



Low-cost Anechoic Chamber Construction and its Applications for Educational Purposes

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1. Extended Abstract

Anechoic chambers are general purpose facilities that provide isolated, controlled environments to support different types of RF measurements such as antenna pattern measurements, radar cross sections, system sensitivity, etc. [1-2]. Due to the high cost of absorbing and shielding materials, anechoic chamber constructions are usually expensive. Having access to such a facility in a cost effective manner would enhance the quality of teaching activities involved in electromagnetics theory and RF technology.

In this paper, we introduce a set of instruction for the construction of a rectangular anechoic chamber built around a network analyzer. This chamber is used at the Catholic University of America by both graduate and undergraduate students for educational and research purposes. The proposed external dimensions of the chamber is 36" x 36" x 36" working from 8 GHz up to 40 GHz. The chamber is shielded using 2 layers of standard aluminum foil with thickness 0.0025"/layer. For performance assessment, return loss and insertion loss measurement are implemented on the side walls of the chamber. Measured results show that return loss and insertion loss of the side walls are lower than -70 dB on frequency band of 8 GHz-40 GHz. To reduce the cost of construction and for application purposes, the chamber does not have a shielded cover top. However, this is compensated by using absorbing materials to cover the top region of the chamber.

The chamber is supported by a planar antenna scanner that resides on top to enable different types of experiments. To validate the performance of the system, two experiments were implemented as part of the year long senior design project at Catholic University, namely (i) 3D-imaging of buried objects and (ii) near-field antenna measurement.

- (i) The main objective of 3D-imaging of buried objects is to locate and reconstruct the shapes of the buried objects inside unknown medium. This is appropriate for different applications such as land-mine detection [3], or road condition surveys [4].
- (ii) Near-field antenna measurement [5] can be critical under circumstances in which far-field antenna measurements cannot be implemented (i.e. lack of large dimension anechoic chambers, etc.)

The results from these experiments show that the constructed anechoic chamber is efficient and practical in which it is able to support different types of measurements but still cost-effective enough for educational purposes. Compared with commercial product, the budget required for this chamber construction is much lower while acceptable performances in isolation level are still acquired.

2. References

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