# Technical Topics

PAT HAWKER, G3VA
37 Dovercourt Road, London SE22 8SS

## BALANCE-FED LARGE LOOP ANTENNAS

THERE APPEARS to be a marked revival of interest in the use of open-wire, ladder-line and ribbon transmission lines, both as matched and as tuned lines. Twin balanced feeders have always offered several useful advantages, not only lower attenuation than coaxial cables, but also the elimination of the need for a (possibly lossy) balun at the feed-point to a dipole-type element. Provided the line, the ATU output and the antenna structure itself are all well-balanced to earth, there will be little feeder radiation such as is commonly experienced from the outer-braid of coaxial cables - often advantageous in overcoming RFI problems. When used with an appropriate ASMU (antenna system matching unit) and appropriate length of transmission line, virtually any length of element (preferably at least an electrical quarter-wave long on the lowest band) can provide an effective multi-band antenna, particularly important for the use of the non-harmonically related WARC bands.

For some years, I have used a balanced-fed irregular horizontal loop of indeterminate length (roughly 150ft or so) running down my narrow 70ft back garden to tree supports and then back again to the house at a height that varies from about 18 to 30ft: see TT July 2000, p56, Fig 6. While I would certainly not claim this as a particularly good system, it does function between 3.5 and 30MHz (and occasionally 1.8MHz). With horizontal polarisation it is too low to be suitable for DX on the lower bands. Because of its marked directivity towards the east, I have put up a crude 21MHz dipole, (no attempt made to check resonance) in the roof-space fed from ladder-line. With the tuner used on 14/21/28 MHz for the loop, this works reasonably well on all three bands for working North American stations. The ability to switch quickly between two simple wire antennas with different horizontal radiation patterns is a dodge that I first used in the 1950s. I was then operating from a first floor flat in Central London, using one antenna stretched across a front balcony and a second (sloping) at the rear of the solid four-storey building.

The use of large horizontal loops (circular, square, rectangular, triangular (delta)) with balanced feed is proving increasingly popular; whether like mine, it is just a long indeterminate length of wire, or a more ambitious design such as that described by Kirk A Kleinschmidt, NT0Z, in A Balanced, Everyday Approach to All-Band Bliss (*QST*, April 2002, pp47-50). This is sub-titled Feed lines, antenna tuners, baluns, RFI, computer noise and all-band antennas now there's a snake pit of potential conflict. After years of experimentation, the author has found the path to multiband nirvana.

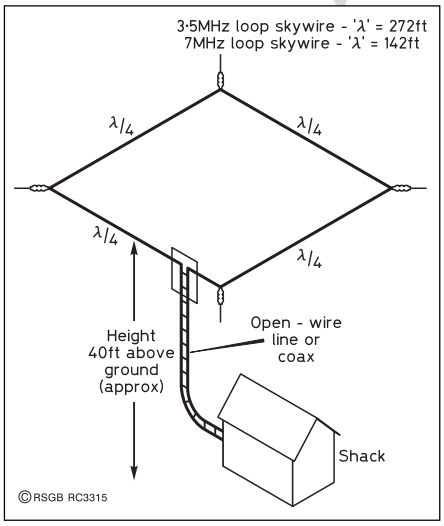


**Fig 1: NT0Z advises: Put up the largest horizontal loop your site can support while keeping the 'loop' as square as possible. Don't worry about perfect symmetry [or resonance but try to preserve balance to earth –*G3VA*]. Loop could be scaled down for 14MHz and above.**

NT0Z's opening remarks will be endorsed by many: For most of us, the Holy Grail of ham radio is antenna performance. It's often the key element in determining ham radio success and operating enjoyment. You can get by with a second-rate transceiver, a deep gravelly voice but if you have an underperforming antenna, ham radio isn't nearly the fun it could be.

After imagining an antenna system that qualifies as a navigation hazard, most of us will scale things down to the real matter at hand how to put up an affordable, easy-to-build multiband antenna that works great and fits on an average-size lot Although dipole antennas in all of their various shapes and configurations perform well, in my experience the *best* all-around multiband antenna is the horizontal loop. It's efficient, omnidirectional over most real ground, it's quiet, it operates well on *all* HF frequencies [including 50MHz] above its design frequency (and even those below ). [It can] be an *outstanding* antenna for domestic *and* DX contacts alike.

NT0Z endorses Fisher's First Rule of Horizontal Loop Construction. (Dave Fischer, W7FB, formerly W0MHS, in The Loop Skywire (*QST*, November 1985) gave this as enclose as much area as possible within the confines of the loop. That is to say a circular loop is ideal, but a square loop is much more practical and performance doesn't suffer.) NT0Z adds: My lot could only accommodate a triangular loop which is pretty much the geometric limit of what you can get away with. If you make the loop any more elongated or constricted, it loses it loop-like qualities. [Mainly, I would suggest, its omni-directional pattern, as found in my very irregular elongated shape *G3VA*].

**Fig 1**, taken from the NT0Z article, but clearly not his triangularly-shaped antenna, is captioned: Put up the largest horizontal loop your site can support while keeping the loop as square as possible [as high as possible, but don't fret overmuch if you can't exceed say 25 - 30ft *G3VA*]. Don't worry about perfect symmetry. For size reference, values are shown for 3.5MHz and 7MHz. Although NT0Z originally used coax feeder, he shows the significant improvement possible with open-wire or 450Ω ladder-line, particularly when there is a high SWR on the feeder. For twin-wire balanced feeders, he provides (**Fig 2**) a simplified schematic of the balanced tuner originally presented by Rich Measures, AG6K (*QST*, February 1990, which gives full constructional details). AG6K's article was noted in TT May 1990 (*Technical Topics Scrapbook 1990-94*, pp23 - 24). NT0X recognises that the use of two similar, high-power roller-coaster inductors is expensive and notes that some constructors use fixed, tapped coils to save money. In TT May 1990 (also TT July 2000) I included a diagram showing the low-cost balanced π-network tuner that I use on 14/21/28MHz with a fixed coil (using a π-network rather than fixed 50Ω output on the transmitter), repeated here as **Fig 3.**

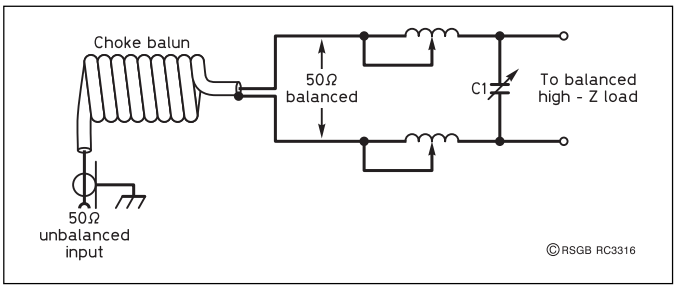


**Fig 2: Simplified schematic of the balanced tuner, as originally presented by AG6K in 1990. The two roller inductors should be adjusted in sync. This design uses only a single (high-voltage) variable capacitor and is not suitable for balanced low-Z loads, unless the capacitor is moved to the input side of the inductors. To reduce costs, tapped inductors can be used instead of rollers.**

## ECONOMISING DRIVE TO AB1 LINEARS

JORGE Dorvier, EA4EO, notes that the present practice of driv-