Antennas for Emergency Communications

Emergency Antennas

- VHF / UHF - FM
- HF – Voice, CW, or Digital

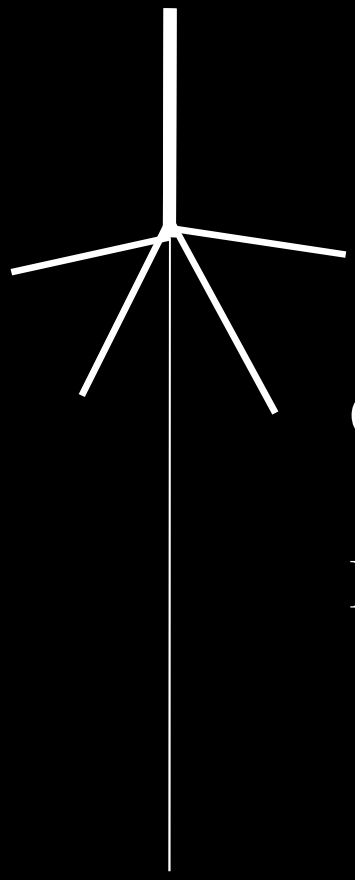
Antennas for VHF

- Quarter Wave Vertical
- Half Wave Vertical
- Vertical Dipole
- J-Pole

Design Parameters

- Primarily line of sight
- Mounted on trunk or top on vehicle
- Mounted on vertical pipe – metal or plastic
- Mounted in vertical polarization

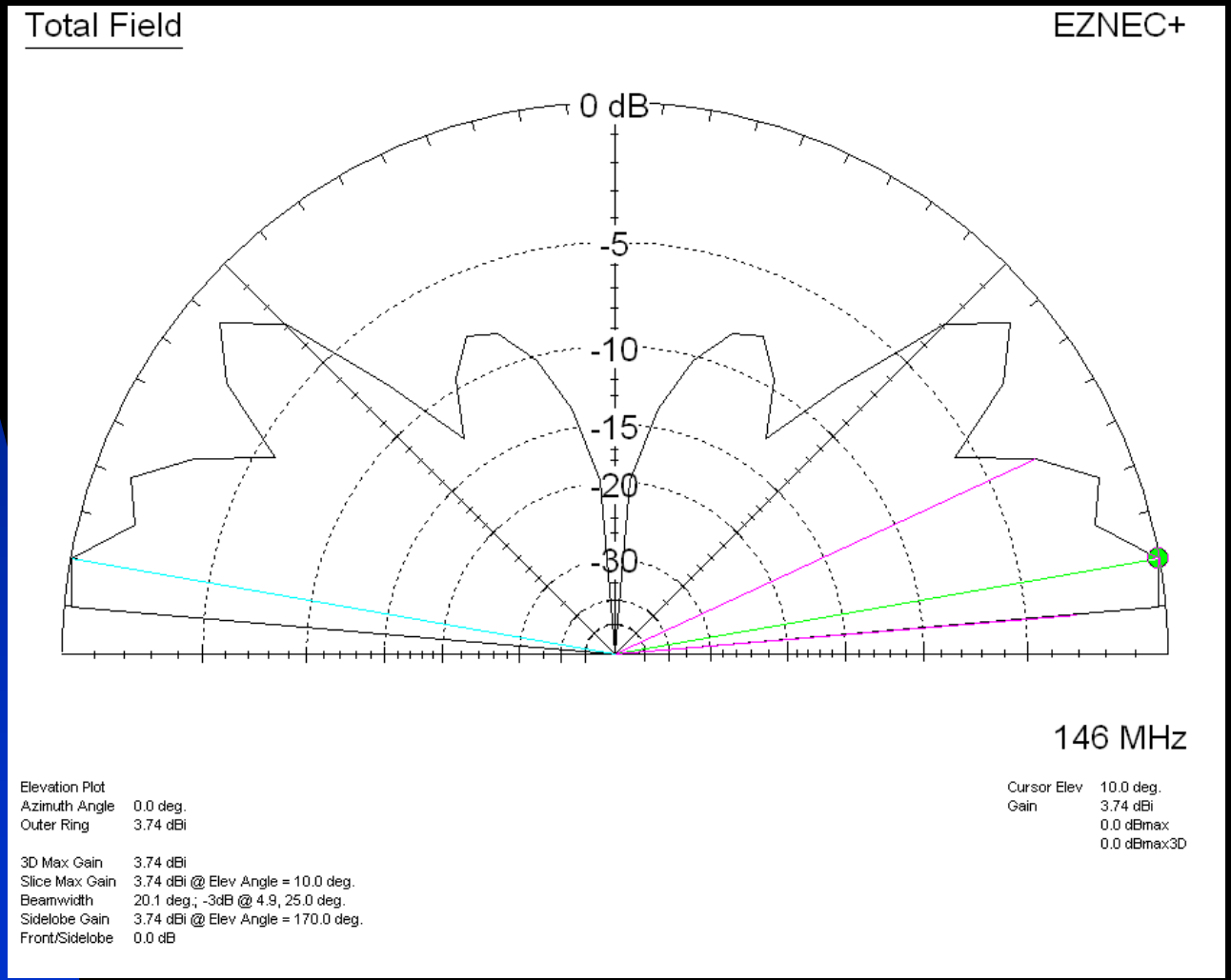
The Quarter Wave Vertical



Quarter Wave Vertical: 19”-20”

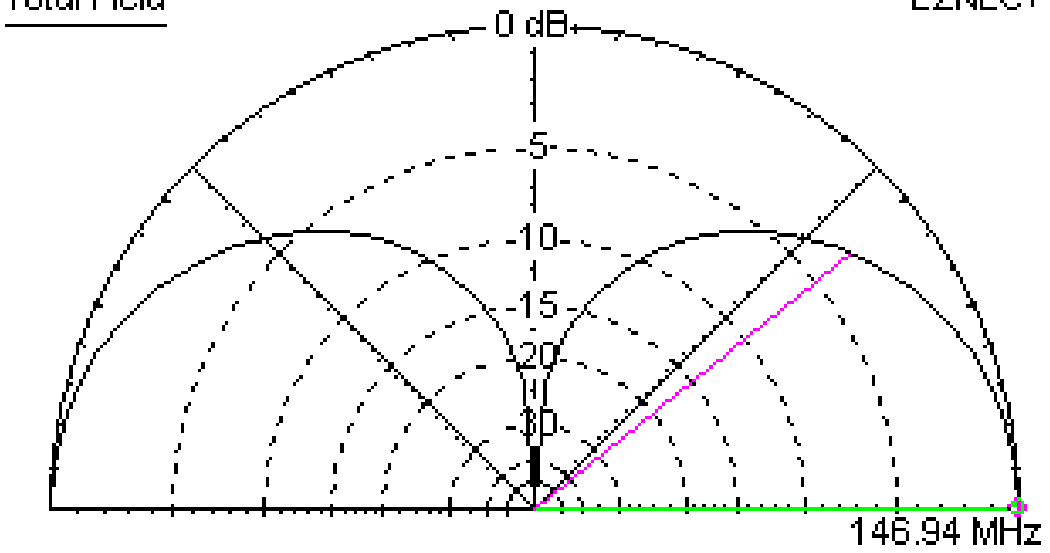
Radials: 45º `105% of vertical length

Quarter Wave Vertical



Quarter Wave Vertical

On Roof of Vehicle

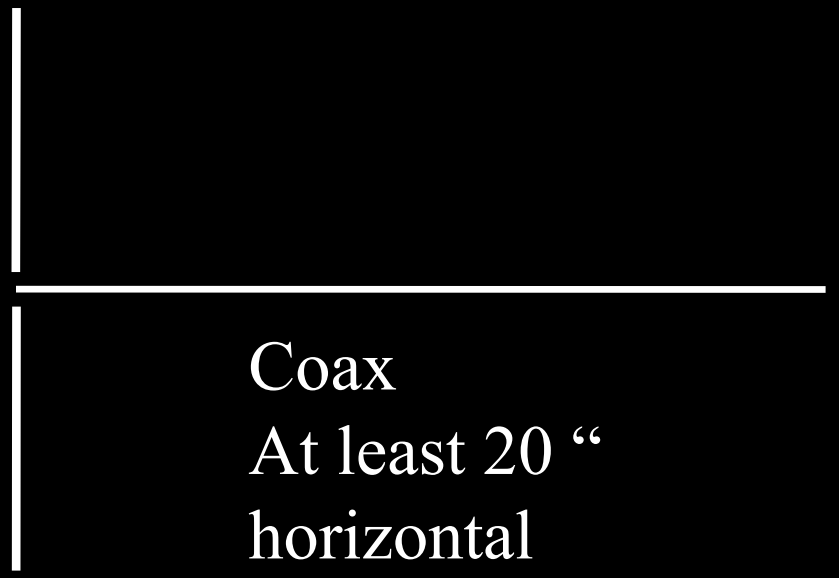


Elevation Plot		Cursor Elev	0.0 deg.
Azimuth Angle	0.0 deg.	Gain	5.14 dBi
Outer Ring	5.14 dBi		0.0 dBmax
			0.0 dBmax3D

3D Max Gain	5.14 dBi
Slice Max Gain	5.14 dBi @ Elev Angle = 0.0 deg.
Beamwidth	?; -3dB @ 38.9 deg.
Sidelobe Gain	< -100 dBi
Front/Sidelobe	> 100 dB

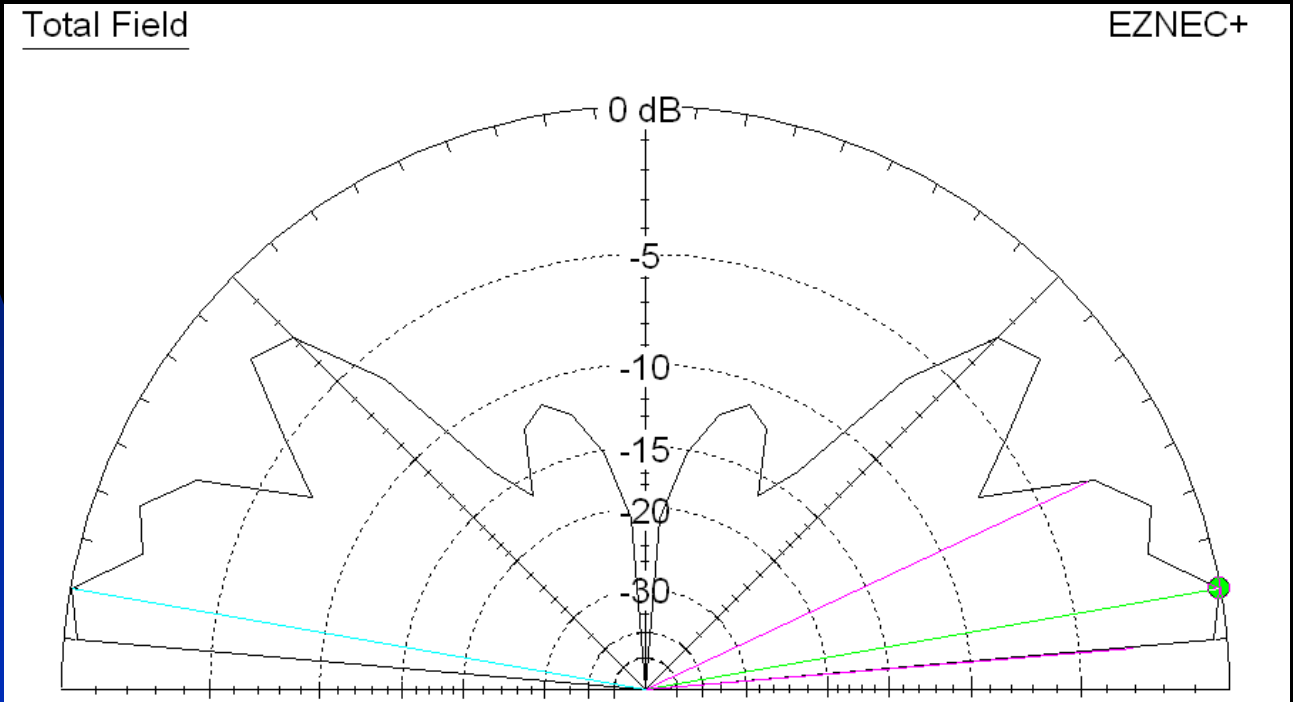
Vertical Dipole

Elements: 19.5” each

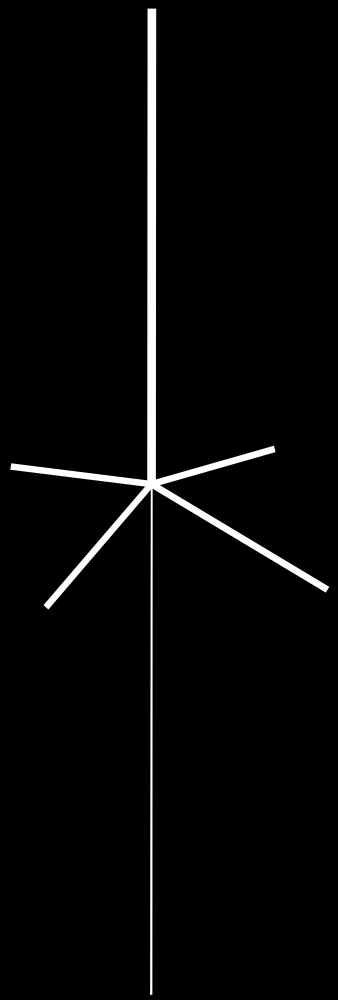


Coax
At least 20 “ horizontal

Vertical Dipole



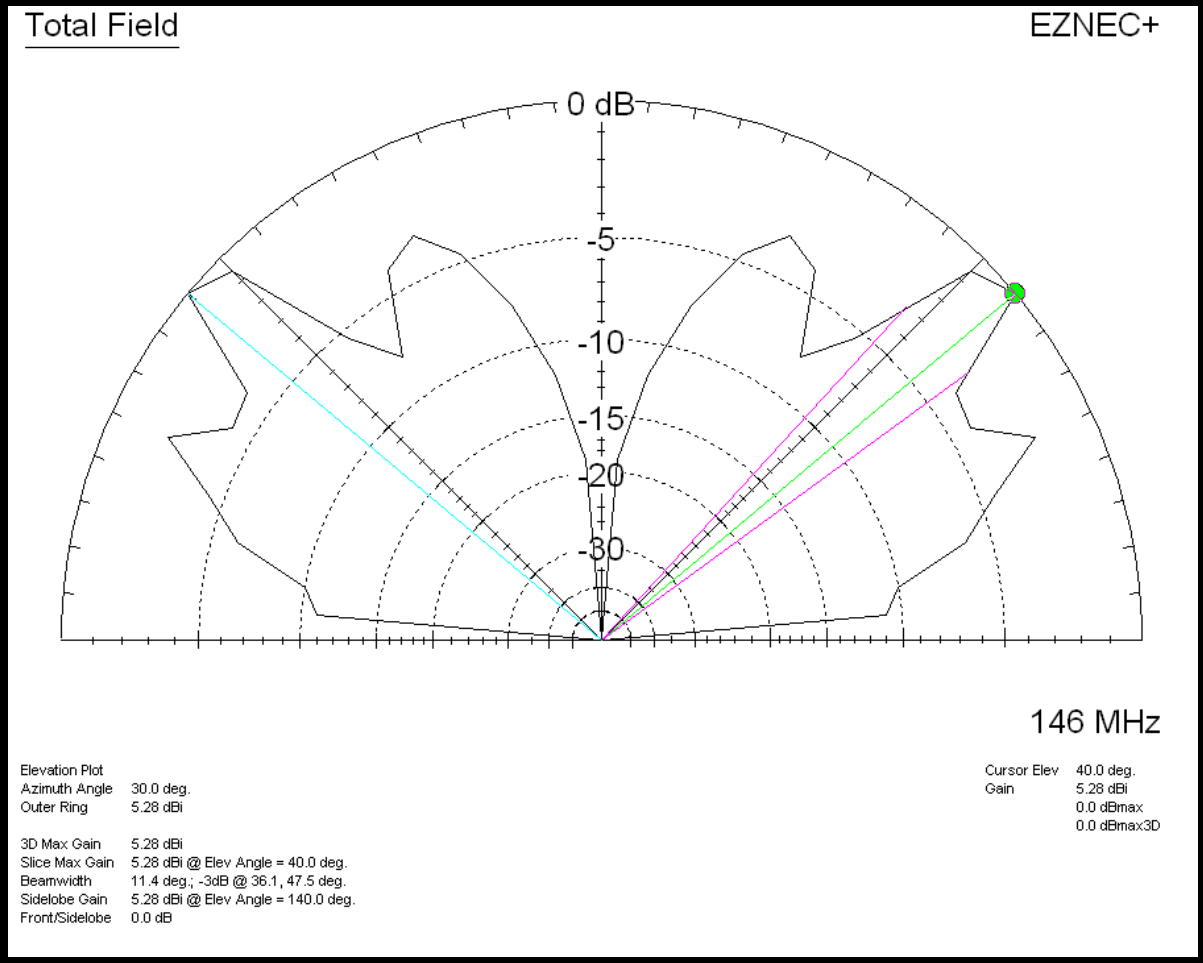
5/8 Wave Vertical



Element: 48”

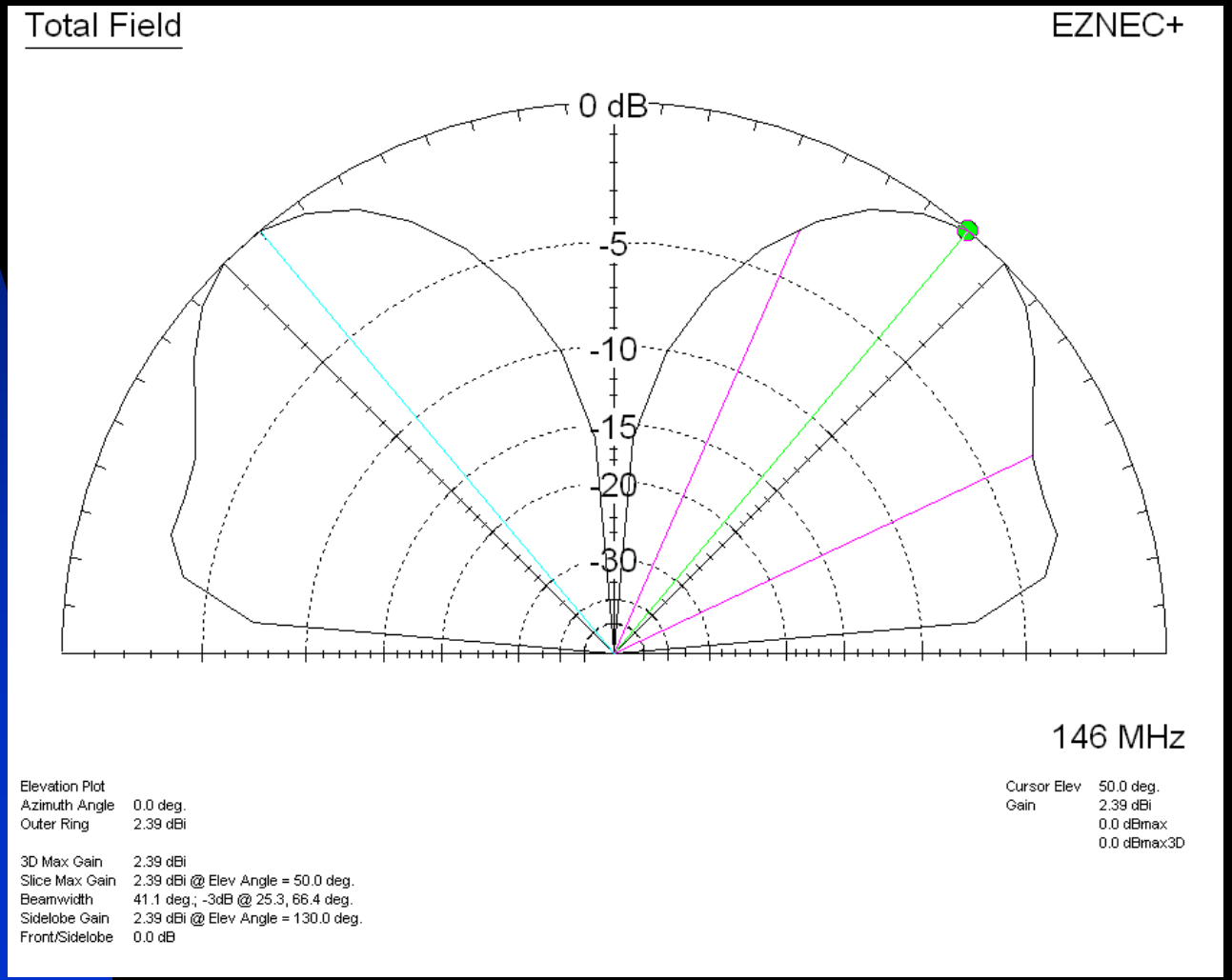
Radials: 20”

5/8 Wave Vertical
10 feet above ground

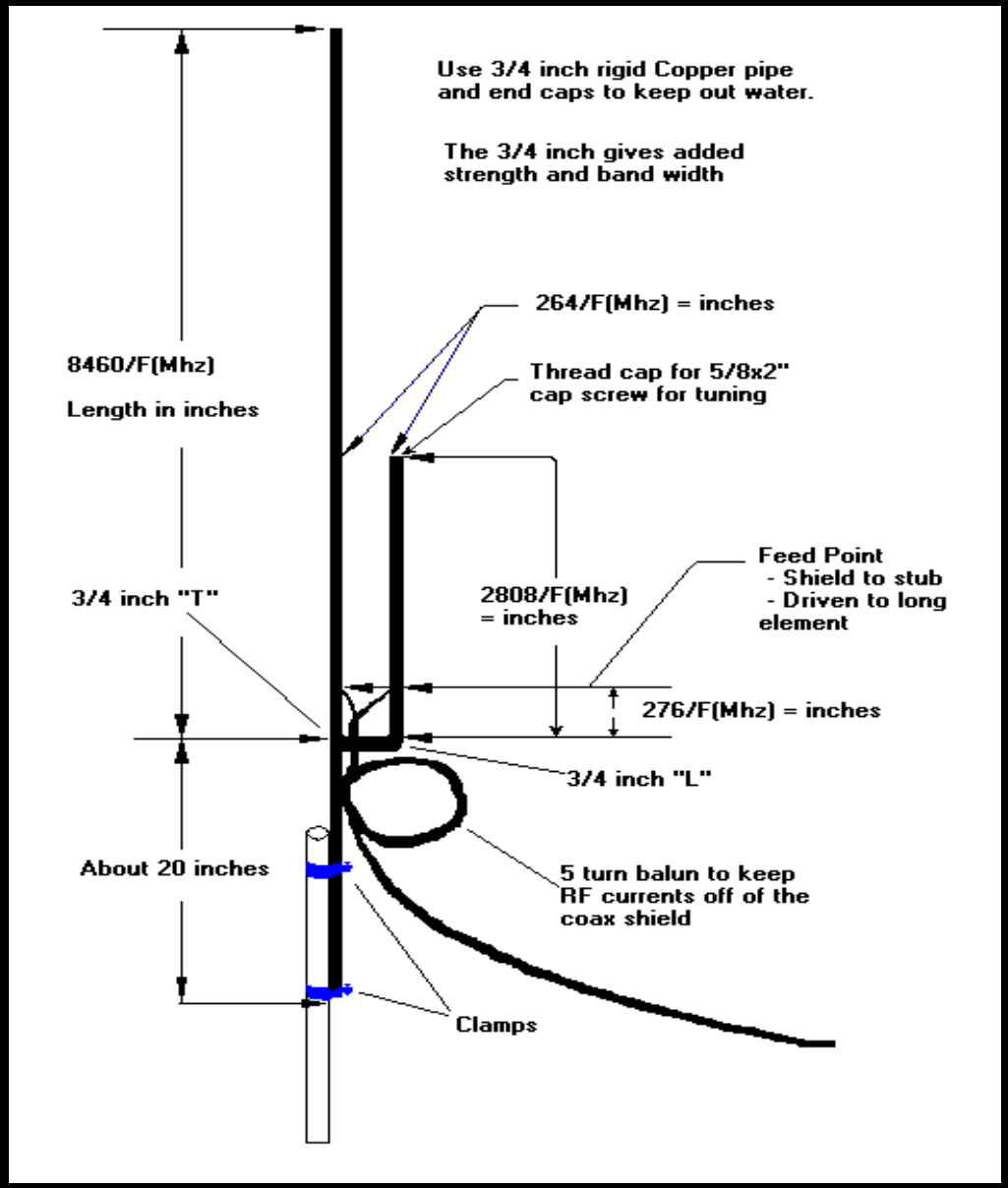


5/8 Wavelength Vertical

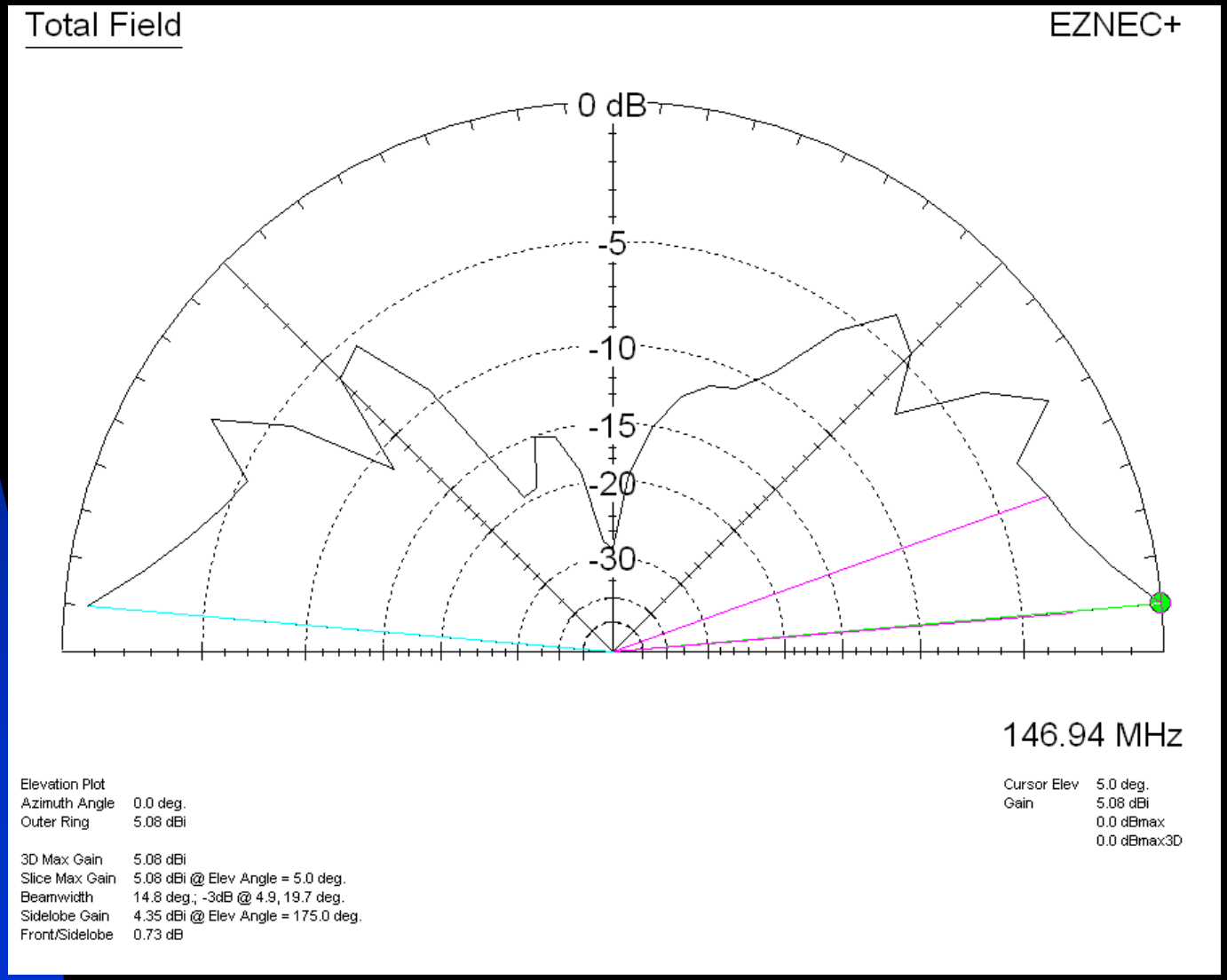
On Roof of Vehicle



J-Pole Antenna



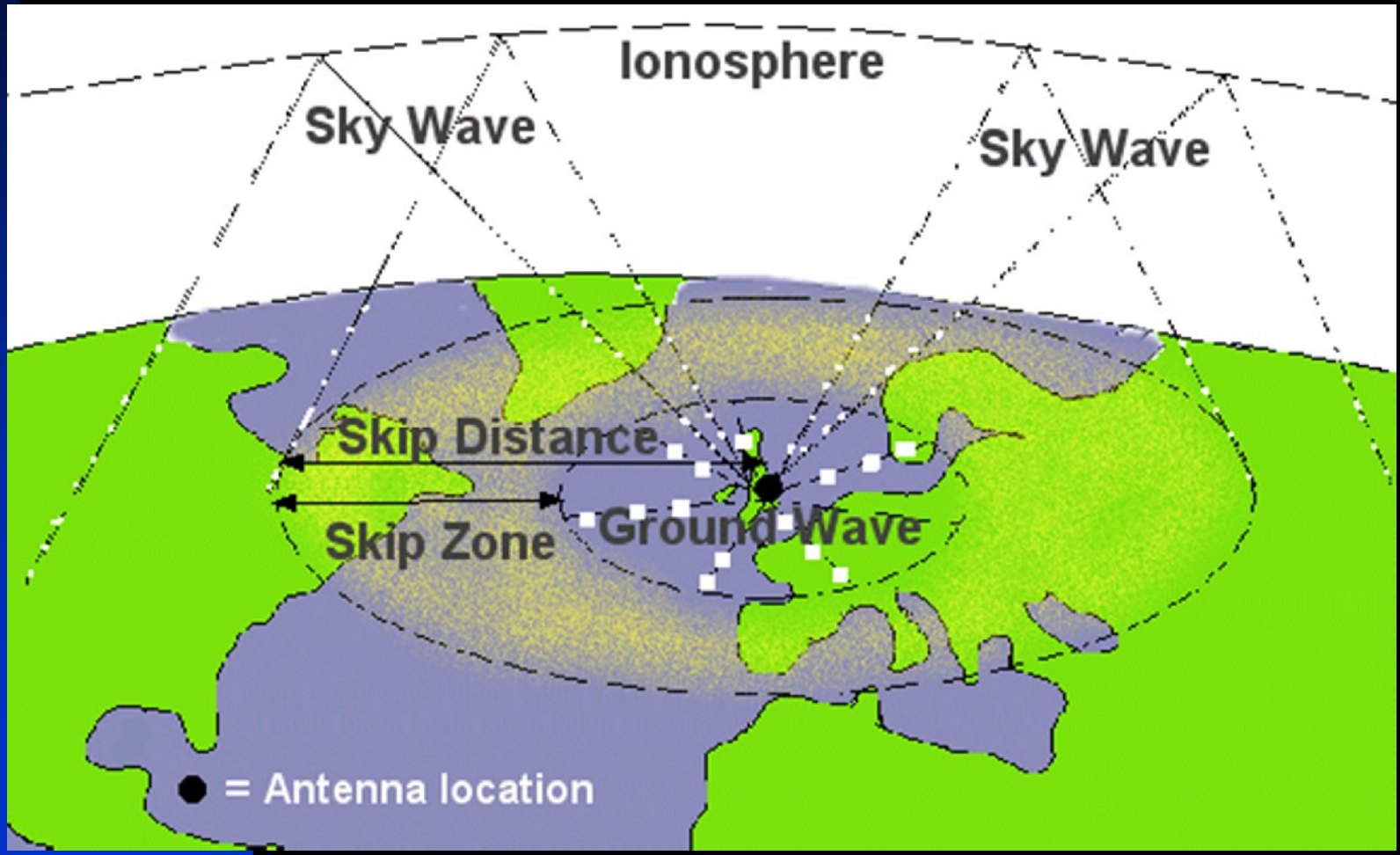
J-Pole Antenna



HF Antenna

The NVIS Antenna

The Problem


Ionosphere
Sky Wave
Sky Wave
Skip Distance
Skip Zone
Ground Wave
= Antenna location

Introduction to NVIS

- What Is NVIS?
- What are the advantages of NVIS?
- How to deploy NVIS.

What Is NVIS?

- NVIS, or Near Vertical Incidence Skywave, refers to a radio propagation mode which involves the use of antennas with a very high radiation angle, approaching or reaching 90 degrees (straight up), along with selection of an appropriate frequency below the critical frequency, to establish reliable communications over a radius of 0-200 miles or so, give or take 100 miles.

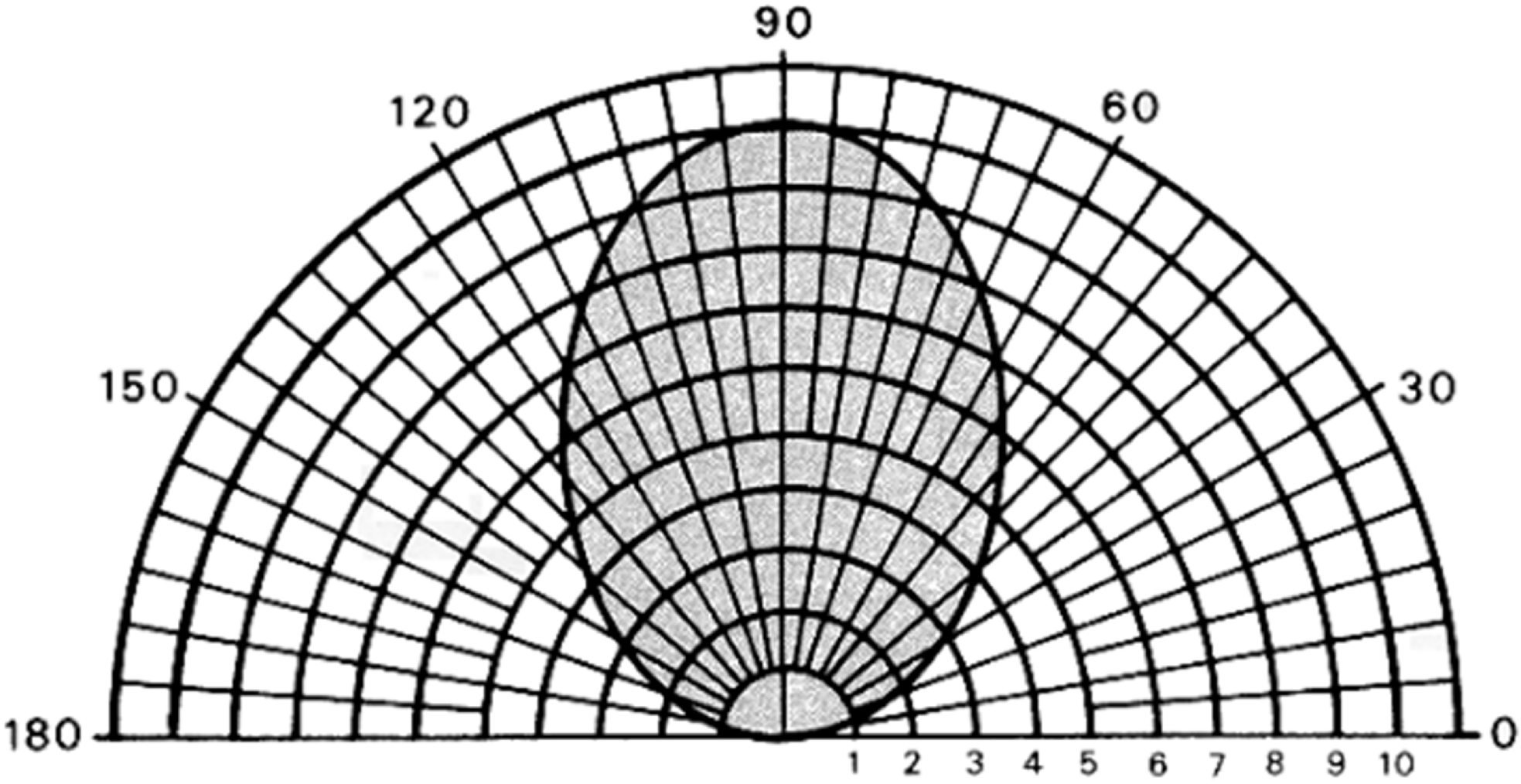
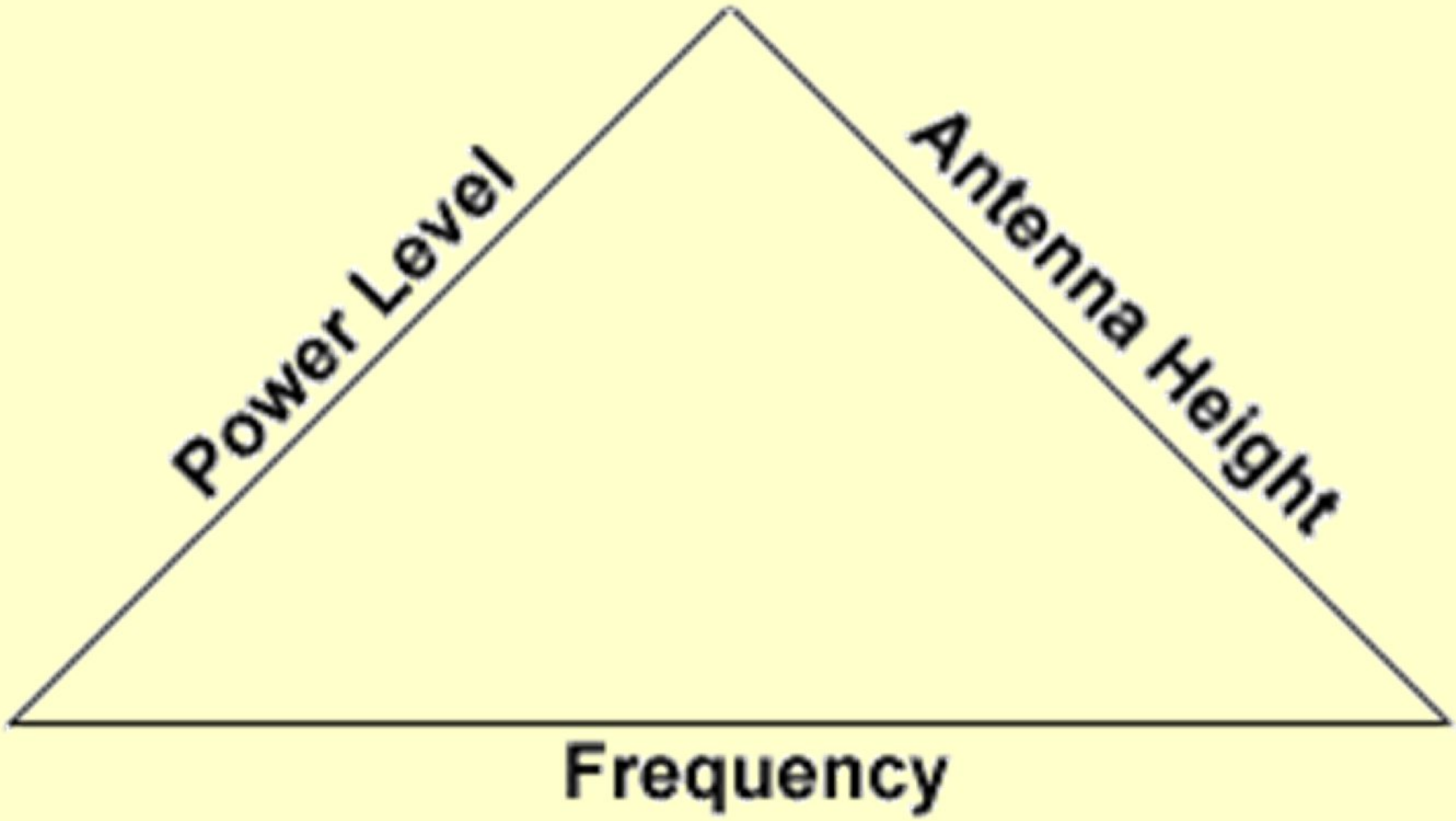


Figure M-6 Typical elevation plane patterns for half-wavelength antennas one-eighth wavelength or less above ground.

Propagation Considerations

- "D" layer losses
- Ionospheric scattering for vertical propagation
- Importance of critical frequency



NVIS is not an antenna, but a technique. Reliable communications between stations are based on three major factors.

Advantages of NVIS

- NVIS covers the area which is normally in the skip zone, that is, which is normally too far away to receive ground wave signals, but not yet far enough away to receive sky waves reflected from the ionosphere.

There is no skip zone unless you, the communicator, create it.

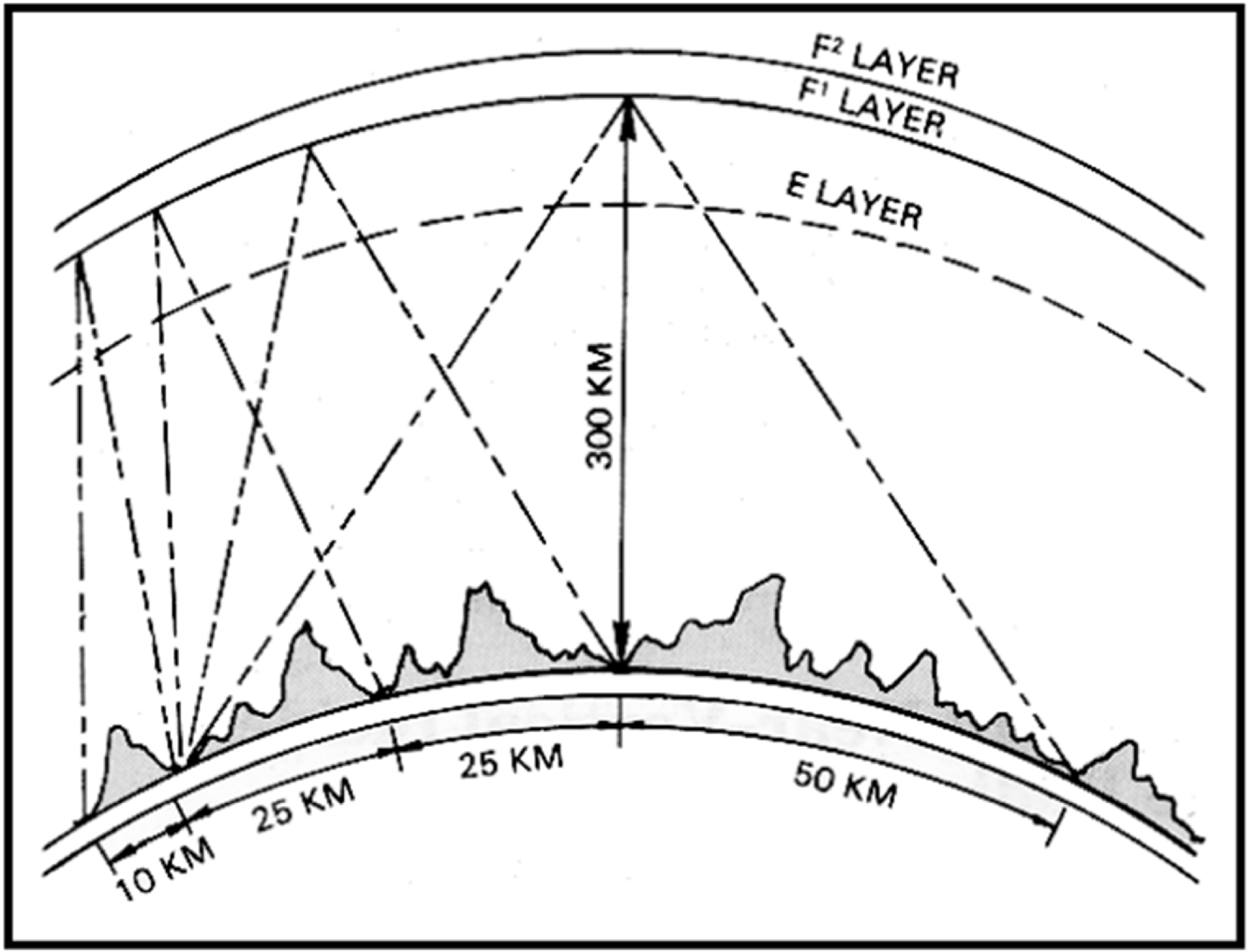


Figure M-1. Near-vertical incidence sky-wave propagation concept.

- If you squirt a garden hose at the ceiling you can blanket a large area with water very effectively.

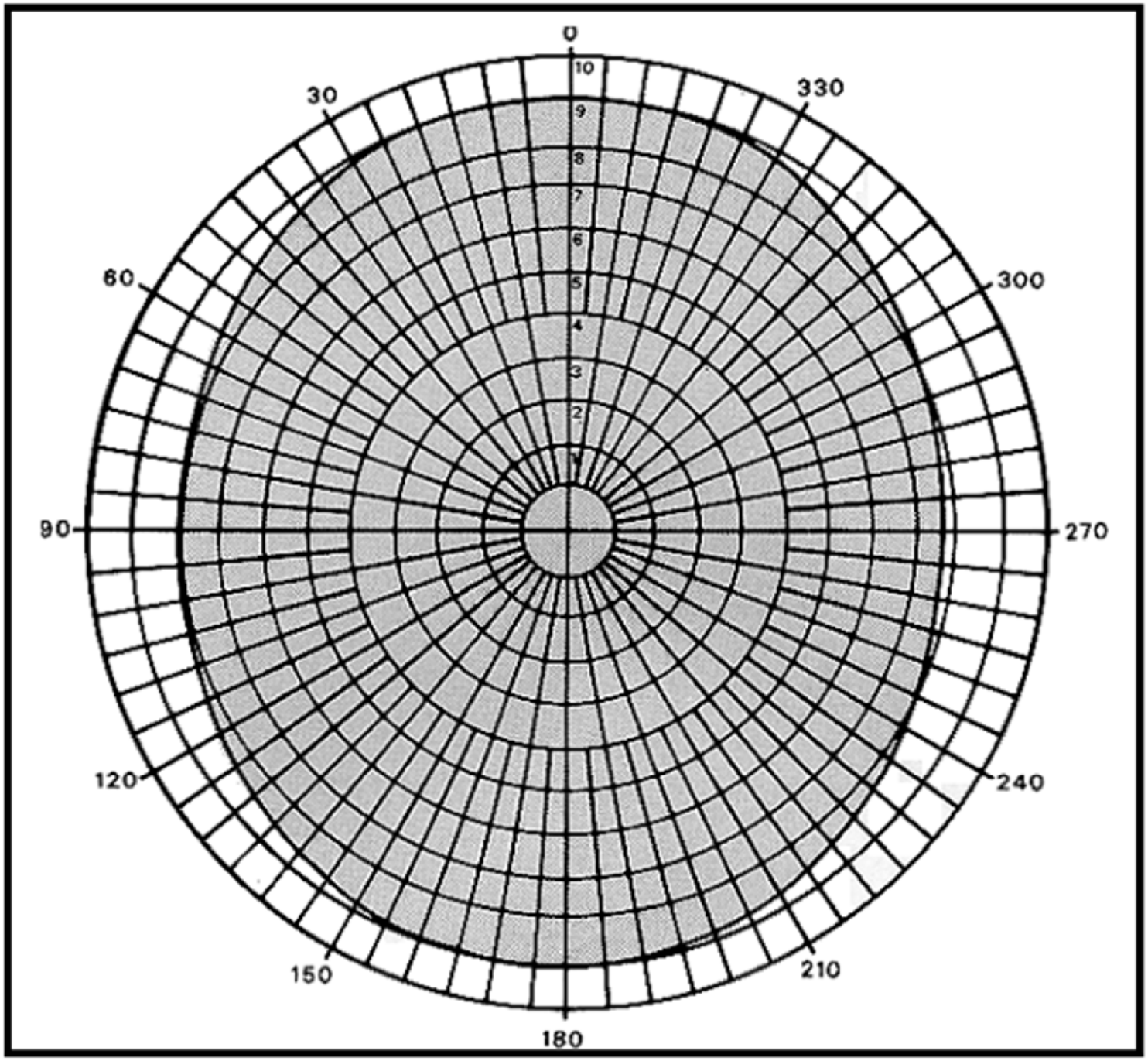


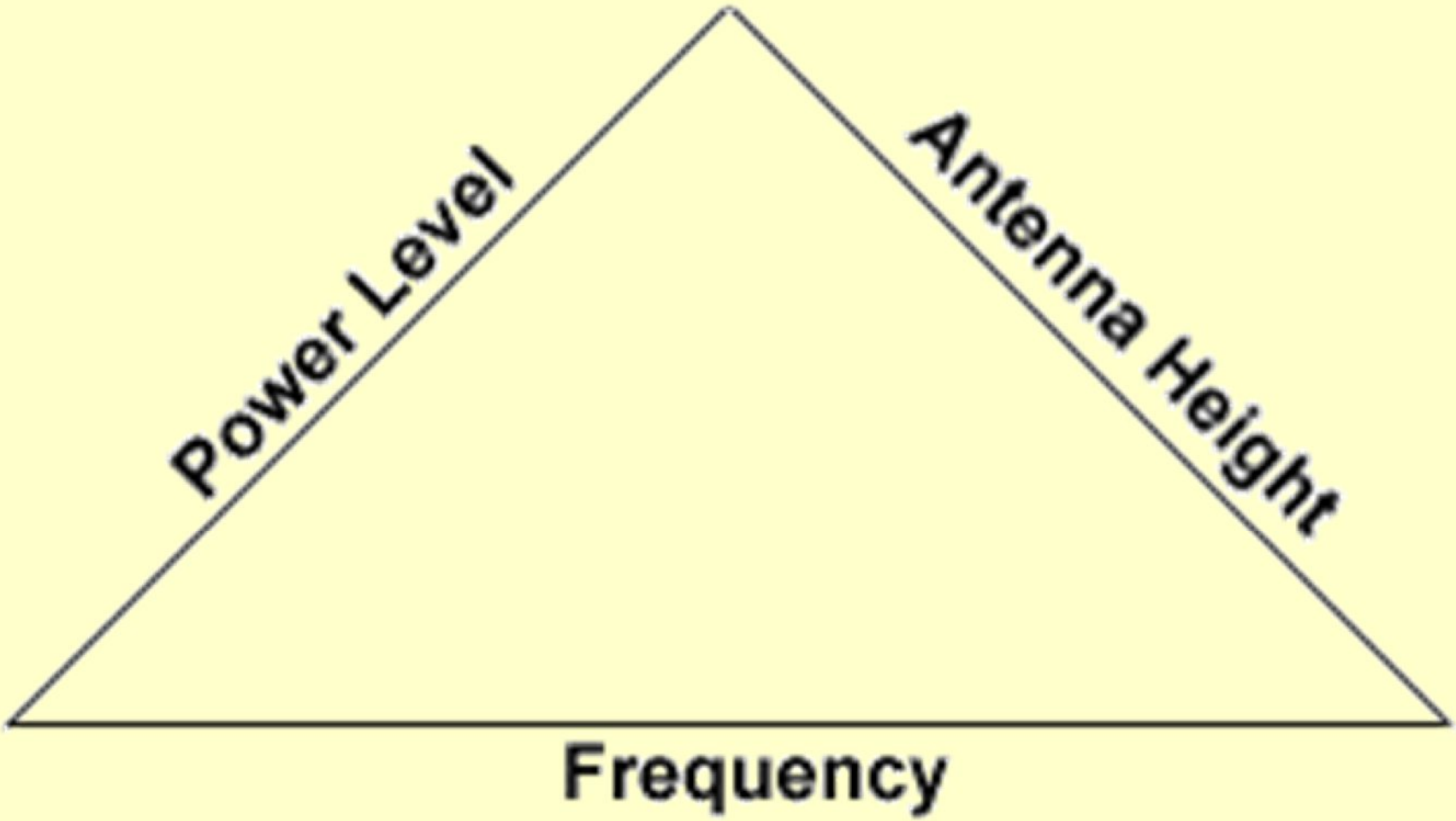
Figure M-2. Near-vertical incidence sky-wave antenna typical azimuth plane pattern.

Advantages of NVIS

- NVIS requires no infrastructure such as repeaters or satellites. Two stations employing NVIS techniques can establish reliable communications without the support of any third party.
- NVIS techniques can dramatically reduce noise and interference, resulting in an improved signal/noise ratio.
- With its improved signal/noise ratio and low path loss, NVIS works well with low power.

Advantages of NVIS

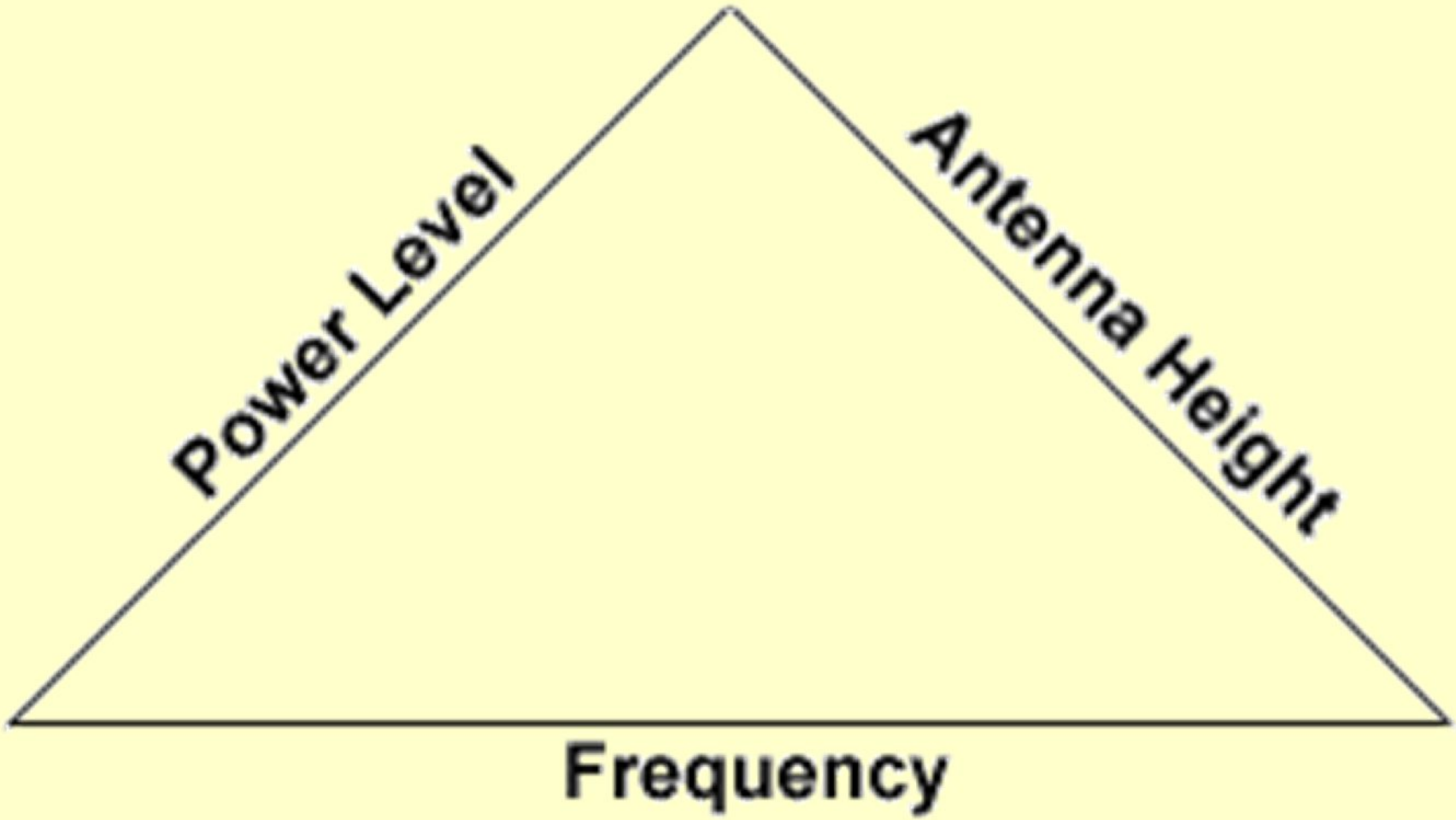
- Pure NVIS propagation is relatively free from fading.
- Low areas and valleys are no problem for NVIS propagation.
- Antennas optimized for NVIS are usually low. Simple dipoles work very well. A good NVIS antenna can be erected easily, in a short amount of time, by a small team (or just one person).



Antenna Height

NVIS Deployment

- One of the most effective antennas for NVIS is a dipole positioned from .1 to .25 wavelengths (or lower) above ground.
- Heights of 5 to 10 feet above ground are not unusual for NVIS setups.
- The inverted vee is another good NVIS antenna so long as the apex angle is kept gentle--about 120 degrees or greater.



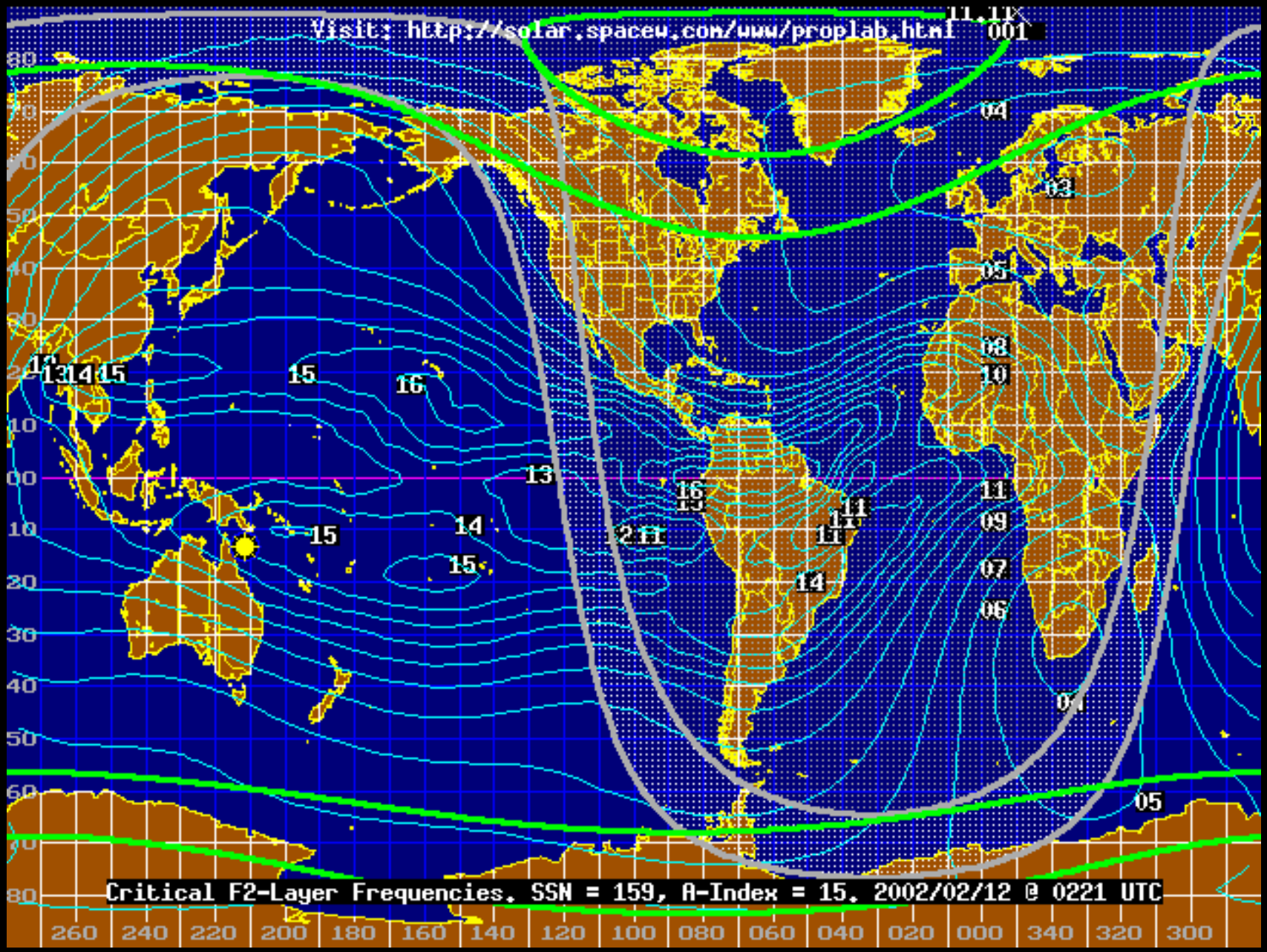
Frequency

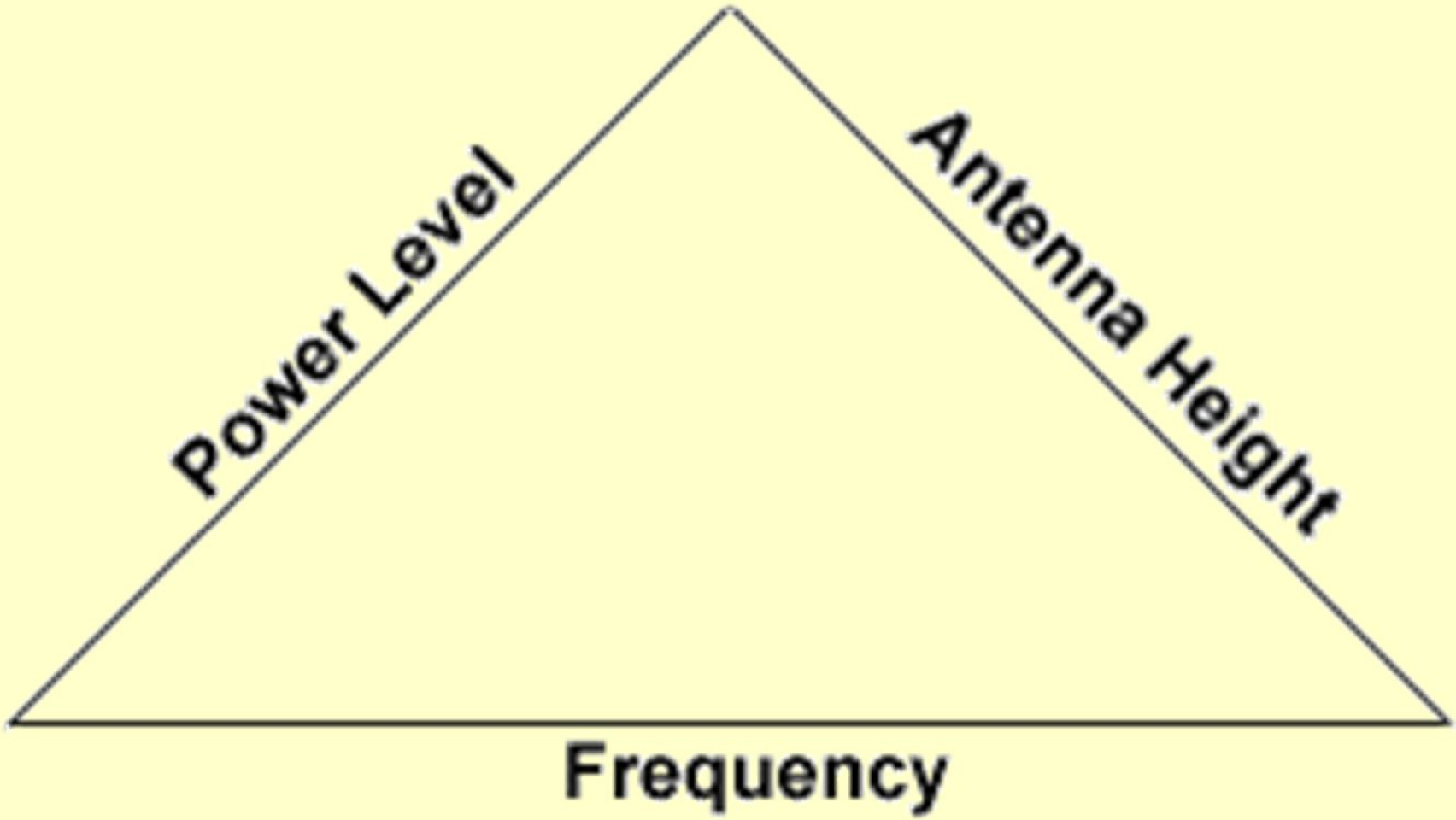
NVIS Deployment

- Typical frequency ranges used for NVIS are usually between 2.0 and 10 MHz.
- 40m amateur band for daytime and 75/80m for nighttime communications.
- The new 60m band with it's power & antenna limitations can be very effective using NVIS techniques.
- Desired modes are SSB, RTTY and PACTOR.

STD Aurora Monitor

Advanced Monitor for Auroral Activity, Weather Satellite Activity, Solar Activity, and Space Environment Conditions. Download Software at: http://www.spacew.com/aurora





Power Level

NVIS Deployment

- With its improved signal/noise ratio and low path loss, NVIS works well with low power.
- 20 – 30 watts portable stations have a very high reliability factor making them very favorable for emergency or clandestine operation.
- Low power stations can run RTTY at 100% duty cycle.
- NVIS stations can generally be of the 100 watt variety.

NVIS Conclusions

- By steering the take off angle of your signal, HF communications can be extremely reliable for the long haul, medium haul and short haul.
- NVIS and high angle waves are very effective for ranges of 200 to 300 miles and out to 800 miles.
- No need for third party support such as repeaters or satellites.

NVIS Conclusions

- NVIS is effective in any terrain.
- Because of low S/N ratio NVIS is good for RTTY, PACTOR and SSB.
- NVIS is easy to deploy and very portable.

Stuff To Checkout

Here are some areas that might be of interest to those that would like to learn more about NVIS

- This book is a must have. "Near Vertical Incidence Skywave Communication", by David Fiedler and Edward Farmer, Oct 1996, (Currently out of print.)

- Here are some websites of interest
- http://www.tactical-link.com/field_deployed_nvis.htm

- SGC makes some very rugged and portable gear http://www.sgcworld.com

- This is the NVIS reflector http://groups.yahoo.com/group/nvis/