Title : WiFi Antenna
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(8 Bit ASCII Graphics use code page 437 or 850)

The Wifi project started as a need to supply a relative, living not far away, having no landline with some Internet access. The actual distance between the two is 0.5km LOS, with one site visible to the other, providing the antennas are mounted at chimney height. Between the two sites were lots of other wifi access points, so the signals needed to be both very directional and horizontally polarised, based on an assumption that most average wifi users will use their access points with vertical polarisation. The finished job also needed to be robust enough to suite the UK weather.

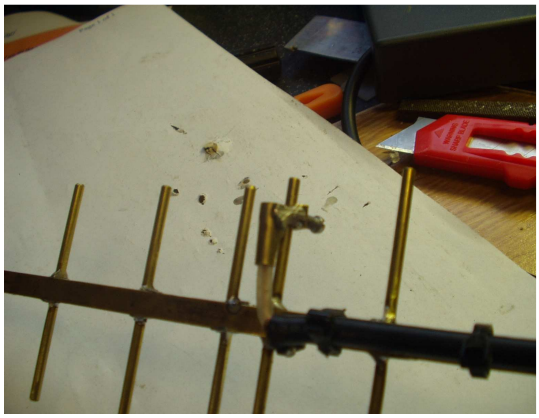
For the link I used an old redundant wifi router with built in twin diversity antenna, with 4x LAN ports and a DSL connection intended for connection to the landline; a USB wifi dongle; coax and some home made antennas built as per this description, but not quite..

The antennas...

http://www.geocities.com/gimmickmo/wireless/antenna/brassyagi/

Instead of the brass tube, I used rod. The rod or tube plus the square box section brass can be had from model type shops at a cost of around £10.

Other than the rod, I built it as per the above design, but was then unable to get the Gamma match to tune up correctly. So as an alternative for the active element I tested a folded dipole, which worked perfectly. The folded dipole was made from rod left over from making the elements.

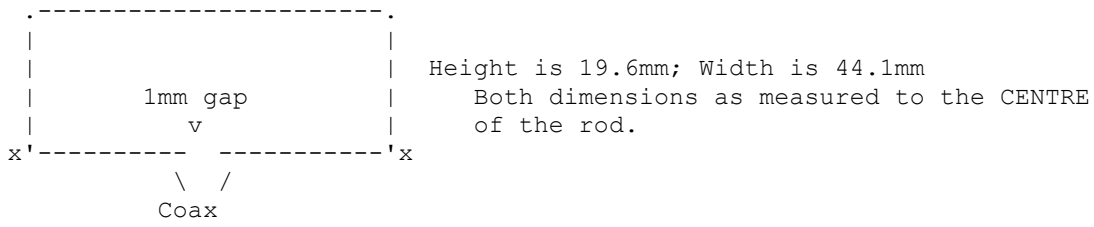

Shows the failed attempt using the Gamma match.

Make up and assemble as per the brassantenna, but leave off the active element and reflector, to allow my alternative active element to be fitted.

I made the rods to length by the use of a digital vernier gauge, cutting a fraction long, then trimming them to final length by very careful grinding to get them to an accuracy of better than 0.05 of a mm. Through hole drilling positions all marked out using the cheap digital vernier to scratch marks along the brass box section, before popping and drilling. How crucial the accuracy is to the final outcome, I don't know.

This is how I made the active element

1x U; and 1x straight section for the bottom of the 'box', as it is almost impossible to bend it accurately out of one piece.

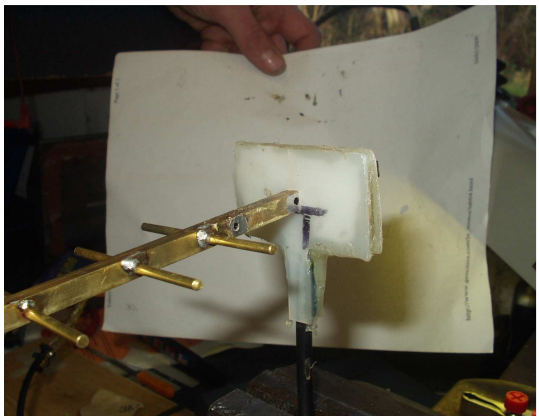


Bend the U first, get it spot on, then make the bottom as a single piece and solder it into the U at x. Now mark the centre and cut it through and file to a 1mm gap. The inner and outer of the coax then solder either side of the gap, as tight up to the gap as possible and with an absolute minimum of exposed core. The previously soldered corner joints need to be kept cool, to stop them
unsoldering - I used wet tissue paper.


Shows the rough active element inside the plastic T

To locate the active element on the boom, insulate it and make it weather proof I used the following method-

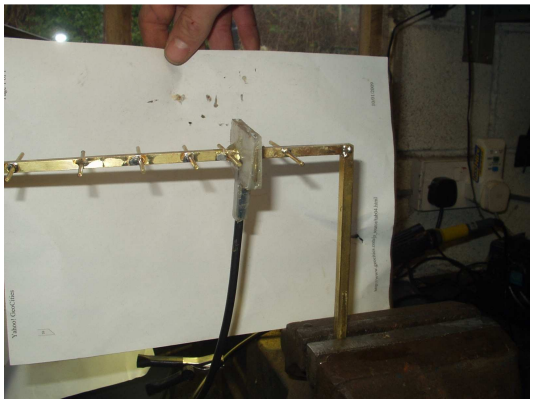
For each antenna cut two T shaped pieces of ice-cream tub plastic material as used in Tupperware type boxes. This was made to overlap the sides of the above element, with the leg of the T long enough to grip the coax. The element plus
coax was then clamped between the T's and some hot melt glue dribbled around the outer gaps and down along the sides of the coax. I only tested the RF properties of the uncoloured glue, which was fine - but I note you can now get coloured varieties.


Shows how driven T element fits onto the

Once all glued up, sealed, allowed to cool and tidied up - I then marked up the the exact centre of the element and drilled a pilot hole then a second time with a drill to match the beams OD size, which I then turned into a square with a file. I then ran more hot melt glue in via the square holes, all the way around.

The active element is then located on the beam, set up to centre on the exact same spot as the brassantennas active antennas location. More hot melt glue will keep it in place. Then finally the reflector element needs to be inserted, set accurately in place and soldered, using more wet tissue to prevent the heat spreading to the active element.

Shows the almost finished beam, tack soldered onto more brass box section for initial tests.

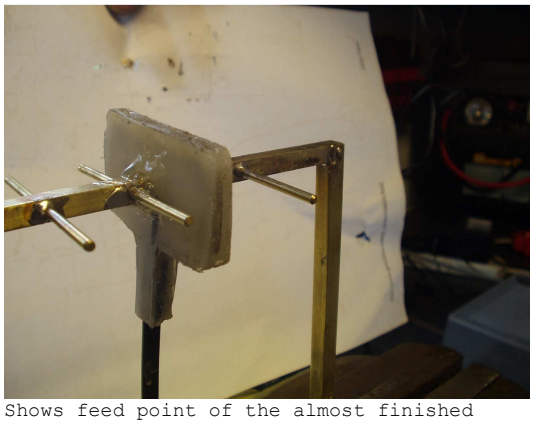


Shows the almost finished beam, tack soldered onto more brass box section for initial tests.

As the brass is quite thin and not that strong - To help brace the corner joint between the box section of the beam and the box section of the vertical,
on the final design I added a length of the brass rod about 1.5" long at 45 deg, fitting through holes in both box sections and then soldered.

The wifi router.....

This was a type with diversity (twin) permanently fixed antennas. When it connects, it is designed to use which ever of the two antennas provides the best signal. I removed both antennas and their coax feeders completely back to the PCB. I bridged one antenna's connection with a surface mount 62Ohm resistor and connected my new coax to the second output to feed my new antenna, via about 18" of coax. That avoids the router becoming confused as to
which antenna to use, I think.



Shows feed point of the almost finished beam, tack soldered onto more brass box section for initial tests.

The router was then fixed in a waterproof box with coax, CAT5 and its low
voltage feed cable out the bottom. The box, plus antenna were then fixed to a spare bit of galv steel plate plus pole clamp, ready to mount on my 2m mast. Once mounted on the pole, the CAT5 plus low voltage feed were fed into the loft, CAT5 plugged into my main router serving the house and providing the adsl connection.

The other end of the link...

Similar to the above, except I had to adapt a USB wifi dongle to accept an external coax and antenna. Basically open up the dongle, find the etched antenna on the PCB plus the local ground connection. Cut the antenna track, solder the coax in place and reassembler the case. To prevent any stray pickup, I then wrapped the dongle in several layers of cooking foil which I grounded by trapping it with the USB plug as it was inserted.

USB then goes down to the PC. USB cables can be had upto 5m in length. Longer than this is possible by using more 5m legnths, but each extra 5m a hub has to be fitted. An alternative would be to use a powered repeater, which I understand allows around 25m.

The coax lengths need to be kept just as short as they can be to avoid losses, hence the need to have the router and dongle outside and the exposed ends for connections kept very short. For the coax I used HDF200, which is sold by Solwise, which is 5mm OD, solid core.

My early and quite crude tests on the antennas, using Netstumbler with a wifi card's built in signal strength reports, suggested around 20dB gain and very directional. Probably the true figure is much lower than this, as they are usually quoted between 12 and 18db - but the link works splendidly, much better than I had dreamed it could possibly do.

At the moment only my end is set up permanently, the other end just has the antenna looking out through a bedroom window. Despite this it is working solidly and with no loss of speed at all, showing 90% signal strength as a minimum over a 0.5km LOS path - under no rain conditions. Along the path are a great many other access points to interfer with the signal, but all are below 40% as received at the antenna. The link works better and more reliably than my own connection to my internal router which is just 25 feet away.

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Why don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP