

San Jose State University
Electrical Engineering 172
Microwave Engineering
Final Project



Slot Antenna: Radiation Pattern Project
Charles Tumbaga

Outline

- The Theory
- Uses for Slot Antenna
- The Design
- Procedure
- Results
- Future Work
- Conclusion

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The Theory

- Waveguide Slot Antennas have horizontal polarization
 - Babinet's principle

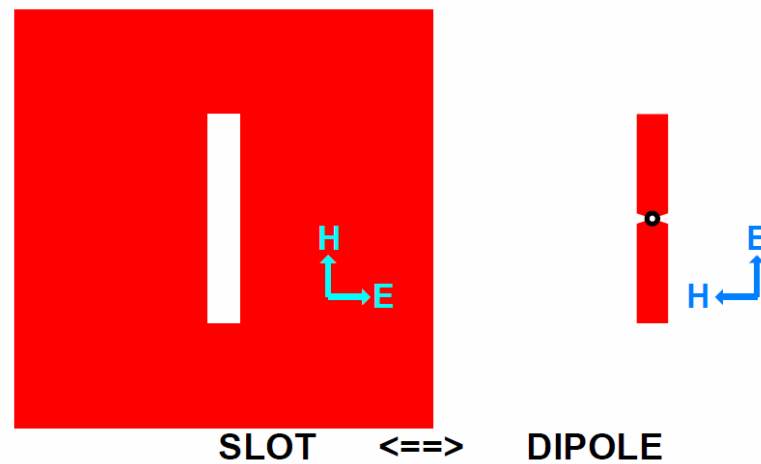


Figure 1: Slot to Dipole Relation [1]

The Theory

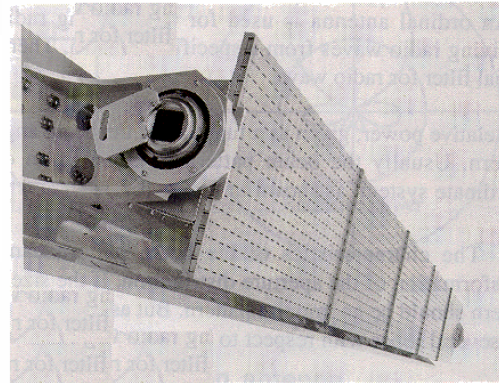
- Waveguide cutoff frequencies still apply
- Radiation occurs when slot is not directly in the center of the waveguide
- Allows very high transmission of EM waves
- To excite the wave, there must be a coupling of $\lambda g/4$ for E field

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Uses for Slot Antenna

- Radars Antennas



A waveguide slot array antenna for a real aperture radar.

- Cell Phone Tower

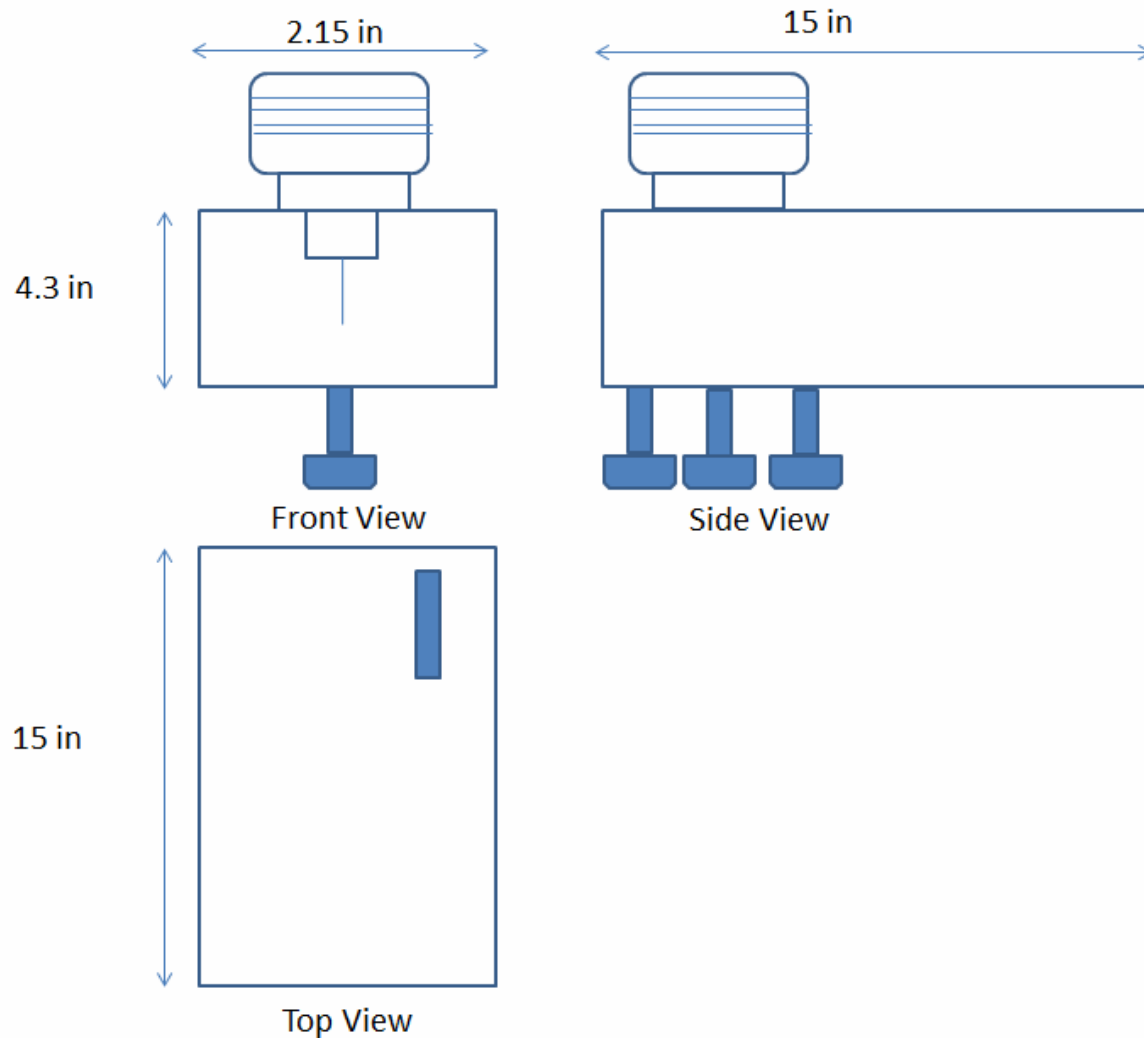


Alford Antenna

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The Design

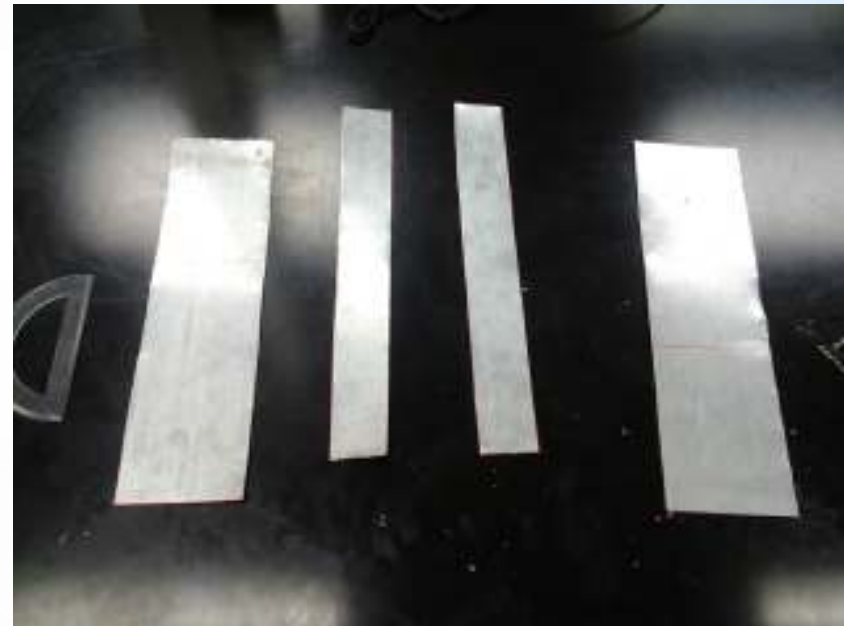


Dimensions of 2.4 GHz Slot Antenna using WR-430 Parameters

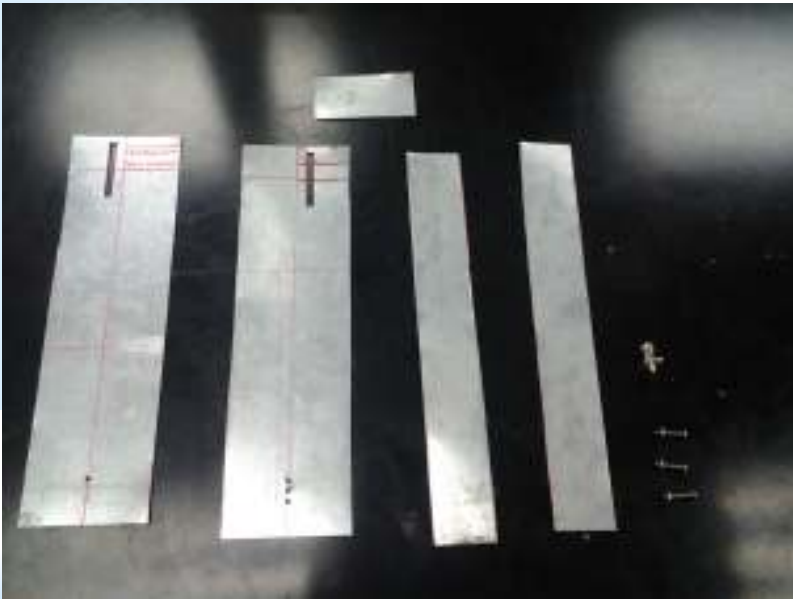
The Design

- Wavelength λ is 4.921 in
- Guided Wavelength λ_g is 6.000 in using
 - $\lambda_g = (\lambda / (1 - (f_c/f)))$
 - f_c is 1.375 GHz and f is 2.4 GHz
- $\lambda_g/4$ distance between open end of waveguide and BNC
- $\lambda_g/4$ distance between closed end and middle of slot
- $3*\lambda_g$ between slot and BNC
- $a=4.3$ in $b=2.15$ in $d=15$ in

The Design



The Design



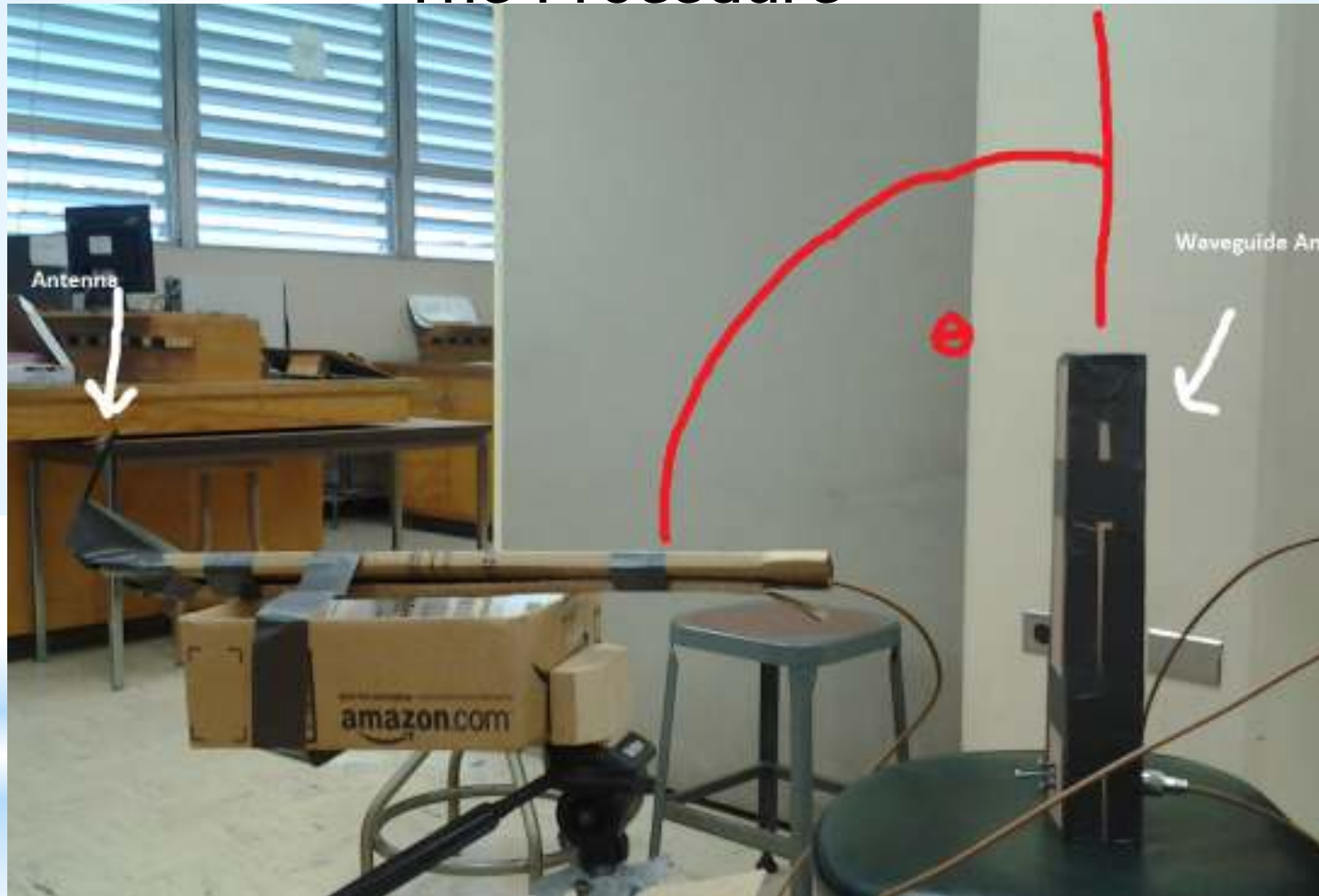
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The Procedure



The Procedure



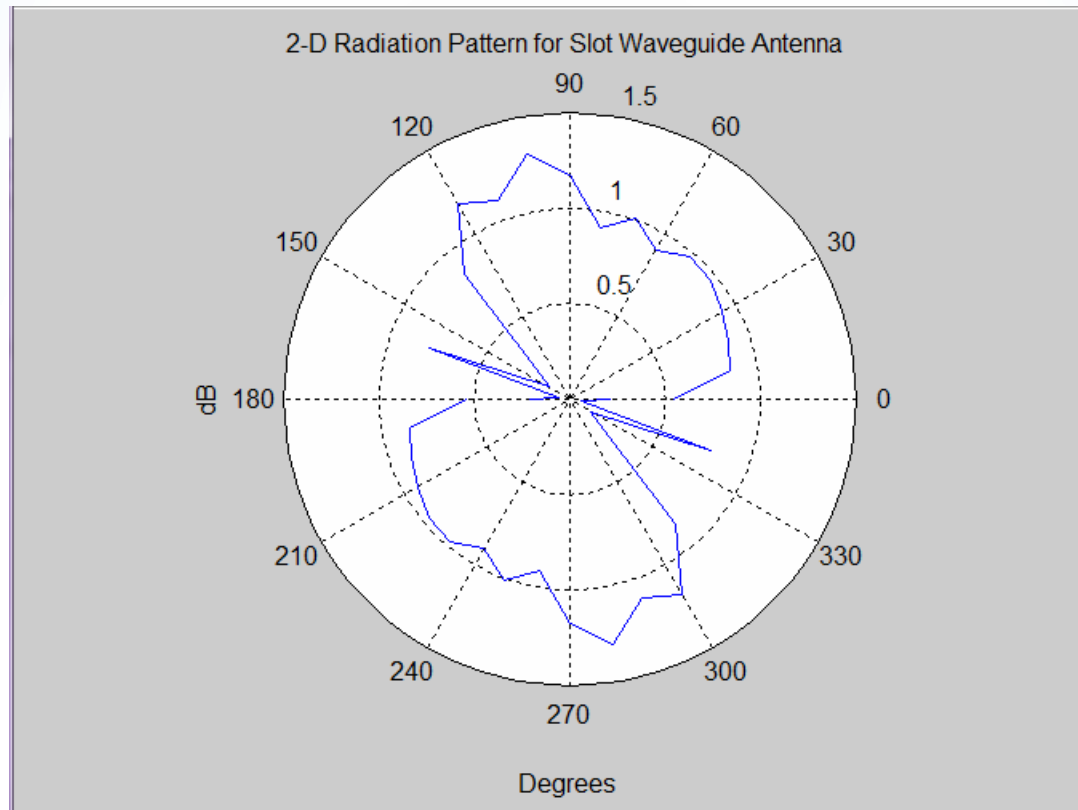
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Results

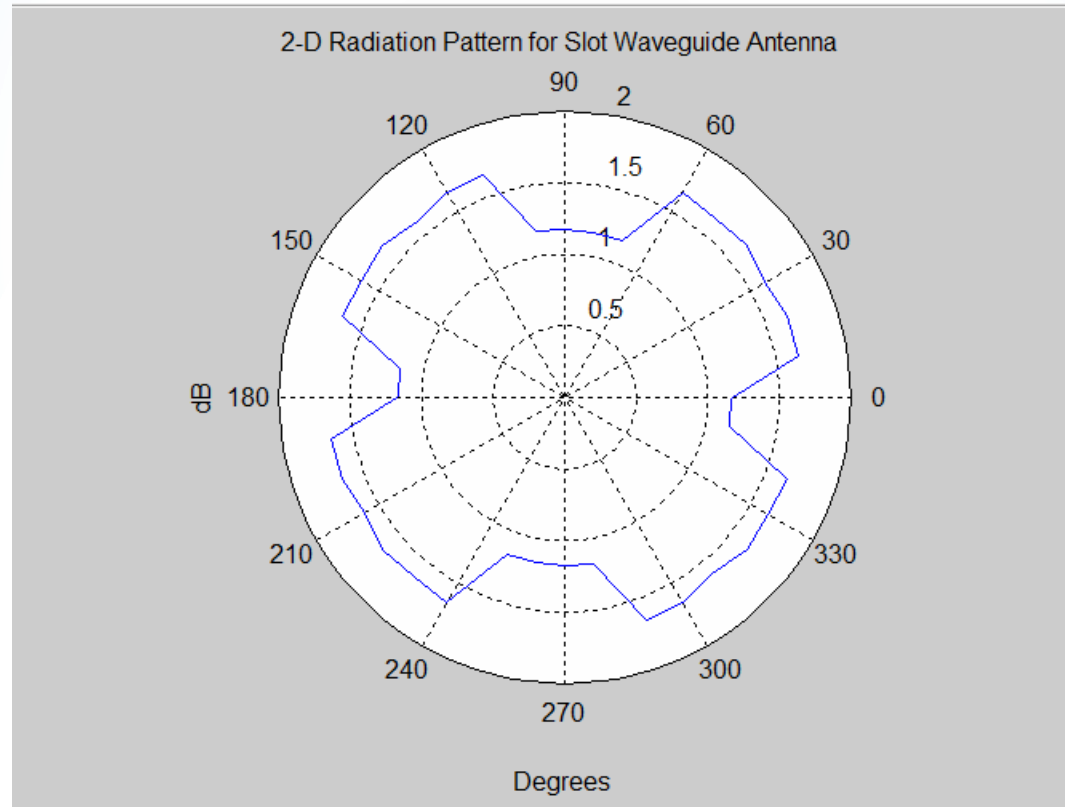


Results



Azimuth Angle 2-D Pattern

Results



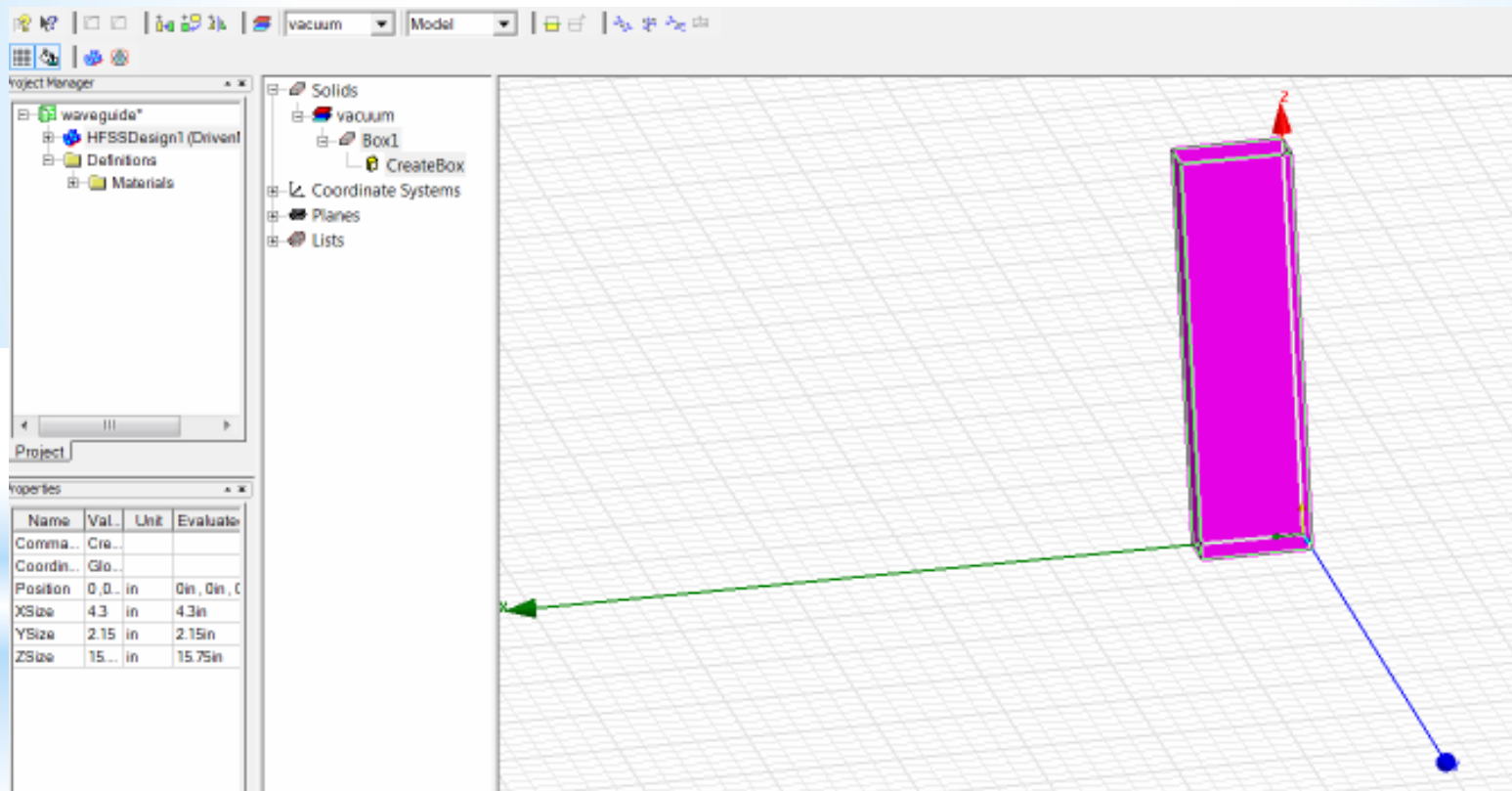
Elevation Angle 2-D Pattern

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Future Work

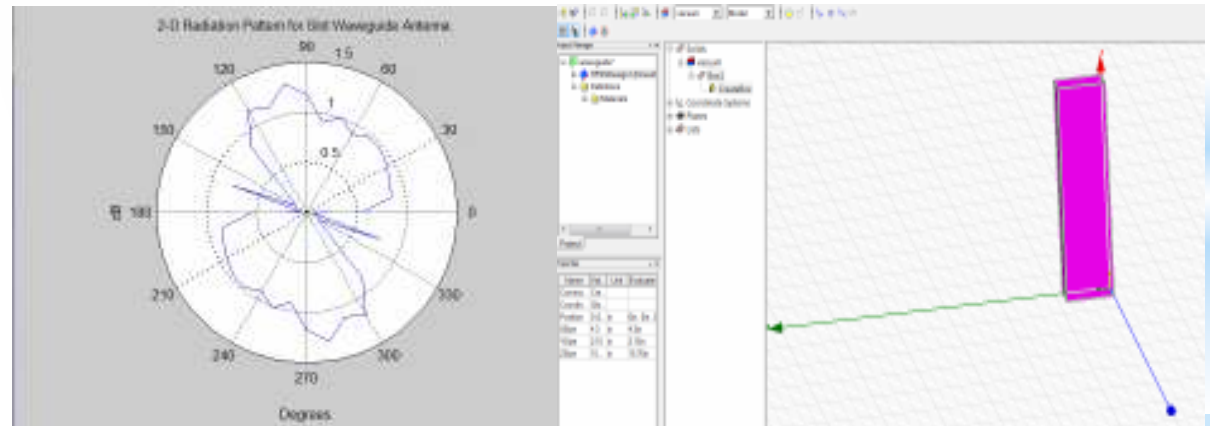
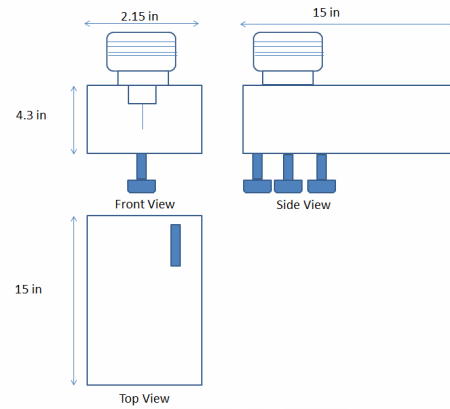
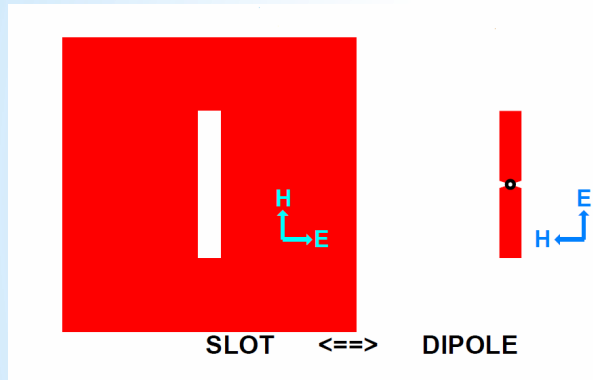
- HFSS Modeling
- Measure data slower and process data more accurately



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Conclusion



Reference

[1] Wade, Paul. *W1GHZ Microwave Antenna Book*. 2001