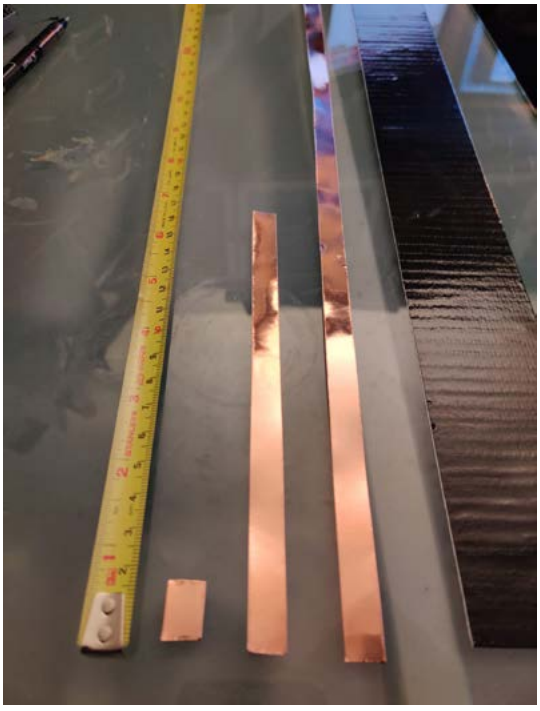
Fort Purbrook Amateur Radio Club, Fort Purbrook Activity Centre, Peter Ashley Lane, Cosham, Hampshire, PO6 1BJ, United Kingdom

ANTENNA CONSTRUCTION … FOR EMOTIONAL HEALTH!

DEAN M7SUX 10 August 2024

Showing near 1:1 SWR antenna match
A near 1:1 SWR match



Copper tape preparations
for duct tape J-Pole antenna.

One of the major struggles I have with amateur radio construction is having the insides of my head yell: "you're going to make ONE mistake, and the whole construction will be ruined because you don't know how to undo errors!". Borrowing from mental health concepts, to fellow amateur radio enthusiasts I've begun to refer to this struggle as my "emotional QRM". The naming helps describe the mess my thinking can get into - but it also remains an unfortunately strong deterrent to being able to just play and experiment in this hobby.

So, two things that I very much liked about this project when it crossed my radar were:

The materials were cheap. I mean… Supermarket cheap! If I made a mistake, I've only lost minutes (or a few hours) of investment to lose (rather than the days I think a new construction will take me). I also would have a vast supply of materials to try again because cheap!

Magnets help with finding the right position for the coax connections. Magnetic connections would allow me to move the coax connection around the j-pole until I found positions that produced good SWR readings. I could then mark the coax inner & outer braid positions, making the connections permanent. What could possibly go wrong?

Read on, and I'll tell you what…! (TBH it's not very much)

SPOILERS

My first SWR measurement was abominally high:1. I couldn't figure out what had gone wrong in the construction. However, with a little help from The Practical Evening, the final SWR measurements were nearer 1.1:1 - SWR measurements pictured via my IC-705.

THE FINAL RESULTS ARE GREAT!

At time of writing, the antenna is hung in the attic of my bungalow, and I've taken part in my club's Open Net.

It receives good signal reports despite being indoors, only 5 or 6 metres above ground, and surrounded by 2-story houses. Probably of negligible gain, though some sources say: "…the J-Pole is really […] a medium gain antenna. It's a half-wave antenna by design so it has about 2.5 - 3 dB of gain, depending on how you want to calculate things." So maybe half an S-Point.

DEAN M7SUX

https://www.youtube.com/watch?v=d5itl1uWGtU

2m version

Bestpoke BNC connector to connect a nanoVNA to the copper tape using magnets.

HOW THIS PROJECT BEGAN
I came across a YouTube video from Ham Radio Rookie: "How to make a 2m Duck (sic) Tape Antenna".

The antenna was of simple construction, and the presenter inspired me with his innovation and his "let's play with things" attitude.

In watching this video, what gave my inner head-criticism some relief were the magnets and the copper tape phenomenon:

When the coax is ready to be attached for testing, by using magnets one can move the coax connections around the copper tape until a good SWR is achieved.
The video shows that sticking lengths of copper tape upon one another is electrically conductive. J-Pole too short? Lengthen it by sticking some more copper tape to the end.
(I later found this conductivity wasn't so much the case with the tape that I was using - see later).

CONSTRUCTION OVERVIEW
This text avoids repeating the details you'll find in the video, but gives an overview of the process:-

BUY THINGS!
Measure out the best length of duct tape to be the base of the copper/slug tape j-pole (so, maybe add 10cm top & bottom for the 2m j-pole, and add 2cm padding either side left and right.
Measure out the three lengths of copper tape, sticking the copper tape upon the duct tape to form a J shape (with the bottom corners of the tape adhering over each other (see matter below, though).
Construct a BNC testing connector using two magnetic connections (pictured below).
Use the magnets to attach the BNC wires upon the j-pole and connect the antenna to nanoVNA.
Using the nanoVNA, move the magnetic connections around until one achieves an acceptable SWR.
Mark the magnet positions, then adhere a permanent coax cable (some solder or hot glue).
Brag to your friends on your next Net night!
Unexpected High SWR!
After putting everything together, I measured the standing wave ratio (SWR) using a nanoVNA and was surprised to get a value of around 30 : 1 (or maybe an "infinity" measurement from the nanoVNA, I don't remember now).

This was a bad measurement (it should be a maximum of 3:1, preferable lower).

I could not figure out why the SWR was so very high, despite trying to place the coax connectors in various positions along the copper tape.

The insides of my head were panicking!

A fellow builder at The Practical Evening asked: "does the copper tape really conduct where you've stuck the pieces together?" (as the video presenter had demonstrated).

We tested the copper tape's continuity when it's stuck together via the adhesion, and we found that it wasn't very good. The adhesive on the bottom of my copper tape (around the lower part of the "J") seemed to get in the way of a good electrical connection. In the video, the copper tape's continuity was excellent .

Magnetic adapters
Materials for a BNC testing lead

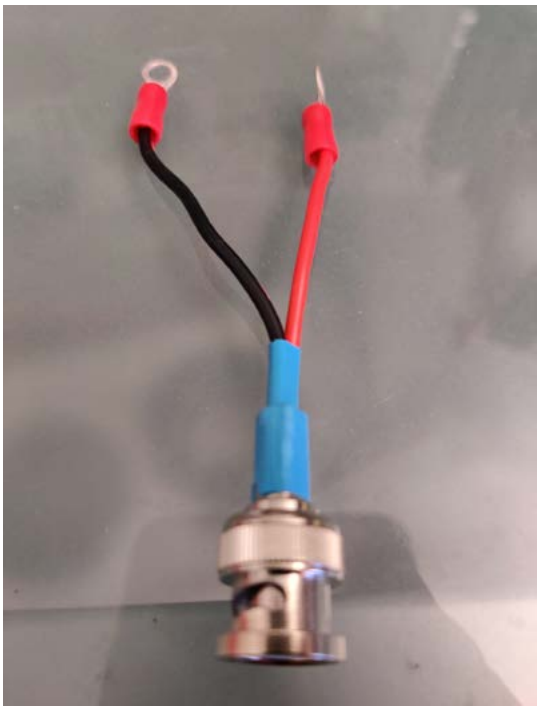
My solution: take another piece of copper tape for the bottom part of the 'J', turn the section of the tape over so that copper-touched-copper, and then cement it down with a duct tape cover.

Problem Resolved! 1.1 : 1 SWR!

CONCLUSION
As successful as this project was (six months ago, and as I write this up, I'm surprised at how the process of correcting myself as I went along was kinda straightforward), I can still struggle with new projects. Breaking tasks down into tiny, manageable parts helps somewhat.

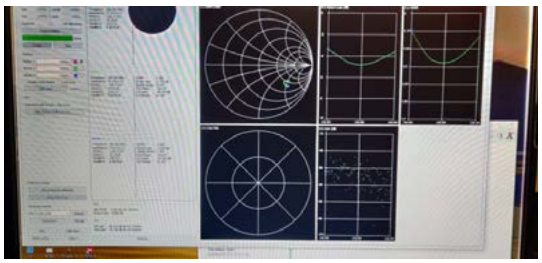
I hope, at least, this article lends some inspiration to others on how we can take steps to mitigate the mental and emotional struggles some of us have.

After all, it's a fully working, good-operational, antenna that's made of frickin' slug-tape!



Magnetic adapters
Finished BNC testing lead

Testing the SWR with a nanoVNA



Testing the J-Pole
nanoVNA Measuring 4:1 SWR

Magnetic adapters
Magnet and screw
- basic parts

Magnetic adapters
Magnets with Screw attached