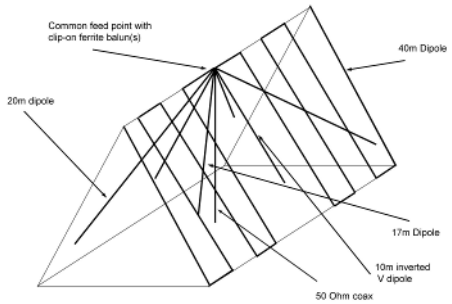
Multi-band loft-mounted dipole for 40, 20, 17, 15 and 10m



Amateurs are always after the Holy Grail – an antenna that will work on all bands, is inconspicuous, effective, but above all inexpensive. Unfortunately, you seldom find something that fits all these factors.

This antenna has nothing new about its design, but it does bring together quite a few useful ideas and characteristics.

These are:

- Fully no-tune antenna system for five popular HF bands
- Suitable for SWLS, QRP, M3 licensees and PSK31 operating plus occasional use up to 100W, but watch out for RFI at high powers. DO NOT USE A LINEAR!
- Uses non-inductive (zig-zag) loading for 40m
- Feed point balun reduces RF pick-up and interference, making for a quiet antenna. This may also help prevent RF flowing down the coax outer and causing RFI
- Totally stealthy – no-one need know you are operating
- Totally weatherproof – don't worry about wind, rain or lightning
- What you do need is lots of wire, a chocolate block connector and a staple gun. Oh, and a large loft. Your actual mileage may vary depending on the type of loft you have, the tile type and the amount of metalwork in your attic. I have used this antenna at three different modern semi- and detached houses and it has always worked well.

What surprises me is just how well it does work – so well, in fact, that I have yet to find another experimental indoor antenna that can beat it, including magnetic loops, crossed field loops and EH antennas.

It has been used for seven years at my present QTH and as it is entirely indoors has not needed any attention. It has been compared with the following:

- 85-feet W3EDP end-fed that goes up to the top on a 60ft oak tree in my garden with a 17 foot counterpoise – the multi-band dipole beats it hands down on 20m and up and offers much lower noise level. On 40m they are fairly even.
- Capco and MFJ magnetic loops mounted in the loft and outdoors at a height of 4 metres – the multi-band dipole is consistently either equal to or 1-2 S points better. The MFJ 1786 can also cover 10MHz though which is a bonus, but the endless tuning gets tiring.
- TGM MQ-1 2-element mini-beam at 30-feet – The mini-beam was a better performer, but not by much. On 20m the beam was either 1 S-point better or equal. On 15m and 10m the mini-beam was 2 S–points better, although this varied depending on direction. The beam, however, did not cover 17m or 40m and needed an expensive ground-mounted mast and rotator. An all in price of about £1,000 compared with about £10 for the dipoles.
- Cushcraft MA5V vertical at 30 feet – the multi-band dipoles beat the Cushcraft on 20m by 1-2 S-points. But the MA5V beat the dipoles on 17m on 15m by the same amount. They were very similar on 10m, although the MA5V also tunes 12m. The SWR is flatter on the multi-band dipoles. While trying to read weak CW from the Peter 1st Island 3Y0X Antarctic DXpedition they were inaudible on the Cushcraft and S1 on the dipoles on 20m.

The antennas consists of separate half-wave dipoles for 40m, 20, 17m and 10m, cut to 468 (feet)/frequency. Only the resonant dipole will accept current at the desired frequency – the others are effectively ignored.

These are fed via RG58 5 0Ohm coax at a common feedpoint at the very apex of the centre of the loft – just buy an electrical chocolate block connector. The original version was potted in a 35mm film canister with fibreglass resin as it was going to put up outside.

Two large clip-on ferrites (of the type used to get rid of RFI) are clipped on the coax at the feedpoint. This prevents interference flowing up the outer of the coax and makes the antenna very quiet electrically.

The trick is to zig-zag the 40m dipole up and down the rafters, BUT ONLY ONCE YOU HAVE PULLED THE FIRST 10 FEET OR SO OF EACH LEG OUT HORIZONTALLY.

It is the current flowing in an antenna that does the radiating and this is concentrated towards the middle of the dipole. You can staple the dipoles (made out of PVC coated wire) to the rafters with a staple gun. Allow the ends to dangle free for about 6 inches to prevent end effects and RF leakage to earth via the woodwork.

The second trick is to make sure that each dipole is as far away from the other as possible. This helps bring down the SWR and improves the 10m performance dramatically. When it was originally put up all the dipoles were bundled together and although the 10m SWR was OK it was very deaf. Separating the dipoles made a huge difference. The third trick is to arrange the dipoles as inverted Vs where possible - especially the 10m one – this gives good all-round performance and a mixture of a horizontal and vertical polarisation. The vertical polarisation can work well on local contacts with amateurs using ex-CB half wave verticals.

If the lengths are calculated correctly you should find the SWR less than 1.5:1 on all bands bar 15m where the dipole acts as three half waves and the SWR rises to about 2:1.

It isn't a beam antenna, but it is very useable and lively. It is an inexpensive antenna that your neighbours will love, as long as you keep the power levels down a bit.

Adding 80m to make a six-band antenna

After using the antenna for a few years my biggest bug-bear as that it didn't cover 80m. Yes, with an ATU you could get the antenna to load on 80m but the performance was down somewhat.

I therefore looked at adding traps at the ends of the 40m dipole and then zig-zagging extra wire horizontally across the inside ends of the house walls. I had some commercial traps laying around, but you could always made your own using the tried and tested coaxial trap idea.

I calculated the amount of wire required using the fact that a W3DZZ trap dipole is usually 108 feet long. Therefore, I added 54 – 33 = 21 feet to each end. A quick SWR test showed that it wasn't enough and I had to add a further three feet to each end to bring to resonance. The length needed will depend on the inductance of the traps apparently.

If you try this I suggest adding more wire than you need as it is easier to cut wire off once installed in the loft than it is to solder wire on – safer too!

The end result is a minimum SWR of 1.2:1 at the centre of the band rising to 3:1 at the band ends. An ATU takes care of the mismatch.

But how does it perform? Actually, not bad – at least as good as a 1.7m Capco magnetic loop mounted outdoors and a couple of S points down on the 85-foot W3EDP mentioned earlier. With signal levels around the UK on 80m being the usual S9+10-20dB the loss of 10db or so isn't a problem.

It is not an effective DX antenna on 80m. When east coast US stations are just audible on the outside end-fed they are usually absent on the loft-mounted dipole.

Nevertheless, it is very good for high angle NVIS-type radiation such as is required for around UK and near-European contacts.

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