MASTER OF SCIENCE
IN
APPLIED PHYSICS

INVESTIGATION OF HIGH FREQUENCY SHIP RADAR CROSS SECTION REDUCTION BY MEANS OF SHAPING

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The objective of this thesis is to investigate and evaluate the effectiveness of ship radar cross section (RCS) reduction in the high frequency (HF) band by means of shaping. The study is based on a computer simulation which uses the method-of-moments to compute the RCS of a number of conventional and shaped ship geometries. It was found that a ship with canted deckhouse walls and a standard hull had little reduction in RCS relative to a conventional ship. This result shows that shaping is not as effective at these frequencies (3-30 MHz) as it is in the optical region. The hull is the major contributor to RCS near broadside. Shaping the hull did reduce the RCS slightly for the frequencies and elevation angles investigated.

DoD KEY TECHNOLOGY AREAS: Electronics, Sensors, Surface/Under Surface Vehicles-Ships and Watercraft, Modeling and Simulation

KEYWORDS: HF Radar, Ship, RCS, Method-of-Moments, CAD

A FUTURE SATELLITE TECHNOLOGY

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Tiny earth-orbiting spacecraft known as nanosatellites are now possible due to breakthroughs in microelectromechanics that permit engineers to build extremely small yet fully functional devices. With today's satellite launch costs averaging around $20,000 per pound lifted into space, nanosatellites could revolutionize the future of space access by significantly reducing the size, mass, power requirements, complexity and ultimately the costs of space systems. The small satellite concept fosters a faster evolution in space science and introduces and tests state-of-the-art space technology. Of the technologies required to design a miniaturized and yet autonomous vehicle, nanoelectronics is at the forefront.

The field of nanoelectronics is primarily concerned with integrated circuit (IC) technology at geometries well below 100 nanometers. It is in this realm that the quantum mechanical nature of the electron becomes of paramount importance. With the tools of quantum physics, reduction in the size of individual transistors has yielded the quantum dot; a three-dimensional structure for confinement of a single electron. The theoretical study in this thesis will show that the width in p-n junctions is generally

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underestimated for curved interfaces by textbook formulas. This result is significant for semi-cylindrical quantum dots which are the logical result of continued down scaling in semiconductor devices.

DoD KEY TECHNOLOGY AREAS: Space Vehicles, Electronics

KEYWORDS: Nanosatellites, Nanoelectronics, Solid State Physics