Applications and Development of The DLM Antenna on Glass

Overview:

This project will be to investigate the implementation of DLM antennas within or on glass. The DLM antenna is a two dimensional antenna developed at the University of Rhode Island and provides high performance when compared to a standard antenna even though the antenna is one third the size. The antenna applications to be investigated will be for Bluetooth, WiFi, Cellphone and a host of other applications. Because DLM antennas are two dimensional they lend themselves nicely in applications such as this.

The emphasis will be for the automotive industry but other applications will also be investigated

This Capstone project requires two Electrical Engineering students, who will be tasked with a variety of design, assembly, and testing tasks. Knowledge of RF design practice and electromagnetic principles is preferred, but not required. The project offers opportunity to learn about PCB design (specifically, issues specific to high frequency operation which is a major driving point in professional practice) as well as RF design and testing procedures. Students will have the opportunity to work with bleeding edge technology and advanced manufacturing processes not encountered in many environments. The Capstone team will work and communicate with the inventor of the technology as well as an Electrical Engineering Masters Student, a prior Capstone team member.

Students will learn basic antenna principles and will also become familiar with the use of terms such as SWR, antenna gain and bandwidth to name few. Students will learn to use instruments used in this field, these include field intensity meters, Spectrum analyzers, Network Analyzers as well as basic electronic instrumentation.

Students will also learn the principles of transmission lines, the applications of resonance and antenna radiation.

Students will develop a background in a variety of RF related disciplines, including fundamental antenna design techniques, RF board/component layout rules, and electromagnetic test apparatus and protocols. Students have an opportunity to learn about concepts such as impedance matching, transmission line theory, resonant systems, and antenna radiation patterns and will develop an appreciation of industry terminology. Finally, students will be exposed to a variety of advanced test instrumentation such as spectrum analyzers, vector network analyzers, and SWR measurement instrumentation. Though this is an antenna design project, this knowledge is very applicable across a variety of engineering disciplines (for example, very high speed digital logic layout and electromagnetic compatibility analysis.)

Students will also become familiar with the use of CAD programs as used in development of engineering drawings and design of printed circuit layouts as applied to

DLM antenna development.

Two-dimensional DLM antennas can be manufactured on a variety of substrates. This specific project focuses on a antenna printed on film, which is sandwiched between glass layers of a windshield. The actual antenna designs are produced using a PCB CAD program, giving students an exercise in the development and interpretations of drawings. Students will also learn about mechanically integrating an assembly into a larger system.

Students will be required to interface with local corporations in the fabrication of antennas. They will participate in the testing and evaluation of antennas and will become familiar with many types of antenna measurements such as SWR, bandwidth, radiation field intensity, gain and efficiency. This project will require travel to these local corporations.

References:

U S Patent 7,187,335

Principles and Theories for the Understanding and Development of Distributed Loaded Monopole Antenna April 2, 2009 (available from Author)

Iridium Satellite Antenna, PDF (Available by googling title)

For additional information or questions contact references below

Mr. Robert J. Vincent, University of Rhode Island Research Foundation
robvi3@gmail.com

Ms. Rachel Simon, University of Rhode Island, Department of Electrical Engineering
rsimon@ele.uri.edu