WLAN-SECURITY-2002

Achieving the Best Compromise Between Workspace Coverage and Signal Security

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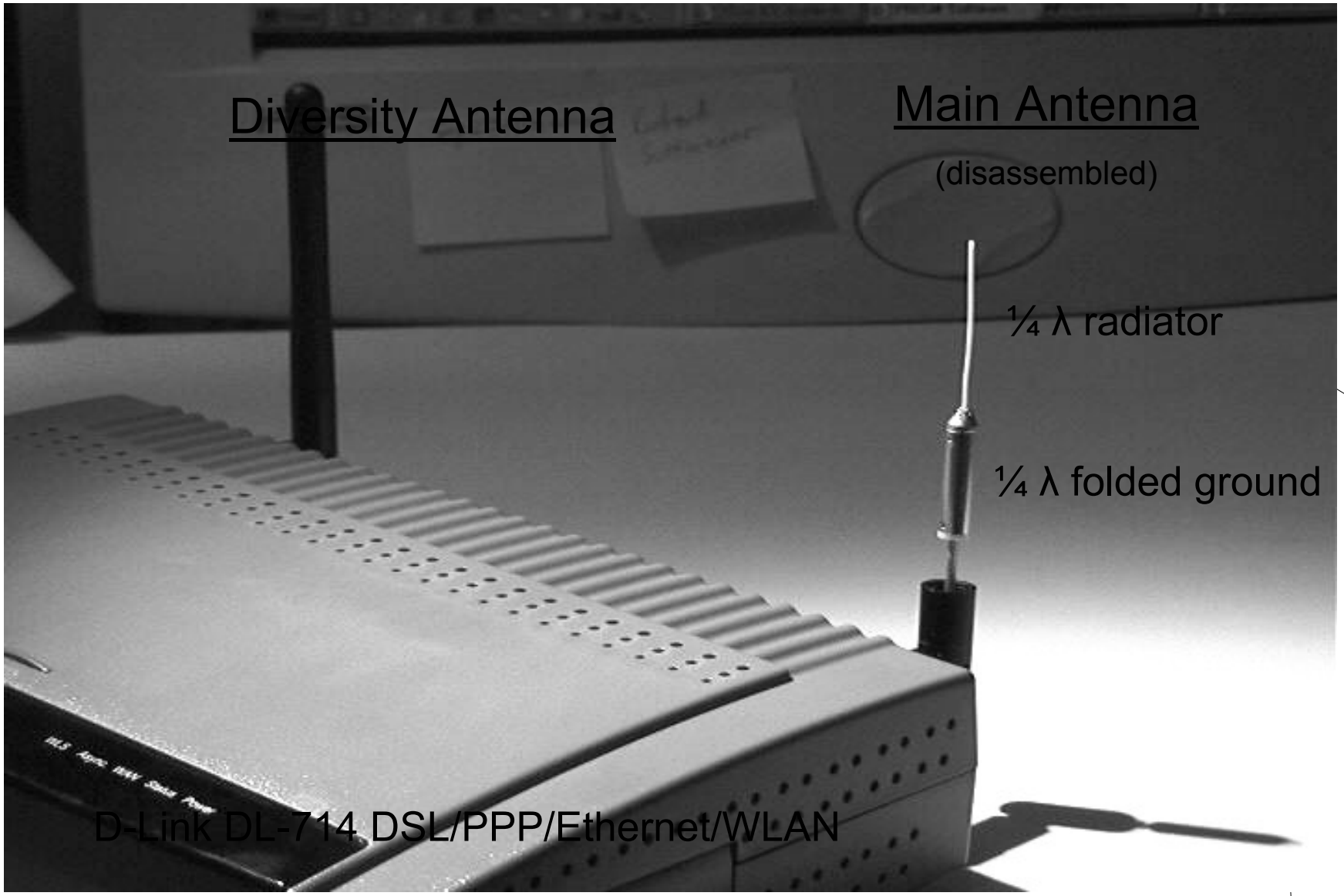
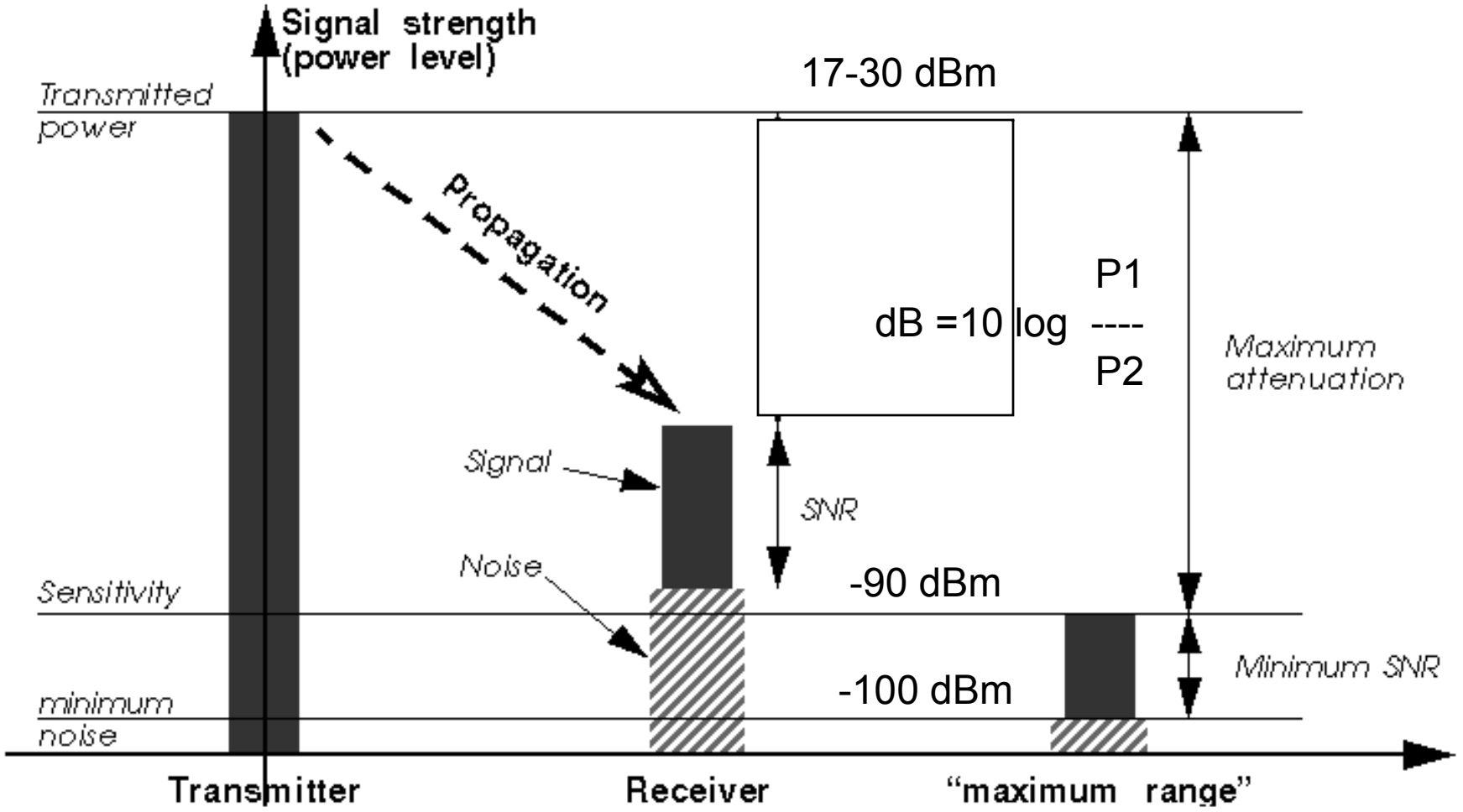
Signal Characteristics

- 802.11b uses 2.41 to 2.48 GHz ISM
- 802.11a uses 5.18 to 5.81 GHz UNII
- Microwaves do not penetrate foliage well, are also attenuated by rain and snow
- Microwaves are 12cm & 5.5cm wavelength: easily reflect off metal objects & structures
- Microwave Ovens share 2.4GHz band
- Telephones, instrumentation,also 2.4GHz
- Other wireless (HiperLAN) shares 5 GHz

Typical Access Point Antennae

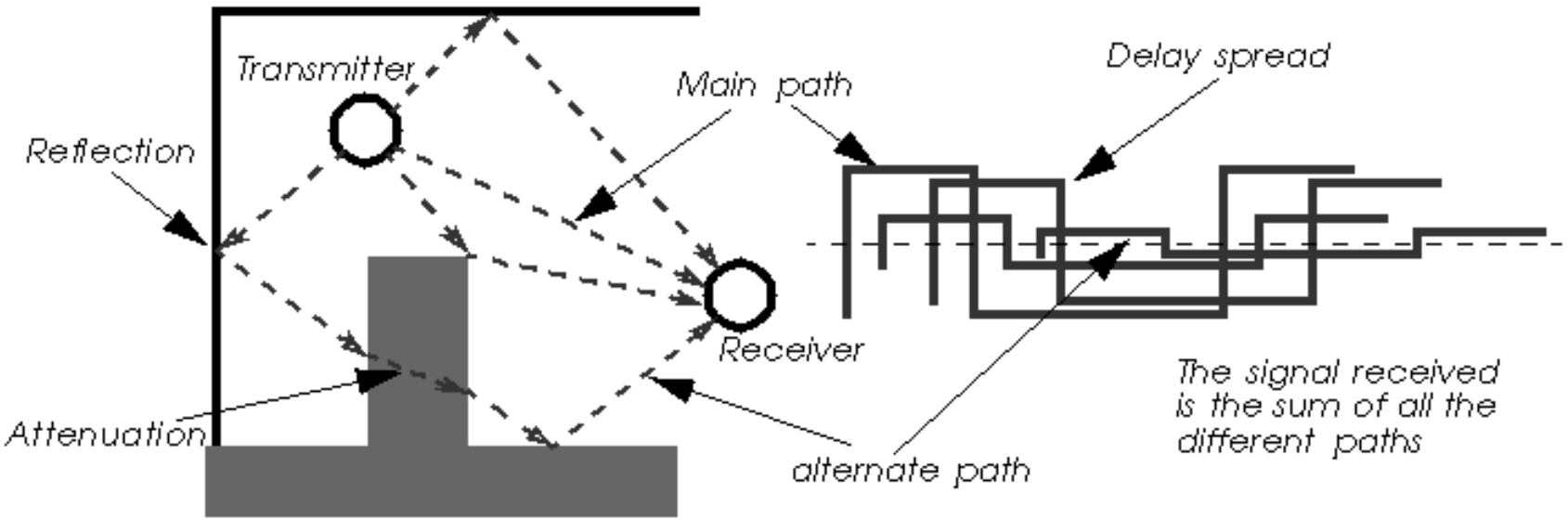


Signal, Noise, Propagation, Attenuation



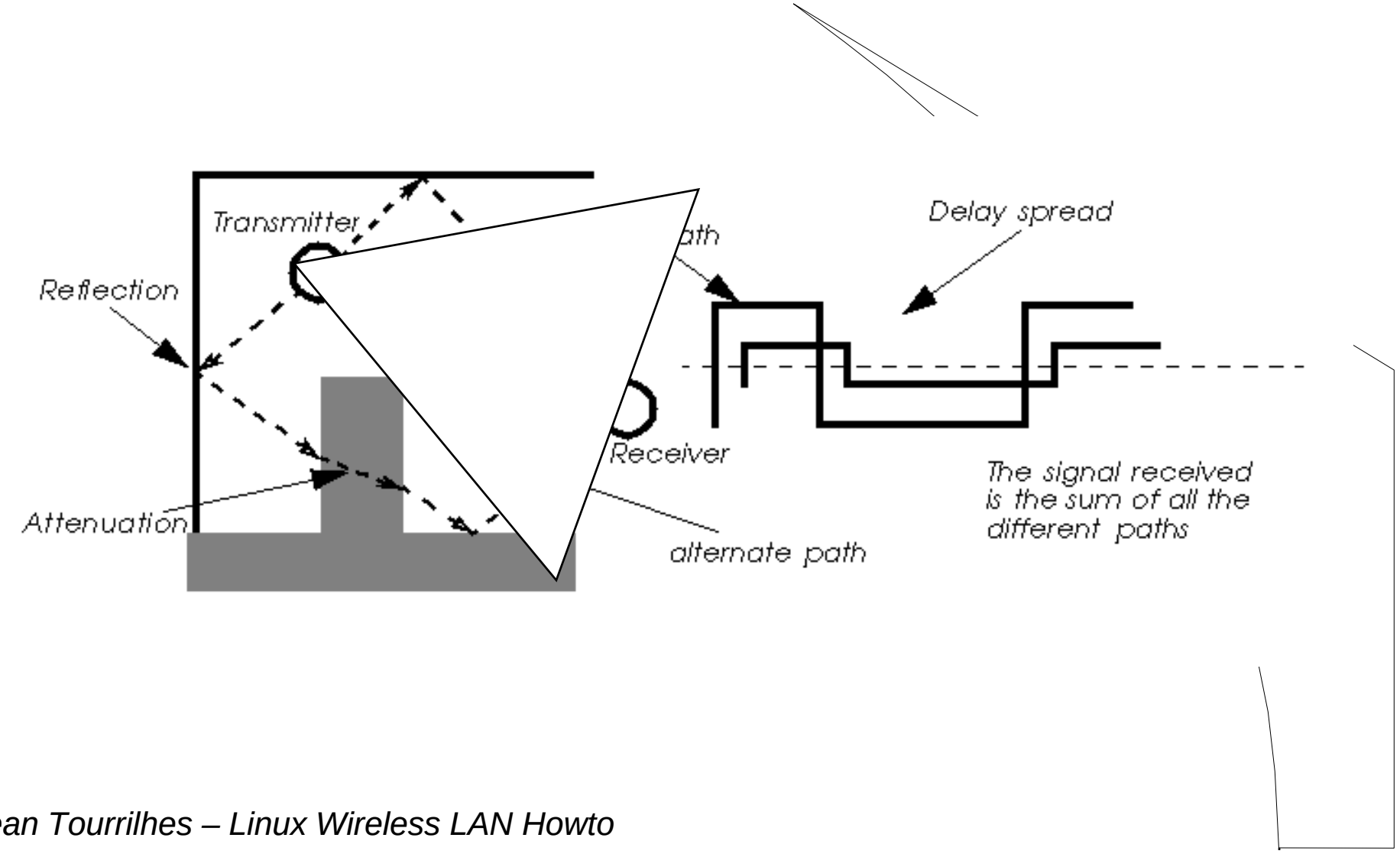
Jean Tourrilhes – Linux Wireless LAN Howto

Multipath Reflection and Distortion

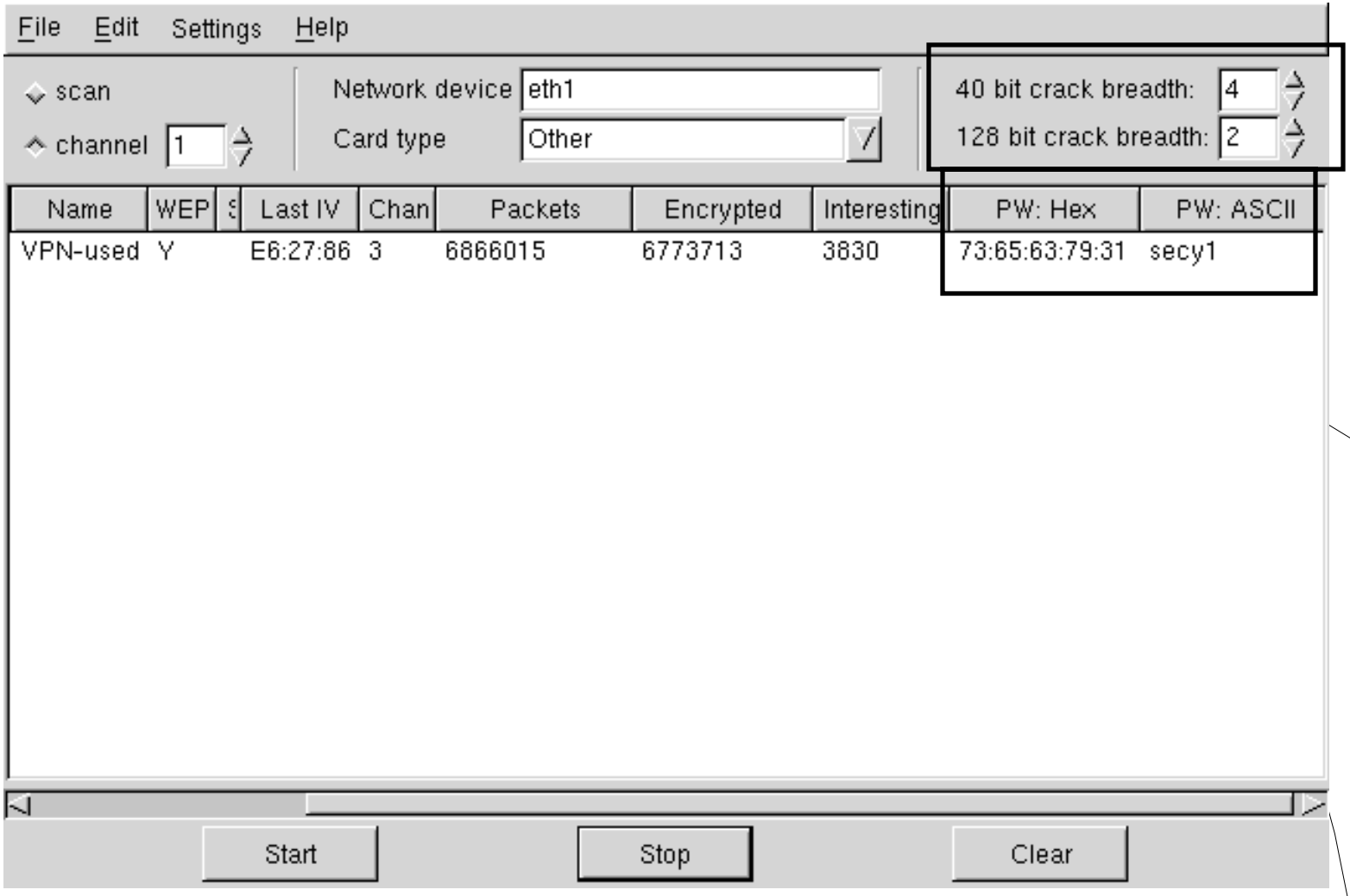


Multipath Reflection and Distortion

(Directional Antenna)

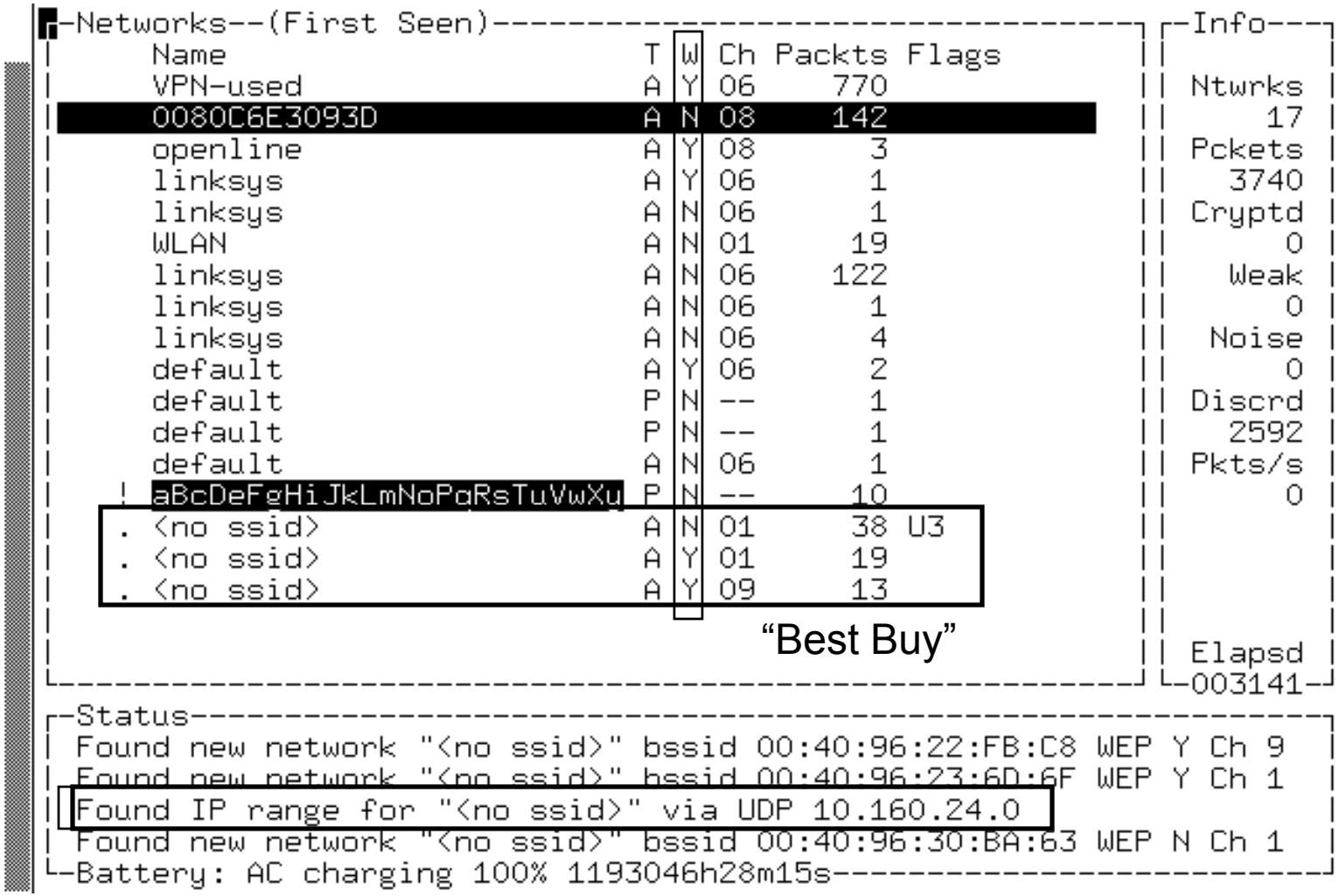


Other Reasons to Limit Signal to Workspace



Linux utility ‘AirSnort’ working at decoding a WEP Password

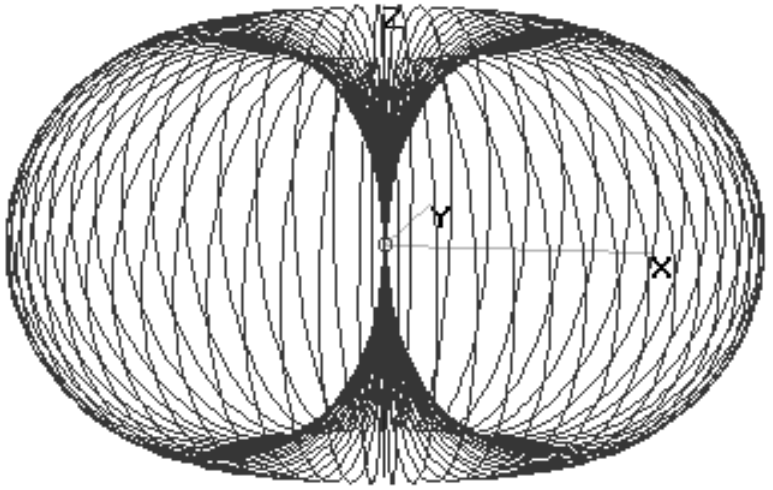
Other Reasons to Limit Signal to Workspace



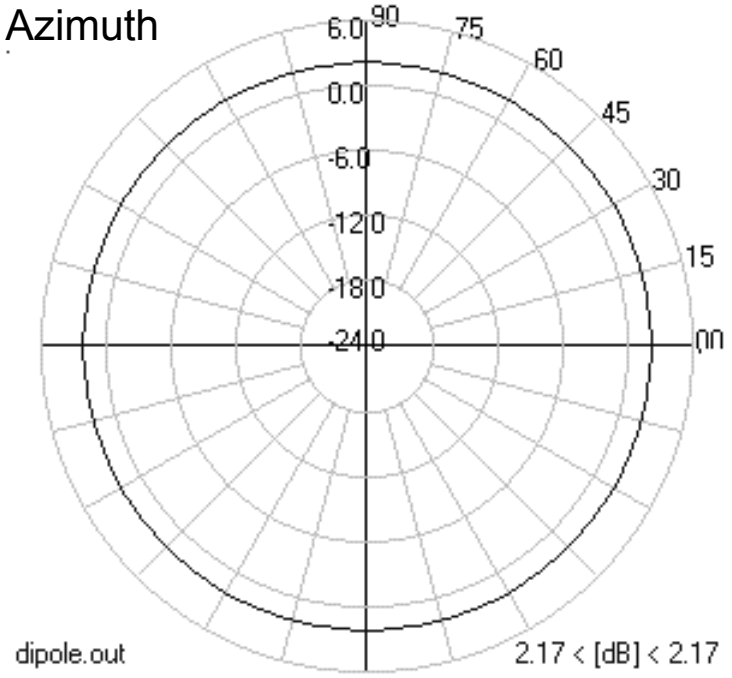
Linux utility ‘Kismet’ – ‘Wardriving’ a local neighborhood

Visualizing a Dipole

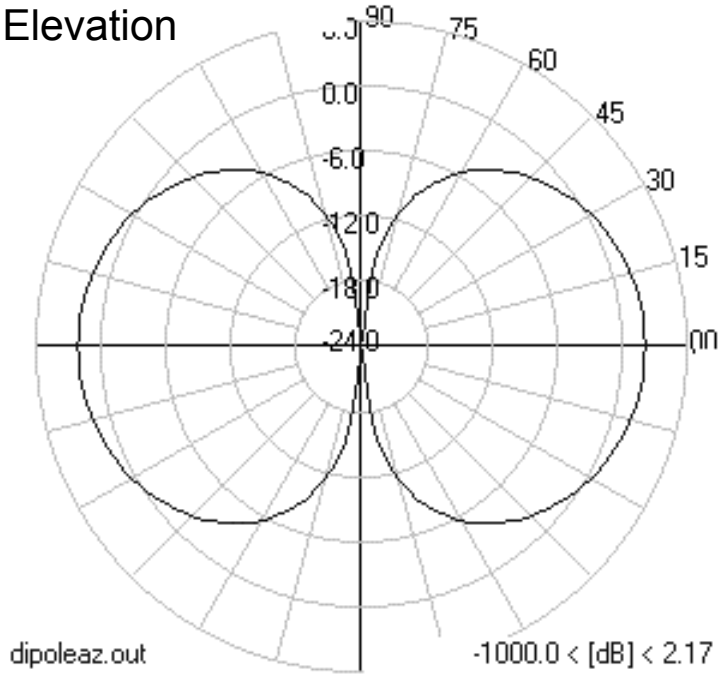
(as is used on the D-Link)



Azimuth

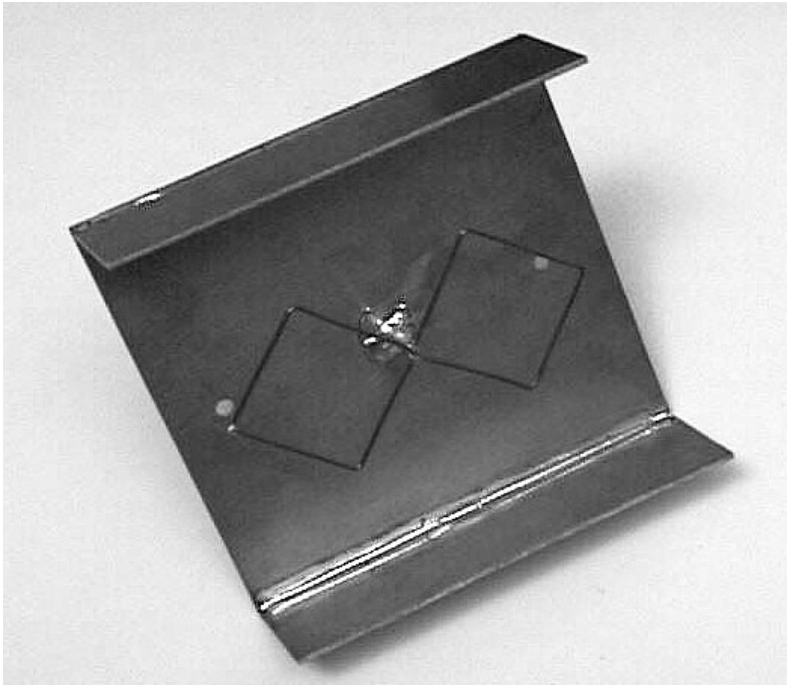


Elevation



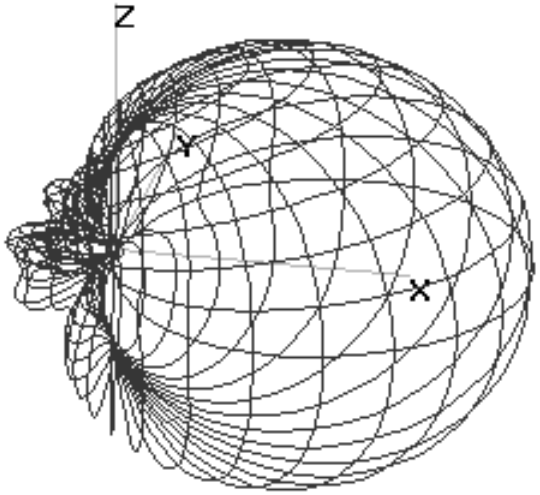
Basic Directional Antennas:

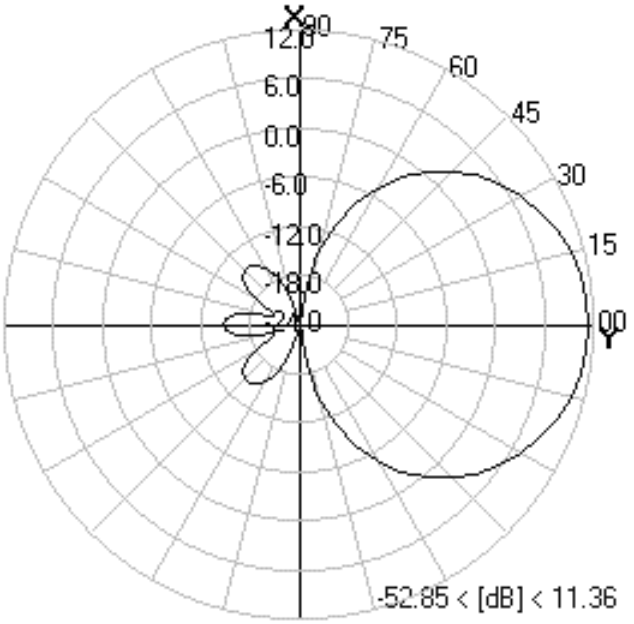
Example: The BiQuad

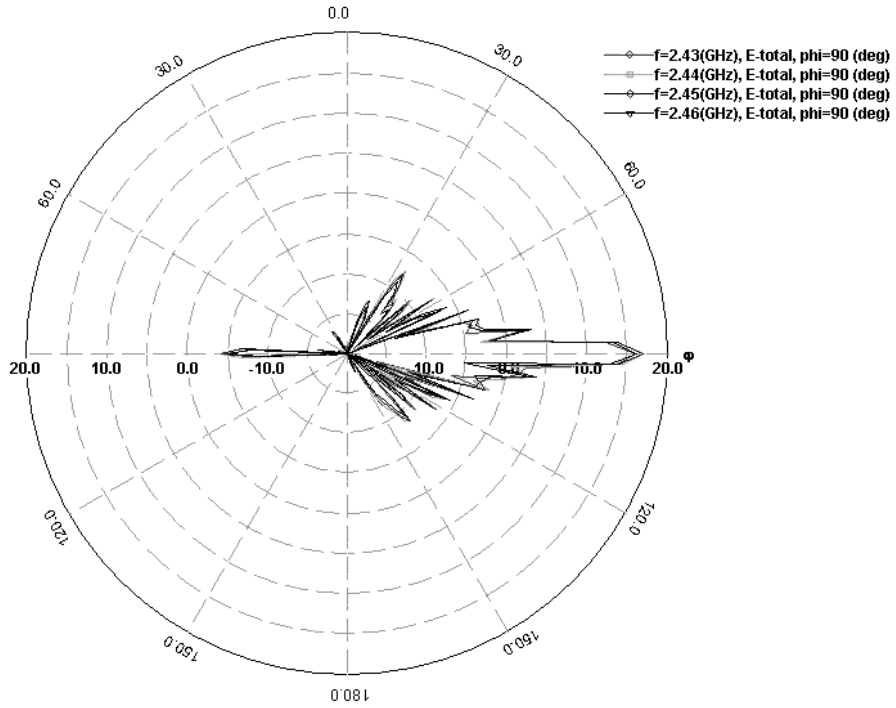


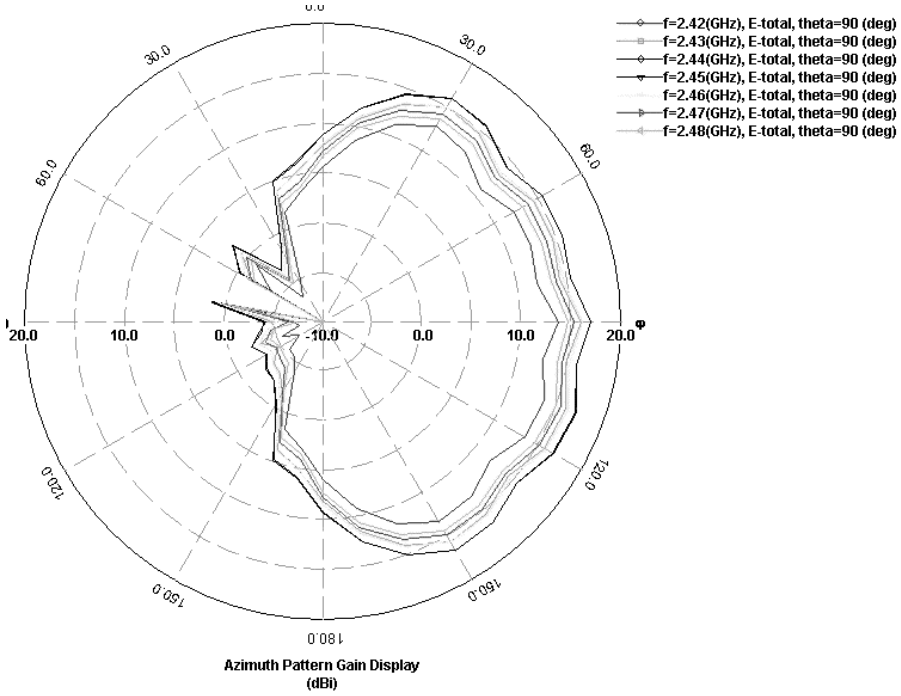
'Patch' and "Panel' antennas are mass-produced devices giving radiation patterns similar to this.

Be careful of high side-lobe radiation from some of the less expensive 'patch' antenna models







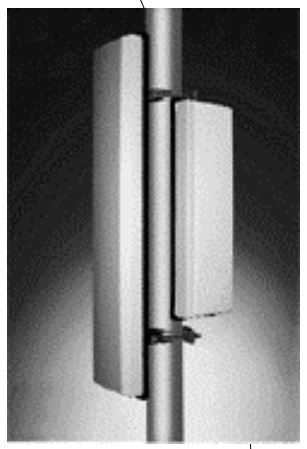


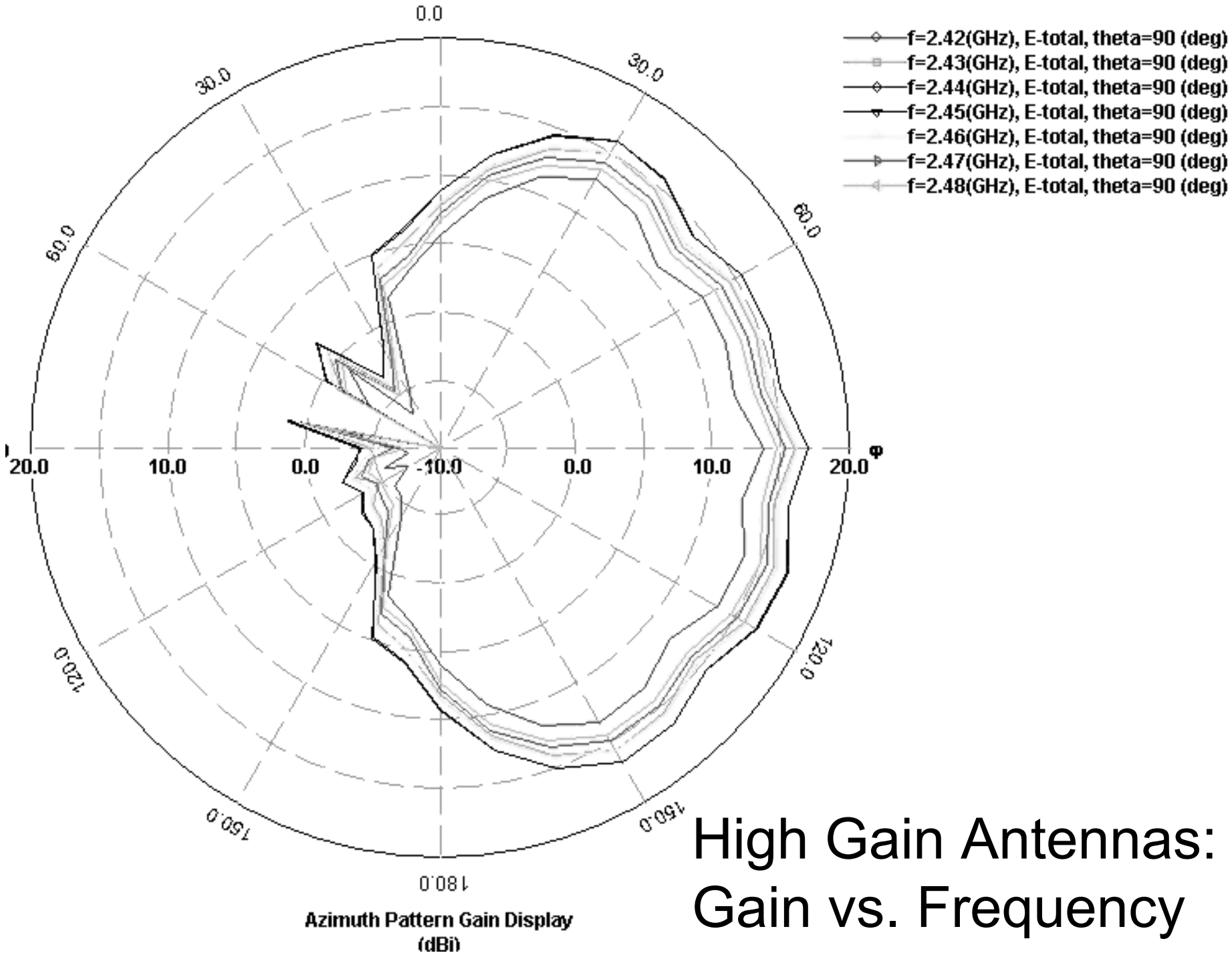
Extreme Directional Antennas:

Example: The Slotted Waveguide

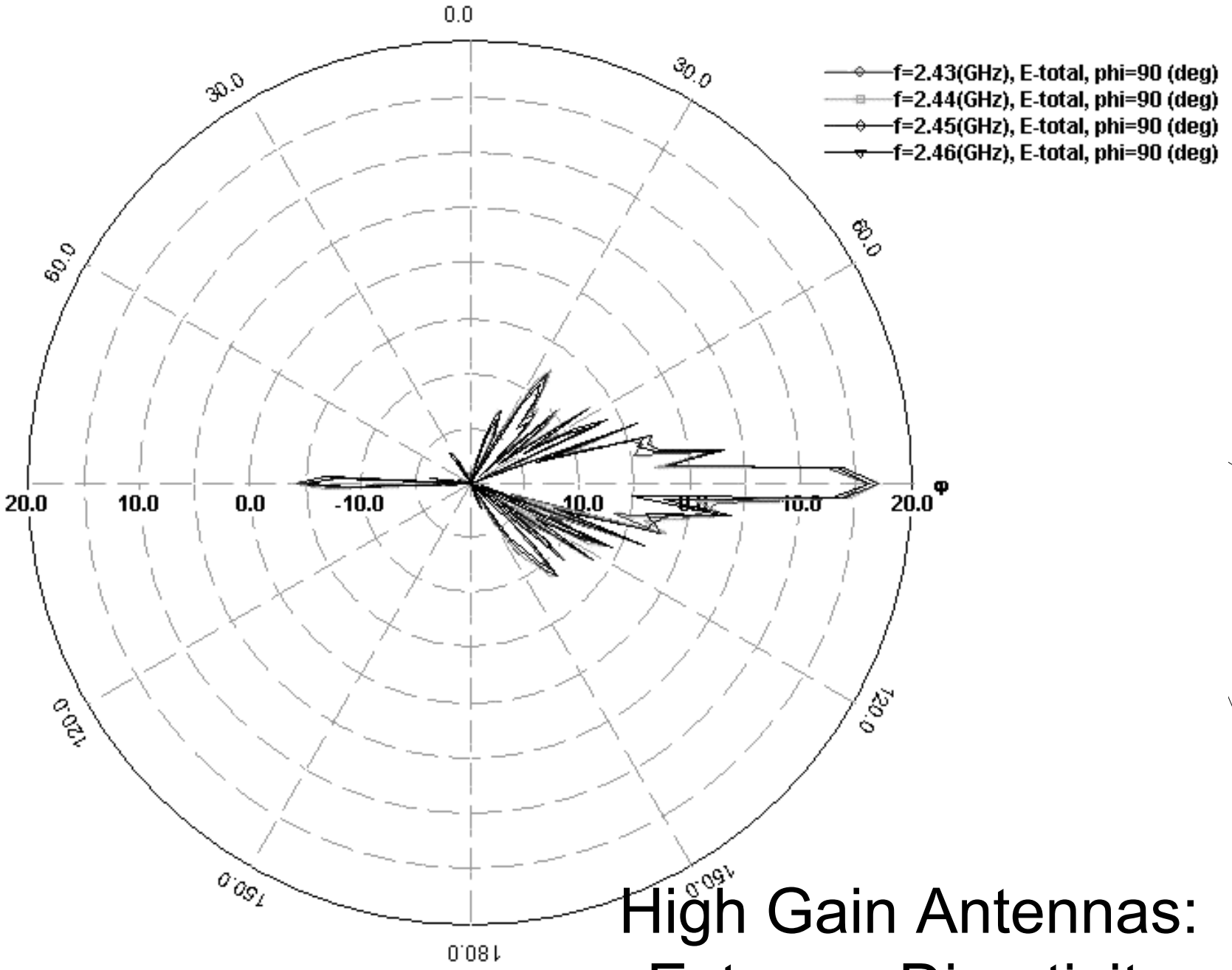
<u>Sector Antennas</u>

Are less extreme commercial antennas similar to waveguides



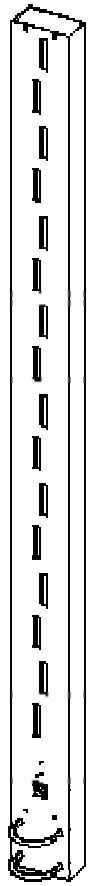


High Gain Antennas: Gain vs. Frequency



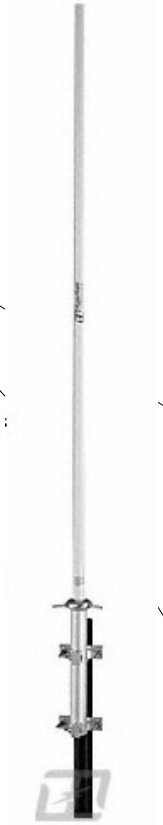
High Gain Antennas: Extreme Directivity

Long Antenna Arrays



16 Slot Waveguide

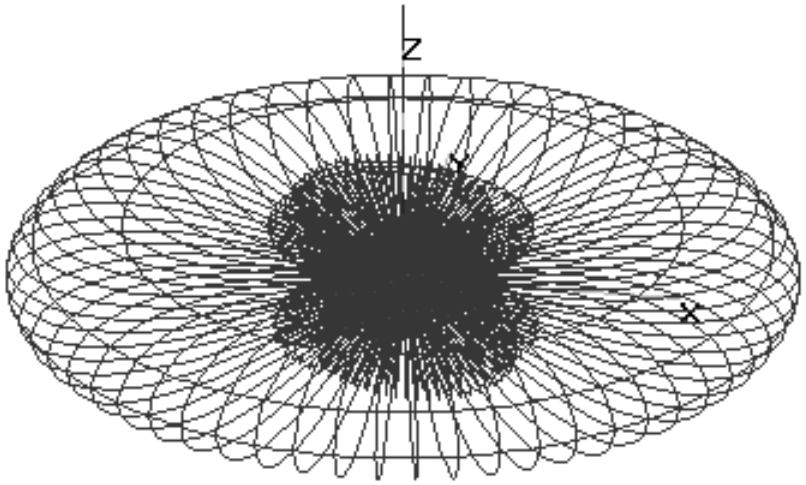
Typically
1.5 meters
In height

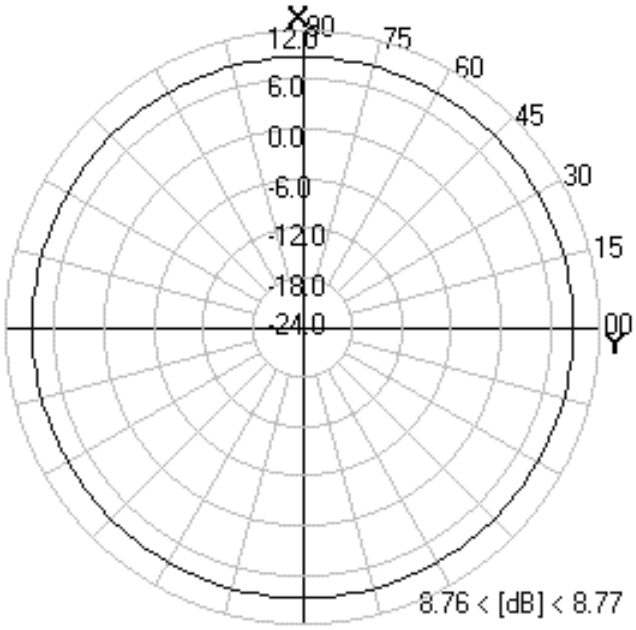


Collinear Omnidirectional
(Hyperlink HG2415U)

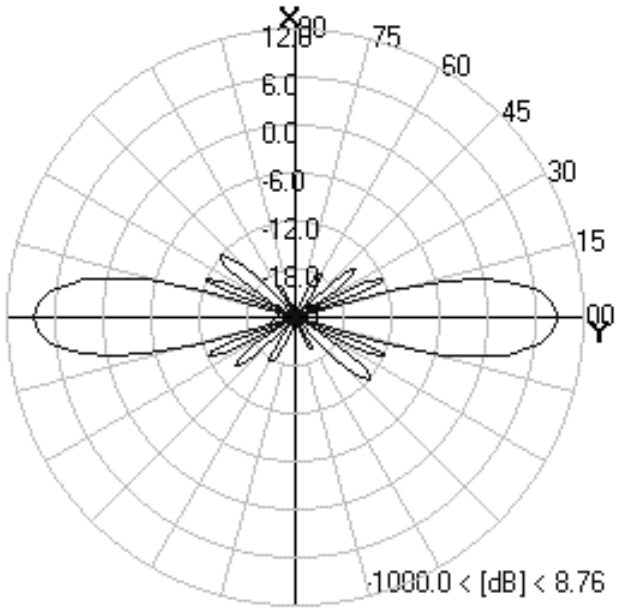
Extremely directional in vertical plane
Will radiate along just one floor in a building

The Squashed Donut – Multistory Buildings

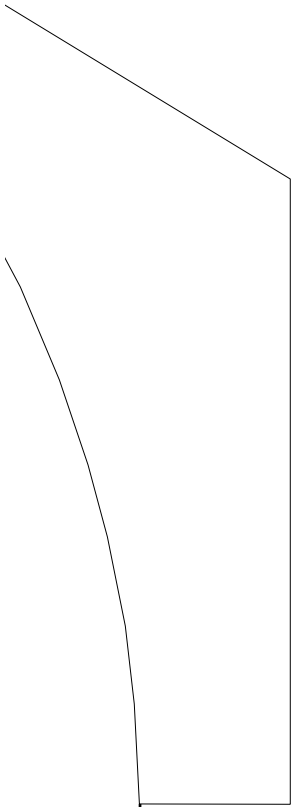




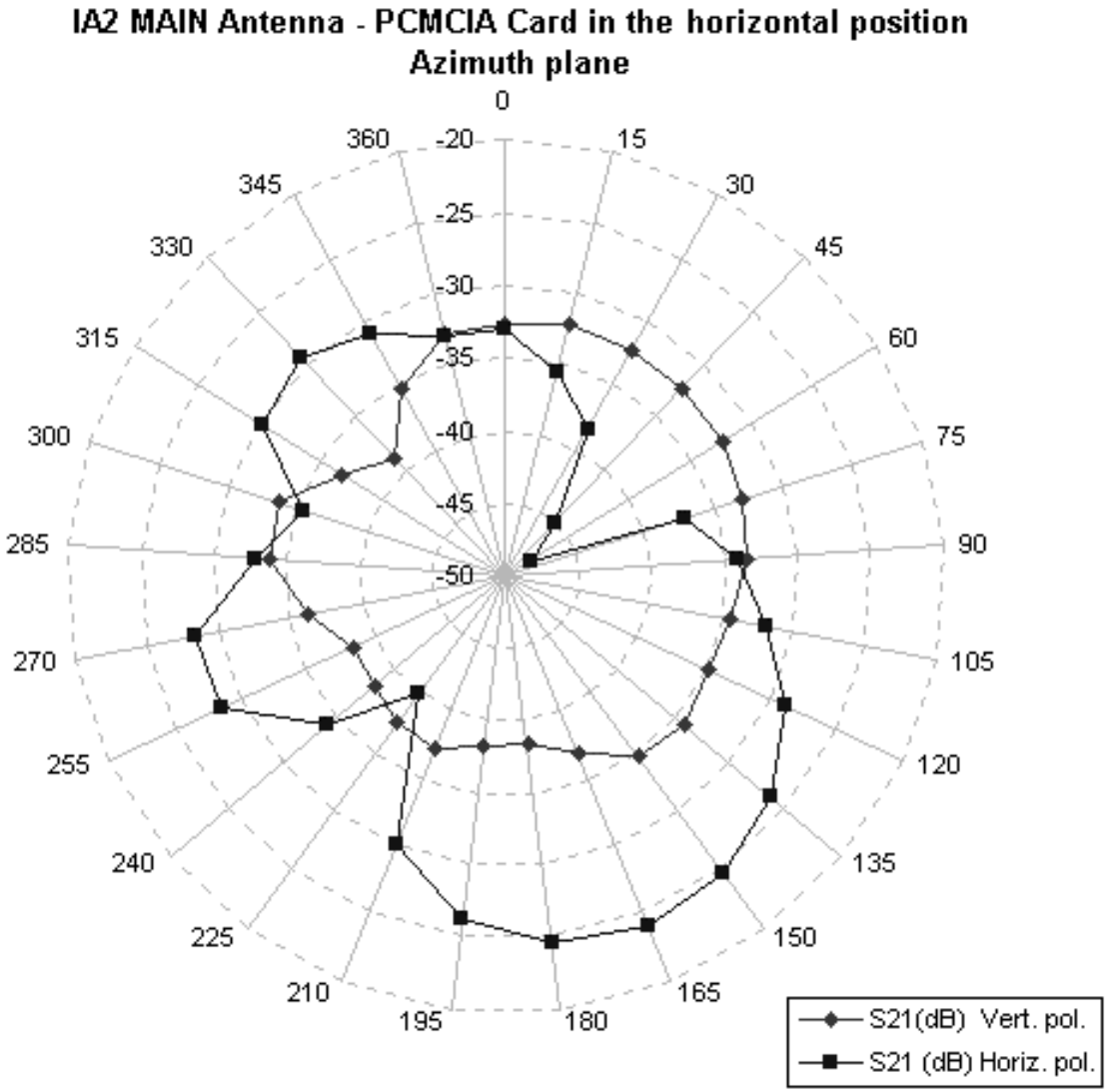
AZIMUTH



ELEVATION



PCMCIA Card Antennas



There are two antennas printed onto the PCMCIA circuit board that protrudes out the side of the laptop. One is the main antenna, the other a diversity.

The antennas are very low gain, typically less than isotropic, and are optimized for convenience, not for signal radiation or security.

Note that Horizontal is the preferred polarization.

Summary

- Network Security does not require compromise of either data rate or coverage
- There is a wide difference in power and features of laptop WLAN cards – standardize on a reliable vendor and monitor MAC addresses
- Use few access points and better antennas
- Access Point antennas should be directional and focused upon work area in both azimuth and elevation planes – a stronger signal within your work area generally means a weaker signal for hackers to prey upon
- Always select antennas with minimal sidelobes.