Ray Howes G4OWY's Antenna Workshop
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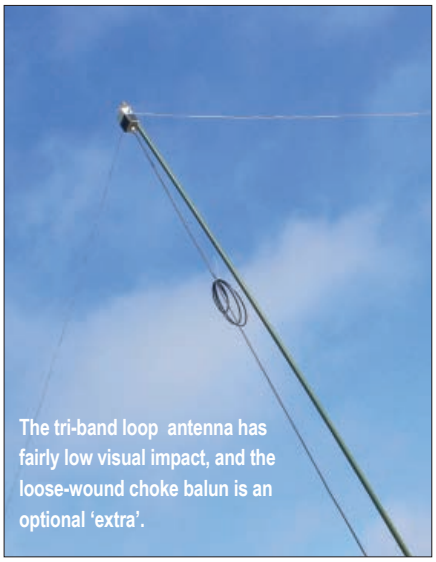

The tri-band loop antenna has fairly low visual impact, and the loose-wound choke balun is an optional 'extra'.

A 3-Band 'Keep it Simple Stupid' Delta Loop

Ray Howes G4OWY describes a simple Delta loop system that he's managed to get to work successfully on three bands. The Delta loop is often overlooked and it can prove very effective – so why not try one yourself?

Over the years I've been active in the hobby, I've found that I can get a lot of mileage out of extremely simple wire antennas. Tri-band, quad-band or whatever. It seems as if any old piece of wire can be almost fashioned into any imagined shape and size and be made to work on any band of your hearts desire. It often seems as a miraculous invention – when it works!

What's more important however, is that most, if not all simple wire antennas, are very inexpensive and easy to assemble. So described here is a Keep it Simple Stupid (KISS) antenna just like that.

The antenna sort of tumbled out of my head one sunny day while I was day-dreaming about my one of my favourite topics; how to operate on several high frequency (h.f.) bands – with one antenna? And now that the upper h.f. bands (particularly, 21 and 28MHz (15 and 10m) appear to be perking up on a daily basis, I remembered reading long ago that some clever fellow had built himself a Delta loop which operated on three bands.

Not The Usual Delta Loop

Now of course, the three band version wasn't the usual Delta Loop configuration. By that, I mean just a length of wire cut appropriately, and fashioned into a triangular shape and fed at the bottom end by 50Ω coaxial cable. No, on the contrary, what it was in this case was 21.6m (71ft) of wire (insulated) fed at the apex with a 4.1 balance-to-unbalanced (balun) transformer, 7.1m (23ft) or so on each side. At least I think that's what the measurements were!

Anyway, it was getting late and my wife was banging the dinner-gong to announce that eating time was imminent. So I decided to leave further research into what the actual measurements were until the next day.

Next day, having retrieved one of my old antenna scribble pads, I found exactly what I was looking for. There, on one of the dog-eared pages, almost indiscernible (I'd written the info in pencil), I could just make out a rough sketch of the Delta loop mentioned here.

Fortunately, I could also just about read what the measurements were, and it was my handwriting! The actual measurements were 21.85m (71ft 7in) in total wire length (I still think in imperial though!). This then works out to 7.28m (23ft 9in) – so I wasn't that far off. I only wish I could remember wedding anniversaries and birthdays so easily as I can remember antenna measurements!

Also on that dog-eared page was that other piece of the missing puzzle, where I'd actually seen it all those years ago. It looks as if was gleaned from an old issue of *World Radio News*? No doubt, someone somewhere out there will remember it! I probably just jotted the relevant details down on the pad and then forgot about it, hoping one day to put it together, but never did. Until now, that is.

Balanced To Unbalanced

As I've already mentioned, the Delta Loop antenna will need a 4.1 balun transformer. Luckily, I had one of these to hand. I purchased several of them at some long forgotten radio-rally for about £5 each. Today however, this type of balun is in the £30 to £40 ball-park. Expensive!

Fortunately, the cost of the wire is minimal or nothing and you get to operate on three h.f. bands too! You could, of course, just stick to the single band Delta Loop, which means you won't need to splash out the cash for a 4.1 balun. If so, just feed it at the bottom with coaxial cable or 300Ω feeder via an antenna tuning unit (a.t.u.). And it won't take up so much space either – at least not on 28MHz.

There again, you could make a 4.1 balun instead. Perhaps using a design published in one of the many antenna construction books and *HF Antennas For All Locations*, written by **Les Moxon G6XN** and published by the RSGB, is good place to start. In passing, I briefly met Les G6XN once at a Longleat Radio Rally. He was a very nice man and was always a font of antenna wisdom.

Straightforward Construction

The actual construction of this antenna is, as you've probably guessed, very straightforward. I supported the apex of the Delta loop to a 1.8m length of copper-tubing, which I secured to the top of a 6m high plastic pole **Fig. 1**.

The balun was attached to the support pole via several layers of water-resistant gaffer-tape. The gaffer-tape was also used to secure the balun to the top of the plastic pole. All that was left to do was to fix the two top wires of the Delta Loop to the balun connectors, attach the coaxial cable and hoist up the pole (which was put into an already prepared hole).

Next, I carefully formed the desired shape using a couple of insulators which I'd already looped through the wire. I had already prepared a length of rope which was also looped through the other holes of the insulators (I used those dog-boned shaped insulators which have a hole on

each end). The rope was used to pull the wires into the familiar triangular shape of the Delta Loop described here and tied off at two fixing points.

If you've measured the wire correctly (I didn't, it was a foot (300+mm) too long and I'll blame my silly error on my tools!). When the wire is finally pulled to its Delta configuration – via the two ropes – all sides should be 7.28m (23ft 9 in). If not, you'll have to get the measuring tape out again, like I had to do.

At my QTH in Weymouth, Dorset, the support pole is placed alongside the garden path. I did this because I needed at least 4.5m or so either side of the scaffold pole to tie off the ropes. When the antenna isn't in use, all I have to do is undo the two restraining ropes and lift the scaffold pole out of its hole. And it keeps my better-half very happy too!

How Did It Work?

So, readers are probably wondering "How did it work out?" The answer is an immediate "Very well"! In the first week of operation, I'd worked all around Europe into Canada and the USA, on all three bands. All QSOs were achieved with 10W single sideband (s.s.b.).

Signal reports were in the main, much better than I usually receive on my vertical or my other outdoor loops – not unexpected of course. The only thing of concern was that the standing wave ration (s.w.r.) on 21MHz was slightly higher than I expected at around 2.5.1.

On 14MHz band the s.w.r. was a reasonable compromise. However, up on 28MHz the s.w.r. was near unity across most of the band. Anyway, an a.t.u. will probably sort out the 21MHz s.w.r. problem, as it did with my antenna. So, whoever originally designed this antenna – they designed a very good one!

Three Delta Loops?

Now, I must confess that I've not tried this myself (yet). But, if you are fortunate and have a couple of very tall supports and can hang a sturdy rope between them – you could in theory, suspend three Delta Loops spaced evenly along its length. Then, the middle loop would act as a reflector* with each outer delta-loop independently fed with coaxial cable. In so doing, dependent on which way the loops are orientated, it should be possible to work either North or South or East or West.

Directivity would be at hand. Whether the unused loop would interact with the other two is probable. But at least it would be worth an experimental hour or two one sunny afternoon with nothing else better to do. Besides, where could you buy a beam-type radiator for the price of a roll

Fig. 1: The overall layout of Ray's delta loop for the three bands of 14, 21 and 28MHz, A tuner/matcher will be needed for best matching.

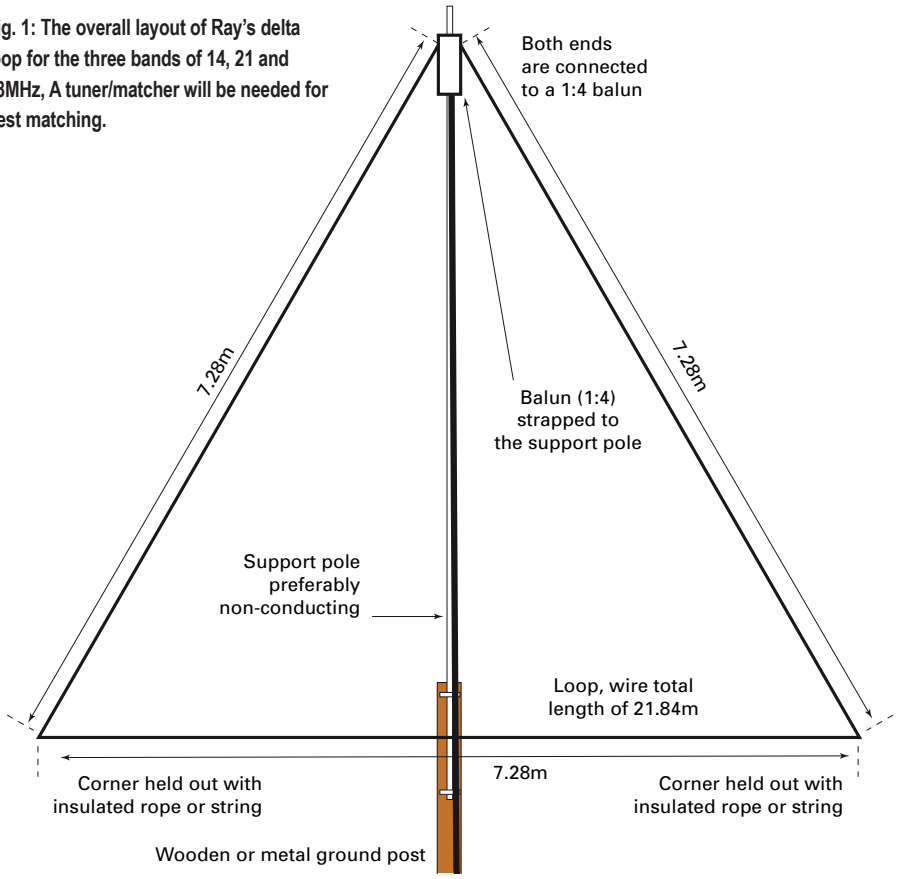

Fig. 2: a closer look at the bottom of the 1:4 step-up balun, which Ray bought some time ago before they went up in price significantly.

of bell-wire? My last two rolls of bell-wire (500 feet on each roll) cost me the grand sum of £5.00. I wouldn't advise running a kilowatt through it though! So please keep the linear at the off position if you decide to suck it and see.

***Editor's note**: It's important to remember that – very usefully – a reflector used with a Delta Loop does not need to be tuned to act as a reflector – although the efficiency as a reflector increases as the tuning approaches the frequency of the driven element. In recent years I've used a separate Delta Loop on 24 and 28MHz on the same assembly (Yacht sail fashion, as published in* PW, *with the bottom of the triangle fabricated from bamboo with the wire element taped to it). When operating on 28MHz the front-to-back ratio is quite effective (around 2 S-points when using the 24MHz Delta Loop as a parasitic (non-driven)reflector. The front-to-back ratio is slightly less (at around 1 S-point) when I operated on 24MHz, using the 28MHz Delta Loop as a parasitic reflector. Still very worthwhile when the directivity of the loop is taken into account.* ***G3XFD**.*

Star Performer!

There's absolutely no doubt in my opinion that this type of antenna is a star performer. It's almost simplicity itself. It's cheap, it's easy to build and it works! And what's more, just like a dipole, you can hang it horizontally as well as vertical. It's multi-functional performer.

By and large, all loops – for many people, the jury is still out on the magnetic variety but they do work and of course, being small, they're not prone to gobbling up lots of real estate – are extremely effective h.f. antennas. The only downside is their relative size for the lower h.f. bands, although they can be bent to fit the available space where appropriate.

And importantly – Delta Loops tend to be almost 'invisible' if they're hidden around fairly tall trees using (for example) thin wire. Perhaps the perfect stealth type antenna?

So, I'm sure if you build a Delta Loop you won't be disappointed. Finally, not unsurprisingly, the internet is chock-full of info regarding these star performers. Just tap in 'loop antennas' in the search box). I urge you to check it out and prepare to be amazed, just as I was when I began using them many years ago. A Delta Loop might be the only antenna you ever need. ●