

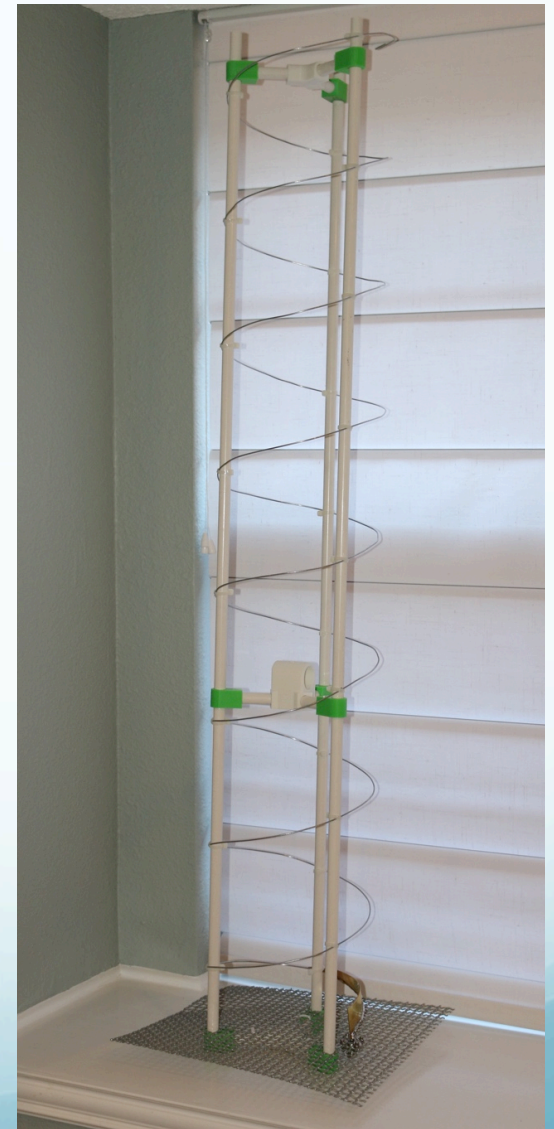
Building a Helical Antenna

It was easy!

Jonathan Brandenburg, 01/16/2016

Why do I want a helical antenna?

- Wish to improve reception of circularly polarized signals.
 - Satellites tumble.
- Generally, expect a 3 dB loss when using a linear antenna to receive a circularly polarized signal.



How do I build a helical antenna?

- Use an online calculator to get dimensions
 - <http://www.daycounter.com/Calculators/Helical-Antenna-Design-Calculator.phtml>
 - <http://jcoppens.com/ant/helix/calc.en.php>
- SatNOGS has instructions and 3D models
 - <https://satnogs.org/documentation/hardware/>

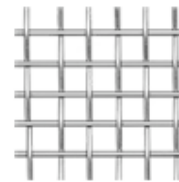
Input:		
Wavelength (wavelength), OR Frequency	0.687 436.5	(m) OR (MHz)
Number of Turns	8	
Spacing between coils	0.25	(wavelengths)
<input type="button" value="Compute"/>		
Antenna Gain	13.8	(dBi) Relative to an isotropic antenna
Characteristic Impedance	150	(Ohms)
Diameter	21.9	(cm)
Spacing between coils	17.2	(cm)
Length of wire	585	(cm)
HPBW (Half Power BW)	36.8	(degrees)
HPBW (BW first nulls)	81.3	(degrees)
Effective Aperture	0.904	m ²

Bought some hardware

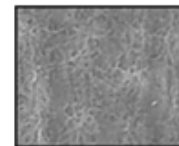
- McMaster-Carr
 - About \$60
 - Galvanized Steel Wire
 - enough for > 10 antennas
 - Galvanized Steel Mesh
 - Fiberglass Rod
 - Brass Strip
 - enough for 8 antennas
 - See <https://brandenburgtech.com> for part numbers.
 - The mesh is ~\$30!
 - Must be a more economical option



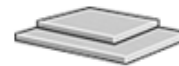
Zinc Galvanized 1006-1008 Carbon Steel Wire
0.080" Diameter, 5 lb. Spool, 290' Long
8872K69



Weather-Resistant Galvanized Steel Wire Cloth
2 x 2 Mesh, .080" Wire Diameter, 24" x 24" Sheet
9220T72



Structural Fiberglass Rod
3/8" Diameter, 5' Length
8543K49



Easy-to-Form 260 Brass Strip, 0.050" Thick, 2" x 36"
8956K127

Remaining parts

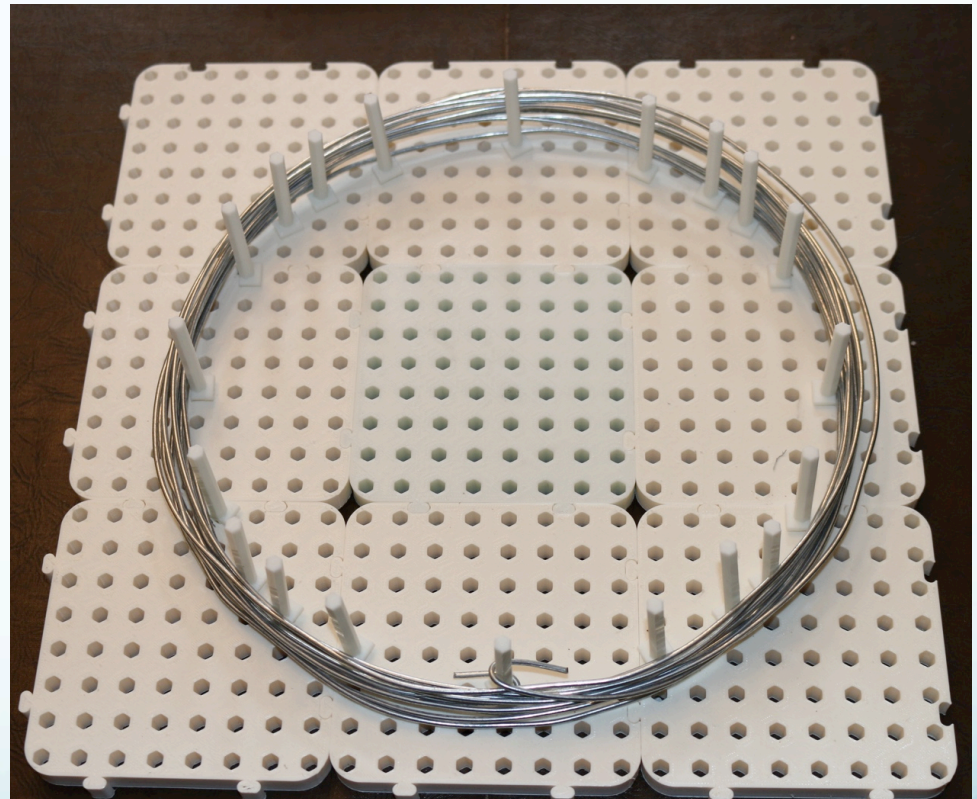
- 3D-printed parts
- Cyanoacrylate (a.k.a. Super Glue)
- Wire ties
- Coax connector
- Screws, nuts, washers



The build

- Only took a few hours
 - The hardest part was figuring out how to coil the wire.
 - I ended up 3d printing a jig
 - Actually, I stumbled across a toy (Sam's Gears) that could be used as a jig.

<http://www.thingiverse.com/thing:30981>



Results

- I ended up messing up the reflector.
 - Should have been bigger
 - Should have been round
- Why not use crossed Yagis with phasing cables?
 - Crossed Yagis probably makes sense for VHF and UHF frequencies
 - Higher frequencies require a lot of directors with very specific lengths