Matthew Spencer – Spring 2018

E190AK Lab 4: Anechoic Chamber

In this lab you will use the anechoic chamber and a VNA to measure the propagation behavior of antennas.

Read the Datasheet for the Calibration Antenna and the Anechoic Chamber

Find and read the datasheet for the BBHA9120LF Double Ridged Horn antenna, which is the calibration antenna in our chamber. What are the gain and VSWR of the antenna at 2.4GHz? What is the S11 of the antenna at that frequency?

Read the specifications page for the PWTC 48-8anechoic chamber. What are the maximum and minimum frequencies supported by the absorbers used in the chamber? Look up the purpose of the absorbers and summarize your findings in one paragraph. Measure the inside of the chamber and determine the frequency at which the test turntable leaves the far field of the calibration antenna.

Helpful links are below:

- http://www.schwarzbeck.de/en/antennas/broadband-horn-antennas/double-ridged-horn-antenna/408-bbha-9120-lf-double-ridged-broadband-horn-antenna.html
- http://www.ramayes.com/Portable_Wireless_Test_Chambers.htm

Measure a 2.4GHz Antenna

The lab has a number of TL-ANT2409A antennas (https://www.tp-link.com/us/products/details/cat-5067_TL-ANT2409A.html). Calibrate the VNA and then mount one in the anechoic chamber to serve as our antenna under test (AUT). Note that calibrating the VNA requires a bit of creativity: the cables are quite far apart, so you may need to correct the electrical length of the cables later.

Measure the S-parameters of the link between the AUT and the calibration antenna. Back out a plot of input impedance vs. frequency for the AUT. Make a link budget for this communication link and use it to extract the gain of the AUT assuming the calibration antenna datasheet is perfect. (This assumption is pretty good: we've characterized the calibration antenna extensively.)

After that, use the turntable to measure a radiation pattern for the AUT. Compare it to the datasheet and explain any deviations. Guess what kind of antenna it is based on the gain and shape.

Characterize a Patch Antenna

A machined patch antenna is sitting on top of the VNA. Use theory to predict its gain, input impedance, operating frequency and radiation pattern. Confirm with the anechoic chamber.

Extra Credit: Characterize a Weird Antenna

Pick any weird antenna you can find in the lab and find measure it's gain, input impedance and radiation pattern. Include a picture of the antenna in your report. Eyeball the antenna dimensions to be sure that it's near field is suitable for the chamber (and that it will fit inside!).