MASTER OF SCIENCE
IN
SYSTEMS ENGINEERING

DESIGN, PROTOTYPING AND MEASUREMENTS OF CAVITY-BACKED CONICAL SPIRAL WIDEBAND ANTENNA FOR SUBMARINE APPLICATIONS

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Currently, submarines contain wideband receive and several narrowband transmit antennas. Due to the limited space available for antennas on submarines, wideband transmit antennas that fulfill new mission requirements are needed. RATTLE-1 is a wide band antenna covering te 300 MHz to 3 GHz frequency range. The design was subject to user-specified physical constraints on antenna installation as well as operational constraints including of transmitting one kilowatt of power. The antenna is a two-arm conical Archimedean spiral backed by a hemisperical cavity. This thesis develops a physical prototype for the antenna, tests the basic design, models the antenna in an operational environment and performs limited testing in an operational environment. The results for prototype measurements show that RATTLE-1 operates with a 60 to 70 degree beamwidth, a main beam gain of 0 to 15 dB and a front to back ratio of 7 to 25 dB within the desired frequency range. Computer simulations were performed, using the Numerical Electromagnetics Code (NEC), and the antenna was tested on an outdoor antenna range to determine the effects of seawater on the antenna performance.

DoD KEY TECHNOLOGY AREAS: Command, Control, and Communications, Electronics, Electronic Warfare, Sensors, Modeling and Simulation

KEYWORDS: Command, Control, and Communications, Electronics, Electronic Warfare, Sensors, Modeling and Simulation, Wideband Communications Antenna, Conical Spiral Antenna

ULTRA-WIDEBAND RADIO FREQUENCY VEST ANTENNA

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The Ultra-Wideband Radio Frequency Vest Antenna is the result of the research efforts to develop an antenna system to support the Joint Tactical Radio System (JTRS) currently being procured by the United States Department of Defense. The JTRS is an Ultra-Wideband radio system that is expected to operate in the two Megahertz to two thousand Megahertz frequency range. It is a frequency agile system that requires an equally responsive antenna system. The operating spectrum of the radio has been determined to be effectively covered through the use of three separate antennas. The frequency divisions are two to thirty Megahertz, thirty to five hundred Megahertz, and five hundred to two thousand Megahertz. This thesis focuses on the thirty to five hundred Megahertz frequency range in support of the dismounted Marine or soldier in all combat environments.

DoD KEY TECHNOLOGY AREAS: Command, Control and Communications, Electronics, Modeling and Simulation

KEYWORD: Antennas, Numerical Electromagnetics Code (NEC), Method of Moments, Wire Grid Modeling, Loop/Dipole, Man-portable, COMbat Wear INtegration (COMWIN)