Senior Design Project in Electrical & Computer Engineering

DGPS Directional Signal Strength Meter

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Sponsors: C2CEN and NAVCEN

Project Background: **The Coast Guard has been tasked with providing Differential Global Positioning System (DGPS) coverage mandated by the Nationwide DGPS initiative. Currently the Coast Guard does not have the ability to validate coverage prediction software for DGPS beacon transmitters. The purpose of this project is to finish development of a device that will make directional measurements of the signal strength radiated by DGPS transmitters in an effort to verify the coverage software, certify the coverage of each site, and troubleshoot any area of coverage in question. In previous years the concept has been proven, and an initial design has been put together (as shown in Figure 1). Our task is to complete that design so that it can make accurate measurements in the field.**

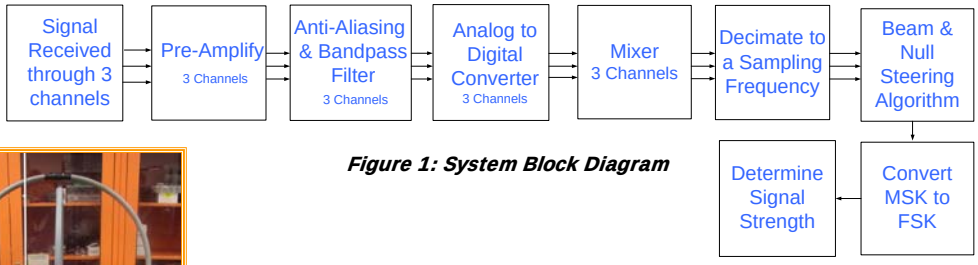


Figure 1: System Block Diagram

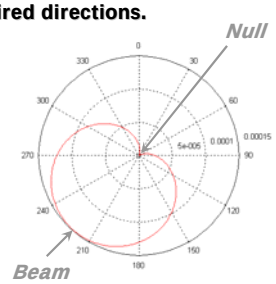
Antennas and Vector Signal Analyzer

Project Work: **Examining the current beam & null steering algorithm for possible enhancements will allow us to make changes and more accurately reach the desired result. In order to design the signal strength algorithm, we will analyze each step in the process, as shown in Figure 1, to determine its effect on the signal – specifically, we will measure the amount of gain that each component produces. Corrections for the gain will then be made when signal strength is calculated.**

Project Plan: **The meter uses two loop antennas and one whip antenna to implement antenna steering and receive DGPS signals in known directions. These signals will be amplified and filtered, then passed through a digital to analog converter so that the signal can be processed with MATLAB®. We plan to enhance the algorithm MATLAB® utilizes to "steer" the beam, where the bulk of the signals are received, and the null, where minimal signals are received, in specified directions (Figure 2). We also plan to design and implement a signal strength algorithm using MATLAB®. Once these steps are completed, the meter will effectively be able to "listen" in a certain direction to detect a DGPS signal and determine its strength, while blocking out signals in undesired directions.**

Project Deliverables: **Our goal this year is to complete the project and present the following:**

- **Documented, working prototype of the signal strength meter**
- **User Manual**



DGPS Transmitting Site

Figure 2: Theoretical example of Steered Beam (225°T) and Null (045°T)