

Brickworks – Dual band J-poles for VHF and UHF

Chris G7LWV

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Ed Fong VHF / UHF J-pole antenna

- Dual band J-pole design by Ed Fong WB6IQN
- 'DBJ-2' design originally published in Feb 2003 QST
- Made from 300 ohm feeder and a coax stub
- Built the 'roll-up' portable version as a first prototype
- First problem - only had 300 ohm ladder line not ribbon feeder
- Worked well on 2m but not so well on 70cm
- Required significant reduction in length to provide a match on 2m – which didn't agree with the theory?

Dimensions of the DBJ-2 J-pole

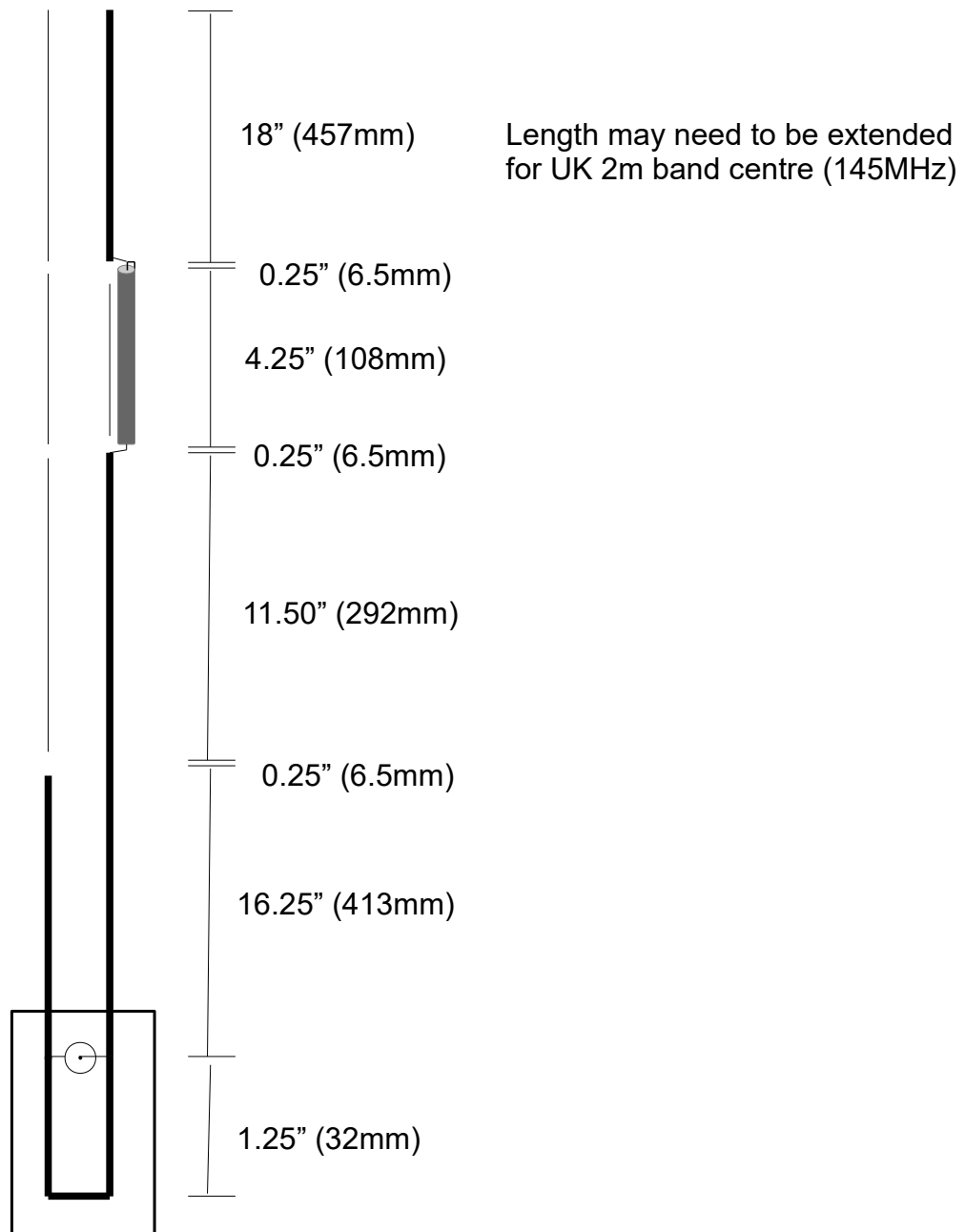
Original dimensions in inches but I wanted to work in metric !

Three basic parts:

A coupling section at the bottom that is $\frac{1}{4}$ wave on 2m and $\frac{3}{4}$ wave length on 70cm.

An end fed $\frac{1}{2}$ wave section for 70cm, restricted by a trap ($\frac{1}{4}$ wave S/C stub) in the middle.

An end fed $\frac{1}{2}$ wave section on 2m, not restricted by the stub.



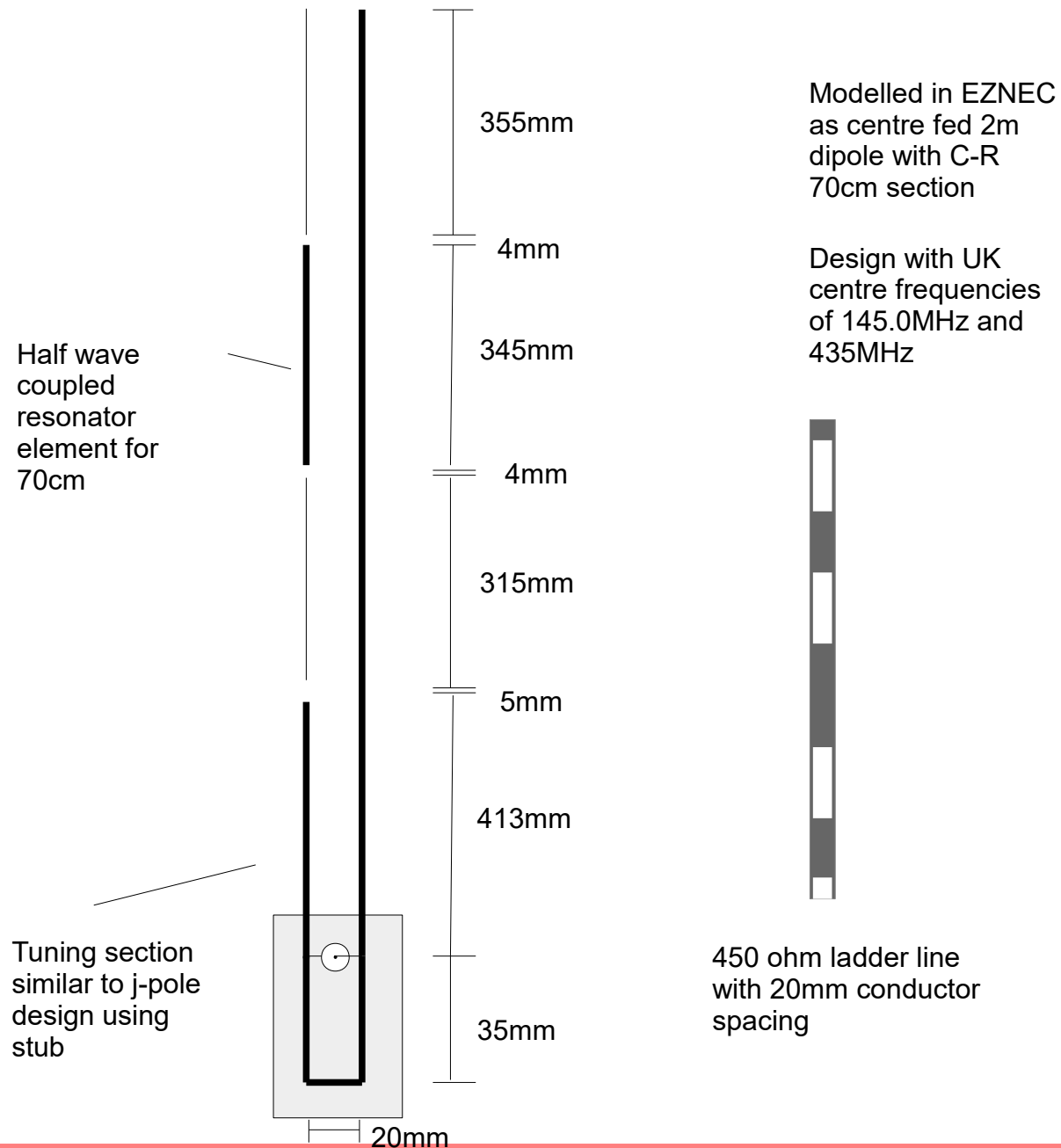
Problems with the first prototype

- Difficult to make cuts in the ladder line whilst keeping structural integrity !
- Some fine adjustment will always be required (but note above)
- An acceptable match was achieved on both bands, but did not work well on 70cm
- Could I produce a simpler design ?

Coupled Resonator dual band J-pole

- New design inspired by Alan's G8IPQ dual band dipole
- see ARRL Antenna book on coupled resonator (C-R) dipoles
- a simplified EZNEC model showed it was possible but would need a minimum of 2cm element spacing
- 450 ohm ladder line has suitable 2cm spacing
- EZNEC model suggested it might be directional at 70cm

Dimensions of dual band C-R J-pole



C-R J-pole pros and cons

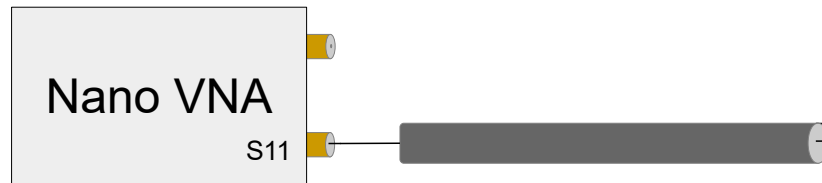
- 2m performance similar to DBJ-2 J-pole
- 70cm **very directional** (ideal if that's what you need?)
- Simpler to design and build than DBJ-2
- Possible to build it using ladder line
- Does not fit so well if using PVC pipe as a radome
- Note that these dimensions need further optimisation

DBJ-2 J-pole second prototype

- Dimensions very dependant on velocity factor of
 - coax stub (RG174)
 - ribbon feeder matching section
- This time built it with 300 ribbon instead of ladder line
- This was actually the third prototype because 70cm radiating section was too short using original design dimensions
- 2m section tunes independently so made it longer than calculated and then cut to length to achieve a match
- Build and tested coax stub before assembly
- Should provide a more repeatable design for anyone who wants to try building one?

DBJ-2 J-pole stub design and build

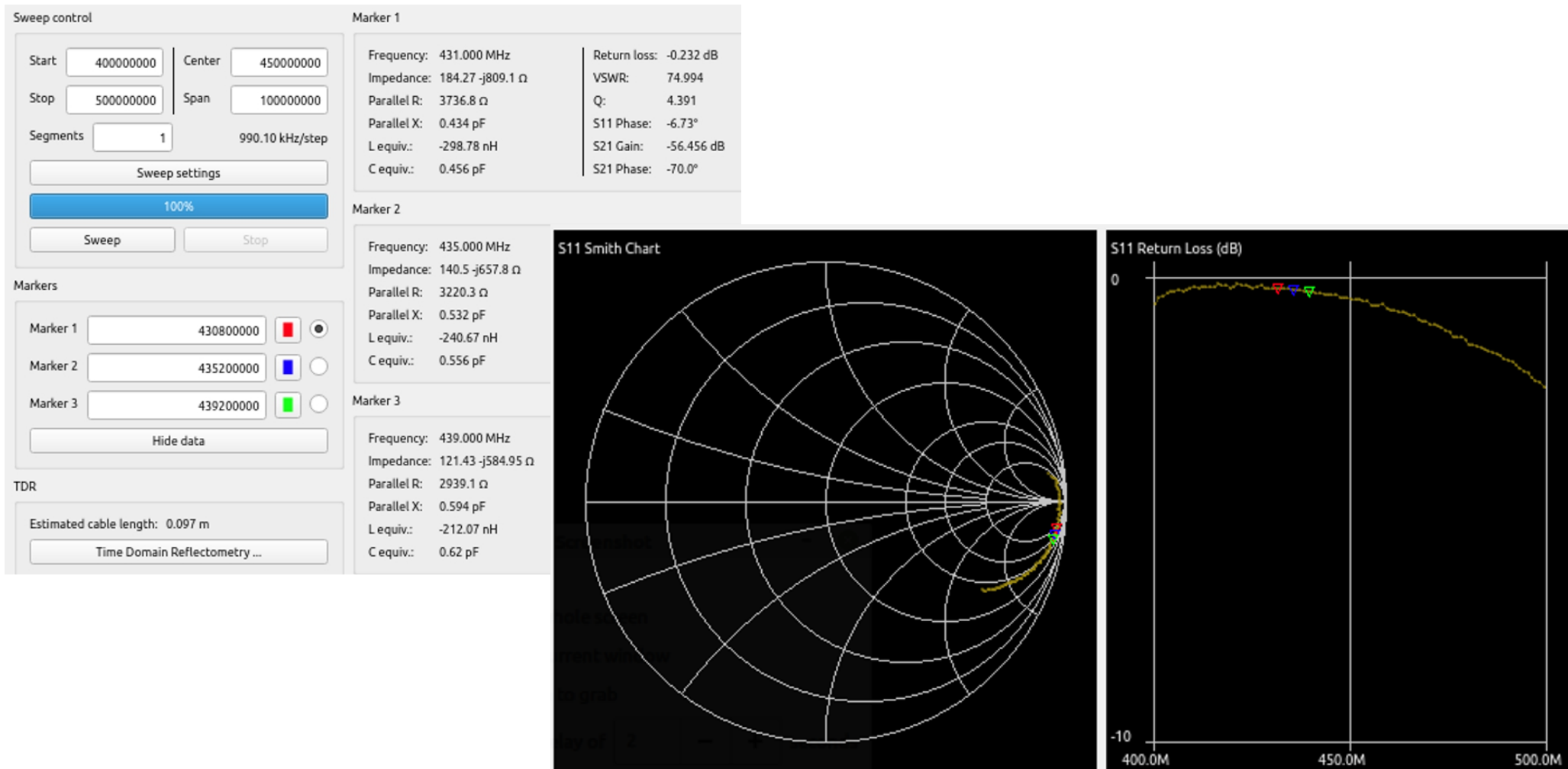
- Requires a quarter wavelength S/C stub at 435MHz
- Must allow for the velocity factor of the coax
- Velocity factor of RG174 is approx 0.66
- VNA allows a more precise stop band for the stub



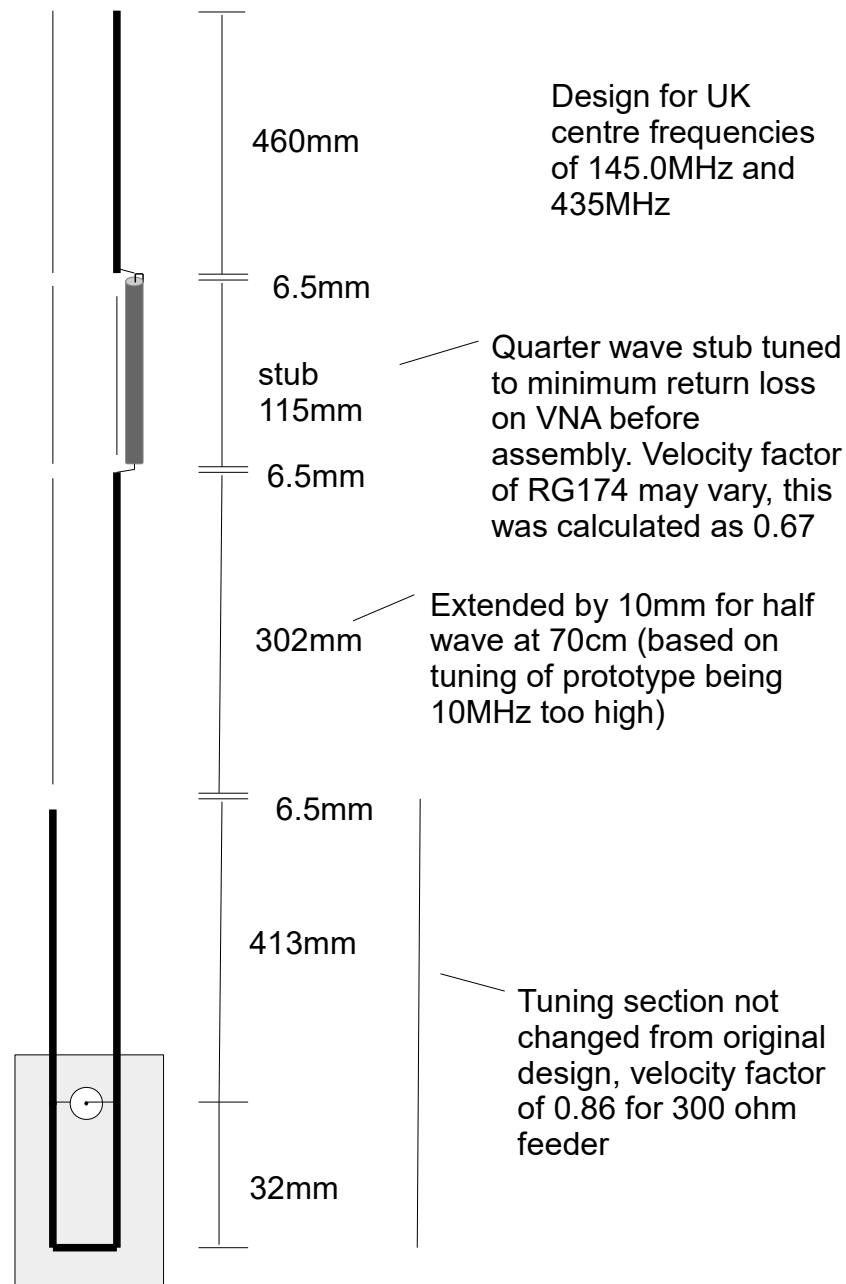
calculated as 114mm at 435MHz, but when tested then found 115mm to be closer to band stop centre frequency

DBJ-2 J-pole stub testing

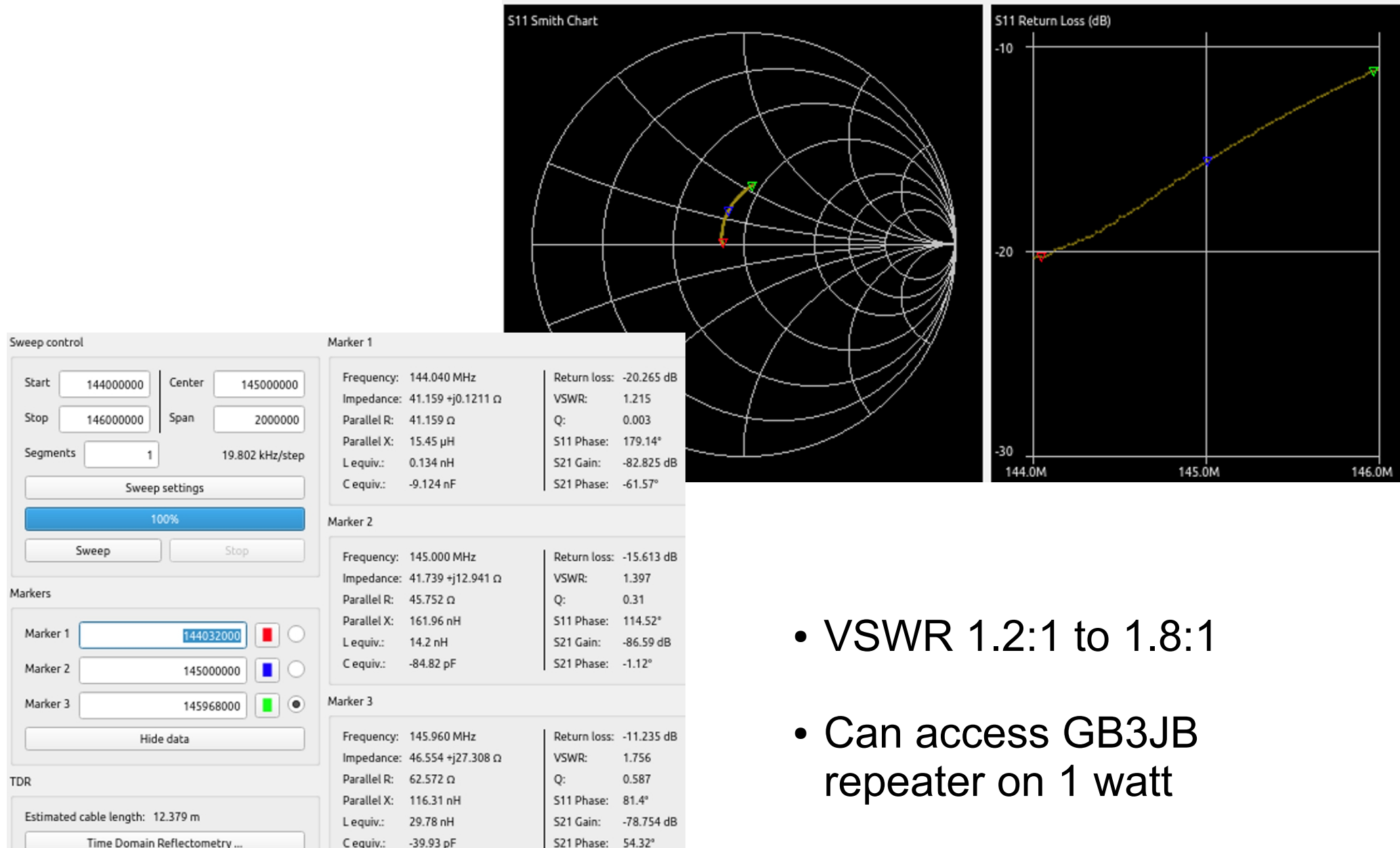
- Short circuit quarter wavelength stub at 435MHz
- Stop band around 435MHz (looks like an open circuit)
- Band pass at 144-146 MHz



Modified DBJ-2 J-pole Dimensions

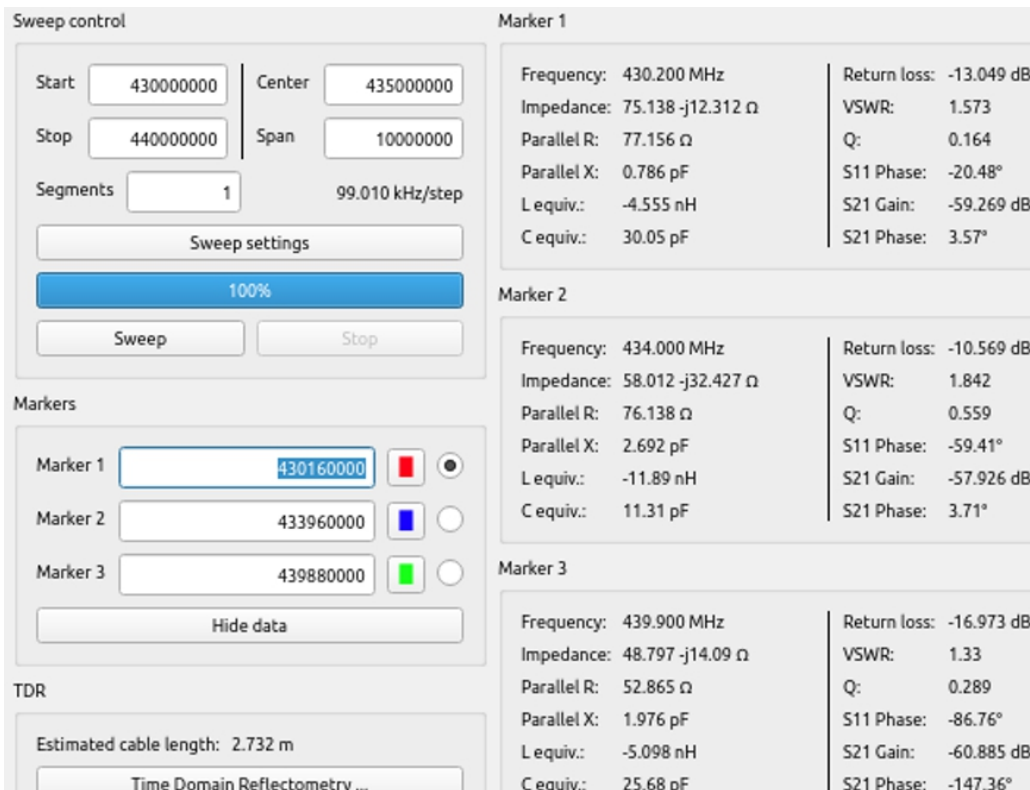


DBJ-2 antenna test results on VHF

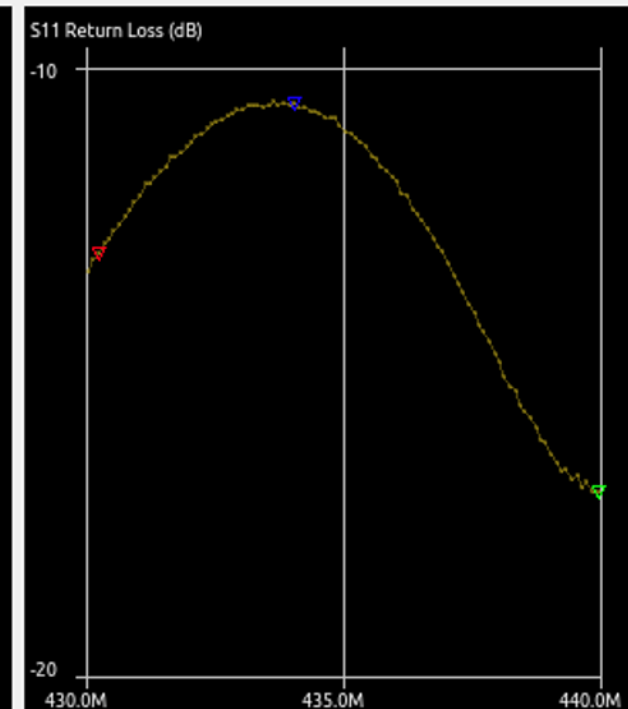
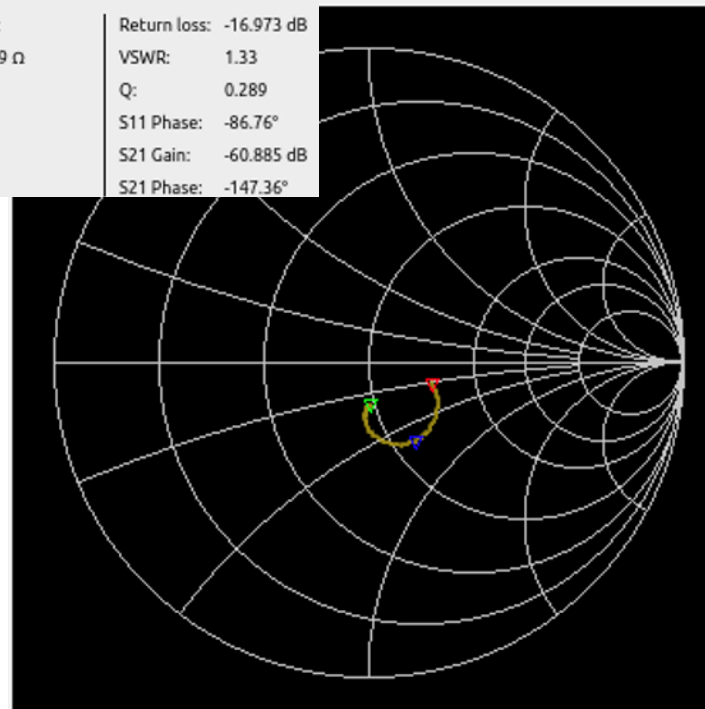


- VSWR 1.2:1 to 1.8:1
- Can access GB3JB repeater on 1 watt

DBJ-2 antenna test results on UHF



- VSWR 1.3:1 to 1.8:1
- Can access GB7KT repeater on 5 watts by rotating antenna



Future work?

- Make weather-proof with heat shrink tubing
- PVC waste pipe as radome for fixed use – needs about 10% reduction in length of radiating elements
- Need better coax for 70cm, RG-8X (Mini 8) has too much loss

References

- Portable Antennas for Everyone – Edited by Steve Telenius-Lowe, published by RSGB
 - A Portable VHF/UHF Roll-up J-Pole Antenna, Edison Fong WB6IQN, QST March 2007
- The ARRL Antenna Book (20th Edition)
 - see C-R dipoles
- Some J-poles That I Have Known, Parts 1-3 – L. B Cebik W4RNL
 - <http://on5au.be/content/a10/vhf/jp1.html>