All-Band Dipoles: 135'-102'-67'

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EDITORS NOTE: *LB mentions the many patterns printed for the antennas done in this article. In the interest of space, I must leave most of them out. While the patterns do change with each different antenna, the patterns included have one thing in common with all the others; They support the conclusion that LB reaches.* ***Ron, KU7Y***

Simple dipoles fed by parallel lines to an ATU make excellent inexpensive all-band antennas. However, they do require some planning that many of us overlook. As we move upward in frequency, the classic figure-8 pattern gives way to a many-lobe pattern typical of antennas longer than a wavelength. The result is major lobes in angular directions relative to the face of the dipole. Equally important are the nulls.

As a guide to planning an all-band dipole, the following pages show the elevation and azimuth patterns for three common types of all-band dipoles: a 135' model (about the length of an 80-meter dipole), a 102' model (the antenna part of a G5RV), and a 67' model (about the length of a 40-meter dipole). Since antenna patterns are a function of the antenna length in wavelengths, the pattern of lobes and nulls changes as we change the length of the antenna.

Each pair of pages contains 8 pattern pairs, one set for each HF band from 80 to 10 meters, for one of the three basic antennas. Each pattern pair includes an elevation and an azimuth pattern for antenna heights of 35 and 70 feet. You can interpolate gains and other factors for intermediate heights by splitting the difference in each case.

Elevation patterns for each band are taken along the lobe of maximum strength. Generally, the lobes for the same antenna at different heights closely coincide, but not in all cases. The pattern with the lowest major lobe is for the 70' antenna. Use the elevation pattern to compare maximum antenna gain between the two heights.

The azimuth patterns for both the 35' antenna and the 70' antenna are taken at the angle of maximum radiation of the 70' high antenna. For all azimuth plots, picture the antenna itself as running from left to right across the center of the pattern. Each azimuth pattern pair gives a picture of the comparative likely dx performance between the two heights. The outside or "stronger" pattern is for the antenna at 70' up. The gain of the lower antenna reaches maximum at a somewhat higher angle which you can extrapolate from the elevation patterns.

The exception to the above convention for azimuth plots is the 80-meter pattern. Even at 70' up, an 80-meter antenna is so low that its angle of maximum radiation is very high. Therefore, azimuth patterns were taken at an arbitrary 45 degrees.

What, in general, do the patterns tell us? First, the general rule that higher is better (within limits of construction and maintenance abilities) is clearly revealed. On all bands and for all antennas, the 70' antenna height yields a lower angle of maximum radiation (sometimes called the "take-off" angle). Although it is possible to place an antenna too high and miss the skip angle to a dx location, in this height range we want the antenna as high as we can get it. The result is more power radiated at angles that generally fall into the dx skip zones.

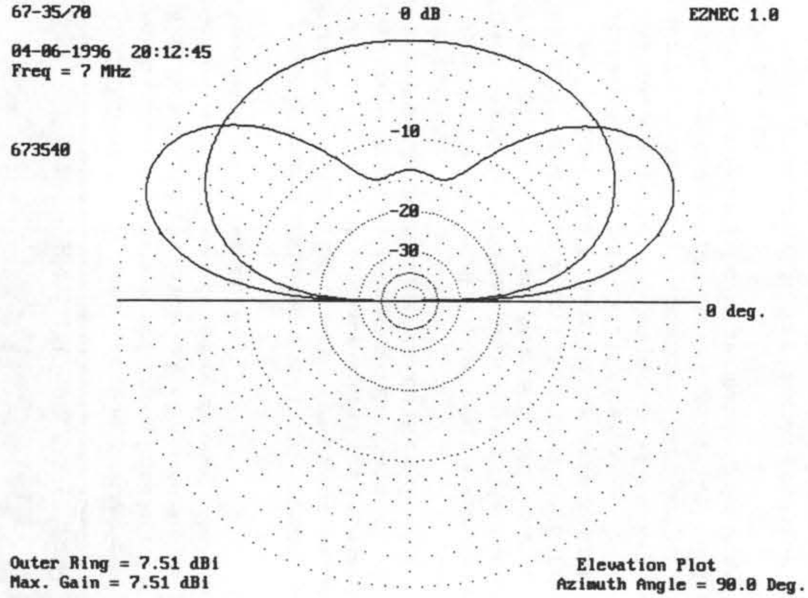
Note that the angles decrease as the frequency increases. This fact reflects both the operating habits of most hams (lower bands for domestic QSOs, upper bands for dx) and typical skip angles (which also tend to decrease as frequency increases).

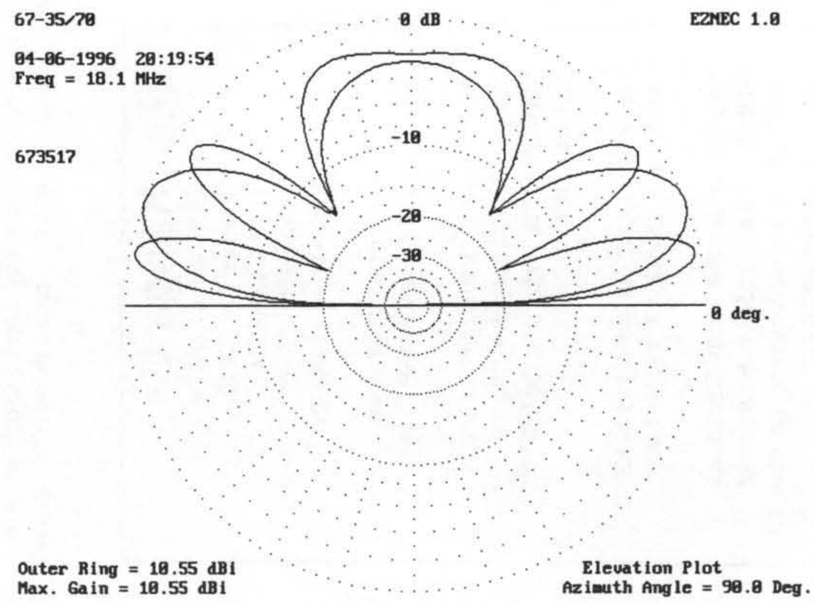
Second, note that as the antenna becomes longer than a full wavelength at a particular frequency, the pattern begins to split into multiple lobes. The lowest band at which split lobes occur, of course, differs for each of the three antenna lengths. Above 1½ wavelengths, the number of lobes is no longer a simple function of antenna length, especially for the nonharmonic WARC bands (17 and 12 meters).

The general trend is that the maximum power lobe moves from perpendicular to the antenna wire toward the end of the wire. For the longest antenna model (135'), on 10 meters, the maximum power lobe has moved 53 degrees toward the end of what is essentially a 4-wavelength-long antenna.

Do not focus solely on the maximum power lobe, since many other lobes are only slightly less strong. Rather, plan the antenna to place one of the stronger lobes at each of your communications targets on your favorite band(s).

You may wish to photocopy the pattern pages and add them to your ready-reference book. **LB**


67-35/70
0 dB
EZNEC 1.0
04-06-1996 20:12:45
Freq = 7 MHz
673540
-10
-20
-30
0 deg.
Outer Ring = 7.51 dBi
Max. Gain = 7.51 dBi
Elevation Plot
Azimuth Angle = 90.0 Deg.


67-35/70
0 dB
EZNEC 1.0
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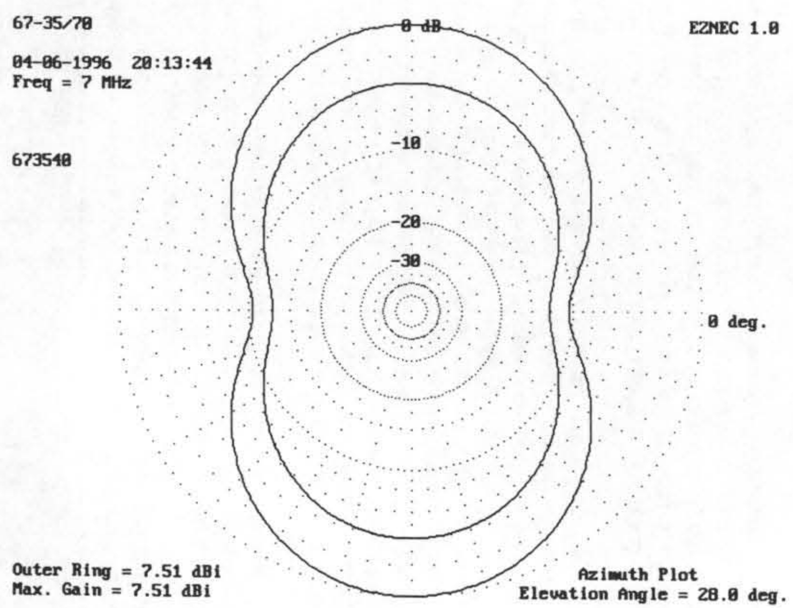
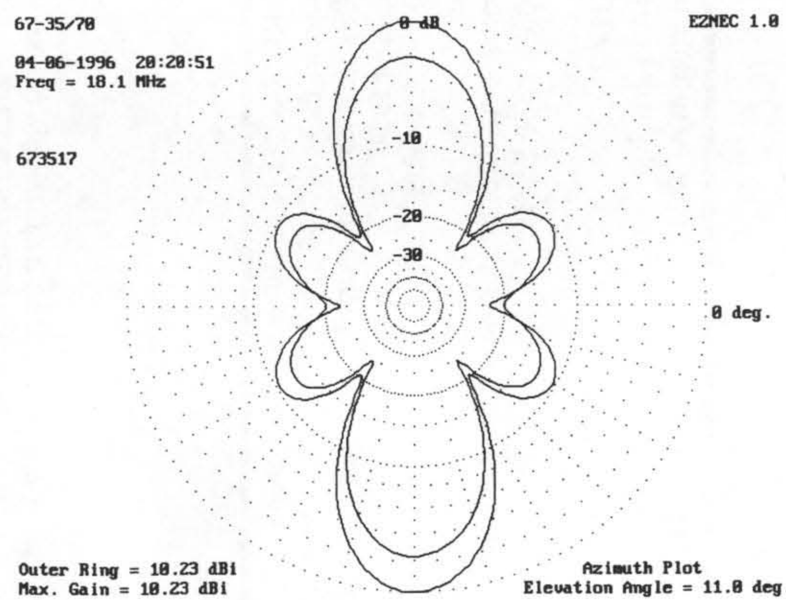
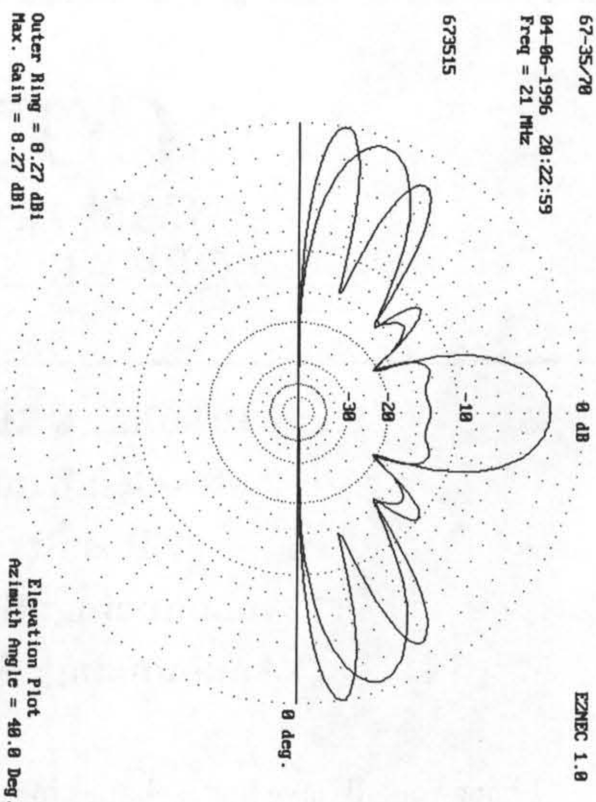
Freq = 18.1 MHz
673517
-10
-20
-30
0 deg.
Outer Ring = 10.55 dBi
Max. Gain = 10.55 dBi
Elevation Plot
Azimuth Angle = 90.0 Deg.


67-35/70
0 dB
EZNEC 1.0
04-06-1996 20:13:44
Freq = 7 MHz
673540
-10
-20
-30
0 deg.
Outer Ring = 7.51 dBi
Max. Gain = 7.51 dBi
Azimuth Plot
Elevation Angle = 20.0 deg.


67-35/70
0 dB
EZNEC 1.0
04-06-1996 20:20:51
Freq = 18.1 MHz
673517
-10
-20
-30
0 deg.
Outer Ring = 10.23 dBi
Max. Gain = 10.23 dBi
Azimuth Plot
Elevation Angle = 11.0 deg.


67-35/70
04-06-1996 20:22:59
Freq = 21 MHz
673515
Outer Ring = 8.27 dBi
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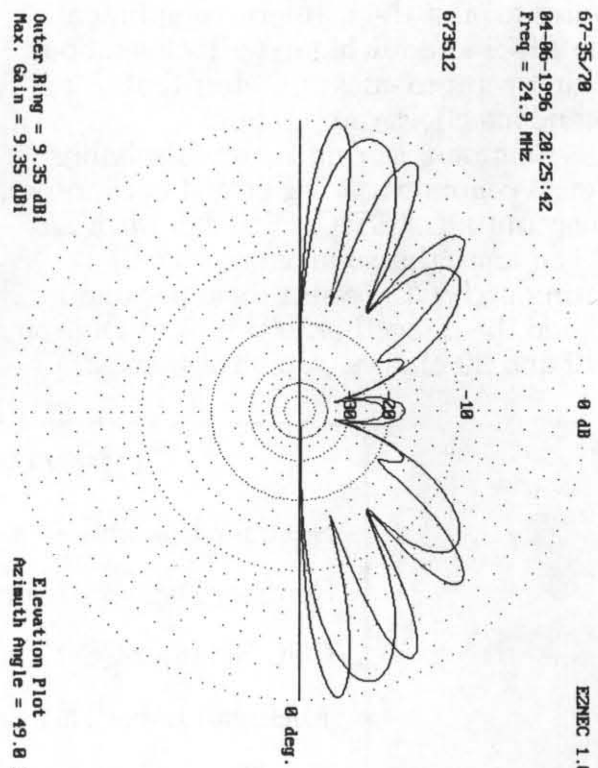
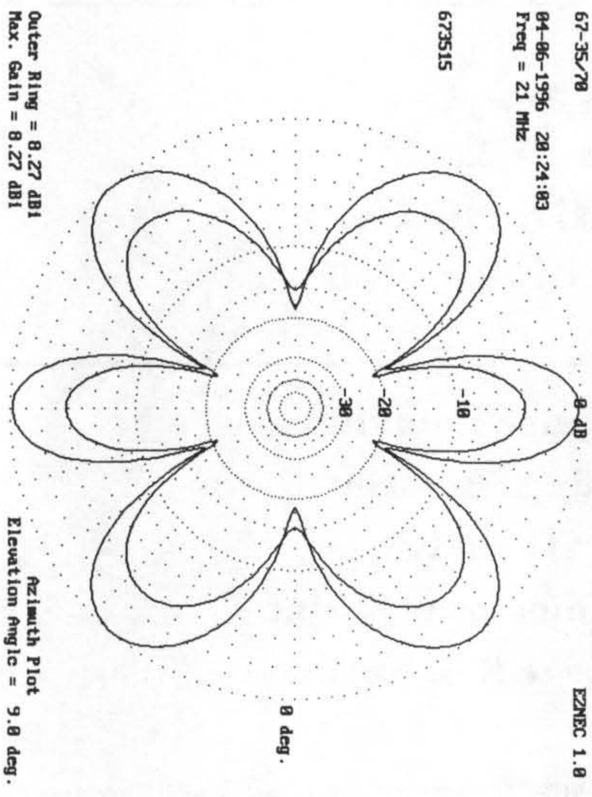
0 dB
-10
-20
-30
0 deg.
Elevation Plot
Azimuth Angle = 40.0 Deg.
EZNEC 1.0


67-35/70
04-06-1996 20:25:42
Freq = 24.9 MHz
673512
Outer Ring = 9.35 dBi
Max. Gain = 9.35 dBi
0 dB
-10
-20
-30
0 deg.
Elevation Plot
Azimuth Angle = 49.0 Deg.
EZNEC 1.0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673515
Outer Ring = 8.27 dBi
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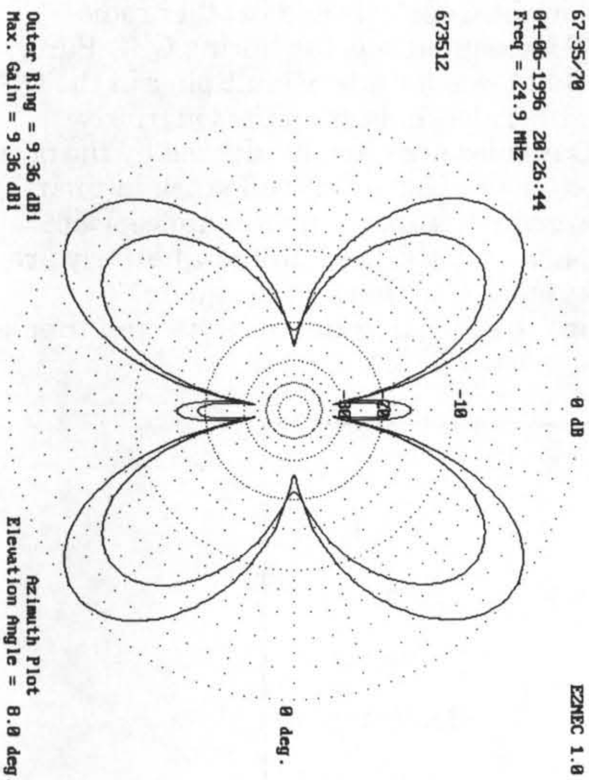
0 dB
-10
-20
-30
0 deg.
Azimuth Plot
Elevation Angle = 9.0 deg.
EZNEC 1.0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673512
Outer Ring = 9.36 dBi
Max. Gain = 9.36 dBi
0 dB
-10
-20
-30
0 deg.
Azimuth Plot
Elevation Angle = 8.0 deg.
EZNEC 1.0