FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2004
Exhibit R-2

BA: 02 PROGRAM ELEMENT: 0602271N
PROGRAM ELEMENT TITLE: RF Systems Applied Research

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
RF Systems Applied Research	69,232	49,244	49,151	54,265	54,045	55,087	56,177

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Radio Frequency (RF) Systems Applied Research Program addresses technology deficiencies associated with naval platform needs for new capabilities in RF surveillance, RF electronic warfare, communications, navigation, RF solid state power amplifiers, vacuum electronics power amplifiers, and supporting RF electronics technologies. The program supports development of technologies to enable capabilities in missile defense, directed energy, platform protection (including electric warship), time critical strike, and information distribution. RF Systems Applied Research developments directly support the Department of Defense Joint Warfighter Plan and the Defense Technology Area Plans. Activities within this Program Element (PE) have attributes that focus on enhancing the affordability of warfighting systems. The program also provides for technology efforts to maintain proactive connectivity and collaboration between Department of the Navy (DoN) Science and Technology (S&T) and Joint, Navy, and Marine Corps commands worldwide.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

PROGRAM CHANGE SUMMARY:

	FY 2003	FY 2004	FY 2005
FY 2004-2005 President's Budget Submission	74,208	44,019	51,415
Cong. Rescissions/Adjustments/Undist.Reductions	0	-568	0
Congressional Actions	0	5,800	0
Execution Adjustments	-3,725	0	0
Inflation Savings	0	0	-165
Rate Adjustments	0	-7	-99

SBIR Assessment	-1,251	0	0
Technical Adjustments	0	0	-2,000
FY 2005 President's Budget Submission	69,232	49,244	49,151

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.
Schedule: Not applicable.

FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2004

Exhibit R-2a

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A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project addresses technology deficiencies associated with naval platform needs for new capabilities in radar frequency (RF) surveillance, RF electronic warfare, communications, navigation, RF solid state power amplifiers, vacuum electronics power amplifiers, and supporting RF electronics technologies. The project supports development of technologies to enable capabilities in missile defense, directed energy, platform protection (including electric warship), time critical strike, and information distribution. RF Systems Applied Research developments directly support the Department of Defense Joint Warfighter Plan and the Defense Technology Area Plans. Projects within this PE have attributes that focus on enhancing the affordability of warfighting systems. The project also provides for technology efforts to maintain proactive connectivity and collaboration between Department of the Navy (DoN) Science and Technology (S&T) and Joint, Navy, and Marine Corps commands worldwide.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2003	FY 2004	FY 2005
RF Electronic Warfare Technology	13,900	11,671	15,078

Supports the Fleet Force Protection (FFP) Future Naval Capability (FNC) and those technologies that enable the development of affordable, effective and robust Electronic Warfare (EW) systems that will increase the operational effectiveness and survivability of U.S. Naval units. Emphasis is placed on non-optical passive sensors and active and passive Radio Frequency countermeasure (RFCM) systems that exploit and counter a broad range of electromagnetic threats. The focus is on maintaining near perfect real-time knowledge of the enemy; countering the threat of missiles to deployed Naval forces; and precision identification and location of threat emitters.

FY 2003 Accomplishments:

Technology development focused on the areas of Tactical Aircraft, Surface Ships, Submarines, Unmanned Aerial Vehicles (UAVs), and EW Enabling Technology. Some specific accomplishments include:

- Completed design of a solid state millimeter wave (MMW) power amplifier for jamming of MMW-seeker threats and successfully demonstrated the transmission and coherent recovery of a narrowband signal using a wireless link for towed decoy applications as part of technology efforts that will enable increased survivability of tactical aircraft (TACAIR) in hostile environments.
- Field demonstrated off-board countermeasures tactics, evaluated and tested advanced multi-level pseudo-random Electronic Attack (EA) waveforms and techniques, integrated an application specific integrated circuit (ASIC) chip with a digital RF memory for countermeasures against inverse synthetic-aperture radar (ISAR) threats, and completed data analysis for modeling clutter returns from a coherent source as part of technology efforts enabling increased surface ship survivability.
- Successfully demonstrated a near real-time signal processing frequency modulation continuous wave (EMCW) subsystem for detection of Low Probability of Intercept (LPI) radar threats against periscopes.
- Completed effectiveness of EA obscuration techniques via hardware-in-the-loop (HIL) experiments.
- Fabricated and tested ASICs for wideband EW channelizer applications and performed analysis and modeling for verification of a combined azimuth and elevation direction finding antenna concept.

FY 2004 Plans:

Technology development in the areas of Tactical Aircraft, Surface Ships, Submarines, UAVs, and EW Enabling Technology continues. Some specific plans include:

- Demonstrate full radio frequency-to-pulse descriptor word system functionality under the Wideband EW Channelizer effort.
- Conduct lab testing of the near real-time processing of the ultra-wideband chirp subsystem under the Electronic Support (ES) detection of LPI Periscope Detection Radar effort.
- Develop and test the frequency agile prediction algorithm for advanced seekers under the EA Techniques to Counter Advanced Threats effort.
- Perform Electronic Countermeasure (ECM) systems analysis and modeling for both onboard and offboard systems under the countermeasures for Wideband Antiship Threats effort.
- Initate analysis and modeling to develop and refine the detailed direction findings (DF) antenna design for the Hybrid Interferometer Technology Development effort.

FY 2005 Plans:

Technology development in the areas of Tactical Aircraft, Surface Ships, Submarines, UAVs, and EW Enabling Technology continues. Some specific plans include:
• Perform at-sea testing of the ultra-wideband chirp subsystem under the ES detection of LPI Periscope Detection Radar effort.
• Perform shore based field testing against advanced seekers using the advanced techniques generator in the EA Techniques to Counter Advanced Threats effort.
• Conduct vulnerability analysis of seeker discrimination and home-on-jam (HOJ) subsystems to the ECM system as part of the countermeasure (CM) for Wideband Antiship Threats effort.
• Fabricate and perform lab demonstration of the DF antenna for the Hybrid Interferometer Technology Development effort.
• Continue the analysis and modeling to develop and refine the detailed direction findings (DF) antenna design for the Hybrid Interferometer Technology Development effort.

	FY 2003	FY 2004	FY 2005
Supporting Technologies	11,000	10,000	12,709

Provides for the radiation, reception, signal control and processing of very high frequency (VHF), ultra high frequency (UHF), micro wave (MW), and millimeter wave (MMW) power for Navy all-weather radar, surveillance, reconnaissance, Electronic Attack (EA), communications, and smart weapons systems. The technology developed cannot, for the most part, be obtained through commercial off the shelf (COTS) as a result of the requirements placed on power, frequency, linearity, bandwidth, weight, and size.

FY 2003 Accomplishments:

• Continued the development of octave bandwidth linearizers with emphasis placed on circuit design using the results of the architecture study as a basis.
• Continued the wide bandgap transistor reliability effort with insertion of the knowledge gained in FY 2002 into the device technology and subsequent testing to document the improvements in the stability and lifetime of next-generation Silicon Carbide (SiC) and Galium Nitride (GaN) devices.
• Continued the effort to develop high power channelizers by demonstrating the individual band filters and designing combining manifold within size and power requirements.
• Continued the development of high power, wideband, isolators by applications of improved modeling and control of low frequency losses (<2 dB insertion) to a low power isolator with >15dB of isolation operating over the 4-20 GHz frequency range.

• Demonstrated submicron scaling of Indium Phosphide (InP) transistors to 0.8 microns needed for complex circuits operating at clock speeds to 20 GHz for application to a direct digital synthesizer (DDS) frequency source with programmable integral modulation capabilities.
• Demonstrated packaging of microwave frequency DDS with integral modulator in integrated circuit form for use in an electronically scanned array operating to 4.5 GHz.
• Fabricated and demonstrated radio frequency (RF) microelectronic mechanical systems (MEMS) tunable filter elements and modules that will demonstrate size and RF performance requirements in a 5 bit tunable filter assembly.
• Demonstrated expected ultra-low phase noise performance of free running oscillator over the short time scales and developed the phase locking circuit to provide, over long time scales, the same noise performance required to accurately beam steer a phased array.
• Developed monolithic wide bandgap low noise receiver amplifiers with increased survivability under RF drive, enhanced linearity, and high temperature operation.
• Demonstrated Silicon Carbide (SiC) Bipolar Junction Transistors (BJTs) and PiN diodes with Ion=25A and Vb=1200 for application to a 40-100 kW motor drive.

FY 2004 Plans:

• Fabricate and test linearizers with 2 GHz of bandwidth.
• Perform full RF life tests of SiC discrete devices and Monolithic Microwave Integrated Circuits (MMICs).
• Broaden the database for addressing infant mortality issues in GaN discrete devices and begin to establish approaches to RF life testing of GaN High Electron Mobility Transistors (HEMTs).
• Demonstrate the power handling channelizer in the laboratory.
• Demonstrate increased power handling (up to 20 Watts) and reduced losses (<1 dB) of the high power, wideband, isolators.
• Increase the performance and yield of devices used in the DDS frequency source.
• Demonstrate a superconducting analog-to-digital converter (ADC) with a 5 GHz center frequency and programmable bandwidth in the 20-400 MHz range.
• Optimize the wide bandgap low noise receiver amplifier designs by targeting specific spectral bands and explore approaches to the utilization of these amplifiers with reduced limiter protection.
• Explore cost reduction technical approaches critical to the development of digitally programmable RF electronics components for electronically scanned arrays.

FY 2005 Plans:

• Fabricate and test linearizers with 4 GHz of bandwidth.

- Continue the effort to improve DDS device performance and yield for InP transistors.
- Transfer results of initial SiC RF life tests into the manufacturing technology and initiate a second iteration of testing.
- Perform initial RF life testing of discrete GaN devices and establish approaches to RF life testing of GaN based MMICs.
- Initiate development of specifications for next generation high power channelizer.
- Continue development of high power, wideband isolator technology by focusing on size reduction and geometry to fit the 20 GHz array spacing.
- Continue the effort to improve InP device performance and yield for application to the 20 GHz DDS and incorporate True Time Delay (TTD) into the DDS to facilitate RF microwave beamsteering in a single packaged monolithic integrated circuit.
- Continue to investigate cost reduction technical approaches critical to the development of digitally programmable RF electronics components for use in electronically scanned arrays.

	FY 2003	FY 2004	FY 2005
RF Surveillance Technology	7,200	5,200	6,447

Emphasizes non-optical advanced sensor and sensor processing systems for continuous high volume theater-wide air and surface surveillance, battle group surveillance, real time reconnaissance and ship defense. Major technology goals include long-range target detection and discrimination, target identification (ID) and fire control quality target tracking in adverse weather, background clutter and electronic countermeasure environments.

FY 2003 Accomplishments:

- Continued development of the Digital Array Radar (DAR) technology with emphasis placed on element level and sub-array wideband digital beam-forming techniques to enable rapid steering and precision control of multiple beams.
- Continued development of Radio Frequency (RF) sensor waveforms, operating characteristics and signal processing for maritime situational awareness.
- Expanded the study of Non-Cooperative Target Recognition (NCTR) technology to encompass harbor (short range) as well as long range all weather target identification.
- Continued the development of component prototyping for the Horizon Extension Sensor System (HESS) with emphasis on technologies for light weight integrated active arrays for deployment from surface combatants.
- Continued development and integration of the Common Affordable Radar Processor (CARP) Data Distribution Module (DDM) by incorporating and evaluating the performance of multiple parallel DDMs integrated into a

simulated multi-channel radar front end.
• Conducted airborne demonstrations on the AN/APY-6 radar Inverse Synthetic Aperture (ISAR) and Micro-doppler modes against small sea surface targets and against slow moving ground targets.

FY 2004 Plans:

• Continue the development of DAR technology with hardware demonstrations at the individual array element and sub-array levels.
• Continue development and characterization of advanced NCTR algorithms in congested harbor environments.
• Demonstrate critical enabling high power amplifier technology capable of supporting the Horizon Extension Sensor System (HESS).
• Demonstrate synchronization of multiple DDMs in a CARP architecture with asynchronous network topologies.
• Initate the development to demonstrate signal processing, waveform generation and one dimensional active phased array apertures for Harbor Surveillance and situational awareness.

FY 2005 Plans:

• Continue development of system level hardware for DAR and characterize its performance at the element, sub-array and system levels.
• Continue demonstrations of advanced NCTR algorithms in congested harbor environments.
• Continue the HESS project integration of High Power Amplifier (HPA) and digital beamforming X-band sub-arrays.
• Continue the development to demonstrate signal processing, waveform generation and one dimensional active phased array apertures for Harbor Surveillance and situational awareness.

	FY 2003	FY 2004	FY 2005
RF Communications Technology	8,160	3,500	5,269

Addresses critical Navy communications technology deficiencies and needs that are not addressed by the commercial technology sector. The activity emphasis is on reliable interoperable communications between U.S and coalition forces, at all levels of command, and rapid and reliable utilization of government and commercial telecommunications assets worldwide that are efficient and responsive to warfighting needs.

FY 2003 Accomplishments:

• Completed the X/Ku band phased array system design optimization and prepared a transition plan for

development of an advanced technology demonstration to take place within PE 0603271N.
• Completed characterization of a prototype K/Ka/Q band phased array with emphasis on simultaneous multi-beam operation, this effort will be continued in FY 2004 and beyond in PE 0603271N.
• Completed development of the Defense Advance Research Projects Agency (DARPA)/Office of Naval Research (ONR) developed Ultra Small Aperture Terminal (USAT) K/Ka Band Phased Array technology to be incorporated into K/Ka/Q band phased array development within PE 0603721N.
• Completed final design for Next Generation Buoyant Cable Antenna (NGBCA) for incorporation into the KSA FNC apertures program for advanced technology demonstration unit to be developed within PE603271N.
• Continued developed of the Naval Battle-Force Network (NBN).
• Incorporated the tactical communications payload for Vertical Take-Off Unmanned Air Vehicles (VTUAV) into the NBN architecture and implemented queuing management technology in Navy Line of Sight (LOS) networking radios.
• Continued to augment the Quality of Service (QoS) strategy for the Automated Digital Network System (ADNS).
• Investigated multi-function communications systems architectures to enable integration into the Navy's Advanced Multi-Function Radio Frequency Concept (AMRF-C) technology test bed.

FY 2004 Plans:

• Complete development and demonstration of the NBN technologies and transition to acquisition programs at Space and Naval Warfare Systems Command (SPAWAR).
• Continue development of standardized interfaces and Information Protocol (IP) standards for multi-function communications systems architectures to enable integration into the Navy's, to facilitate integration and efficient management and control of multiple data link and satellite communications functions into the Navy's AMRF-C technology test bed.
• Continue to augment the Quality of Service (QoS) strategy for the Automated Digital Network System (ADNS).

FY 2005 Plans:

• Integrate multi-function communication system functions into the Navy’s AMRFC technology test bed and evaluate resource management and control processes.
• Investigate technologies and tactics to minimize electromagnetic compatibility and interference issues with other AMRF-C functions such as Electronic Support (ES) and Electronic Attack (EA).
• Continue to augment the Quality of Service (QoS) strategy for the Automated Digital Network System (ADNS).

	FY 2003	FY 2004	FY 2005
RF Solid State Power Amplifiers	3,500	3,000	3,500

Provides for the generation of Very High Frequency (VHF), Ultra High Frequency (UHF), Microwave (MW), and Millimeter Wave (MMW) power amplifiers for Navy all-weather radar, surveillance, reconnaissance, electronic attack, communications, and smart weapons systems. The technology developed cannot, for the most part, be obtained through Commercial-Off-the-Shelf (COTS) as a result of the simultaneous requirements placed on power, frequency, linearity, bandwidth, weight, and size.

FY 2003 Accomplishments:

- Continued development of SiC bipolar transistors and extended their frequency of operation to L-band.
- Continued development of millimeter wave (MMW) Aluminum Gallium Nitride/Gallium Nitride (AlGaN/GaN) wide bandgap High Electron Mobility Transistor (HEMT) technology with an emphasis on output signal quality and linearity.
- Continued development of multi-octave wide bandgap power amplifiers with broadband EW applications addressed as demonstration vehicles for the current technology with emphasis placed on the 4-18 GHz band.
- Continued development of the AlGaN HEMT broadband amplifiers for electronic warfare decoy applications.

FY 2004 Plans:

- Demonstrate silicon carbide (SiC) transistors with 300 W of output power at L-band.
- Continue development of MMW AlGaN/GaN wide bandgap HEMTs.
- Develop advanced transistor materials and structures to enhance amplifier efficiency with the emphasis to include development of complete monolithic integrated circuits.
- Continue development of AlGaN HEMT broadband amplifiers for electronic warfare decoys with output powers up to 10 times that achieved with conventional solid state amplifiers.

FY 2005 Plans:

- Continue the development of MMW AlGaN/GaN wide bandgap HEMTs.
- Develop AlGaN HEMT broadband amplifiers with over 20W output power over the full band for electronic warfare decoys.

	FY 2003	FY 2004	FY 2005
RF Vacuum Electronics Power Amplifiers	4,700	3,000	3,500

Provides for the development of microwave (MW), millimeter wave (MMW), and submillimeter wave power amplifiers for use in naval all-weather radar, surveillance, reconnaissance, electronic attack, and communications systems. The technology developed cannot, for the most part, be obtained through commercial off the shelf (COTS) as a result of the simultaneous requirements placed on power, frequency, bandwidth, weight, and size. Responding to strong interests from the various user communities, efforts are focused on the development of technologies for high-data-rate communications and high-power high-frequency radar applications. Technologies include multiple-beam amplifiers, notably the multi-beam klystron (MBK), modeling and simulation, and field emitter arrays.

FY 2003 Accomplishments:

• Designed high dynamic range helix Traveling Wave Tube (TWT) experiments and tested TWTs to improve digital signal error performance.
• Completed time-dependent block model for helix TWTs with memory effects included.
• Designed cavities for multi-beam amplifiers with eight electron beams.
• Completed beta version of the two dimensional/three dimensional (2D/3D) coupled cavity traveling wave tube (CC-TWT) design code with the addition of a model to handle reflections at internal matching elements.
• Developed 3D models for alternating current (AC) space charge for both helix and coupled-cavity TWTs. A hybrid mesh capability (hexahedra and tetrahedra) was introduced into the MICHELLE gun code.
• Developed techniques to address non-axial symmetry in 3D stability analysis for helix TWT design codes.
• Continued the investigation of high brightness scandate cathodes using Pulsed Laser Deposition (PLD) techniques.
• Investigated the optimum chemical composition required for high-current-density scandate emission for cathodes formed by PLD.
• Continued the large-signal time-dependent code GATOR incorporating the reflection models developed earlier for beta testing.

FY 2004 Plans:

• Continue the development of physics-based models and demonstration of low-distortion TWTs, using C-band as a demonstration communication band.
• Validate the time-dependent block models for digital signal amplification in helix TWTs and release to the domestic vacuum electronics industry.

• Perform a radio frequency (RF) optimization for multi-beam klystrons using telegrapher's equation solution for linear amplifiers (TESLA).
• Release to the U.S. vacuum electronics industry the large-signal time-dependent code GATOR incorporating the reflection models developed earlier for beta testing.
• Release MICHELLE v3.0 and TESLA v2.0 to the domestic vacuum electronics industry for beta testing.

FY 2005 Plans:

• Use two-and three-cavity narrow-band S-band multi-beam klystron experiments to validate the multi-beam design tools.
• Develop parallelization techniques for TESLA as the design tool tailored for multiple-beam klystron development.
• Demonstrate a high-data-rate (> 1 Gbps) TWT using 16 bit quadrature amplitude modulation (QAM).

	FY 2003	FY 2004	FY 2005
RF Navigation Technology	2,000	1,700	2,648

Develops key navigation technologies for Naval Battle Groups, Aircraft, Unmanned Air Vehicles (UAVs), Unmanned Underwater Vehicles (UUVs), Ships, Submarines and other Navy vehicles and platforms. This activity applies leading-edge Science and Technology (S&T) to enhance Global Positioning System (GPS) capabilities in order to make GPS more resistant to noise and jamming. Much of the near-term effort concerns the development of antennas with special features.

FY 2003 Accomplishments:

• Demonstrated an antenna, feed network and nulling electronics all integrated into a compact prototype unit within the Miniature Controlled-Radiation-Pattern-Antenna (M-CRPA) antenna effort.
• Completed the Non-linear Array Antenna effort (Defense Advanced Research Projects Agency (DARPA) will manage a follow-on effort).
• Developed the Submarine Mast-Mounted controlled CRPA for the GPS that will fit into the 4.75" diameter area of the OE-538 Submarine Mast Identification Friend or Foe (IFF)/GPS Radome/Antenna Subsystem. This effort included computer modeling, brass boarding, and fabrication of the elements, the array, and the matching network to prove the concept.
• Pursued a multistage Space Time Adaptive Processing (STAP) approach using nonlinear filtering methods for jammer-resistant code tracking. In addition, STAP and code tracking were merged for improved timing acquisition in the presence of wideband jamming.

FY 2004 Plans:

• Conduct laboratory testing to determine the effectiveness of its nulling functions of the Submarine Mast-mounted CRPA for the Global Positioning System.
• Develop additional, high ranking, techniques of those initially investigated STAP for GPS Antenna effort. Implementation issues will continue to address concerns for computational speed and performance reliability.

FY 2005 Plans:

• Conduct field testing of the Submarine Mast-mounted Controlled Radiation Pattern Antenna to determine if the laboratory performance can be achieved in a more realistic environment.
• Integrate STAP for GPS Antennas to one of the receiver-antenna systems developed in this activity or to a system recommended by the GPS-Joint Program Office (GPS-JPO). Specific jammer types will be also addressed in this effort.

CONGRESSIONAL PLUS-UPS:

	FY 2003	FY 2004
ADVANCED MICROWAVE FERRITE RESEARCH	0	1,483

Preparation and characterization of advanced ferrite materials for microwave radar circuit tuning will be investigated.

	FY 2003	FY 2004
ADVANCED SEMICONDUCTOR MATERIAL RESEARCH	1,429	1,384

FY03: Advanced the performance and capability of monolithic multifunctional crystalline oxide on semiconductor films for high power amplifiers. FY04: The capability of deposition and characterization of functional oxides will be advanced and microwave tuning performance investigated.

	FY 2003	FY 2004
HIGH BRIGHTNESS ELECTRON SOURCES	2,003	2,076

FY03: Field emitters were fabricated and tested using the results of the FY 2002 efforts as a basis. FY04:

Demonstrate prototype field emission electron source for application to 50 W, 10 GHz vacuum electronic amplifier with 10 dB gain.

	FY 2003	FY 2004
HIGHLY MOBILE TACTICAL COMMUNICATIONS (HTMC)	952	0

Explored the feasibility of integrating Iridium satellite communications with current Expeditionary Maneuvering Warfare Line-of-Sight terrestrial tactical communication systems.

	FY 2003	FY 2004
MARITIME SYNTHETIC RANGE	4,861	4,252

FY03: Expanded the Pacific Missile Range Facility (PMRF) capabilities integrating synthetic systems with live systems to provide a war gamming setting with multiple training range integration. FY04: These systems will be synchronized to increase the complexity of training, testing to provide a realistic setting for joint-to-unit training with coordinated operational forces.

	FY 2003	FY 2004
NANOSCALE SCIENCE AND TECHNOLOGY	1,429	0

Focused on development of prototype electronic piezoelectric and optical devices made with new materials, including nanoscale magnetoresistive sensors, piezoelectric sensors, and neuromorphic networks.

	FY 2003	FY 2004
SILICON CARBIDE HIGH POWERED DIODE DEVELOPMENT	1,666	0

Investigated silicon carbide thin film and bulk growth with the goal of controlling defects and doping to the level required to achieve diode structures with high power performance.

	FY 2003	FY 2004
VACUUM ELECTRONICS	4,766	0

Provided enhanced design codes for modeling vacuum tubes to be used in radars, communications, and millimeter

wave countermeasure systems against millimeter wave sensing missiles using vacuum tubes.

	FY 2003	FY 2004
VESSEL AND PORT SECURITY DEMONSTRATION	0	989

The program will examine and demonstrate the algorithms for sea clutter reduction in a scanning doppler radar system to improve detection and track shipping vessels.

	FY 2003	FY 2004
WIDE BANDGAP SILICON CARBIDE SEMICONDUCTOR RESEARCH INITIATIVE	1,666	989

FY03: Bulk crystal growth and wafering of SiC for high power electronics were developed. FY04: Improve the process to investigate the perfection of SiC for high power electronic applications.

C. OTHER PROGRAM FUNDING SUMMARY:

NAVY RELATED RDT&E:
PE 0601153N (Defense Research Sciences)
PE 0602114N (Power Projection Applied Research)
PE 0602123N (Force Protection Applied Research)
PE 0603271N (RF Systems Advanced Technology)
PE 0603114N (Power Projection Advanced Technology)
PE 0603123N (Force Protection Advanced Technology)

NON NAVY RELATED RDT&E:
PE 0601102A (Defense Research Sciences)
PE 0601102F (Defense Research Sciences)
PE 0602204F (Aerospace Sensors)
PE 0602702F (Command, Control, and Communications)

D. ACQUISITION STRATEGY:
Not applicable