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Antennas

How to erect a visually low-impact delta loop for 7MHz and above

A mast is usually the main problem when trying to get neighbours to accept the installation of an HF antenna. Beams and their support masts can be quite intrusive and wire antennas normally require two supports, although the house can be one of them. One antenna I used for several years was a large delta loop with a chimney as the main support.

A LOW-VISUAL-IMPACT MULTIBAND ANTENNA

As can be seen from the current discussion on loop antennas in *RadCom*, the efficiency of the small loop antenna improves with an increase in size. A loop larger than 0.25λ will lose its predominant 'magnetic' characteristic and become an 'electric' antenna of the quad or delta type. If a loop antenna in the form of an equilateral triangle is used, only one support is required, and if this support were a short mast fixed to the chimney, it can probably circumvent most planning restrictions.

The structure of the antenna is shown in **Fig 1** and it can be constructed with bare copper wire. You could use insulated wire for the entire loop, however lightweight wire and a lightweight support has a low visual impact. Using lightweight thin wire does not affect the antenna performance because the radiation resistance of a loop is fairly high.

The first experiments were carried out with the coax connected directly to the loop but the SWR was over 3:1. However, most literature puts the feed impedance of a loop greater than 100Ω, and models constructed in *EZNEC* confirm this. A 4:1 balun was fitted enabling the antenna to be fed directly with 50Ω coax that can be matched using the automatic ATU fitted to many modern transceivers. (This applies only to harmonic-related frequencies such as 7, 14, 21 and 28MHz).

On the 'WARC' bands, the impedances are rather wild and the best method of feeding is to use 450Ω-ladder feeder and an ATU. (I prefer this method of feeding for all bands).

FIG 1 © RADCOM 249

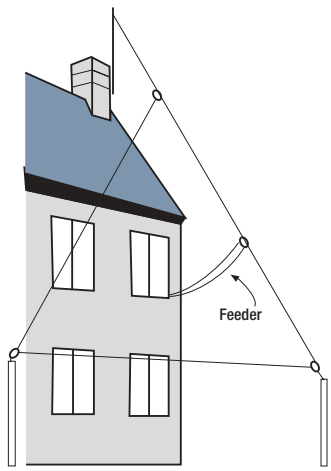


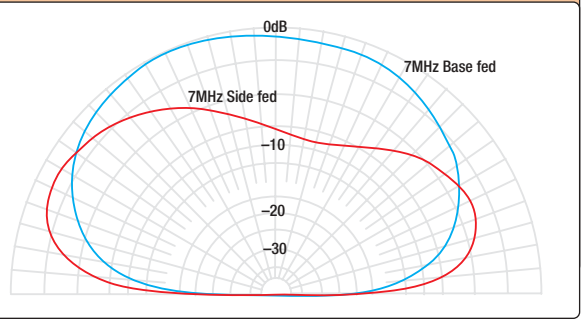
Fig 1
Delta loop antenna one wavelength circumference on 7MHz, using a short stub mast on the chimney as a top support.

Fig 2
Comparison of elevation plots of the full wave delta loop, fed at the base and at the side.

This antenna will give good results, even when the lowest leg of the triangle is only 0.6m from the ground.

The 7MHz characteristics of the antenna varied, depending at just which point the antenna was fed. For use as a NVIS antenna, the centre of the base of the triangle appears to be the optimum point and produces an elevation pattern as shown in **Fig 2**. For use as a DX antenna, the optimum feed point is just over one third up from the bottom on one of the vertical triangle sides as shown in Fig 1. These findings also apply to the 10MHz band. On the higher frequency bands, the lobes become very complicated, and the difference between the base and vertical feeds are less pronounced when it comes to working DX.

FIG 2 © RADCOM 250



CONSTRUCTION

Theoretically, the total length of the loop should be 140ft (42.8m), but my antenna was resonant with a total wire length of 120ft. This might have been due to the close proximity of the base to the ground, or the fact that insulated wire was used for the lower part of the loop, see below. The shape of the delta loop is not important. Fig 1 shows the corner insulators fixed to the ground with tent-peg-type fixtures, although trees and fences will also work as lower supports.

The apex support in the experimental model was a 2.5 metre length of scaffolding pole fixed to the chimney with a double TV lashing kit. The top of the chimney is about 9m above the ground. The pole gives the antenna enough height and a reasonable clearance above the roof. The apex of my loop was nearly 11 metres high.

As you can see, part of this antenna is close to the ground. This means there is a possible danger of someone receiving an RF burn if the antenna was touched when the transmitter is on. For this reason, wire with thick insulation was used for the lower half of the antenna. A loop antenna is not a high-*Q* device, so very high voltages, such as those found at the tips of a dipole, do not occur.

This antenna proved to be a good DX transmitting antenna on 7 and 10MHz. However, it did tend to pick up electrical noise from the house on receive. It could be used in conjunction with a smaller magnetic receiving loop, located in the electrically quietest part of the QTH, if electrical noise or QRM is a problem. This would normally require that the transceiver had provision for separate transmit and receive antenna connectors (rare). I have devised an antenna connector switch box, which I hope to describe in a future 'Antennas' column. ♦