Sponsored by Prof. Zoya Popovic and Prof. Gregor Lasser

Automated Anechoic Chamber
Team DirecRF

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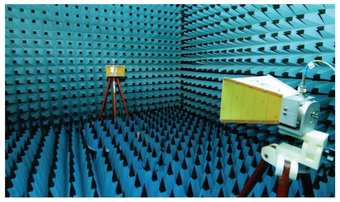
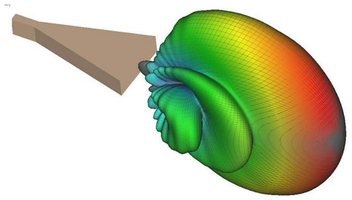
Background

An anechoic chamber is a room covered in absorbent material which reduces the reflection of electromagnetic waves. The purpose of an anechoic chamber is to facilitate measurements of antenna radiation patterns which are used to characterize antenna behavior.

Team DirecRF has automated the antenna measurement process in a pre-existing 2-20GHz chamber at CU Boulder.



Example Anechoic Chamber [1]



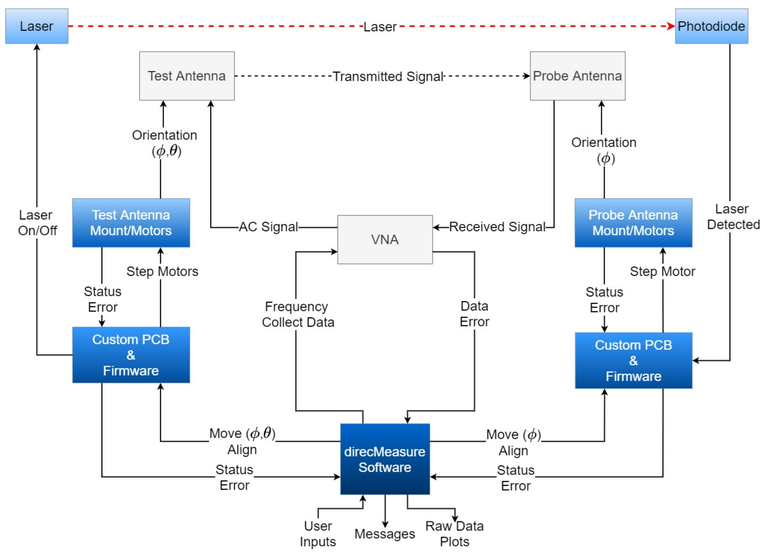
Example 3D Antenna Radiation Pattern [2]

System Overview

Objective: To create a system capable of automating the antenna measurement process that is low cost and easy to use.

System Requirements:

- Mount and rotate antennas of varying sizes and weights
- Rotate over a full 2π on the phi axis and π on the theta axis
- Achieve a maximum of 1° error at each desired orientation
- Generate radiation measurements over 2-20GHz in an easily parsable file format



Acknowledgments

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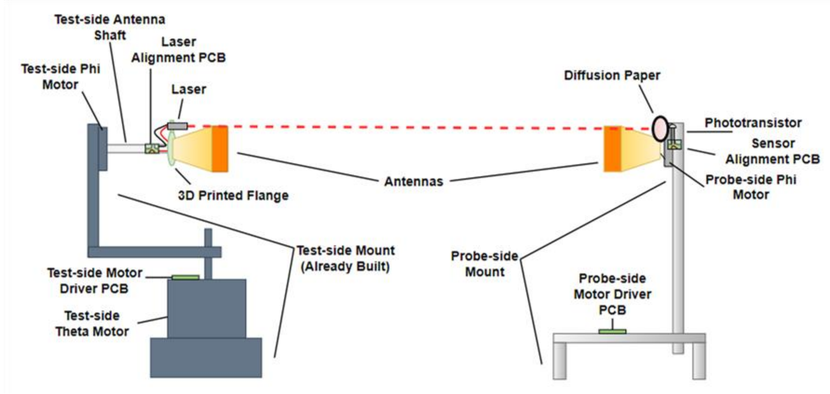
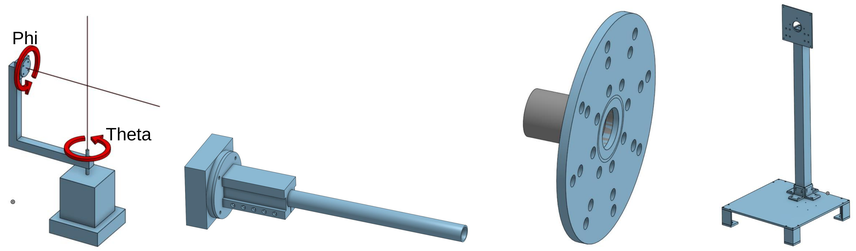


Illustration of Final Hardware Setup

Custom Hardware

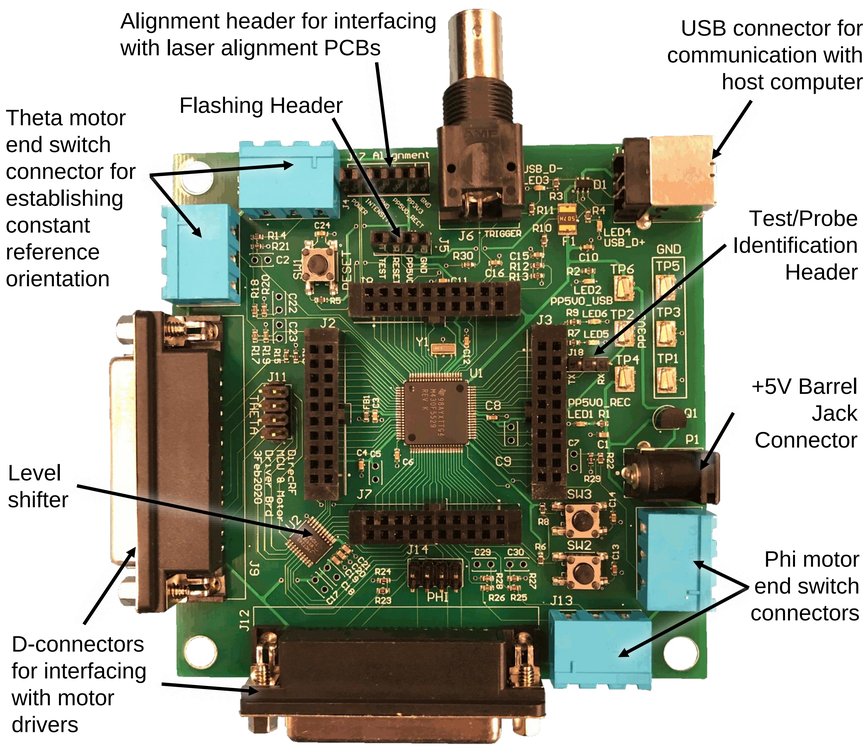


Test-side Mount

Transmit Shaft with Clamp

3D Printed Flange

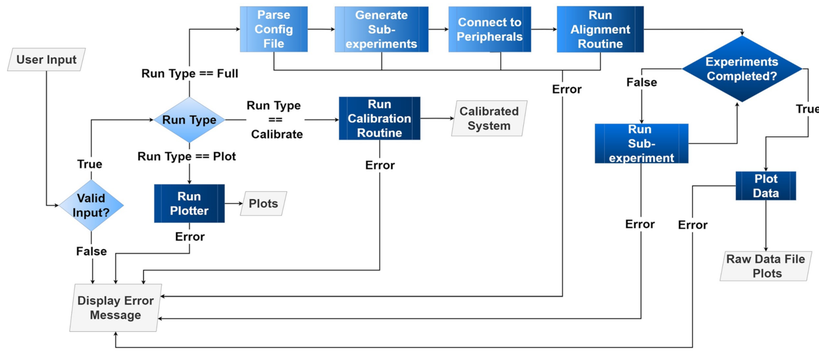
Probe-side Mount



Custom Software

Main functionalities:

1. Calibration - allows user to easily calibrate the alignment routine
2. Plotting - plots previously collected data
3. Experiments - runs specified RF antenna measurement routine

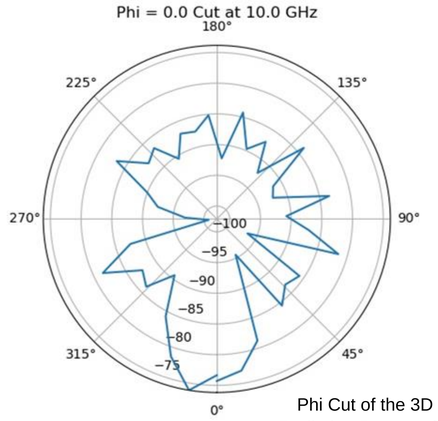


direcMeasure Software Diagram

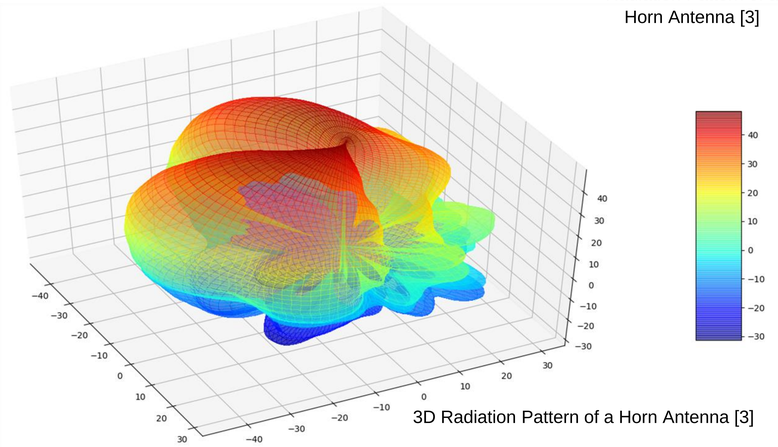
Results

Patch Antenna

Horn Antenna



Phi Cut of the 3D Radiation Pattern of a Horn Antenna [3]



3D Radiation Pattern of a Horn Antenna [3]

[1] G. Dash, *How RF Anechoic Chambers Work*, Glen R. Dash Charitable Foundation (2005)

[2] "Horn Antenna Radiation Pattern." *RAYmaps*, 11 Feb. 2012, www.raymaps.com/index.php/some-common-antenna-radiation-patterns/horn-antenna-radiation-pattern.

[3] Plots generated from data provided by Professor Gregor Lasser.