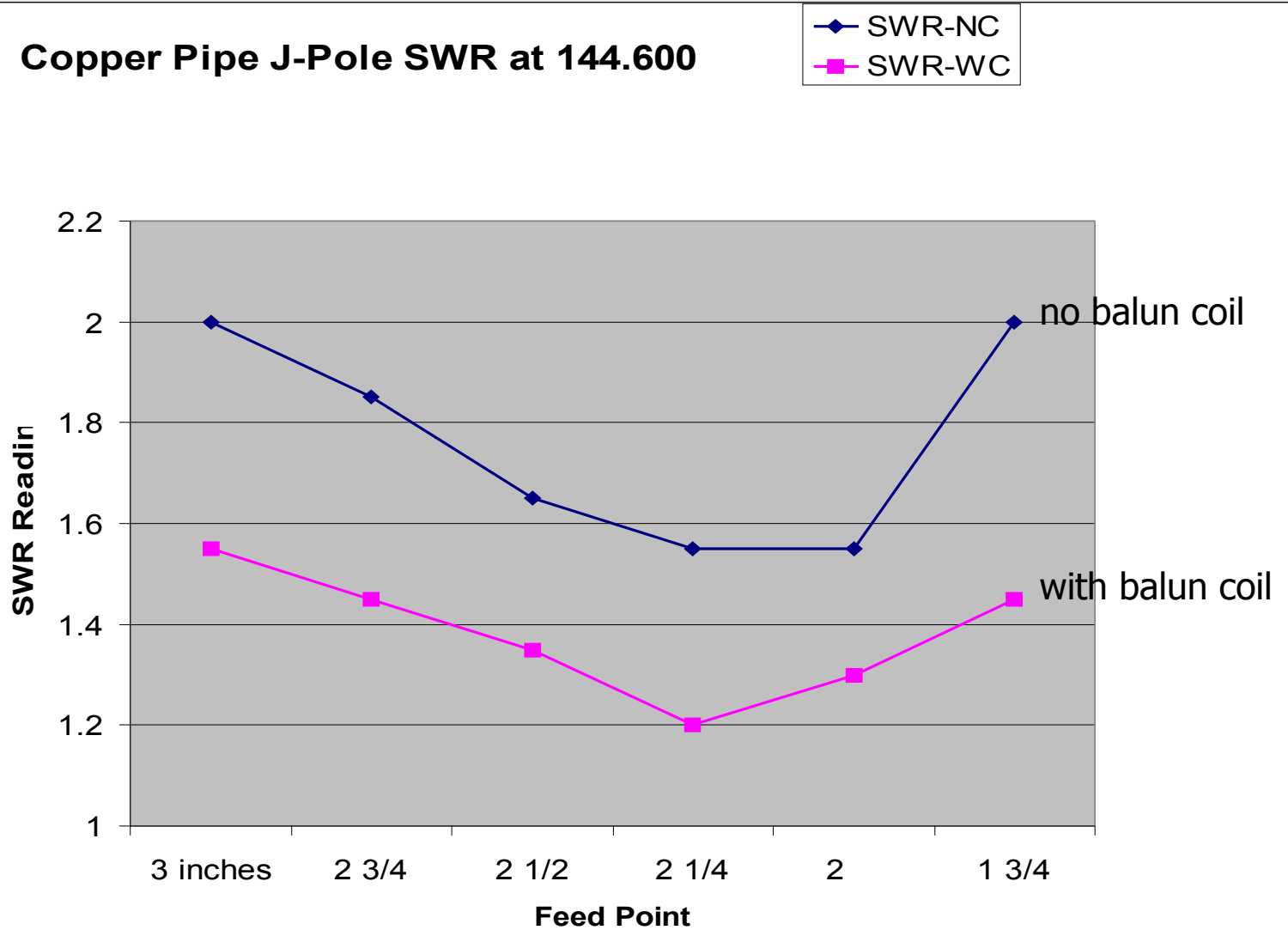
- Knowing you can trip the repeater is good, but which is the best antenna ?
- Is performance due to the antenna, or to cable type, balun ?
- Want to do some systematic testing to try and figure out what's going on.
- Thanks to Eric Pierce for loan of SWR meter

Test Environment

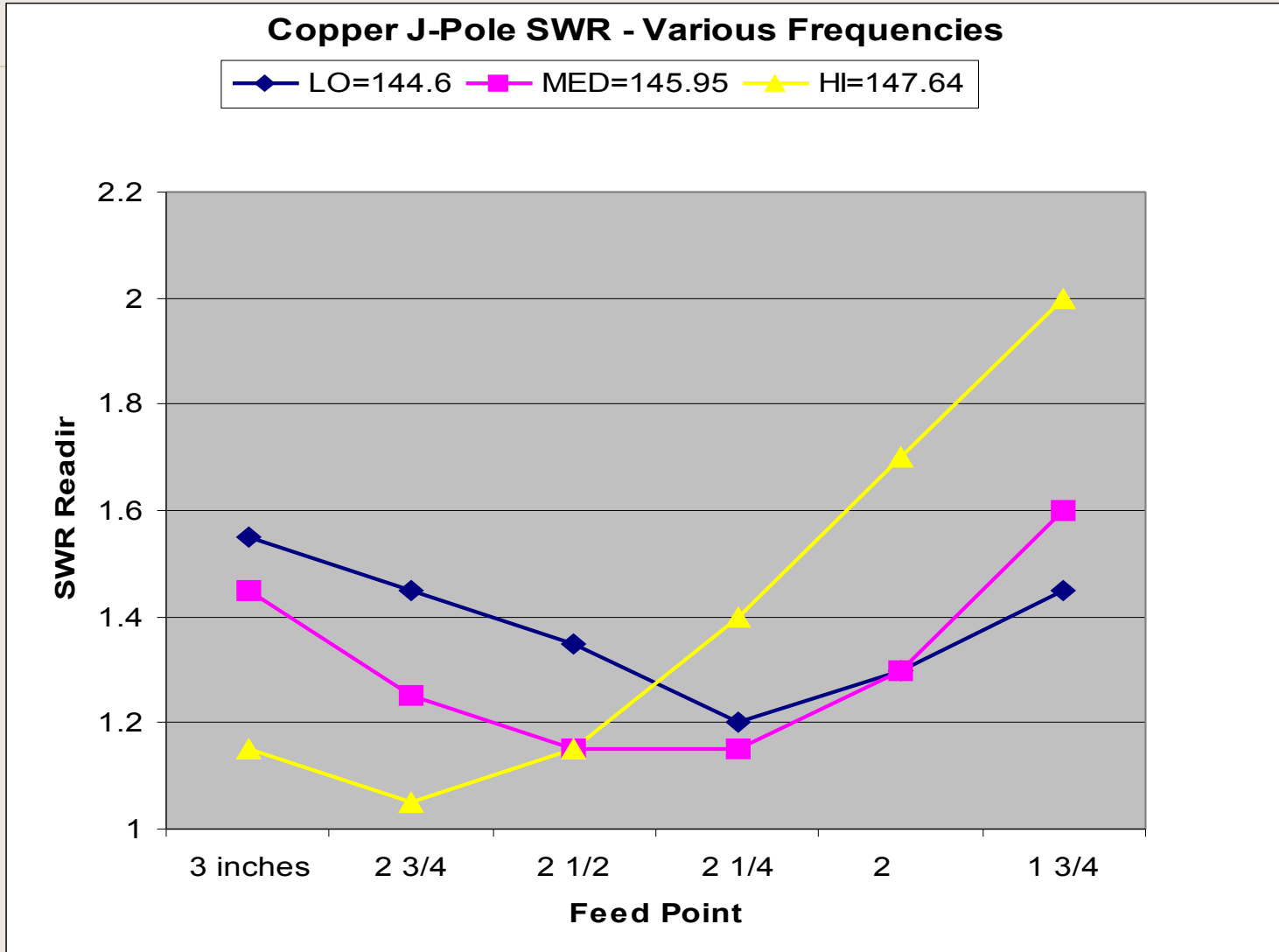


SWR, feedpoints, baluns

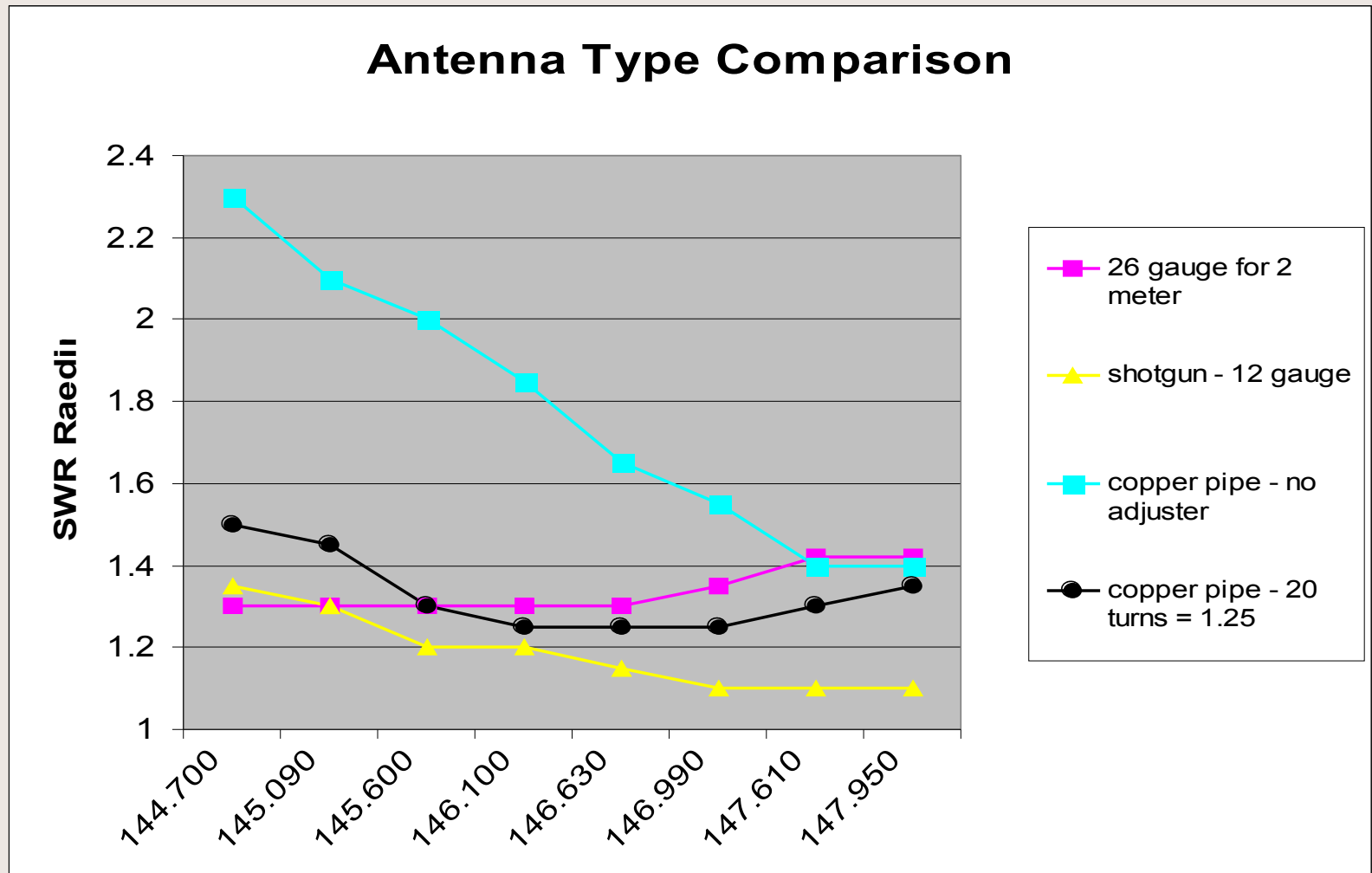
Copper Pipe J-Pole SWR at 144.600



Does Frequency Make A Difference?

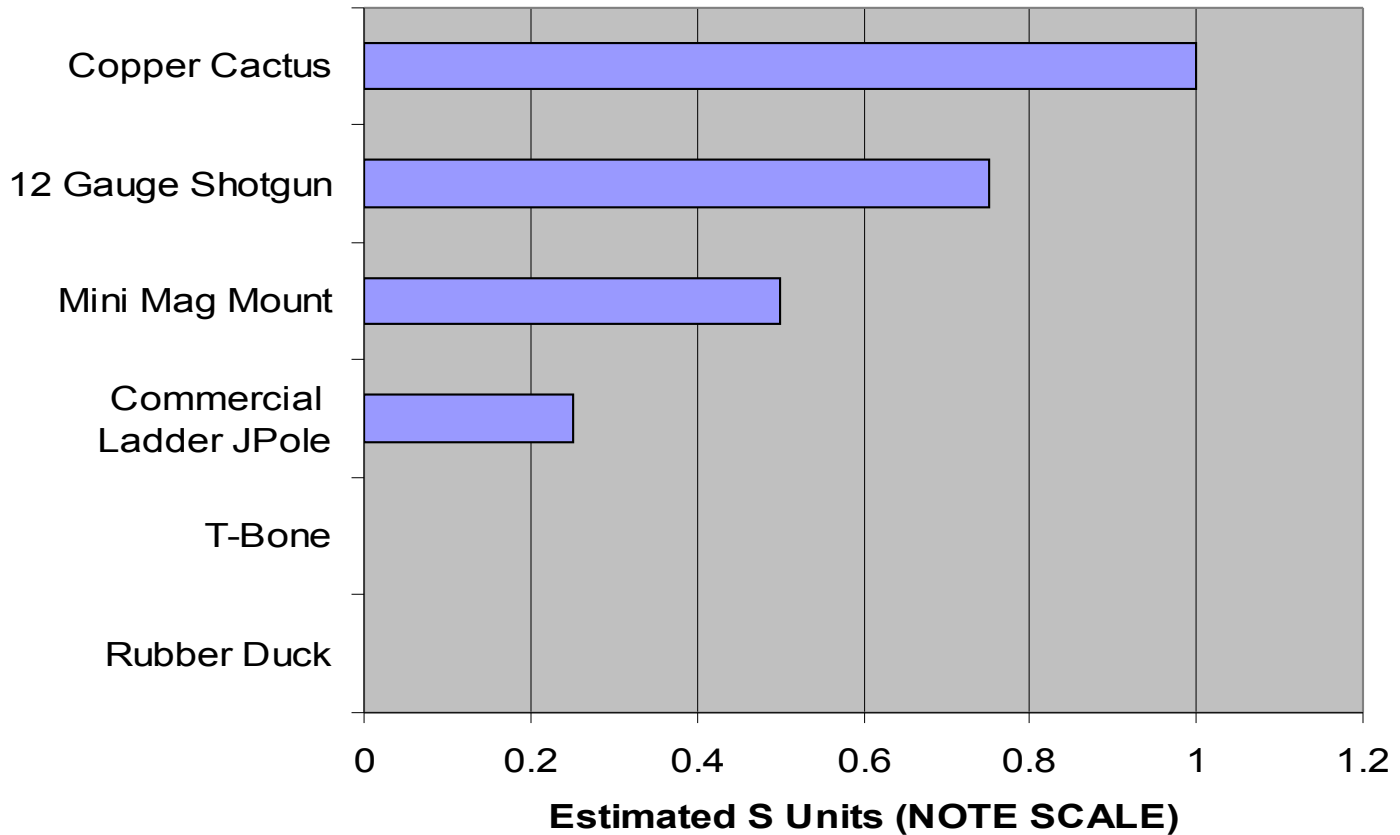


So which antenna works best?

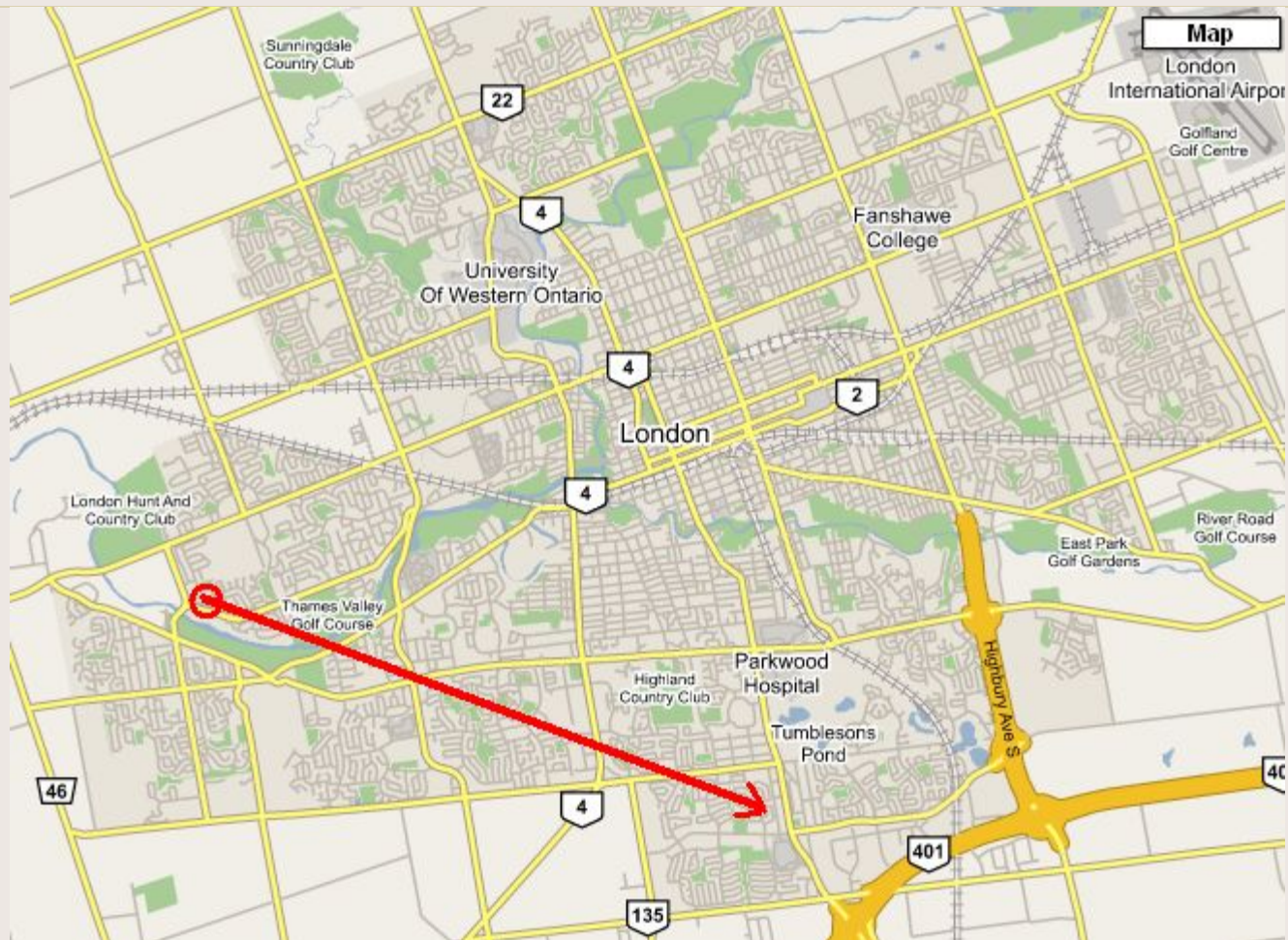


Reality Check

Simplex Transmit Signal Strength (Doug's House to Eric's House)



Test Simplex Path



Other Considerations

- Height is might
- weatherproof: shove it up a PVC pipe & cap
- go overboard on safety
- haven't looked at gain, which is important, but awkward to measure
- there are many good antennas besides J poles

Antenna Followups

- I'd like to fine tune the copper pipe - it's not quite right, & may be the best antenna
- see how non J-poles compare
- glad to loan out my homebrews for test runs
- antenna building workshop anyone?

Other Projects

- saw an antenna tuner project on web
- antenna rotors fit nicely with robot motors
- quick assemble portable antennas
- directional antennas
- antenna simulation software: MININEC...

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References

- Harry's Homebrew Homepage
<http://web.telia.com/~u85920178/>
- Buxcomm Copper J pole
http://www.sedan.org/j-pole_tuneable.htm
- Technical description of SWR
<http://www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=11162>
- The full blown copper cactus
<http://archimedes.galilei.com/raiar/cactus.html>
- Google – tons of stuff out there just waiting to be found
<http://google.ca>
- I'd be glad to work with anyone who wants to build antennas – let me know at va3dae@rac.ca

Thanks!

Questions? Comments? Corrections?

Thanks to John Watson VA3EZP for showing his 1956 collapsible J-Pole, and squirrel cage

John also noted that the distance from the antenna to the coiled feed line should be minimized to avoid having a standing wave there as well. Another idea he had was to put radials off the J-pole's bottom ground point

Would the copper still work if it was filled with water?

I built a 'sealed' one from this site, but it leaked badly...

<http://archimedes.galilei.com/raiar/cactus.html>

My whining about undoing coax braid brought this kind tip: spread a small window in the braid near the jacket, and use a crochet hook to pull the center conductor out through it. Tried it the next day – awesome!