The RXO Unitenna

by R. D. BROWN G3RXO
email: standardtrees@btconnect.com

WHILST touring New Zealand some years ago, I needed a portable all band HF antenna and conceived the following design concept which produced surprisingly good results. Back in the UK, I did have time to construct and test it and it worked surprisingly well. It is extremely cheap, extremely light, and works continuously over an extremely broad bandwidth. It is non-resonant, vertically polarised and out-performs a ground plane throughout a 3:1 frequency range. Accepting a loss of some 3 dB from a ground plane, its useable frequency range is some 5:1. It has very low angles of radiation throughout the range, requires no radials, and is not susceptible to static.

My thinking was along the following lines:

(1) Consider a vertical dipole, it's current distribution and resultant polar diagram.

(2) Consider it as a folded dipole.

(3) Consider it's current distribution and polar diagram if it is fed off centre. The dissimilar currents in the two elements of the dipole are within one evanescent induction field and therefore cumulative as to radiation which can give rise to an overall current distribution and polar diagram which changes very little with change of frequency.

(4) By feeding at approximately one third of the way along the dipole the current distribution and polar diagram vary approximately from that of a vertical dipole to that of a vertical quarter wave over a frequency range of some 3:1; for example from 7 MHz through to 21 MHz.

(5) Above the antenna's maximum useable frequency the polar diagram becomes split and of high angle.

(6) As the applied frequency is reduced below its normal range the polar diagram remains much as for a vertical quarter wave, but with diminishing efficiency, although still useful over a frequency range of some 5:1.

(7) Since the antenna is a closed loop it is less susceptible to static.

(8) It requires no radials and therefore incurs no ground losses.

(9) It is fed with a tuned line which should be as perpendicular to the antenna as possible.

(10) Variation of the feed point to about 25 per cent from the antenna's end results in slightly better current distribution, but reduced bandwidth. The optimum point is around 30–35 per cent from the end.

(11) It is cheap to produce, lightweight, portable, unobtrusive and has virtually no power limits.

The original antenna was made of regular single core conductor taped down each side of lengths of plastic waste pipe and guyed with bricklayer's line. For example; practical dimensions are a 9.2 m dipole, fed 3 m from base and about 1 m above ground; coverage 7 MHz to 21 MHz continuously with full efficiency. Pro-rata for other frequency ranges.

I found the antenna to be surprisingly quiet with respect to background noise and very effective at low angles and long range. I hope that others will give this design a try and would be most interested to learn of their results with it. βi

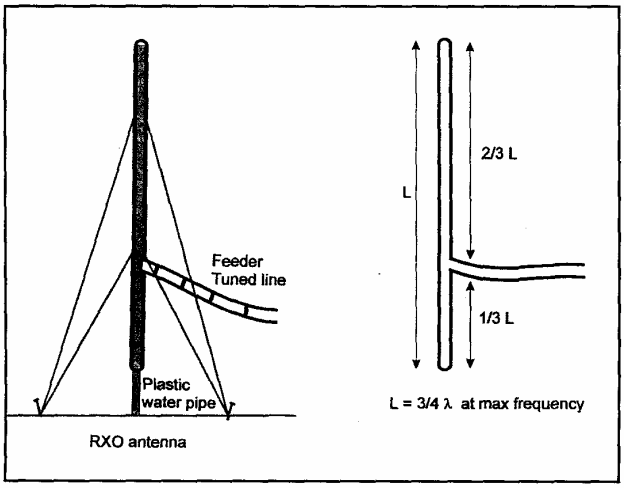

Figure 1.

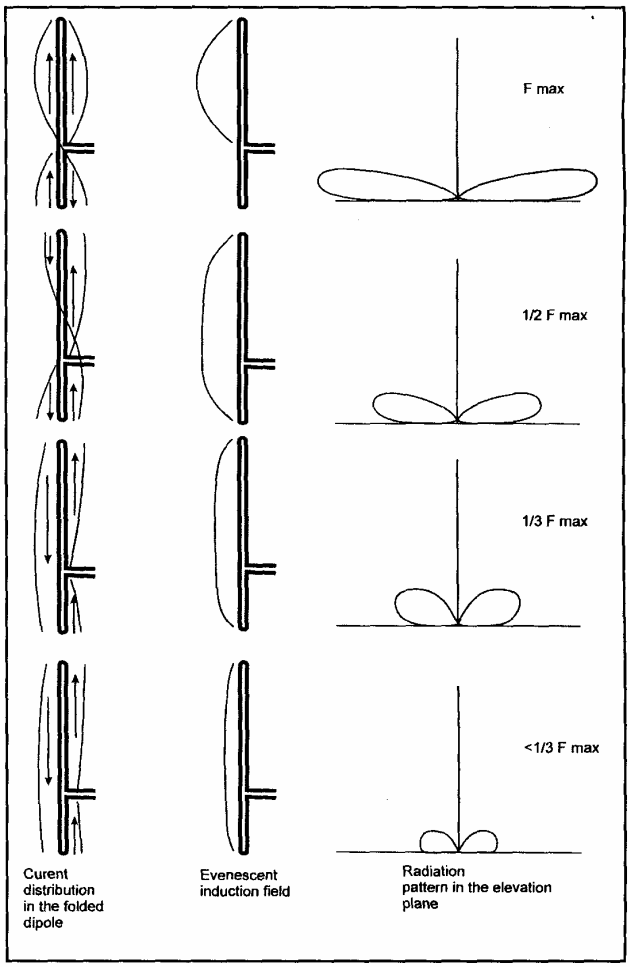

Figure 2.