Peter Dodd, G3LDO

37 The Ridings, East Preston, W Sussex BN16 2TW.

E-mail g3ldo@ukonline.co.uk

Antennas

More about 7MHz delta-loop antennas – how to configure and use them

In the September edition of 'Antennas' I described a delta full-wave loop for 7MHz, where the apex of the loop was supported by a small stub mast on the chimney of the house. Since that time, I moved the loop away from the house and it is now supported by an 18m high mast. The transmitting efficiency was changed very little by this move, but the receive performance, particularly on 7MHz, was much improved, because of the reduction of electrical interference. On the first night of operation on 7MHz, I heard stations from many parts of Latin America and worked a few of them.

If you have two supporting structures, say a mast and the chimney of a house, you could try inverting the loop. This arrangement is used by SM0DTK [1], with the base of the triangle 13.5m high and fed at the apex close to the ground. According to *EZNEC-4*, such an inverted loop would have a gain of around 5dBi over good ground, with a maximum angle of radiation of 50°, compared with my loop that has a maximum gain of only 1dBi but a maximum radiation of less that 30°. The sides of this triangle are 12.6m and the base is 16.9m.

SM0DTK has added another identical loop, located just over 5m away that is tuned with a 100pF capacitor via 4.85m of 450w ladder line so that it can act as a reflector or director. This gives an extra 3 or 4dB gain and a useful front-to-back ratio. The only disadvantage of this arrangement is that it requires four support structures (in SM0DTK's case, trees). It occurs to me that such an antenna could be scaled for the higher frequency bands with a loop spacing arrangement that requires only two support structures.

THE COMUDIPOLE FEED ARRANGEMENT

I received an e-mail from ON6TJ, who uses the same type of single-support delta loop as described above. It is fed on one side, λ/4 down (on 7MHz) from the apex, using 450Ω ladder-line. This ladder-line does not go straight into the house; instead it is connected to the balanced side of a 4:1 balun located outside the house. The rest of the run into the house is made using coax cable. Such an arrangement, shown in **Fig 1,** is known as the 'comudipole'; it was first described in [2], but can also be found in [3]. The lengths of the coax and the twin feeder are not critical, although losses will be minimised by having as much of the total feeder length as possible being made up of twin feeder. I also use the comudipole feed method for my loop. In this case, the coax length is 6m and the 450ω ladder-line, 30m. The balun is a PA0SE wideband 4:1 coax type, as shown in the photograph, and is described in [2] and [4].

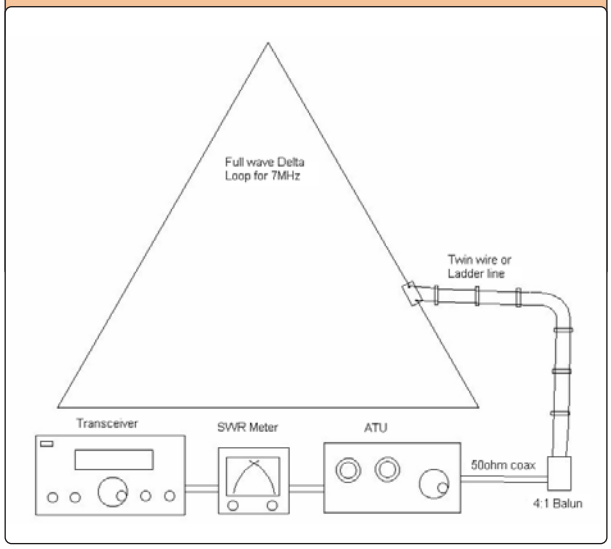
WHY A 4:1 BALUN?

I was recently asked why the balun in an ATU should use a ratio of 4:1. Good question.

Most commercial ATUs use a T-match arrangement, which provides the best compromise between efficiency, simplicity and cost. However the T-match is an unbalanced antenna tuner, and some type of balun transformer must be incorporated if it is to be used successfully with balanced feeders. While a balun transformer provides a very simple solution for coupling a balanced feeder to an unbalanced tuning unit, it may not be as efficient as a properly-balanced ATU. Many published designs use a 4:1 balun on the assumption that most of the balanced impedances that will be encountered will be in the range 150 to 600w. The feed impedance of the full-wave loop discussed above is around 130w on 7MHz and 1300w on 10MHz (ignoring reactance). The unknown length of the feeder might mean that these impedance values could have a much wider range. In practice, the system seems to work, although some experimental pruning of the twin feeder might be necessary to ensure the antenna loads on all bands of interest.

The impedance range of the ATU can be increased by having a balun that can be switched from 4:1 to 1:1. If the balun is wound on a ferrite toroid core (as are all baluns in ATUs), it can easily be modified by replacing the two (bifilar) windings with three wires wound trifilar fashion. That is to say, three identical windings are wound on together. Lack of space precludes a description here, but full details of the construction of the G3TSO ATU can be found in [5] and [6]. ♦

FIG 1



Top: A 7MHz loop using the 'comudipole' feed arrangement. The coax cable from the balun is connected to the coax output socket of the ATU.

Left: The PA0SE wideband 4:1 coaxial balun. See 'The Comudipole Feed Arrangement'.

REFERENCES

[1] '2-Element Delta Loop for 40 metres', Martin Hedman, SM0DTK, *QTC*.
[2] 'Eurotek', Erwin David, G4LQI, *Radio Communication*, August 1992
[3] *Backyard Antennas*, pp26/27.
[4] *Backyard Antennas*, pp171/72.
[5] 'A General-Purpose Antenna Tuning Unit', M J Grierson, G3TSO, *Radio Communication*, August 1987.
[6] *Backyard Antennas*, pp45/46.[1] 2-Element Delta Loop for 40 metres', Martin Hedman, SM0DTK, *QTC*..