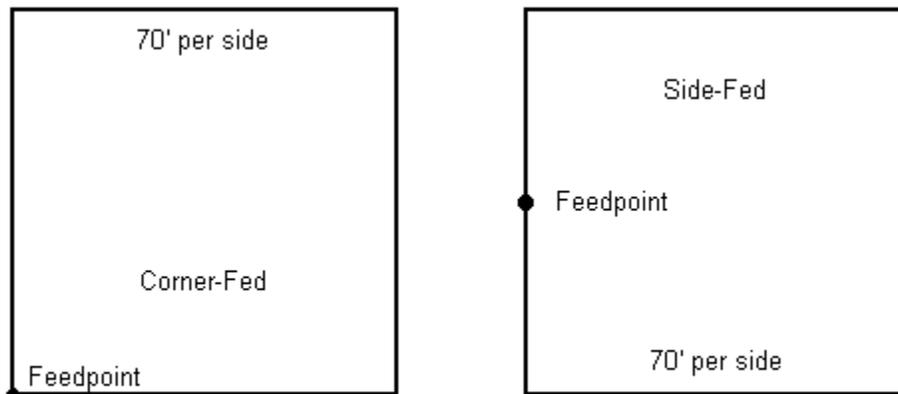


# ANTENNAS FROM THE GROUND UP

## 22. Ho-Ho-HOHPLs or a Horizontal 80-Meter Multi-Band Loop Data Compendium

L. B. Cebik, W4RNL

The Horizontally Oriented, Horizontally Polarized 1-wavelength Loop (at the lowest frequency of operation) (**HOHPL**) has become a fairly popular multi-band antenna. It has an advantage over the single wire that is 1/2 wavelength long at its lowest frequency of operation. Each side of the loop is only half as long as the doublet. But the loop also has a disadvantage: it requires 4 supports rather than 2. Which works better for a given ham location is something that only a careful survey of available land and supports will tell for certain. What can be done is to provide a compendium of patterns for a multi-band loop, similar to those provided in past episode for the 135' doublet, the 102' doublet, the OCF, and the 135' end-fed wire. Therefore, I modeled an 80-meter HOHPL, 70' on a side, using #12 copper wire. This length, when elevated 35' off the ground, was approximately resonant at 3.5 MHz.



Top views of two ways to feed a horizontal-plane loop

Fig. 1

The next question was where to feed the square. There are two reasonable locations: at a corner or midway along one side. Since the resulting patterns can be very different on some bands, there was no choice but to model the antenna both ways.

Also modeled is a corner-fed (no phase line) N4PC loop at 50.7' per side. The N4PC loop is to the 102' G5RV what the 80-meter loop is to the 135' doublet. It has different patterns and somewhat higher elevation angles of maximum radiation than the larger loop.

Although the HOHPL is a cloud-burner on 80 meters--like almost all low-level horizontal antennas--the performance on bands above the fundamental makes it very competitive among multi-band wires. An especially interesting feature is that the feedpoint impedance for either configuration is quite manageable on all bands. The resistive part of the impedance tops out at

about 400 ohms, while only on 30 meters does the reactance exceed 200 ohms. With either 300-ohm or 450-ohm parallel transmission line, the antenna tuning unit (ATU) should have little difficulty establishing a match. The N4PC is only a little more of a matching challenge for the ATU.

As always, the patterns are typical, but not precise, since modeling cannot reproduce the terrain and ground clutter of any given station. Feedpoint impedances are likewise ballpark numbers.

## 80 Meters: 3.6 MHz

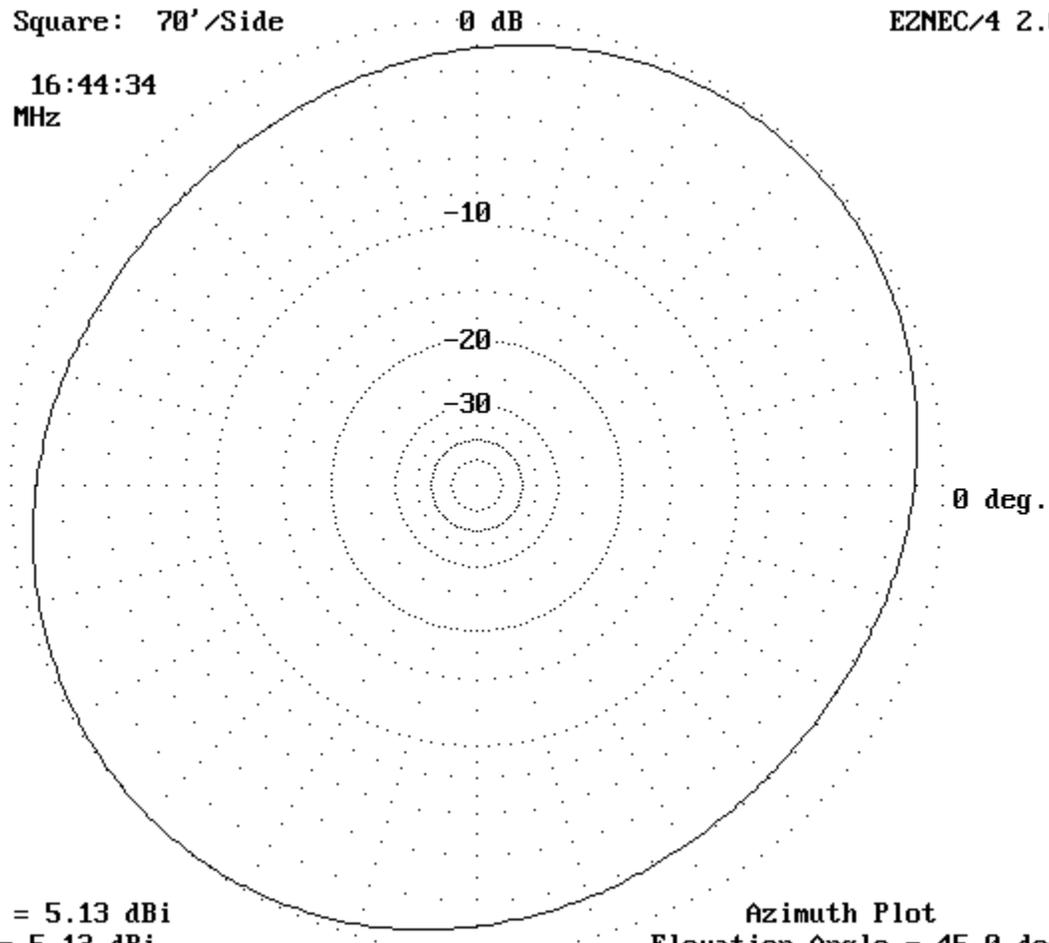
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:44:34

Freq = 3.6 MHz



Outer Ring = 5.13 dBi

Max. Gain = 5.13 dBi

Corner-Fed:  $Z = 70 + j25$  Ohms

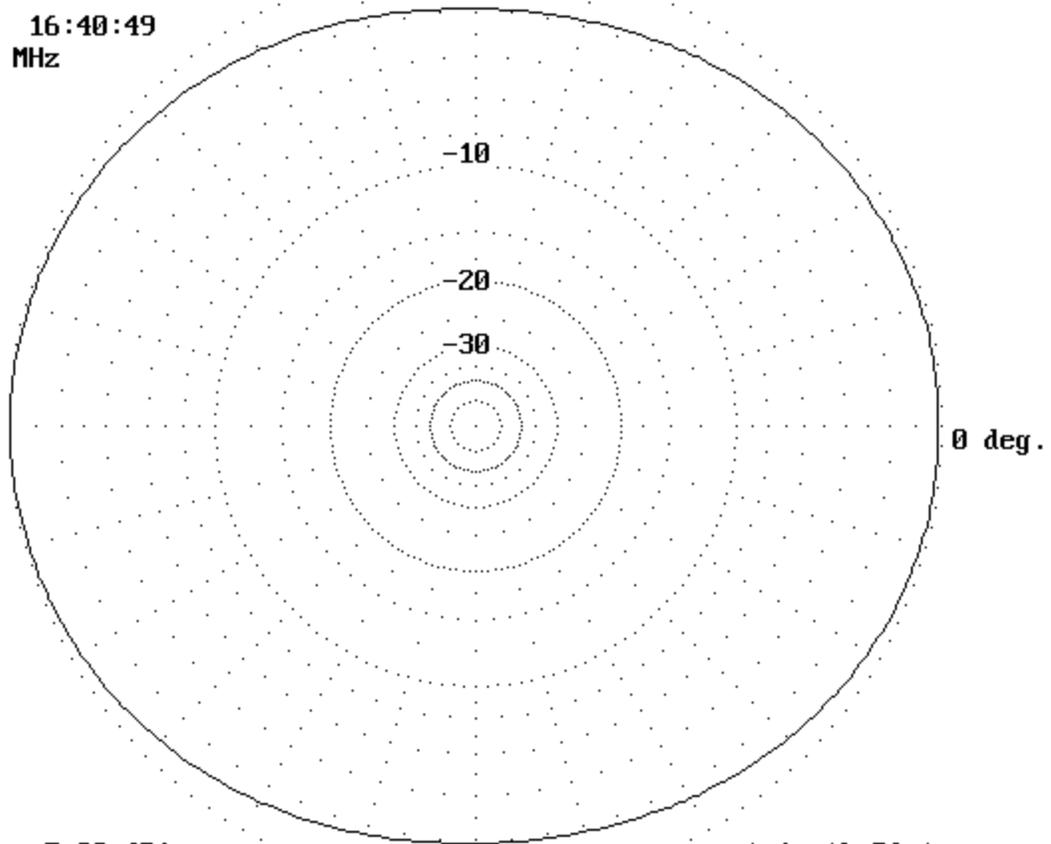
Side-Fed Square Loop: 70' /Side

0 dB

EZNEC/4 2.0

10-28-1997 16:40:49

Freq = 3.6 MHz



Outer Ring = 5.08 dBi

Max. Gain = 5.08 dBi

Side-Fed:  $Z = 65 + j25$  Ohms

Azimuth Plot

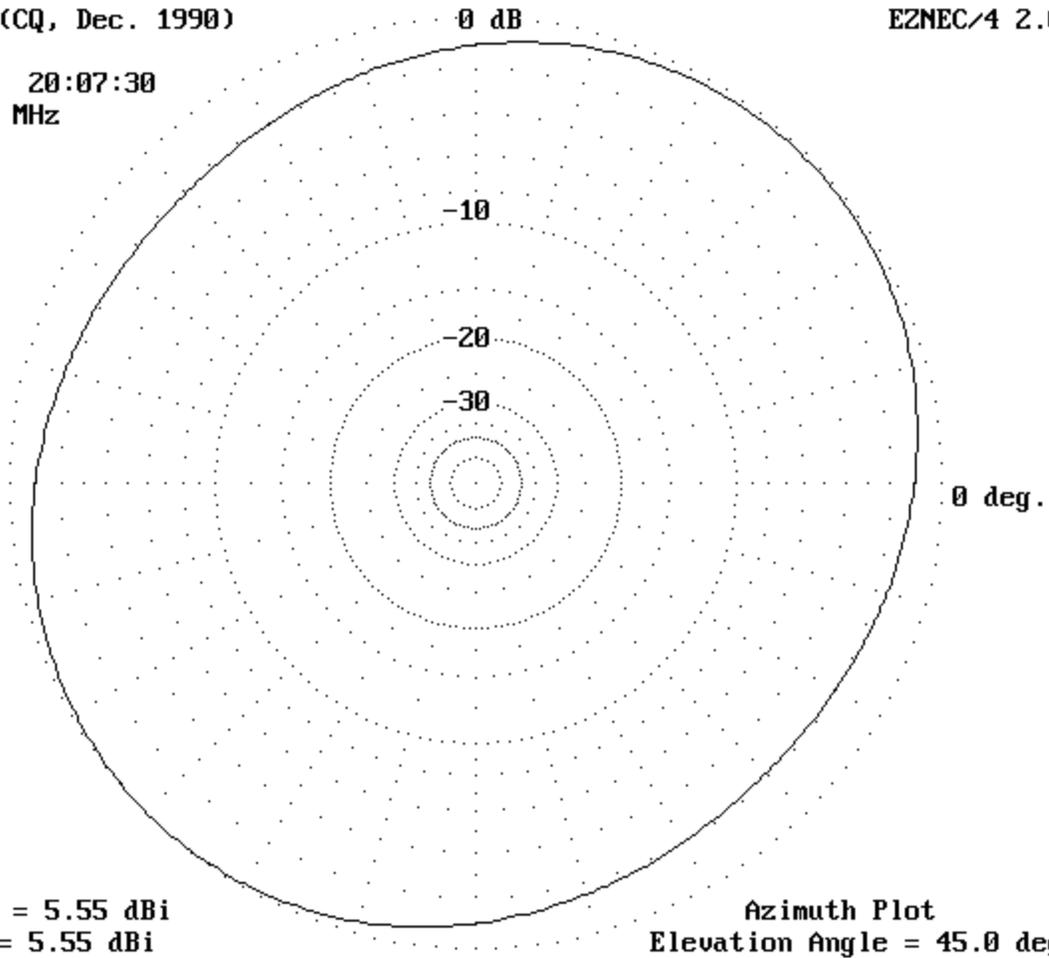
Elevation Angle = 45.0 deg.

N4PC Loop (CQ, Dec. 1990)

EZNEC/4 2.0

10-29-1997 20:07:30

Freq = 3.6 MHz



Outer Ring = 5.55 dBi

Max. Gain = 5.55 dBi

N4PC Corner-Fed:  $Z = 40 - j1215$  Ohms

40 Meters: 7.1 MHz

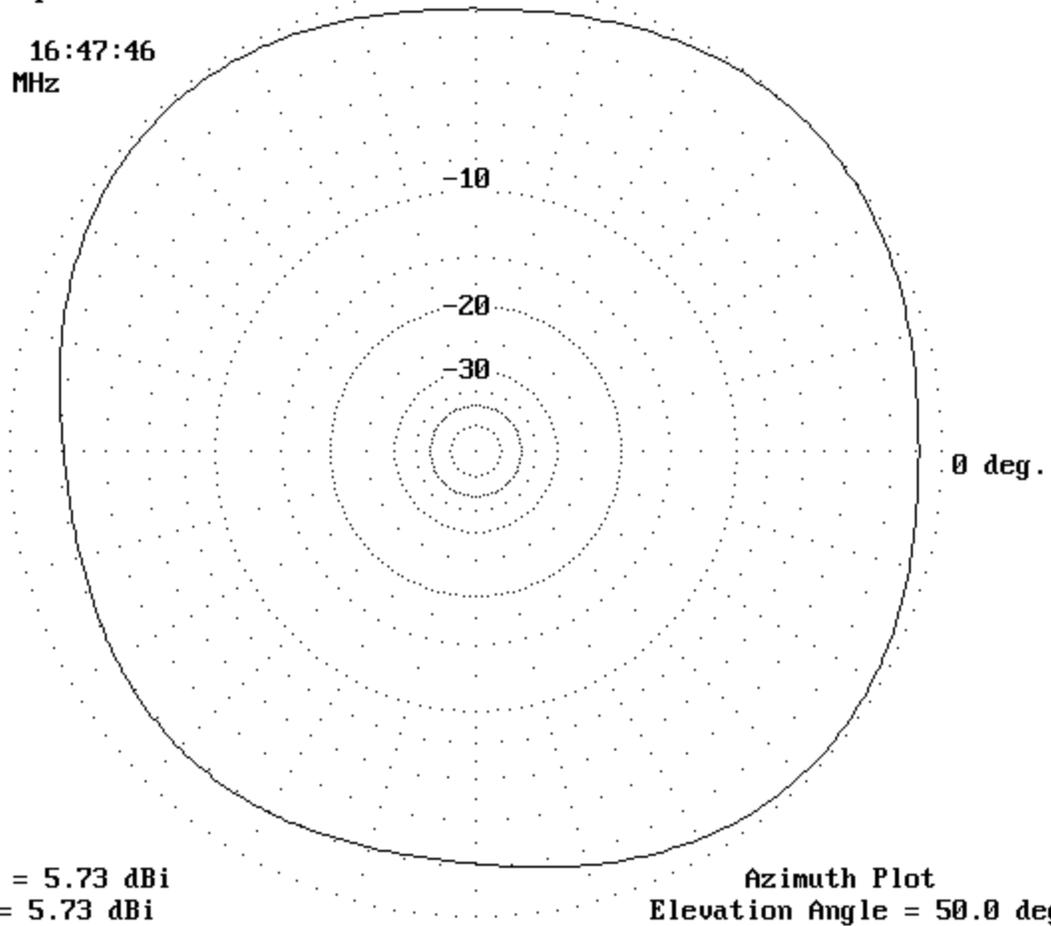
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:47:46

Freq = 7.1 MHz



Outer Ring = 5.73 dBi

Max. Gain = 5.73 dBi

Corner-Fed: Z = 85 - j100 Ohms

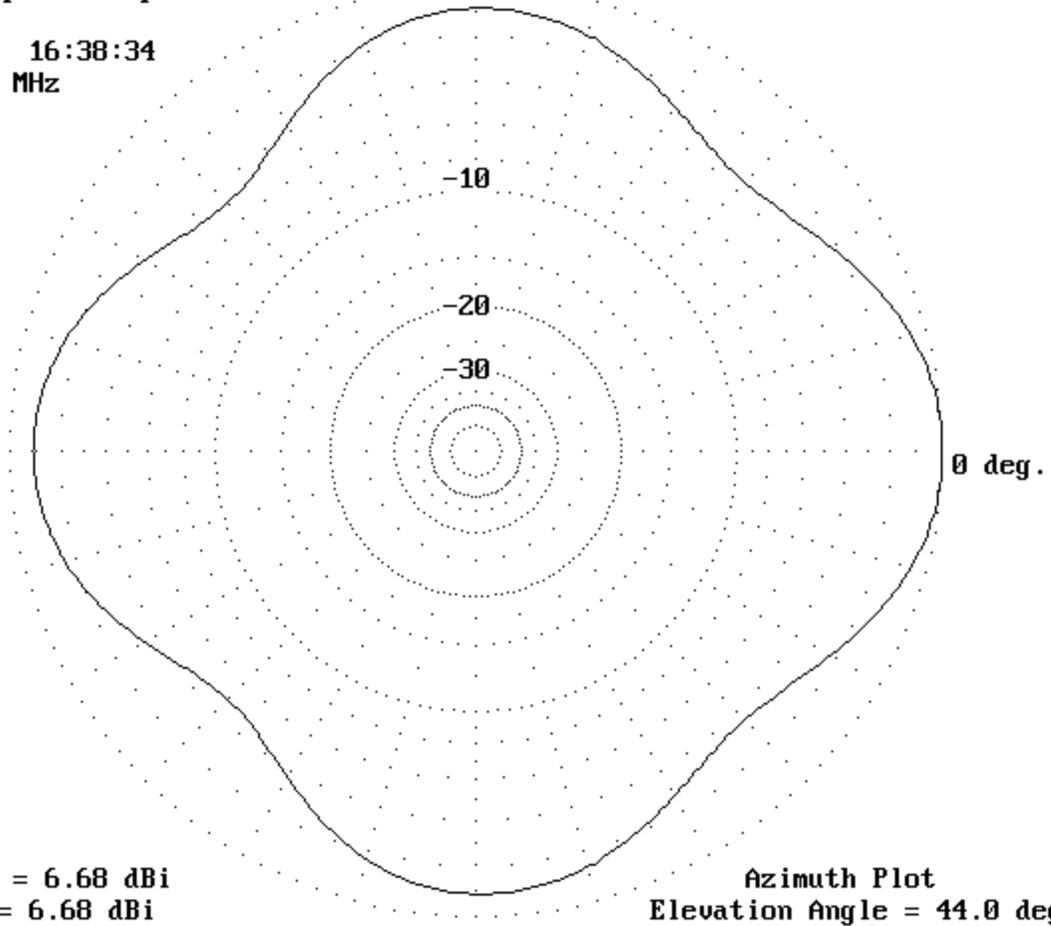
Side-Fed Square Loop: 70' /Side

0 dB

EZNEC/4 2.0

10-28-1997 16:38:34

Freq = 7.1 MHz



Outer Ring = 6.68 dBi

Max. Gain = 6.68 dBi

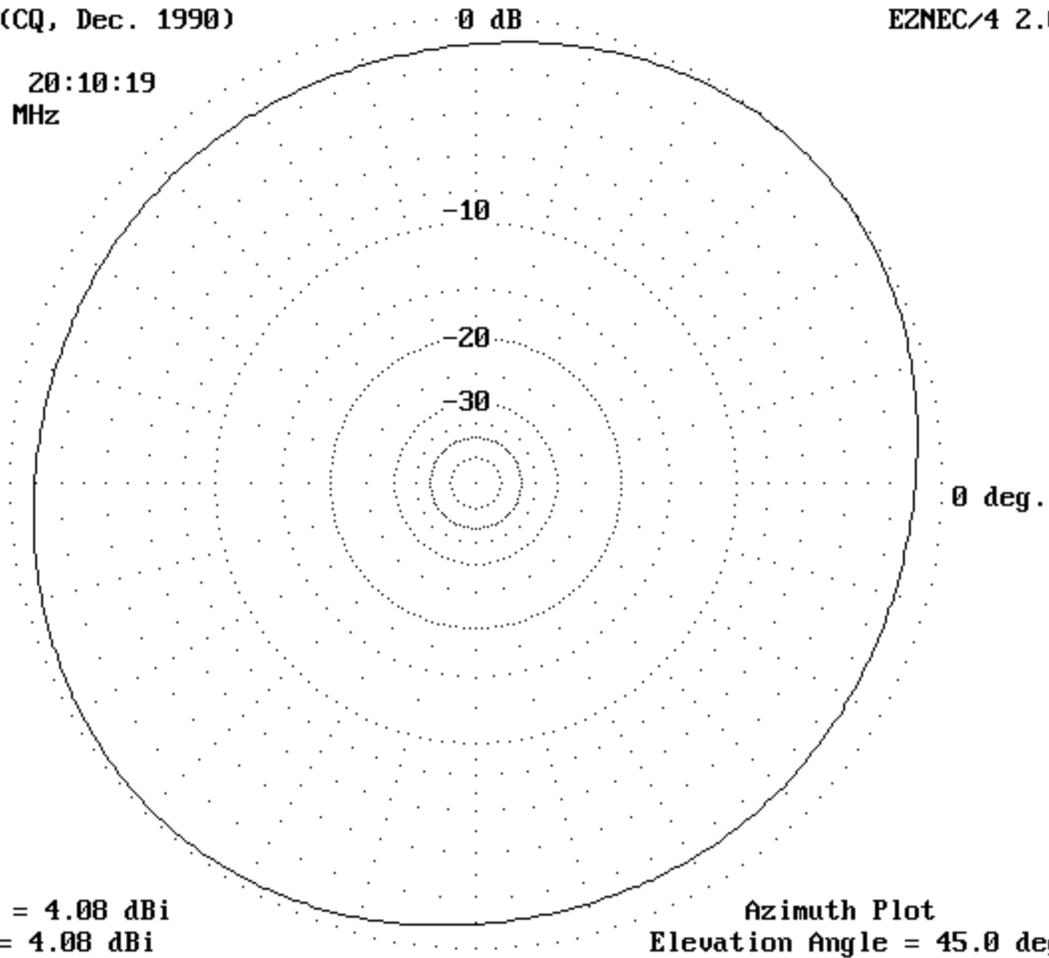
Side-Fed: Z = 260 + j80 Ohms

N4PC Loop (CQ, Dec. 1990)

EZNEC/4 2.0

10-29-1997 20:10:19

Freq = 7.1 MHz



Outer Ring = 4.08 dBi

Max. Gain = 4.08 dBi

N4PC Corner-Fed:  $Z = 4060 + j1640$  Ohms

30 Meters: 10.1 MHz

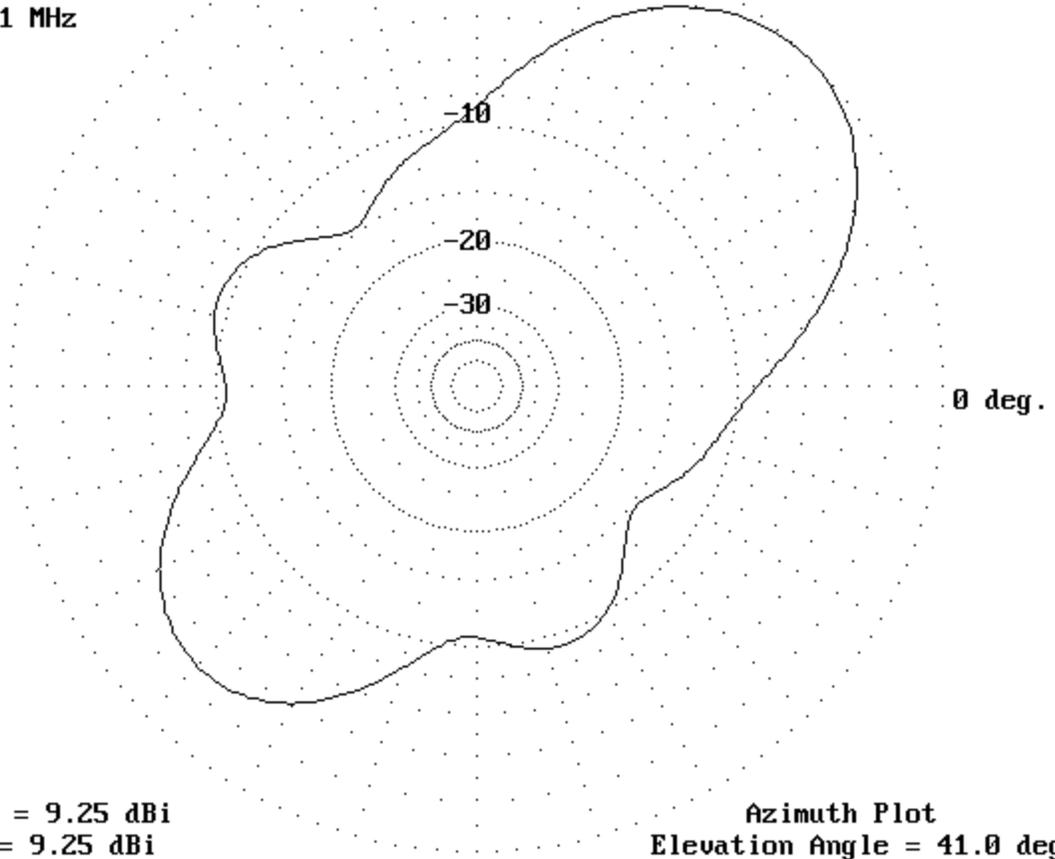
Corner-Fed Square: 70'/Side

0 dB

EZNEC/4 2.0

10-28-1997 16:50:35

Freq = 10.1 MHz



Outer Ring = 9.25 dBi

Max. Gain = 9.25 dBi

Corner-Fed: Z = 360 - j560 Ohms

Azimuth Plot

Elevation Angle = 41.0 deg.

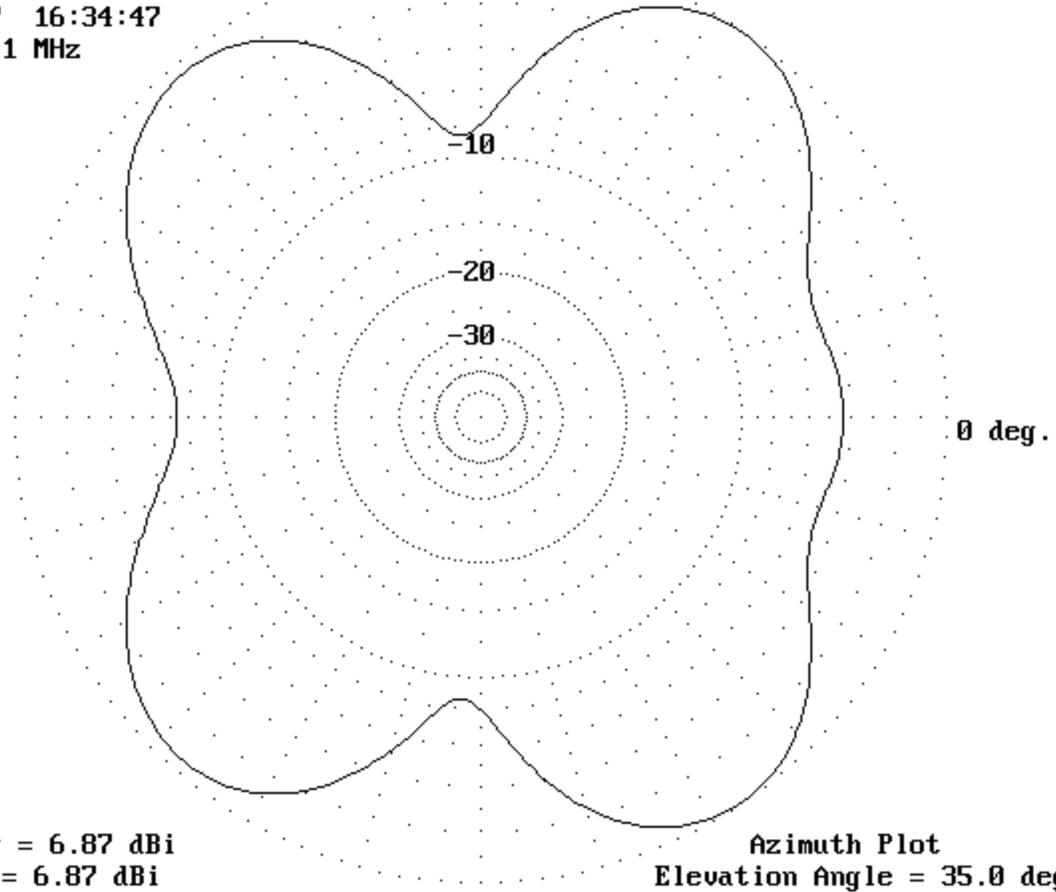
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:34:47

Freq = 10.1 MHz



Outer Ring = 6.87 dBi

Max. Gain = 6.87 dBi

Side-Fed: Z = 280 - j535 Ohms

Azimuth Plot

Elevation Angle = 35.0 deg.

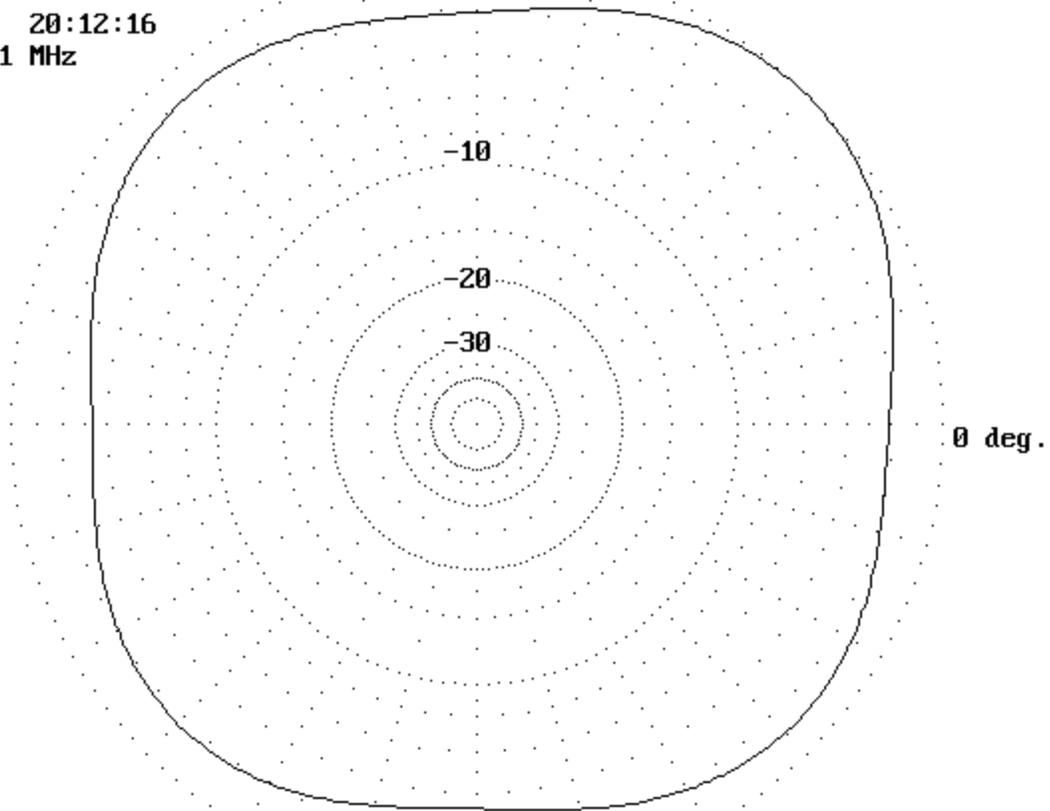
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:12:16

Freq = 10.1 MHz



Outer Ring = 5.92 dBi

Max. Gain = 5.92 dBi

N4PC Corner-Fed:  $Z = 105 + j25$  Ohms

Azimuth Plot

Elevation Angle = 42.0 deg.

20 Meters: 14.1 MHz

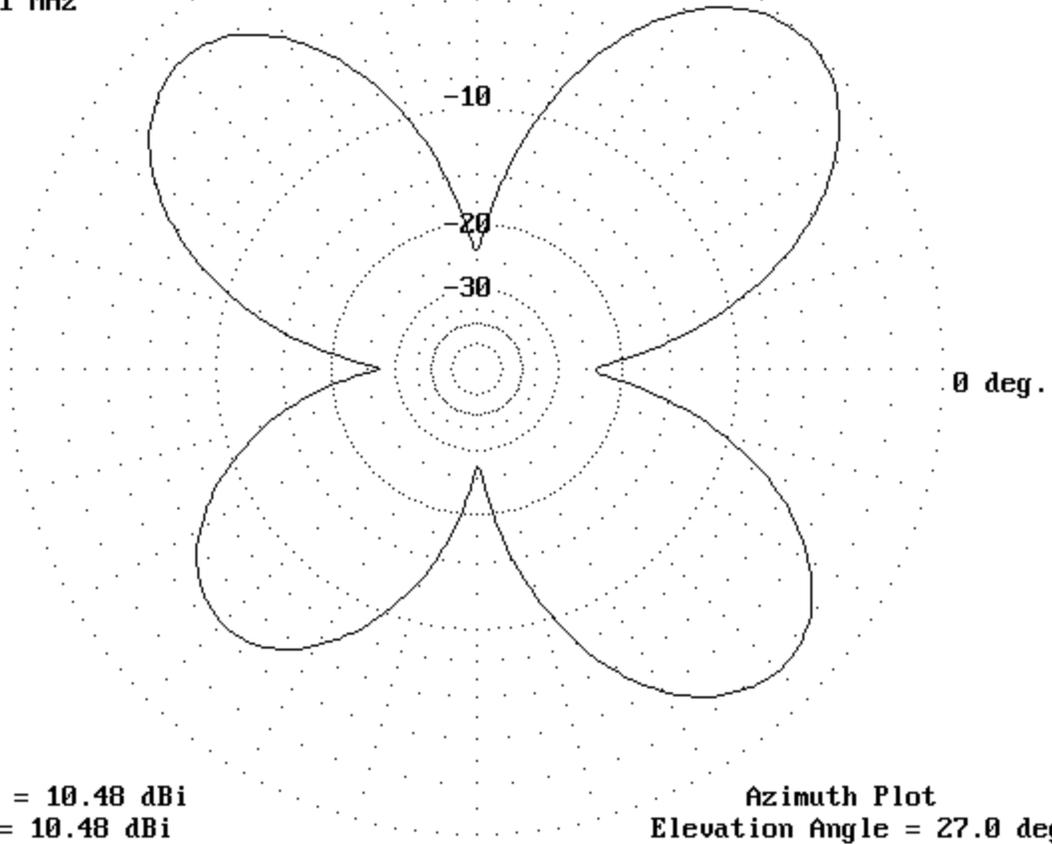
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:52:34

Freq = 14.1 MHz



Outer Ring = 10.48 dBi

Max. Gain = 10.48 dBi

Corner-Fed: Z = 285 - j120 Ohms

Azimuth Plot

Elevation Angle = 27.0 deg.

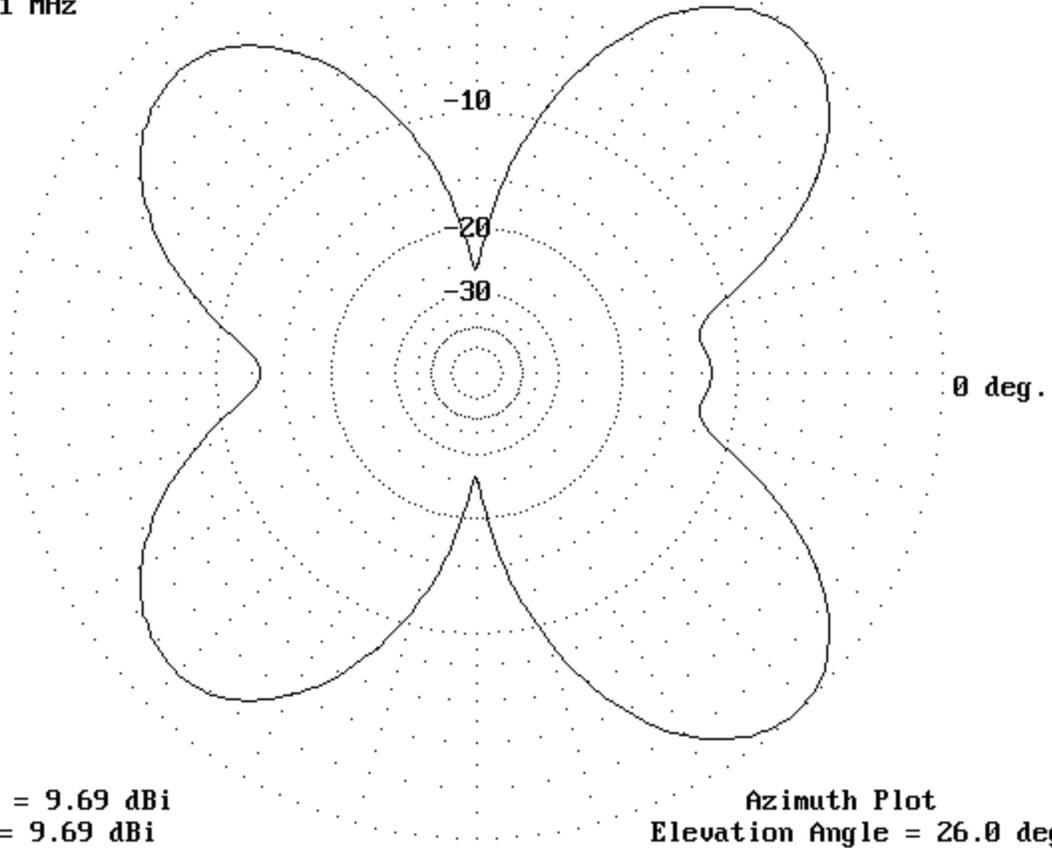
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:32:24

Freq = 14.1 MHz



Outer Ring = 9.69 dBi

Max. Gain = 9.69 dBi

Side-Fed: Z = 265 - j165 Ohms

Azimuth Plot

Elevation Angle = 26.0 deg.

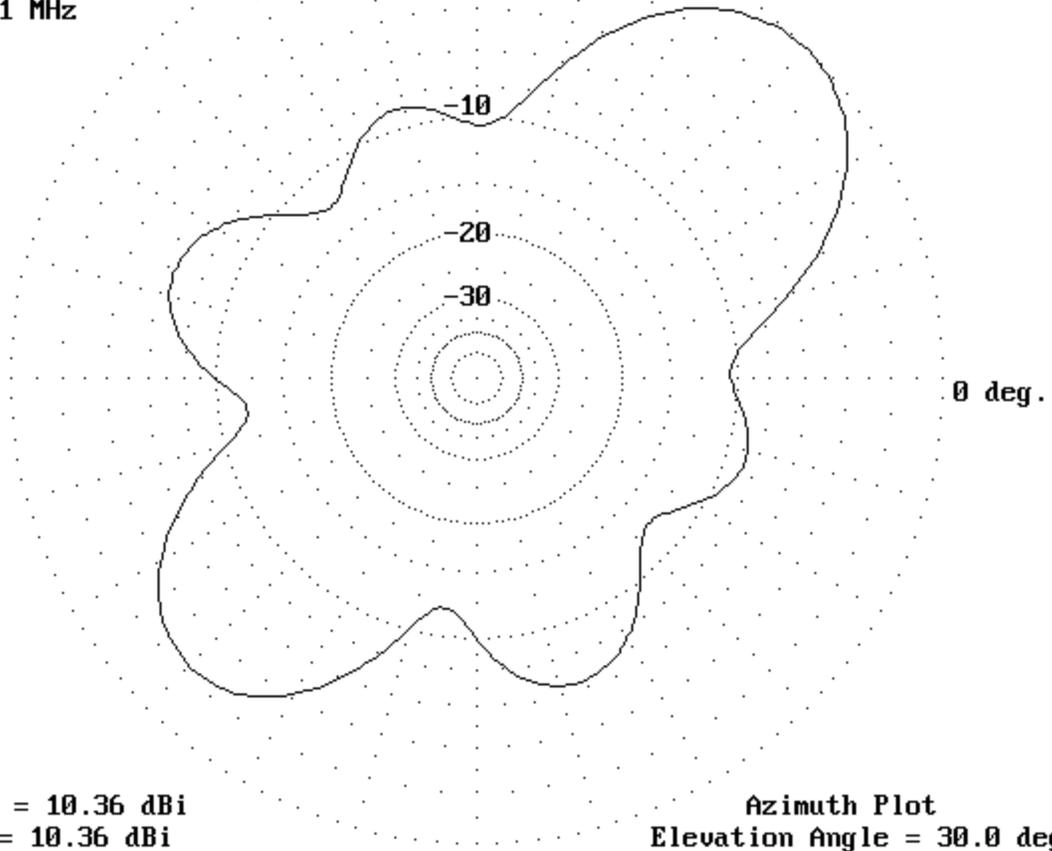
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:14:30

Freq = 14.1 MHz



Outer Ring = 10.36 dBi

Max. Gain = 10.36 dBi

N4PC Corner-Fed:  $Z = 270 - j570$  Ohms

Azimuth Plot

Elevation Angle = 30.0 deg.

17 Meters: 18.1 MHz

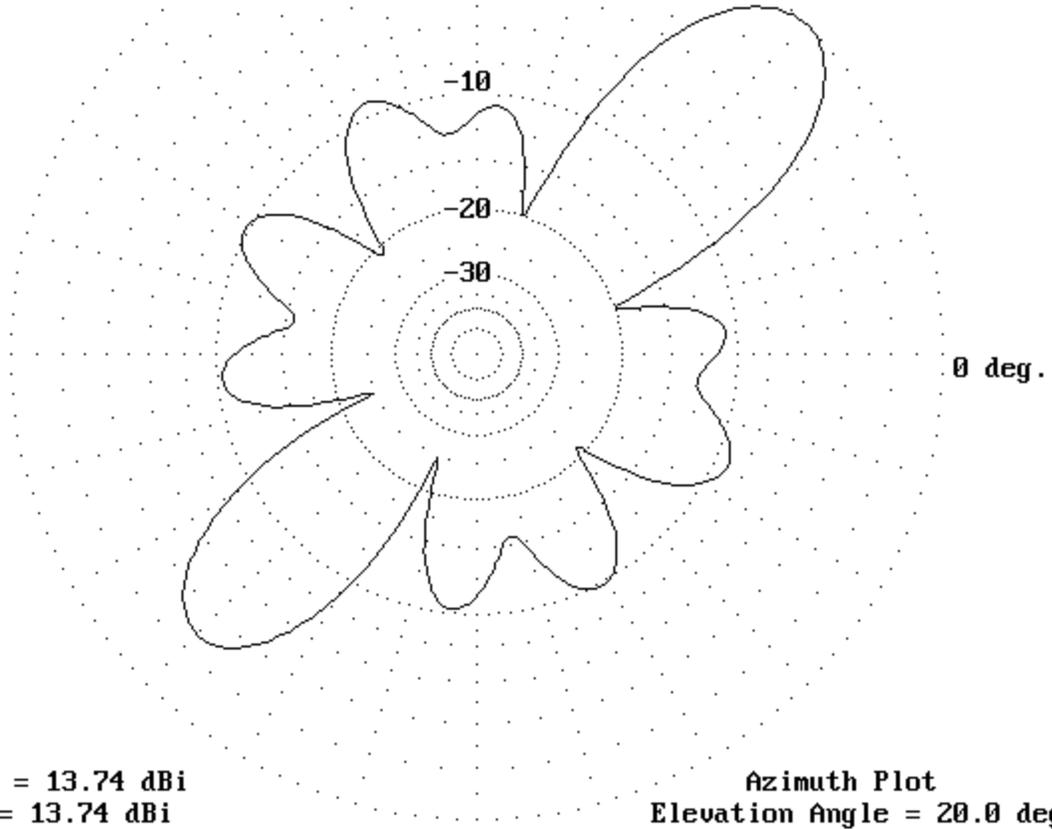
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:54:42

Freq = 18.1 MHz



Outer Ring = 13.74 dBi

Max. Gain = 13.74 dBi

Corner-Fed:  $Z = 370 + j205$  Ohms

Azimuth Plot

Elevation Angle = 20.0 deg.

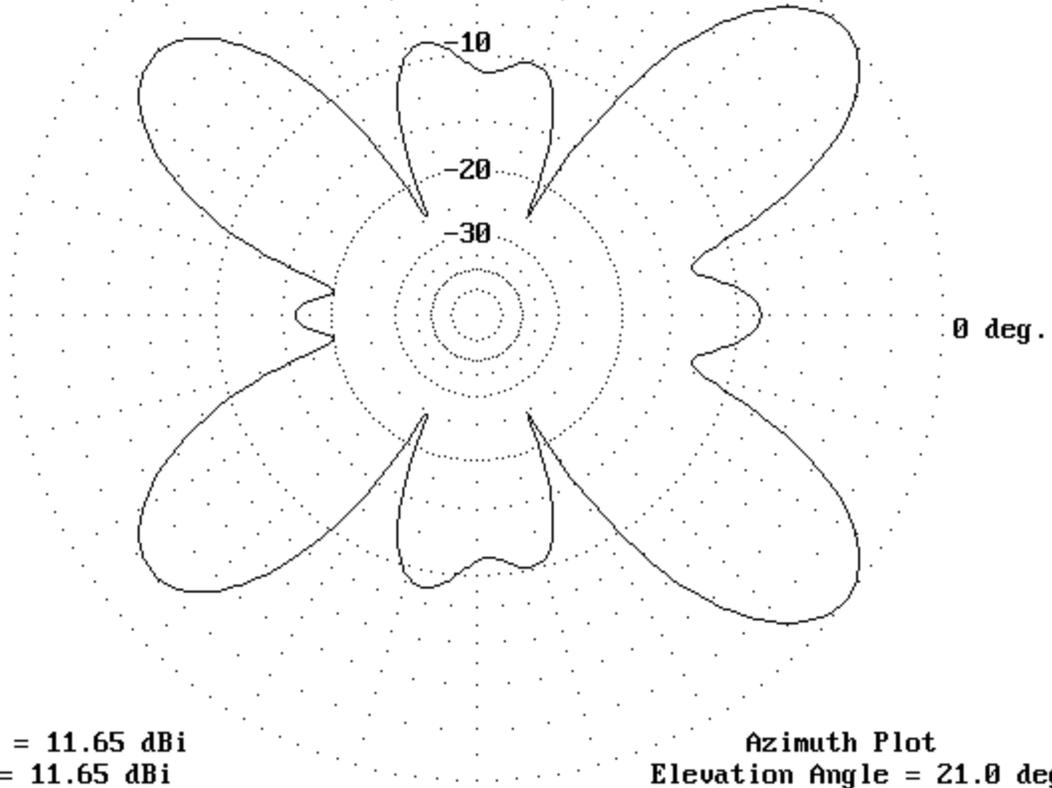
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:29:10

Freq = 18.1 MHz



Outer Ring = 11.65 dBi

Max. Gain = 11.65 dBi

Side-Fed:  $Z = 405 + j175$  Ohms

Azimuth Plot

Elevation Angle = 21.0 deg.

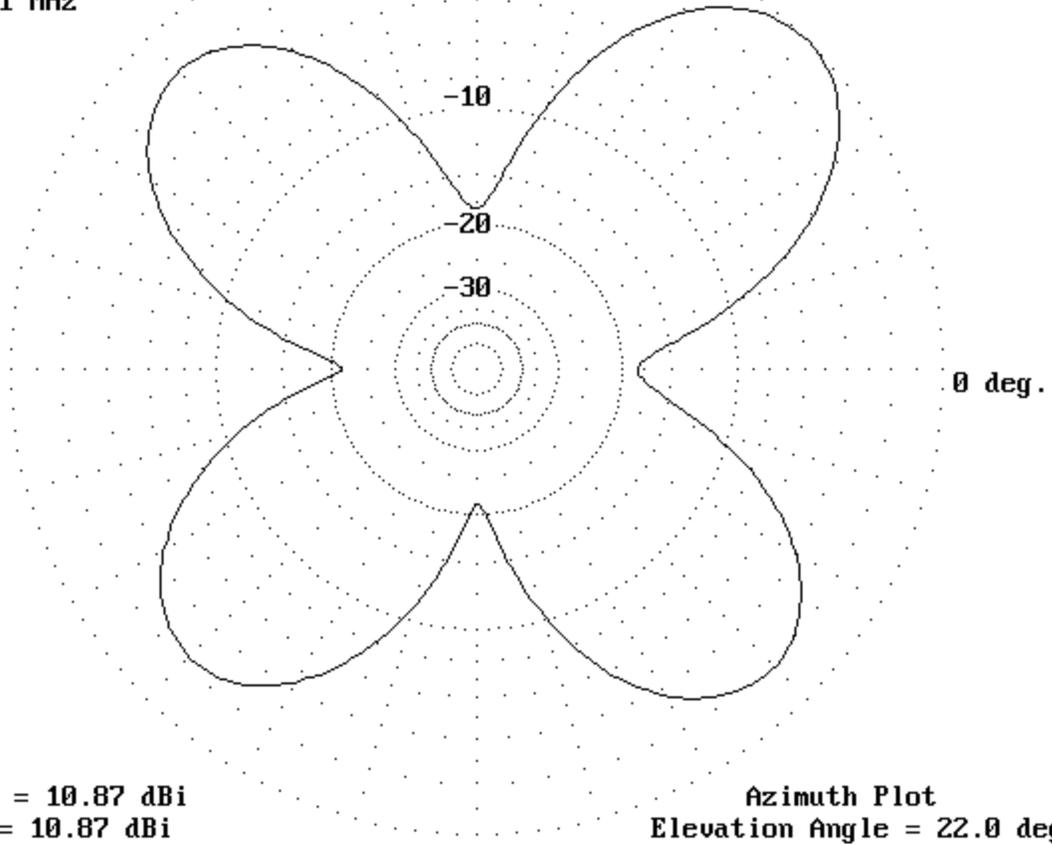
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:16:41

Freq = 18.1 MHz



Outer Ring = 10.87 dBi

Max. Gain = 10.87 dBi

N4PC Corner-Fed:  $Z = 780 - j1165$  Ohms

Azimuth Plot

Elevation Angle = 22.0 deg.

15 Meters: 21.1 MHz

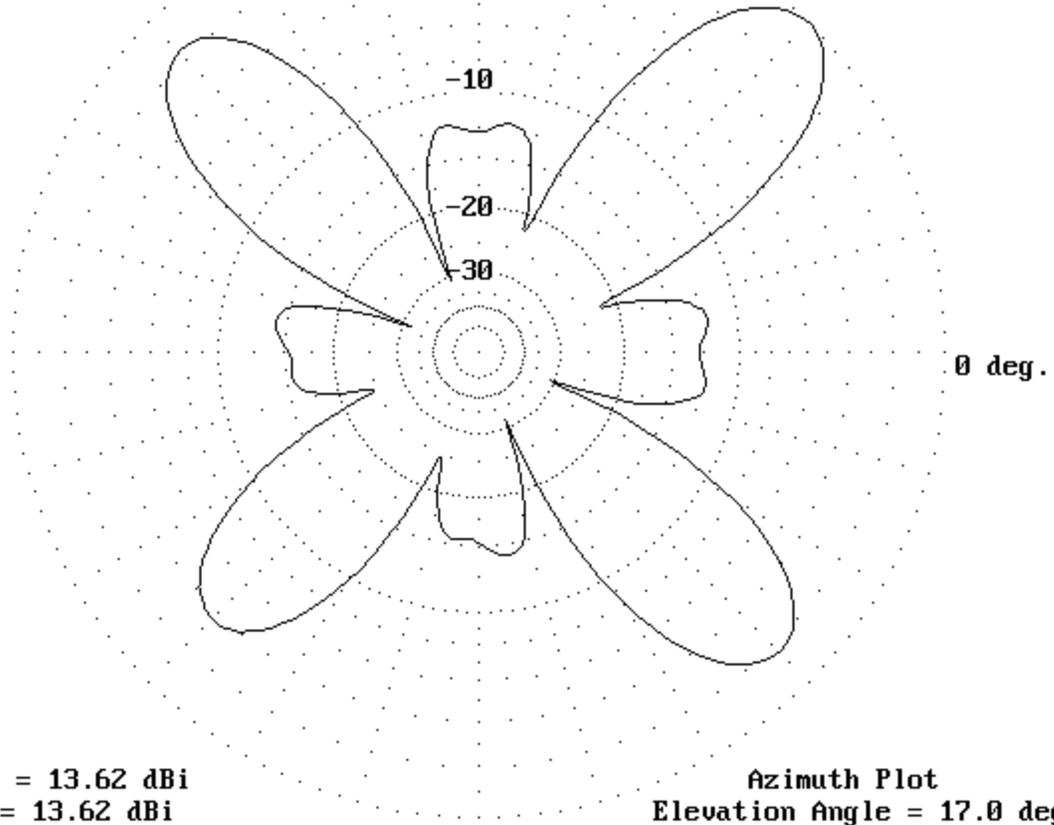
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:56:50

Freq = 21.1 MHz



Outer Ring = 13.62 dBi

Max. Gain = 13.62 dBi

Corner-Fed: Z = 240 - j105 Ohms

Azimuth Plot

Elevation Angle = 17.0 deg.

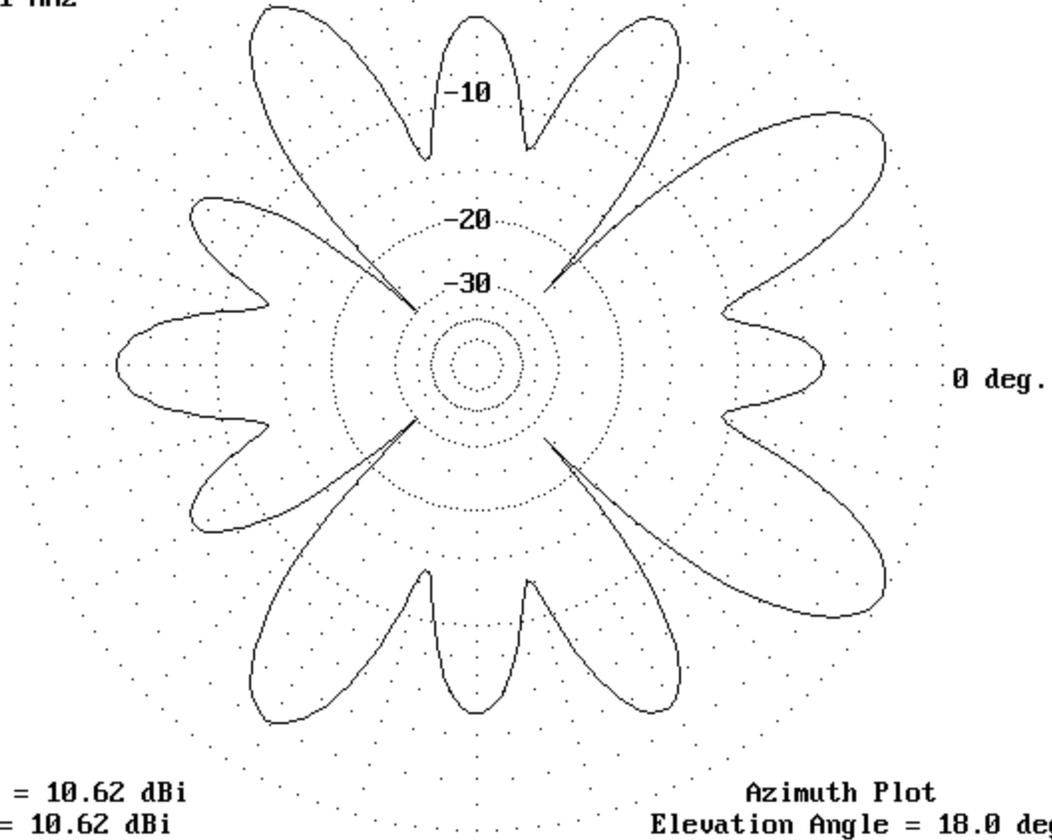
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:26:23

Freq = 21.1 MHz



Outer Ring = 10.62 dBi

Max. Gain = 10.62 dBi

Side-Fed: Z = 405 - j125 Ohms

Azimuth Plot

Elevation Angle = 18.0 deg.

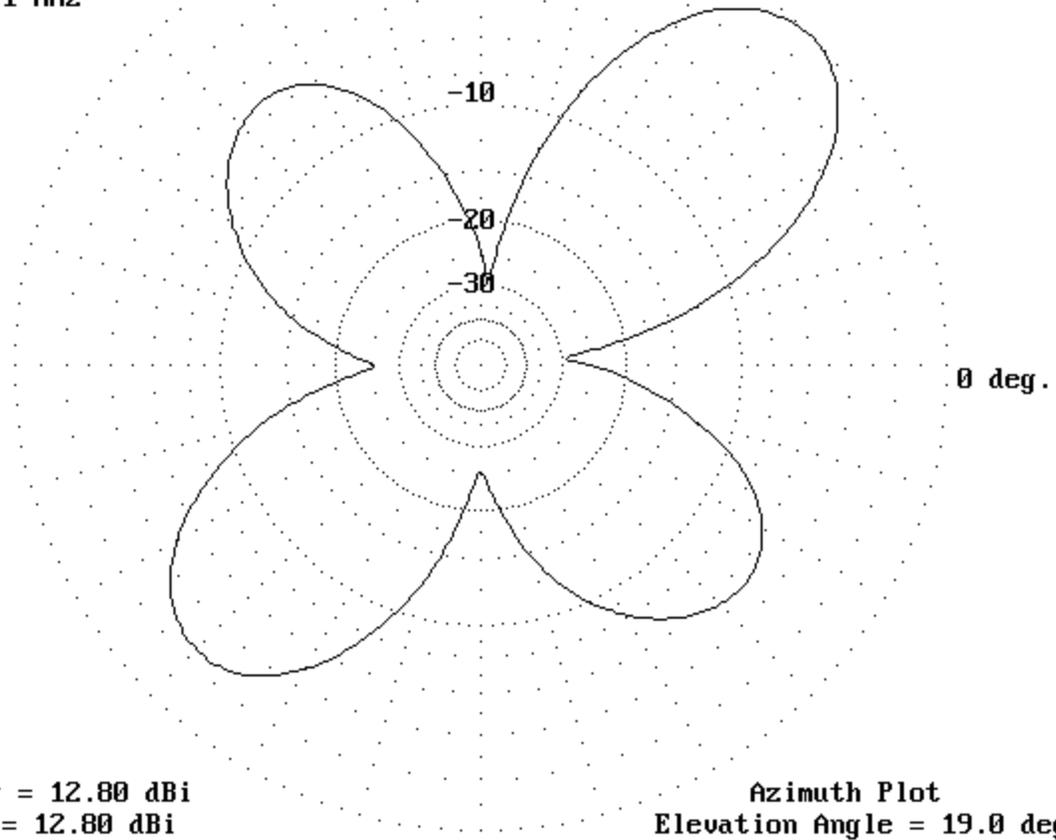
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:18:38

Freq = 21.1 MHz



Outer Ring = 12.80 dBi

Max. Gain = 12.80 dBi

N4PC Corner-Fed:  $Z = 575 + j810$  Ohms

Azimuth Plot

Elevation Angle = 19.0 deg.

12 Meters: 24.95 MHz

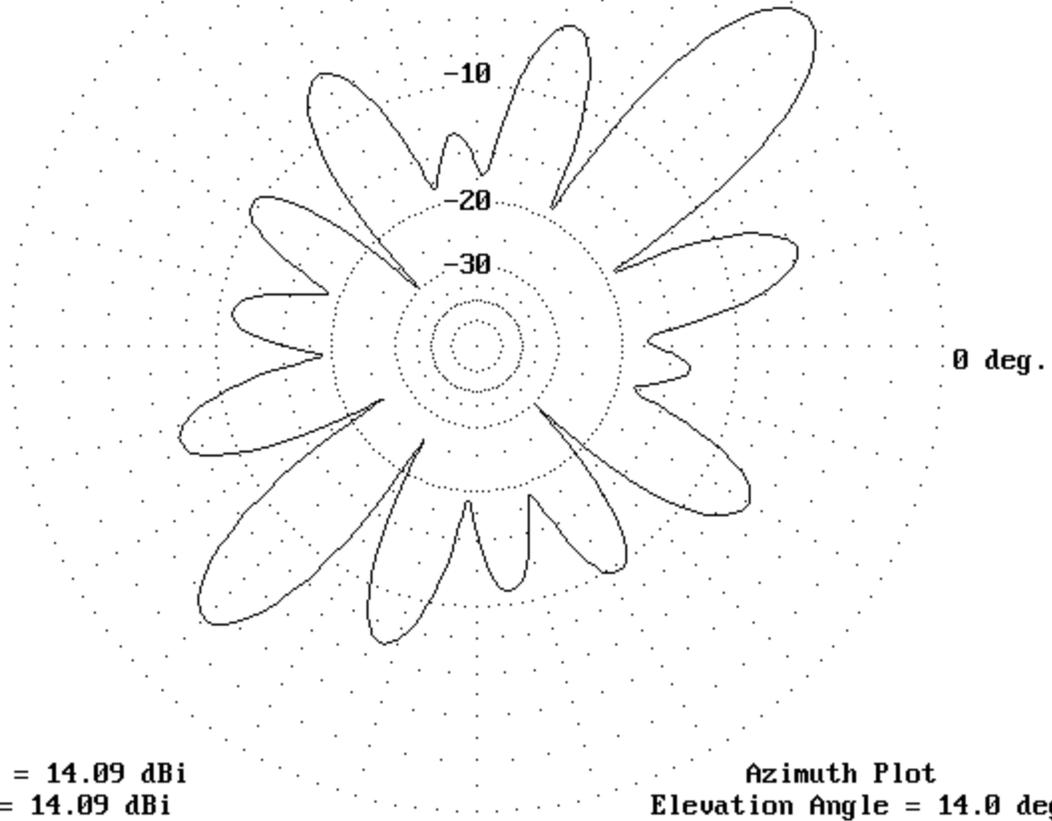
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:58:51

Freq = 24.95 MHz



Outer Ring = 14.09 dBi

Max. Gain = 14.09 dBi

Corner-Fed:  $Z = 325 + j100$  Ohms

Azimuth Plot

Elevation Angle = 14.0 deg.

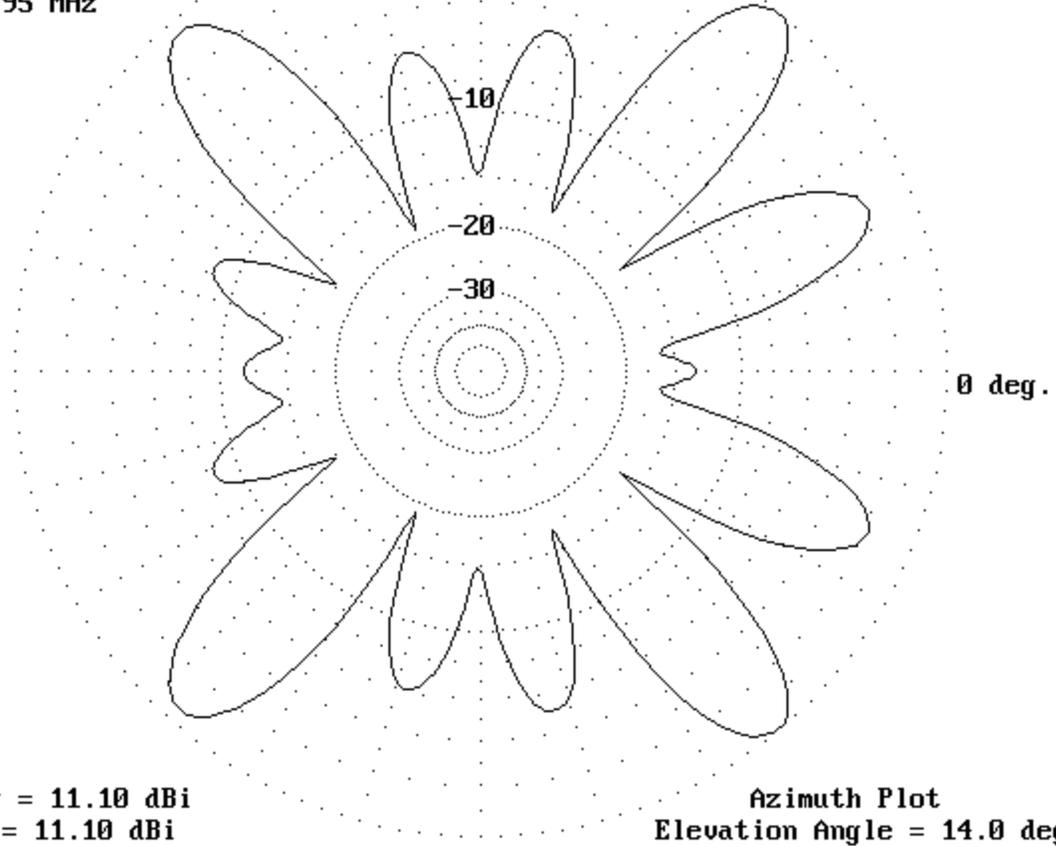
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:23:29

Freq = 24.95 MHz



Outer Ring = 11.10 dBi

Max. Gain = 11.10 dBi

Side-Fed:  $Z = 370 + j35$  Ohms

Azimuth Plot

Elevation Angle = 14.0 deg.

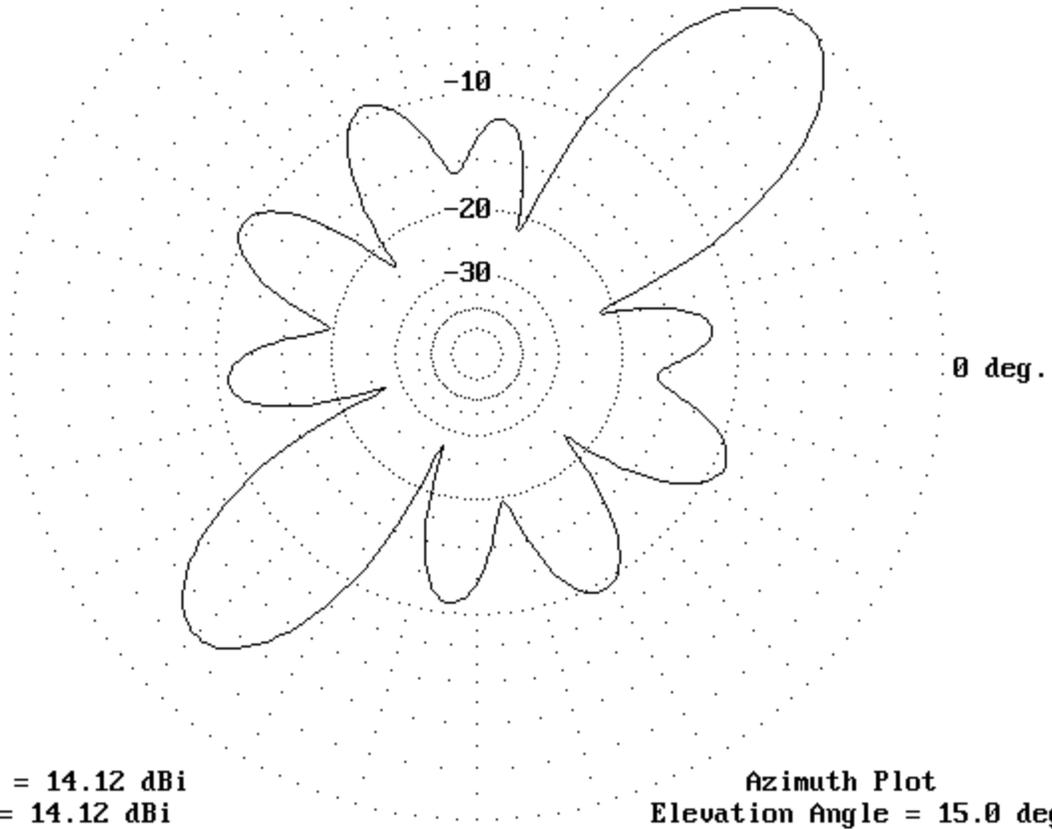
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:20:56

Freq = 24.95 MHz



Outer Ring = 14.12 dBi

Max. Gain = 14.12 dBi

N4PC Corner-Fed:  $Z = 345 + j180$  Ohms

Azimuth Plot

Elevation Angle = 15.0 deg.

10 Meters: 28.1 MHz

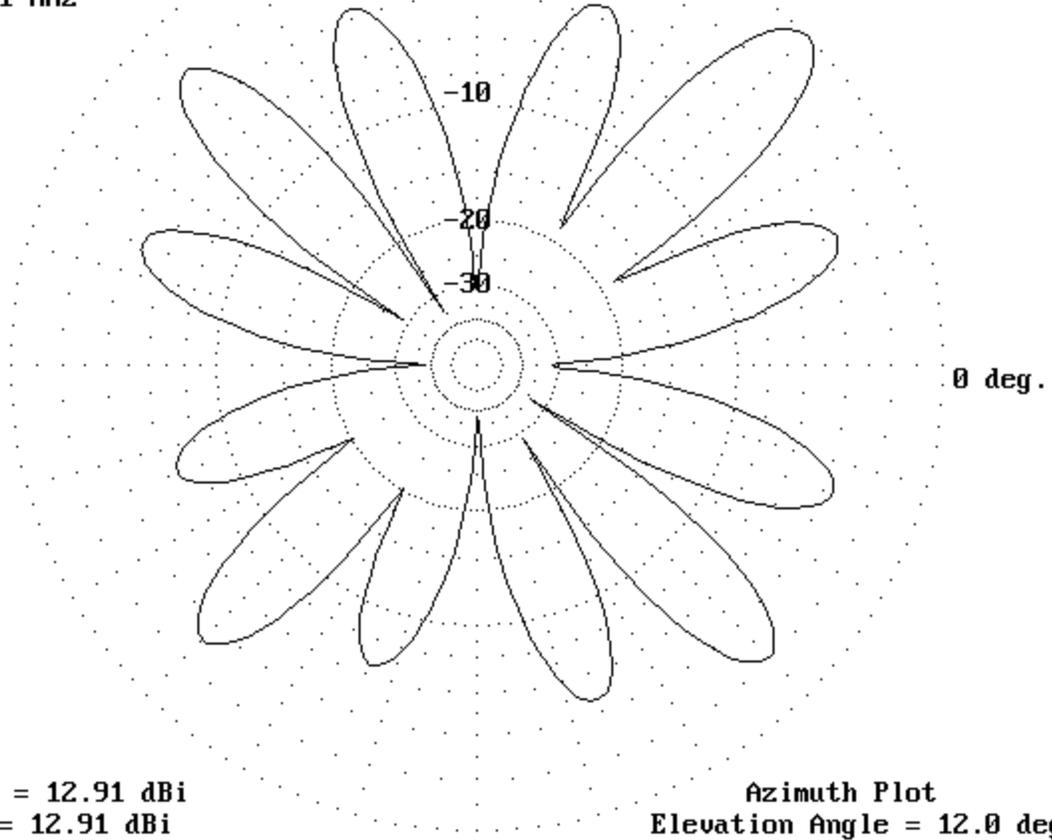
Corner-Fed Square: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 17:01:08

Freq = 28.1 MHz



Outer Ring = 12.91 dBi

Max. Gain = 12.91 dBi

Corner-Fed: Z = 215 - j145 Ohms

Azimuth Plot

Elevation Angle = 12.0 deg.

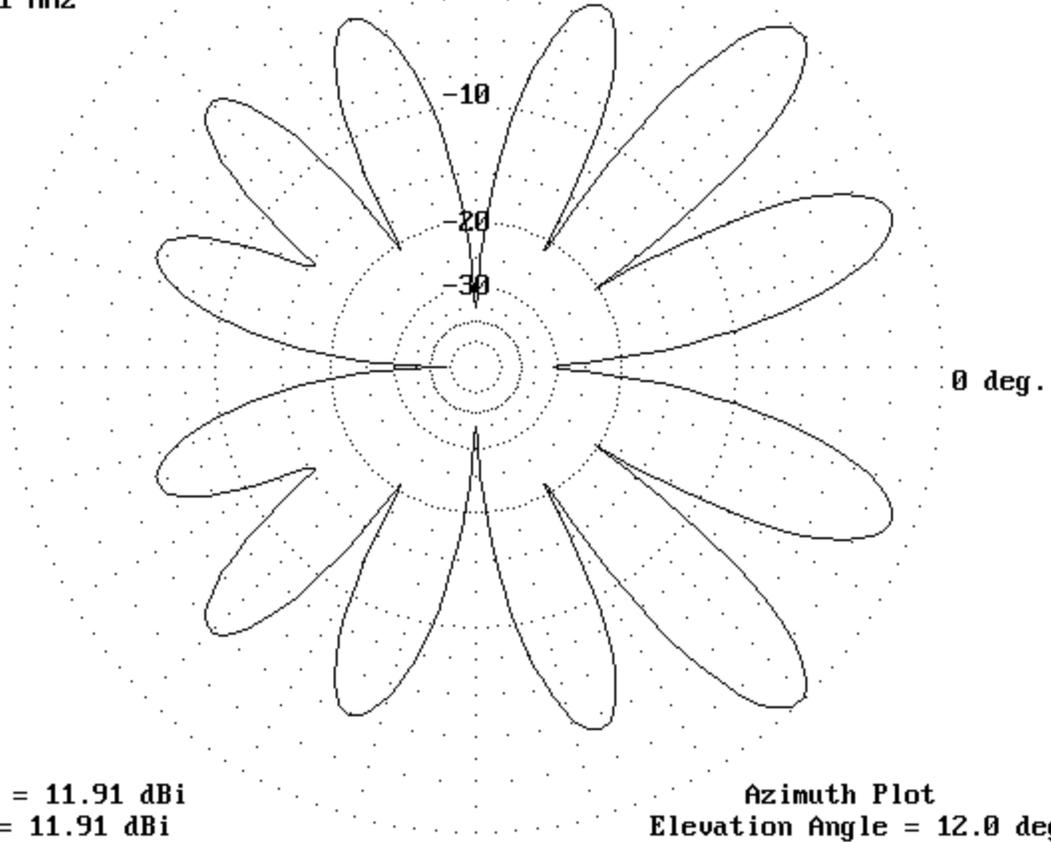
Side-Fed Square Loop: 70' / Side

0 dB

EZNEC/4 2.0

10-28-1997 16:18:43

Freq = 28.1 MHz



Outer Ring = 11.91 dBi

Max. Gain = 11.91 dBi

Side-Fed: Z = 245 - j180 Ohms

Azimuth Plot

Elevation Angle = 12.0 deg.

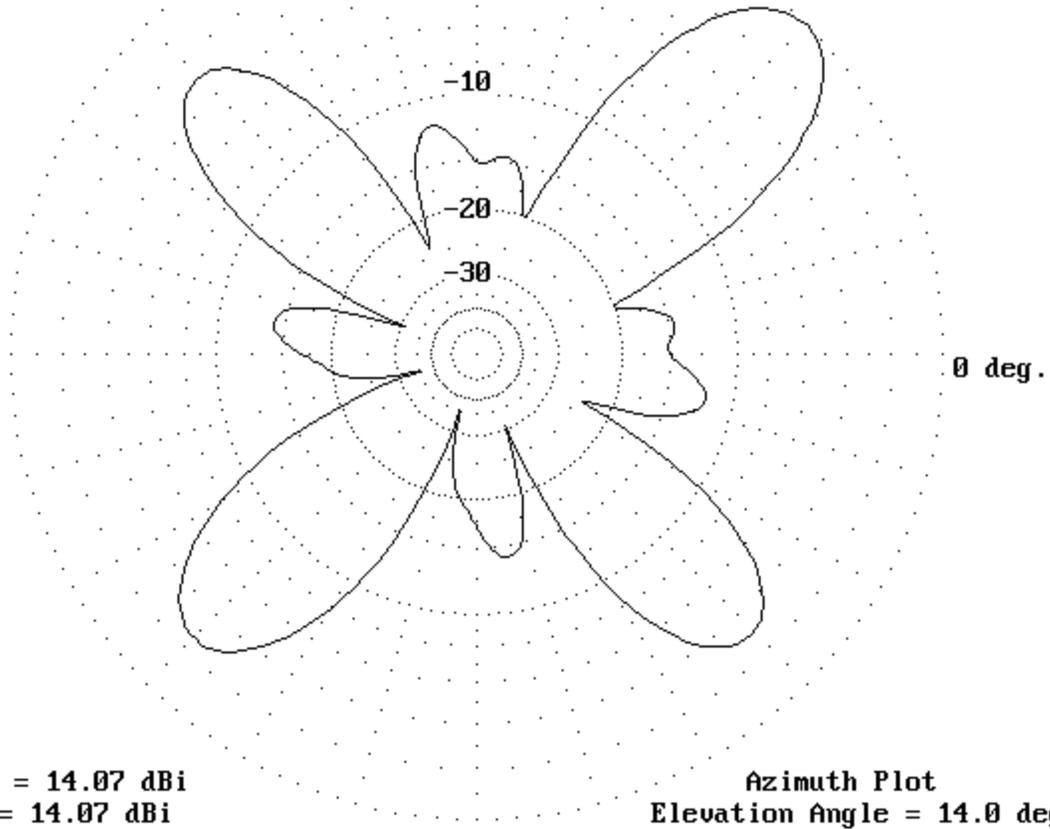
N4PC Loop (CQ, Dec. 1990)

0 dB

EZNEC/4 2.0

10-29-1997 20:22:56

Freq = 28.1 MHz



Outer Ring = 14.07 dBi

Max. Gain = 14.07 dBi

N4PC Corner-Fed: Z = 450 - j725 Ohms

Azimuth Plot

Elevation Angle = 14.0 deg.

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