A Little about Loops

Categories

Large: about 1λ around

- Vertical – Vertically or Horizontally Polarized
- Horizontal, “Loop Skywire”

Little: less than 0.1λ around

- Small Vertical, “Magnetic Loop”

The Long Loop that Isn’t a Loop

- Rhombic

Vertical Loops

- Perimeter length of the closed driven element is roughly one wavelength.

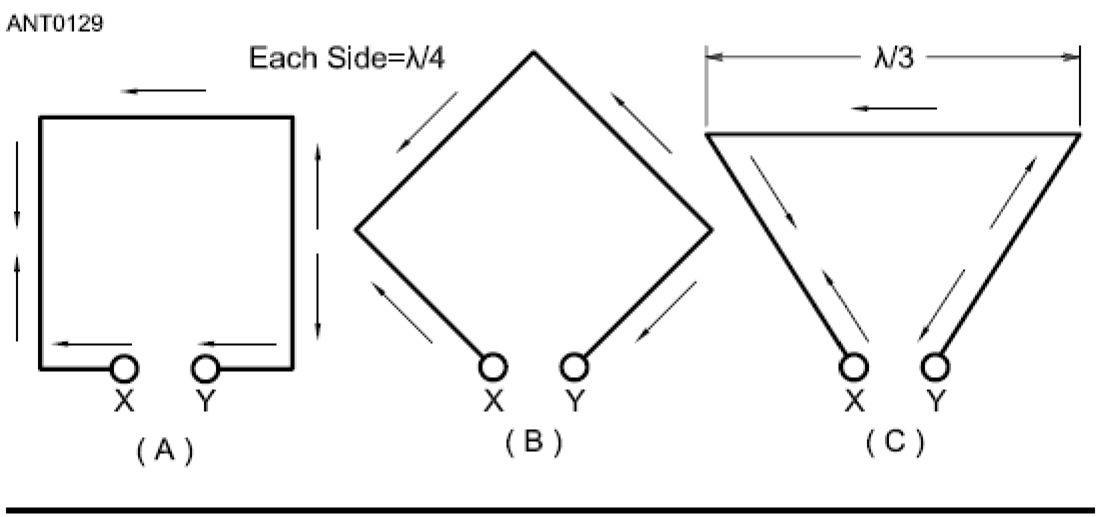

Fig 3—At A and B, loops having sides ¼ λ long, and at C having sides ⅓ λ long (total conductor length 1 λ). The polarization depends on the orientation of the loop and on the position of the feed point (terminals X-Y) around the perimeter of the loop.

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Vertical Loops (2)

- The ideal loop would be circular, enclosing the most area for the given perimeter length. This may be approximated by convex polygons with three (delta), four (quad), or more sides.
- Polarization determined by the feed point.

Vertical Loops (3)

- Multi-element parasitic arrays offer increased gain and changes to patterns.

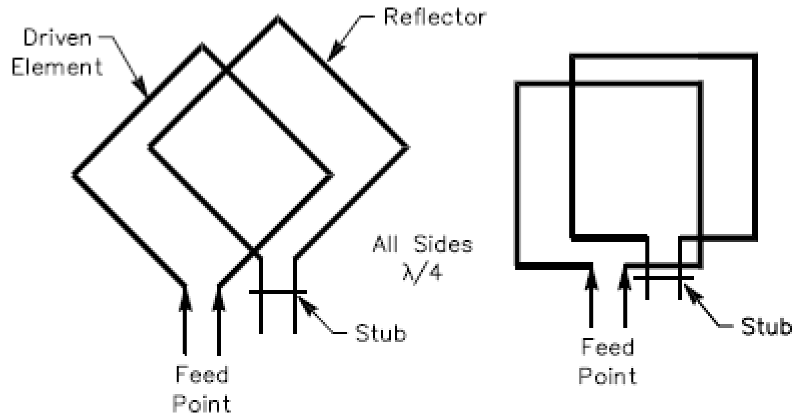

Fig 1—The basic two-element quad antenna, with driven-element loop and reflector loop. The driven loops are electrically one wavelength in circumference (¼ wavelength on a side); the reflectors are slightly longer. Both configurations shown give horizontal polarization. For vertical polarization, the driven element should be fed at one of the side corners in the arrangement at the left, or at the center of a vertical side in the "square" quad at the right.

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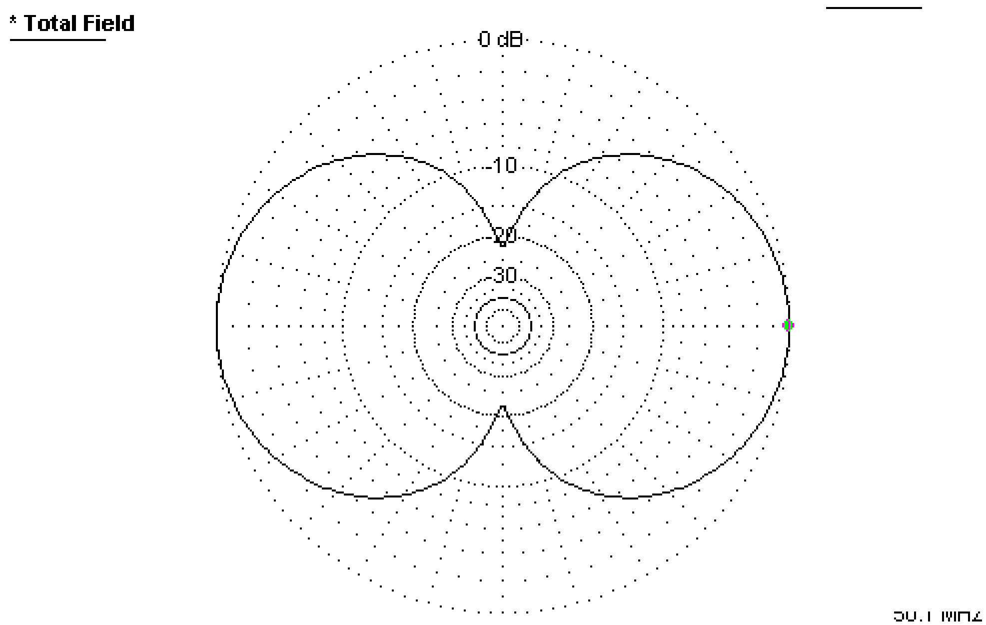
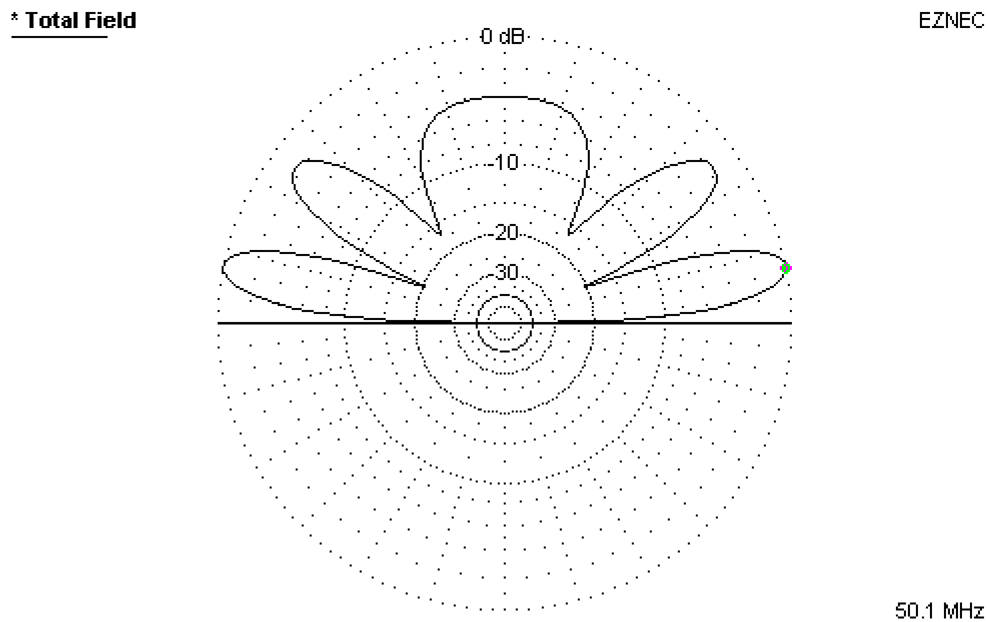
6m Single-element Delta Loop

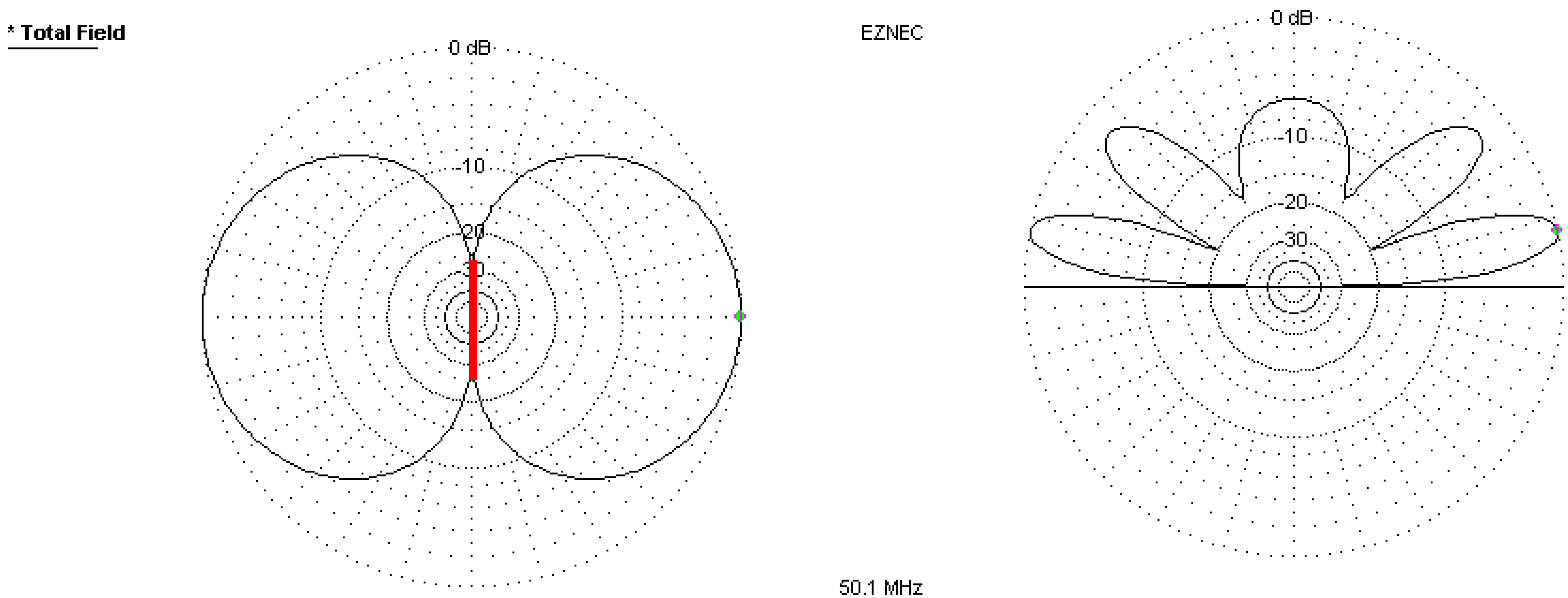
- At 20’, 8.5 dBi, TOA=11 deg, beamwidth=84 deg, F/S=22 dB





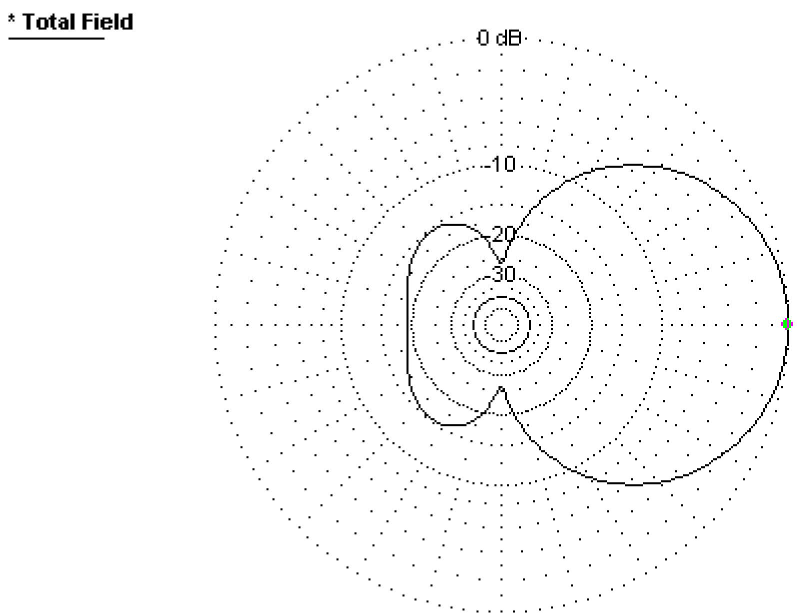
6m Single-element Quad

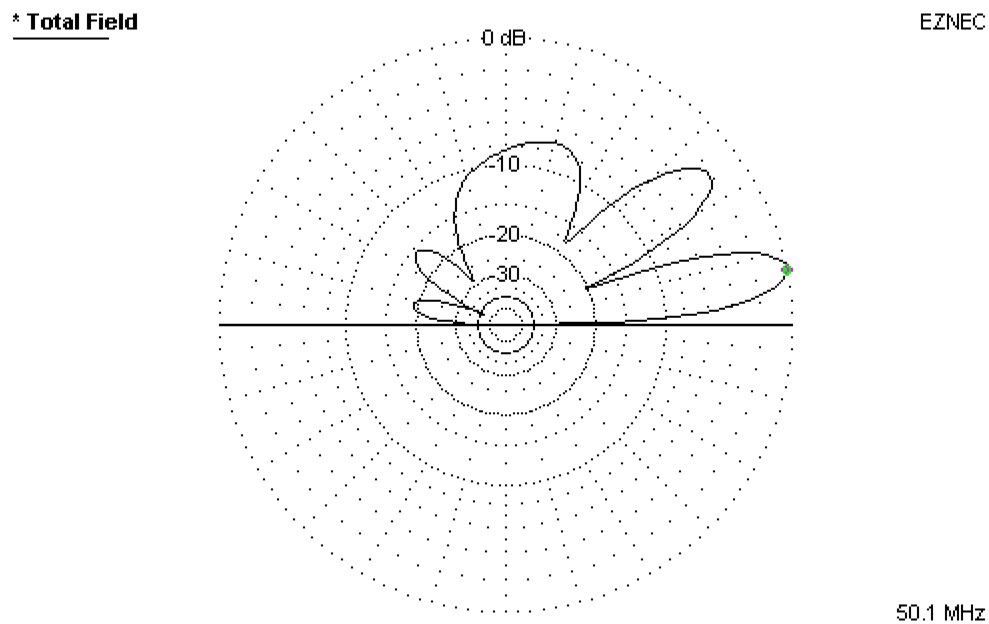
- At 20’, 8.8 dBi, TOA=12 deg, beamwidth=85 deg, F/S=23 dB



6m 2L (Reflector) Delta

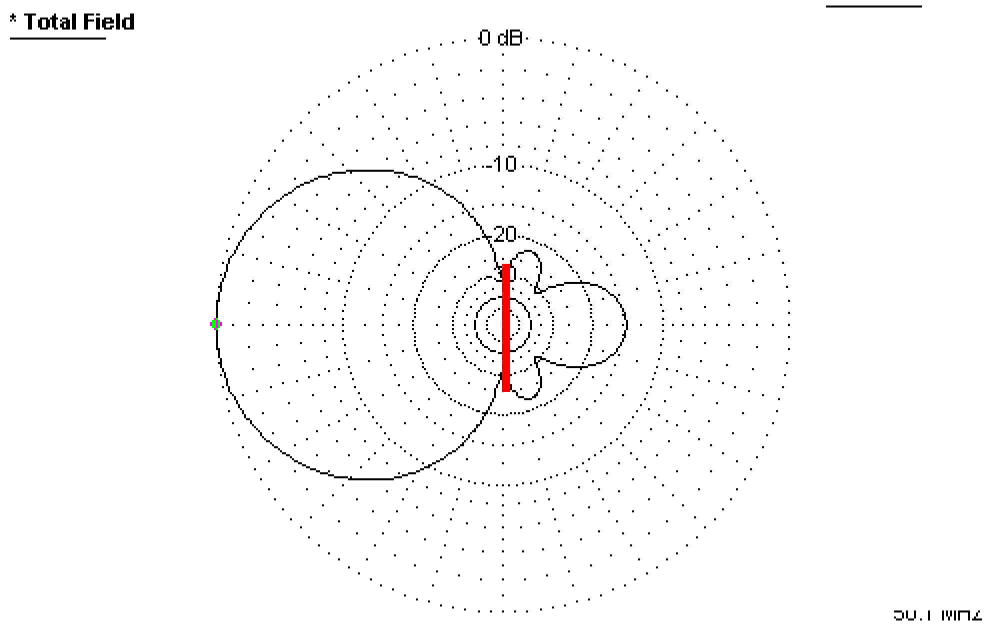
- At 20’, 12.1 dBi, TOA=11 deg, beamwidth=73 deg, F/S=30 dB, F/B=14 dB element spacing 36”

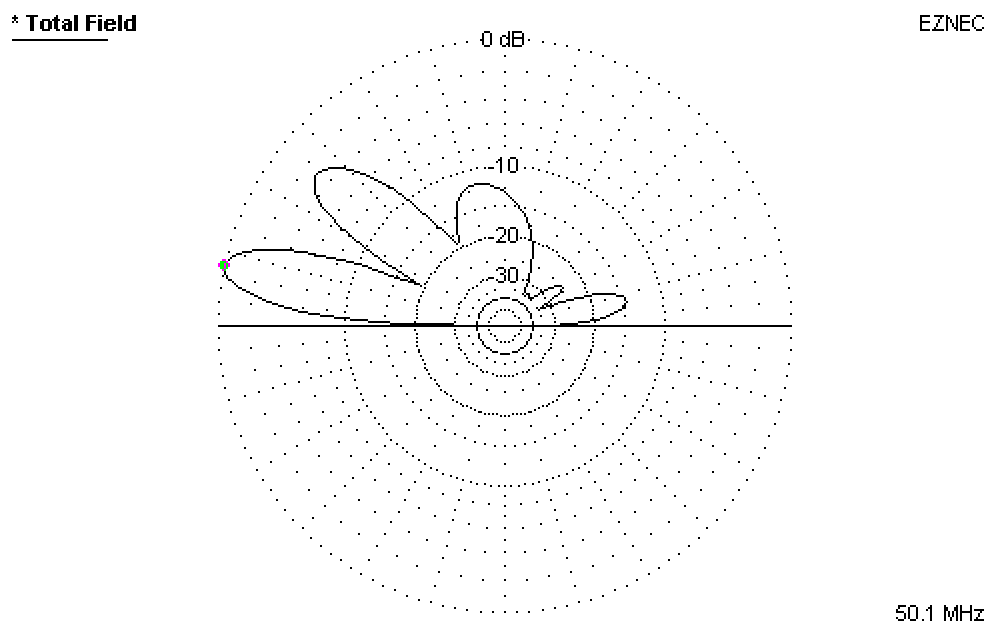




6m 2L (Reflector) Quad

- At 20’, 13.2 dBi, TOA=12 deg, beamwidth=73 deg, F/S=30 dB, F/B=14 dB element spacing 36”





Horizontal Loop

- Often called “loop skywire”.
- Similar to large vertical loops: about a wavelength in perimeter, enclosing as much area as possible.
- Vertically polarized

Horizontal Loop (2)

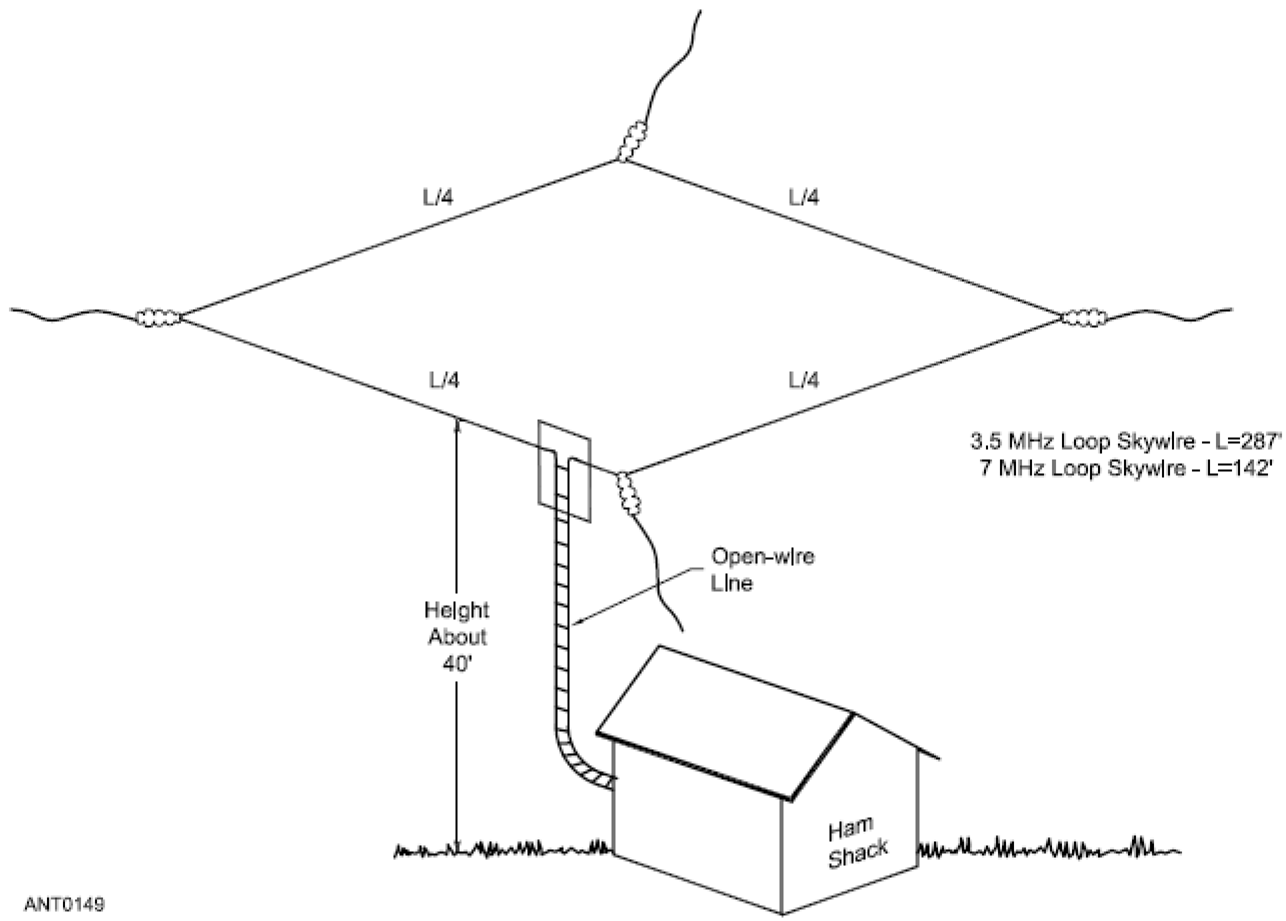


Fig 25—A complete view of the Loop Skywire. The square loop is erected horizontal to the earth.

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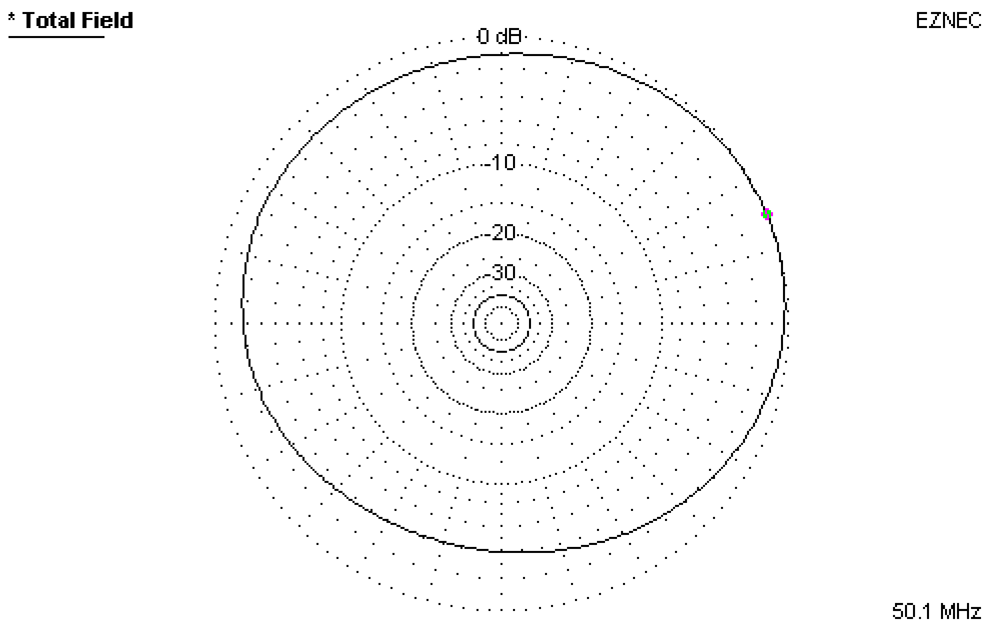
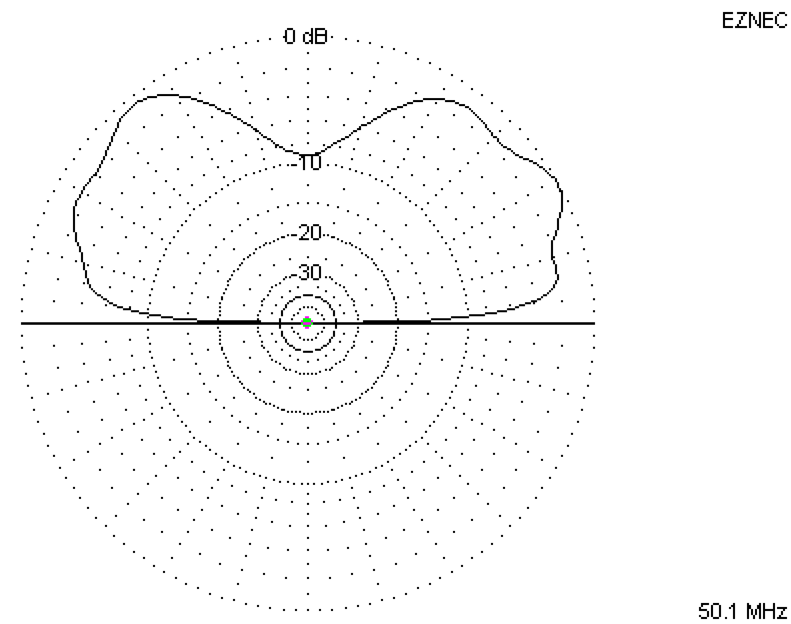
6m Horizontal Loop

- At 10' corner-fed, 4.2 dBi, TOA=29 deg, virtually omnidirectional azimuth pattern, very broad elevation pattern.





Small Loops

- Low radiation resistance, unless wound on a ferrite core, but highly reactive (usually inductive)
- I^2R loss >> radiation resistance, so low efficiency: typically not a transmitting antenna.
- Pattern like a dipole with E & H fields reversed
- Standard EZNEC (no optional engine) does not model well!

Small Loops (2)

- A vertically oriented small loop is vertically polarized regardless of the feedpoint – compare to large loops, which can be vertically or horizontally polarized.
- A horizontally oriented small loop, i.e., parallel to the earth, will be horizontally polarized and have an omnidirectional pattern.
- For the small loop to work properly, it must be balanced – an electrostatic shield may be added.

Small Loop Pattern – 90° Rotation compared with Large Loop

Deep side nulls and small size make this a good direction-finding antenna, often in conjunction with a short vertical to attenuate one of the lobes and resolve direction ambiguity.

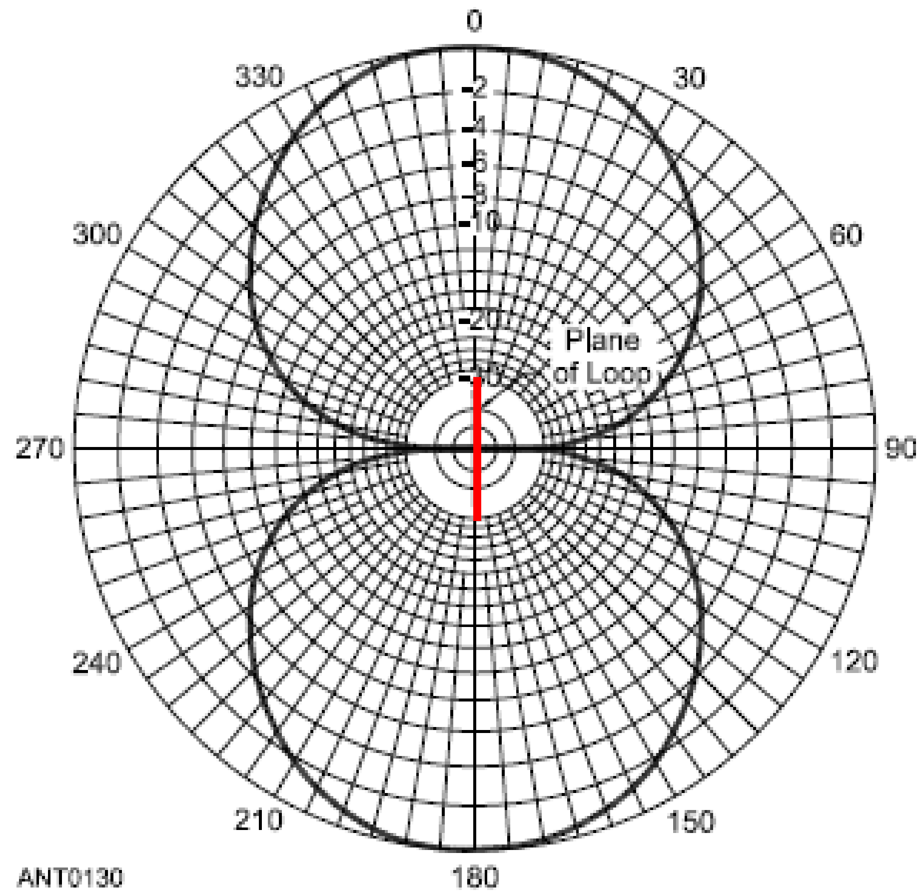


Fig 4—Calculated small loop antenna radiation pattern.

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Rhombics

- Typically several wavelengths long at the lowest frequency.
- Although shaped something like loops, they are fundamentally different traveling wave antennas.
- We’ll cover rhombics along with other antennas much larger than one wavelength in a future program.

Not for a City Lot – even on 6m

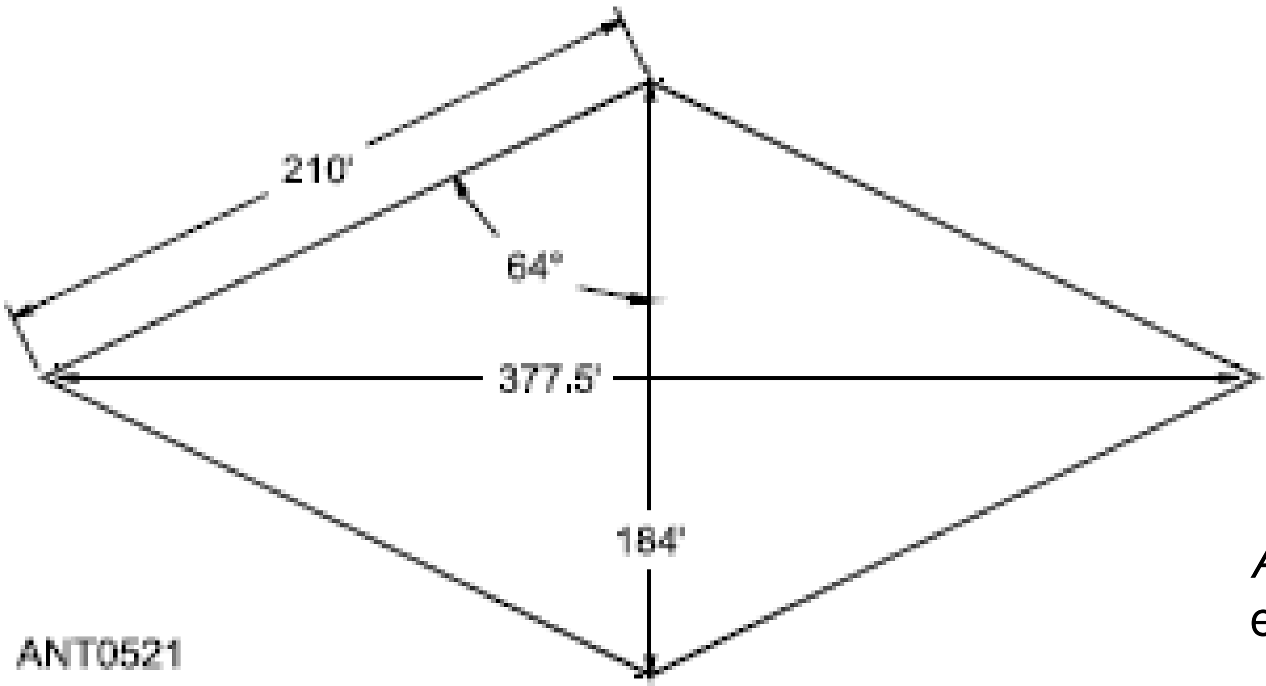

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Fig 26—Rhombic antenna dimensions for a compromise design between 14- and 28-MHz requirements, as discussed in the text. The leg length is 6 λ at 28 MHz, 3 λ at 14 MHz.