

## Senior Design Project in Electrical and Computer Engineering



# Modeling Antennas on 87' and 270' Coast Guard Cutters

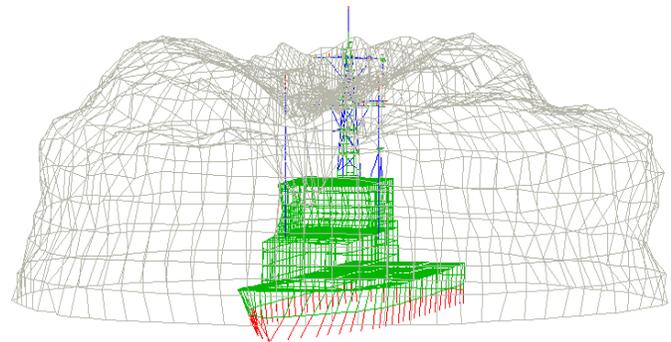
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Project Sponsor: USCG TISCOM

### Project Goal

The goal of this project is to obtain, validate and analyze VHF and HF antenna radiation patterns from a Numerical Electromagnetic Code (NEC) model of the 87' and 270' Coast Guard cutters. The analysis can be used to optimize design and placement of these antennas.



### Procedure

NEC uses the Method of Moments, mapping surfaces to simple wire segments for numerical analysis. Appropriate grid spacing depends on surface complexity as well as transmission frequency. A 3-dimensional plot of field strength can be produced, as shown above. Nulls in the antenna pattern indicate directions in which propagating field strength is weak. By experimenting with different antenna configurations, most nulls can be minimized and the desired pattern, typically omnidirectional, can be obtained. The expense of physically moving antennas and performing repeated full-scale tests is avoided.

### Modeling Efforts

The Coast Guard Academy has developed VHF and HF models of smaller cutters and HF models of some larger ones. With the speed and power of PCs rapidly increasing, the Academy is adding detail to existing models to improve accuracy, and is including more larger cutters such as the 270' to expand the benefits of modeling. The next logical step in antenna modeling at the Academy is to assist in the design and placement of antennas aboard new ships and aircraft, thereby reducing costly redesign and replacement in newly-delivered assets.

