| Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Navy | Date: March 2024 |
|---|---|
| **Appropriation/Budget Activity**<br>1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602271N *I Electromagnetic Systems Applied Research* |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 128.112 | 92.473 | 91.441 | - | 91.441 | 92.855 | 98.715 | 99.364 | 102.069 | Continuing | Continuing |
| 0000: *Electromagnetic Systems Applied Research* | 0.000 | 90.463 | 92.473 | 91.441 | - | 91.441 | 92.855 | 98.715 | 99.364 | 102.069 | Continuing | Continuing |
| 9999: *Congressional Adds* | 0.000 | 37.649 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 37.649 |

**A. Mission Description and Budget Item Justification**

Freedom of maneuver on a global scale for U.S. naval forces depends upon assured access to the electromagnetic spectrum and the ability to deny adversary exploitation. Electromagnetic technologies must fluidly deliver communication, surveillance electronic warfare and digital integration to understand, shape and defend the battlespace. The Electromagnetic Systems Applied Research Program addresses technology needs associated with Naval platforms for new capabilities in Electro-Optic and Infrared (EO/IR) Sensors, Surveillance, Electronic Warfare, Navigation, Solid State Electronics, Vacuum Electronics Power Amplifiers, and Nanoelectronics. The program supports development of technologies to enable capabilities in Missile Defense, Directed Energy, Platform Protection, Time Critical Strike, and Information Distribution. Activities and efforts within this Program have attributes that focus on enhancing the affordability of warfighting systems.

Today's Sailors and Marines are enabled by Naval Science and Technology (S&T). Since 1946, the Office of Naval Research (ONR) has fostered scientific research related to the maintenance of maritime superiority and national defense. ONR manages the Department of the Navy's (DON) portfolio of naval Basic and Applied research, and Advanced Technology Development investments to ensure naval forces can effectively deter conflict, but when called upon, fight, win and come home safe. Current investments hedge against uncertainty, providing solutions to commanders today, and options for the future. The Naval S&T budget supports higher guidance defined by the National Defense Strategy, and responds to requirements identified by the Secretary of the Navy through research priorities set by the Chief of Naval Research, coordinated across the Naval Research Enterprise (NRE), and outlined in the Naval R&D Framework.

This Program Element (PE) funds Applied Research, which is the systematic study to understand the means to meet a recognized and specific need. Most of the work in this PE can be classified between Technology Readiness Level (TRL) 2 (technology concept and/or application formulation) and TRL 4 (component and/or breadboard validation in laboratory environments).

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

| Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Navy | Date: March 2024 |
|---|---|
| **Appropriation/Budget Activity**<br>1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602271N *I Electromagnetic Systems Applied Research* |

| B. Program Change Summary ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 131.288 | 92.473 | 95.693 | - | 95.693 |
| Current President's Budget | 128.112 | 92.473 | 91.441 | - | 91.441 |
| Total Adjustments | -3.176 | 0.000 | -4.252 | - | -4.252 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -3.176 | 0.000 | | | |
| • Program Adjustments | 0.000 | 0.000 | -4.252 | - | -4.252 |
| • Rate/Misc Adjustments | 0.000 | 0.000 | 0.000 | - | 0.000 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2023 | FY 2024 |
|---|---|---|
| **Project:** 9999: *Congressional Adds* | | |
| Congressional Add: *Submerged electro-optical adaptive littoral sensor (SEALS) system prototypes* | 4.827 | 0.000 |
| Congressional Add: *Advanced antenna technology* | 5.792 | 0.000 |
| Congressional Add: *Dark swarm in degraded and denied enviorments* | 5.792 | 0.000 |
| Congressional Add: *Mini-full spectrum hyperspectral sensors for IEDs* | 6.757 | 0.000 |
| Congressional Add: *Open systems architecture for electronic warfare chiplets* | 14.481 | 0.000 |
| Congressional Add Subtotals for Project: 9999 | 37.649 | 0.000 |
| Congressional Add Totals for all Projects | 37.649 | 0.000 |

**Change Summary Explanation**

Financial: FY25 funds reduction is due to (S&T) Applied Research Reduction and completion of several Electronic Warfare Technology research efforts.

Technical: No significant change.

Schedule: No significant change.

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | | | | | | | | | | Date: March 2024 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 2 | | | | | R-1 Program Element (Number/Name)<br>PE 0602271N / *Electromagnetic Systems Applied Research* | | | | Project (Number/Name)<br>0000 / *Electromagnetic Systems Applied Research* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2023** | **FY 2024** | **FY 2025 Base** | **FY 2025 OCO** | **FY 2025 Total** | **FY 2026** | **FY 2027** | **FY 2028** | **FY 2029** | **Cost To Complete** | **Total Cost** |
| 0000: *Electromagnetic Systems Applied Research* | 0.000 | 90.463 | 92.473 | 91.441 | - | 91.441 | 92.855 | 98.715 | 99.364 | 102.069 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Freedom of maneuver on a global scale for U.S. naval forces depends upon assured access to the electromagnetic spectrum and the ability to deny adversary exploitation. Electromagnetic technologies must fluidly deliver communication, surveillance electronic warfare and digital integration to understand, shape and defend the battlespace. This project addresses technology opportunities associated with Naval platforms for new capabilities in Electro-Optic and Infrared (EO/IR) Sensors, Surveillance, Electronic Warfare, Navigation, Solid State Electronics, Vacuum Electronics Power Amplifiers, and Nanoelectronics. The project supports development of technologies to enable capabilities in Missile Defense, Directed Energy, Platform Protection, Time Critical Strike, and Information Distribution. This project directly supports the Department of Defense Joint Warfighter Plan and the Defense Technology Area Plans. Activities and efforts within this program 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 Program Element (PE), the programs described herein are representative of the work included in this PE.

| **B. Accomplishments/Planned Programs ($ in Millions)** | **FY 2023** | **FY 2024** | **FY 2025 Base** | **FY 2025 OCO** | **FY 2025 Total** |
|---|---|---|---|---|---|
| ***Title:*** Electronic Warfare Technology | 42.911 | 38.341 | 37.030 | 0.000 | 37.030 |
| ***Description:*** The overarching objective of this activity is to develop technologies that enable the development of affordable, effective and robust Electronic Warfare (EW) systems across the entire Electromagnetic Spectrum (EMS) that will increase the operational effectiveness and survivability of U.S. Naval units. Technology development is focused on Distributed Electronic Warfare in support of Distributed Maritime Operations. Emphasis is placed on passive sensors and active and passive Countermeasure (CM) 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 against deployed Naval forces; precision identification and location of threat emitters; and development of technologies that have broad application across multiple disciplines within the EW mission area. This activity also includes developments to protect these technologies from external interference, and modeling and simulation required to support the development of these technologies.<br><br>The current objectives are:<br>- Electronic Warfare (EW) Radio Frequency (RF) Technology: Develop and demonstrate technologies in the RF spectrum (covering frequencies from kilohertz to terahertz) that include developments in detection, signal | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| processing and passive/active techniques for wideband Electronic Attack (EA), Electronic Protection (EP) and the Electronic Support (ES) mission areas.<br>- Electronic Warfare (EW) Electro-Optic/Infrared (EO/IR) Technology: Develop and demonstrate counter EO/IR technologies extending from the ultraviolet to the far infrared spectral bands. This includes advances in multispectral sensors, multiband sources, beam forming/steering, and signal processing and transmission.<br>- EW Integrated and Networked Technology: Develop and demonstrate technologies that will enable an increased situational awareness and response across the Electromagnetic Spectrum (EMS) with broad spatial coverage using all available EW assets to provide coordinated, adaptive and networked EW sensing, protection and attack.<br>- Advanced EW Enabling Technologies: Develop classified advanced electronic warfare technology in support of current and predicted capability requirements emphasizing distributive effects.<br><br>***FY 2024 Plans:***<br>Electronic Warfare (EW):<br>- Complete the development of a quantitative model to understand the relationship between laser fluence profiles and resultant emission; developed model will help determine to what extent fluctuation in irradiance and fluence profile affects spatial, temporal, and spectral characteristics of generated emission and demonstrate improved quantitative prediction of effects in laboratory and at range based upon a deeper understanding of laser-material interactions.<br>- Complete the development of a variable-ratio coupler approach to phase demodulation , allowing for the active tuning of a photonics based processor.<br><br>- Continue research in federated, coordinated, and integrated Electronic Warfare (EW) systems for the development of distributed EW technologies for Electronic Surveillance (ES), decoys and countermeasures, and Electronic Attack (EA) against adversary Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance and Targeting (C4ISRT). This EW research includes Electronic Protection (EP) for our own weapons and Command, Control, Communications, Computers, Cyber Defense, Intelligence, Surveillance and Reconnaissance (C5ISR) systems allowing them to operate in a heavily contested environment.<br>- Continue research into developing Artificial Intelligence (AI)-generated tactics against modern and emerging radar sources to improve naval mission effectiveness.<br>- Continue research and development in the area of hard-kill and soft-kill coordination and planning. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue research into simultaneous multi-spectral (Radio Frequency (RF) and optical) countermeasure development to increase survivability across the entire electromagnetic spectrum and continue development of coordinated EW techniques between RF and Electro-Optic/Infrared (EO/IR) transmitters and receivers for single and distributed platforms.<br>- Continue development and implementation of combined EW and cyber effects to increase the reach and effectiveness of each domain in support of distributed maritime operations.<br>- Continue the development of artificial intelligence algorithms to automatically classify tracks for an advanced weapons system and to distinguish anomalous targets, which have not been previously seen by the combat system.<br><br>- Initiate research into distributed EA techniques to develop advanced, coordinated countermeasures against the entire kill chain from far left of launch through terminal phase; components of this research will also include hardware/software payload re-configurability, multi-functionality and heterogeneity in low size, weight and power formats.<br><br>Electromagnetic Warfare:<br>- Complete diverse research spanning multiple projects across a broad spectrum of RF and EO/IR technologies that cover the detection of energy in the environment to the formulation of active and passive engagement techniques.<br>- Complete efforts with focus on near-real-time geolocation of stationary (or slowly moving) RF emitters, and in particular, emerging threat radars employing unusual waveforms resulting in accurate geolocation.<br>- Complete novel real-time signal processing techniques to dramatically increase the useful information content reported in receiver measurements of radar-band signals providing the warfighter with a low-ambiguity warning of detection.<br>- Complete efforts to improve the effectiveness of emitter classification of modern radars for several functions including Automated Identification Systems (AIS) validation increasing Maritime Domain Awareness.<br>- Complete research applying recently developed machine learning methods to the problem of functional classification of radar emissions and demonstrate the ability to perform the functional classification in real time to overcome the inadequacy conventional emitter classification methods.<br>- Complete efforts focused on discovering and defeating unknown and adaptive radios by developing algorithms to observe their behavior, analyze their networking protocols, and optimize engagement techniques to interfere with their objectives. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Complete research to develop and demonstrate high gain distributed aperture technologies compatible with micro-jammer glide vehicles to increase the effective radiated power of a ground-based micro-jammer constellation to provide sufficient power to radars.<br>- Complete development and demonstration of an evolvable Electronic Warfare (EW) transceiver design that optimizes cuing receiver processing to increase situational awareness and enable adaptive electronic attack response in complex electromagnetic environments to provide effective processing of emergent complex radar modes.<br><br>- Continue the development of technology and waveforms to detect the emissions of and deny launch platform targeting radars and/or anti-ship missile seekers the capability to acquire and track ship targets across the electromagnetic spectrum.<br><br>- Initiate efforts into the development of a novel, high-power, Ultra-Wideband (UWB), Ka-band pulse source to prove the utility and effectiveness of unique UWB waveforms for multi-spectral defeat of Radio-Frequency (RF) multi-mode threat systems through modeling, simulation, and measurement. | | | | | |
| ***FY 2025 Base Plans:***<br>Electronic Warfare (EW):<br>- Continue research in federated, coordinated, and integrated Electronic Warfare (EW) systems for the development of distributed EW technologies for Electronic Surveillance (ES), decoys and countermeasures, and Electronic Attack (EA) against adversary Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance and Targeting (C4ISRT). This EW research includes Electronic Protection (EP) for our own weapons and Command, Control, Communications, Computers, Cyber Defense, Intelligence, Surveillance and Reconnaissance (C5ISR) systems allowing them to operate in a heavily contested environment.<br>- Continue research into developing Artificial Intelligence (AI)-generated tactics against modern and emerging radar sources to improve naval mission effectiveness.<br>- Continue research and development in the area of hard-kill and soft-kill coordination and planning.<br>- Continue development and implementation of combined EW and cyber effects to increase the reach and effectiveness of each domain in support of distributed maritime operations.<br>- Continue research into distributed EA techniques to develop advanced, coordinated countermeasures against the entire kill chain from far left of launch through terminal phase; components of this research will also include | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| hardware/software payload re-configurability, multi-functionality and heterogeneity in low size, weight and power formats.<br>- Complete the development of artificial intelligence algorithms to automatically classify tracks for an advanced weapons system and to distinguish anomalous targets, which have not been previously seen by the combat system.<br>- Complete and test research into simultaneous multi-spectral (Radio Frequency and optical) countermeasure development to increase survivability across the entire electromagnetic spectrum and continue development of coordinated EW techniques between RF and Electro-Optic/Infrared (EO/IR) transmitters and receivers for single and distributed platforms.<br>- Initiate research into heterogeneously integrated EW co-processors to enable real-time ES and EA effects across wide bandwidths.<br>- Initiate research into wide bandwidth adaptable front-end technologies with improved simultaneous transmit and receive capabilities for survivability in a contested and congested electromagnetic spectrum.<br><br>Electromagnetic Warfare:<br>- Complete efforts into Initiate efforts into the development of a novel, high-power, Ultra-Wideband (UWB), Ka-band pulse source to prove the utility and effectiveness of unique UWB waveforms for multi-spectral defeat of Radio-Frequency (RF) multi-mode threat systems through modeling, simulation, and measurement.<br>- Complete the development of technology and waveforms to detect the emissions of and deny launch platform targeting radars and/or anti-ship missile.<br>- Initiate research applied research efforts that cover the development of new technologies and techniques for Electronic Support (ES), Electronic Attack (EA), and supporting technologies in Electromagnetic Warfare (EmW) Technologies. Passive ES technologies are developed to detect, deinterleave, classify, identify, geolocate, provide situational awareness, and queue EA systems. Active EA technologies are developed to counter the capability of the adversary to detect, locate, target and track U.S. and friendly forces. It also includes the development of advanced signal processing and receiver technologies and the development of an electromagnetic responses to include offboard decoys, onboard electronic attack, and resources required to coordinate an integrated response. | | | | | |
| ***FY 2025 OCO Plans:***<br>N/A | | | | | |
| ***FY 2024 to FY 2025 Increase/Decrease Statement:*** | | | | | |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| The funding decrease from FY 2024 to FY 2025 is due to the completion of efforts to develop: 1) AI algorithms for auto classification; and 2) Simultaneous multi-spectral countermeasures. | | | | | |
| ***Title:*** EO/IR Sensor Technologies | 7.731 | 12.682 | 12.764 | 0.000 | 12.764 |
| ***Description:*** The overarching objective is to develop technologies that enable affordable, wide area, persistent surveillance optical architectures. Included are modeling and simulation required to support the development of these technologies. Efforts will also include the development of optical RF components, infrared technologies including lasers and focal plane arrays using narrow bandgap semiconductors. The current specific objectives are:<br><br>- Optically Based Terahertz (THz) and Millimeter Wave (MMW) Distributed Aperture Systems: Develop Optically Based Terahertz (THz) and Millimeter Wave distributed aperture systems for imaging through clouds, fog, haze and dust on air platforms.<br>- Wide Area Optical Architectures: Develop wide area optical architectures for persistent surveillance for severely size constrained airborne applications.<br>- Hyperspectral sensors and processing: Develop visible, shortwave Infrared (IR), mid-wave IR, and long-wave IR hyperspectral sensors, along with processing algorithms to detect anomalies and targets.<br>- Coherent Laser Radar (LADAR): Develop and improve components for LADAR applications including fiber lasers, coherent focal planes, and advanced processing.<br>- Autonomous and Networked sensing: Develop algorithms and processing that supports autonomous sensing for Unmanned Autonomous Vehicles (UAV) platforms and that supports networked sensing over multiple sensors and/or sensor platforms.<br><br>***FY 2024 Plans:***<br>EO/IR Sensor Technologies:<br>- Continue to develop novel techniques for Electro-Optic/Infrared (EO/IR) countermeasures to detect, track and/or jam sensors.<br>- Continue demonstration and test real-time combat Identification (ID) algorithms for detecting and tracking simultaneous targets from networked, high-resolution, wide field of view, and persistent surveillance systems.<br>- Continue work on active imaging laser systems to significantly extend operational range and imaging capabilities in degraded conditions (e.g., dense maritime fog).<br>- Continue efforts to develop and test optical architectures to demonstrate simultaneous wide Field Of View (FOV) and high-resolution imaging for search, detection, classification, identification and targeting functions. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue research and development of novel ISR and counter-ISR applications with tailored optical beams.<br>- Continue research into extreme low light imaging cameras built using low-cost Si foundry services as a way to provide all domain imaging for some missions or platforms that can't afford infrared sensors.<br><br>Electromagnetic Warfare:<br>- Complete development and demonstration of a low Size Weight and Power (SWaP) transceiver laser system with high accuracy, covert detection, and threat wavelength discrimination using Non-Mechanical Beam Steering technology (NMBS).<br>- Complete development and optimization of Resonant-Cavity Infrared Detectors (RCIDs) that provide higher sensitivity and reduced optical clutter systems using active imaging.<br><br>- Continue development of EO/IR and Radio Frequency (RF) technologies to improve imaging, target identification, threat detection, and engagement capabilities for the war fighter.<br>- Continue the demonstration of new high performance single band Short-Wave (SW) and dual band SW/Mid-Wave (MW) Infrared (IR) sensors. These sensors will substantially improve the Navy's primary night & day maritime MWIR systems, which will show that a broad range of Naval MWIR imagers can be upgraded with a much more capable monolithic SW/MWIR dual band sensor technology, with minimal impact on Size Weight and Power (SWaP) and system cost.<br><br>- Initiate efforts to demonstrate analog signals via free-space optical (FSO) channel with sufficient fidelity, coherence and timing accuracy for RF signals to be useful for Electronic Support Measure (ESM) functions. | | | | | |
| ***FY 2025 Base Plans:***<br>EO/IR Sensor Technologies:<br>- Continue to develop novel techniques for Electro-Optic/Infrared (EO/IR) countermeasures to detect, track and/or jam sensors.<br>- Continue demonstration and testing of real-time combat Identification (ID) algorithms for detecting and tracking simultaneous targets from networked, high-resolution, wide field of view, and persistent surveillance systems.<br>- Continue efforts to develop and test optical architectures to demonstrate simultaneous wide Field Of View (FOV) and high-resolution imaging for search, detection, classification, identification and targeting functions.<br>- Continue research and development of novel Intelligence, Surveillance and Reconnaissance (ISR) and counter-ISR applications with tailored optical beams. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue research into extreme low light imaging cameras built using low-cost silicon foundry services as a way to provide all domain imaging for some missions or platforms that can't afford infrared sensors.<br>- Complete work on active imaging laser systems to significantly extend operational range and imaging capabilities in degraded conditions (e.g., dense maritime fog).<br>- Initiate development of advanced coherent imaging systems and beam steering for software defined, multi-use optical apertures as a way to improve multi-function systems.<br><br>Electromagnetic Warfare:<br>- Continue the development of Electro Optical/Infrared Technology. The purpose of this thrust is to expand the state-of-the-art in Electro Optical/Infrared (EO/IR) Intelligence, Surveillance, Reconnaissance and Targeting (ISRT) and supporting technologies. The goal will be to develop innovative EO/IR sensing paradigms, components, and signal processing techniques to insure full EO/IR spectrum superiority. Capabilities are pursued in multispectral, hyperspectral, and hypertemporal EO/IR modalities as well as the fusion of these with other electronics intelligence (ELINT) and signals intelligence (SIGINT) modalities to locate hidden/ concealed targets and other hard-to-find objects. This effort is an expansion of previously discussed efforts to develop Electro-Optical/Infra-Red (EO/IR) and Radio Frequency (RF) technologies to improve imaging, target identification, threat detection, and engagement capabilities for the war fighter.<br>- Complete efforts into demonstrating analog signals via Free-Space Optical (FSO) channel with sufficient fidelity, coherence and timing accuracy for RF signals to be useful for Electronic Support Measure (ESM) functions.<br>- Complete the demonstration of new high performance single band Short-Wave (SW) and dual band SW/Mid-Wave (MW) Infrared (IR) sensors. These sensors will substantially improve the Navy's primary night & day maritime MWIR systems, which will show that a broad range of Naval MWIR imagers can be upgraded with a much more capable monolithic SW/MWIR dual band sensor technology, with minimal impact on Size Weight and Power (SWaP) and system cost.<br>- Initiate the development of technology for new and enhanced naval capabilities based on the creation, transmission, modulation and detection of electromagnetic waves throughout the ultraviolet, visible and infrared spectral regions in Optical Technologies. Technologies developed will include concepts and devices for emitting light such as lasers and light emitting diodes; for transmission such as turbulence mitigation and multispectral optical materials; for modulation such as amplifiers and switches; for detection such as multi-spectral, hyper- | | | | | |

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|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| spectral and tunable focal planes, single photon detectors, and event-based sensors. New signal processing techniques and the application of artificial intelligence will be developed to enable naval applications.<br><br>***FY 2025 OCO Plans:***<br>N/A<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>There is no significant funding change from FY 2024 to FY 2025. | | | | | |
| ***Title:*** Navigation Technology | 14.082 | 14.515 | 14.096 | 0.000 | 14.096 |
| ***Description:*** The overarching objective of this activity is to develop technologies that enable the development of affordable, effective and robust Position, Navigation and Timing (PNT) capabilities using non-Global Positioning System (GPS) navigation devices, and atomic clocks. This project will increase the operational effectiveness of U.S. Naval units. Emphasis is placed on GPS Anti-Jam (AJ) Technology; Precision Time and Time Transfer Technology; and Non- GPS Navigation Technology (Inertial aviation system, bathymetry, gravity and magnetic navigation). The focus is on the mitigation of GPS electronic threats, the development of atomic clocks that possess unique long-term stability and precision, and the development of compact, low-cost Inertial Navigation Systems (INS).<br><br>The following are non-inclusive examples of plans for projects funded in this activity.<br><br>***FY 2024 Plans:***<br>Navigation Technology:<br>- Continue research on next generation atomic clocks to improve long-term stability and precision.<br>- Continue development of a gravity navigation system using a strap-down gravimeter.<br>- Continue development of earth magnetic anomaly maps for improved magnetic navigation.<br>- Continue development of magnetic anomaly-aided navigation systems.<br><br>- Initiate development of collaborative navigation capability using multiple tactical networks.<br><br>***FY 2025 Base Plans:***<br>Navigation Technology:<br>- Continue research on next generation atomic clocks to improve long-term stability and precision.<br>- Continue development of a gravity navigation system using a strap-down gravimeter.<br>- Continue development of earth magnetic anomaly maps for improved magnetic navigation. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue development of magnetic anomaly-aided navigation systems.<br>- Complete development of collaborative navigation capability using multiple tactical networks.<br><br>***FY 2025 OCO Plans:***<br>N/A<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>There is no significant funding change from FY 2024 to FY 2025. | | | | | |
| ***Title:*** Solid State Electronics | 9.939 | 9.795 | 10.548 | 0.000 | 10.548 |
| ***Description:*** The overarching objective of this activity is to develop higher performance components and subsystems for all classes of military Radio-Frequency (RF) systems that are based on solid state physics phenomena and are enabled by improved understanding of these phenomena, new circuit design concepts and devices, and improvements in the properties of electronic materials. An important subclass are the 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 weapon systems. Another subclass are the analog and high speed, mixed signal components that connect the electromagnetic signal environment into and out of digitally realized, specific function systems. These improved components are based on both Silicon (Si) and compound semiconductors (especially the wide bandgap materials and narrow bandgap materials), low and high temperature superconductors, novel nanometer scale structures and materials. Components addressed by this activity emphasize the MMW and Submillimeter Wave (SMMW) regions with an increasing emphasis on devices capable of operating in the range from 50 Gigahertz (GHz) to 10 Terahertz (THz). The functionality of the technology developed cannot be obtained through Commercial-Off- The-Shelf (COTS) as a result of the simultaneous requirements placed on power, frequency, linearity, operational and instantaneous bandwidth, weight, and size. Effort will involve understanding the properties of engineered semiconductors as they apply to quantum information science and technology.<br><br>***FY 2024 Plans:***<br>Solid State Electronics:<br>- Complete development of chip-scale, acoustic Radio-Frequency (RF) signal processing components, utilizing acoustoelectric effect with high internal gain, in the 1 to 18 Gigahertz (GHz) range using a ScAlN based device architecture with enhanced power handling up to 10 W. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Complete development of Phase-Change Material (PCM) based couplers with dynamically controllable coupling coefficients to create broadband, low loss, high-tap-count analog canceler filters to provide enhanced TX/RX isolation.<br>- Complete research activity in high throughput, large-area nano-scale lithography for plasmonic devices.<br><br>- Continue metal nitride heterostructure mm-wave device investigations.<br>- Continue research of solid-state devices for high frequency analog and digital operation; high efficiency, highly linear amplifiers for microwave, millimeter-wave, low-noise, and power applications; superconducting and other technologies which are prototyped to demonstrate the ability of these components to deliver superior functionality in a system environment.<br>- Continue development and transition of nitrogen-polar based High-Electron-Mobility Transistor (HEMT) technology for advanced linear receivers and efficient transmitters.<br>- Continue development of new materials, devices, components, and circuits that apply quantum phenomena of entanglement, superposition and/or wave function correlation for performance not achievable by classical methods.<br>- Continue integrated circuit technologies in conventional superconductors and Gallium Nitride (GaN) as platforms for quantum-based functional components.<br>- Continue development of superconducting GaN/niobium nitride heterostructures for Josephson junctions and Millimeter Wave (MMW) resonator circuits.<br>- Continue Millimeter Wave (MMW) to Terahertz (THz) plasmonic photomixer-based focal plane.<br>- Continue relaxed III-nitride channel mm-wave N-polar device development.<br>- Continue development of new types of quantum based sensors for the measurement of motion and fields, which combine high sensitivity with features that improve the practicality of the technologies, to include continuous, high-bandwidth measurement, and low Size Weight and Power (SWaP). (NRL)<br><br>- Initiate low-cost substrate GaN technology for ubiquitous mm-wave transceivers deployment.<br>- Initiate efforts into the flexible manufacturing of High Power Amplifiers using MicroElectronics Transfer-printed Assembly (META). (NRL) | | | | | |
| ***FY 2025 Base Plans:***<br>Solid-State Electronics:<br>- Continue in Radio-Frequency (RF) Solid State Technologies which will develop technologies to ensure dominance of the RF electromagnetic spectrum from megahertz frequencies through the terahertz regime. | | | | | |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| Investments are focused to realize significant improvements in power, bandwidth, efficiency, sensitivity, linearity, dynamic range, and agility in a cost effective manner. Solutions emphasizing efficiency, compactness, and affordability are emphasized in order to address prime power constraints imposed on both large platforms and distributed autonomous systems operating solely or in a swarm environment. This is an expansion on previously discussed efforts towards the development of new types of quantum based sensors for the measurement of motion and fields, which combine high sensitivity with features that improve the practicality of the technologies, to include continuous, high-bandwidth measurement, and low Size Weight and Power (SWaP). (NRL)<br>- Continue metal nitride heterostructure mm-wave device development.<br>- Continue applied research of solid-state devices for high frequency analog and digital operation; high efficiency, highly linear amplifiers for microwave, millimeter-wave, low-noise, and power applications; superconducting and other technologies which are prototyped to demonstrate the ability of these components to deliver superior functionality in a system environment.<br>- Continue development and transition of nitrogen-polar based High-Electron-Mobility Transistor (HEMT) technology for advanced linear receivers and efficient transmitters.<br>- Continue development of new materials, devices, components, and circuits that apply quantum phenomena of entanglement, superposition and/or wave function correlation for performance not achievable by classical methods.<br>- Continue integrated circuit development in conventional superconductors and Gallium Nitride (GaN) as platforms for quantum-based functional components.<br>- Continue development of superconducting GaN/niobium nitride heterostructures for Josephson junctions and Millimeter Wave (MMW) resonator circuits.<br>- Continue Millimeter Wave (MMW) to Terahertz (THz) plasmonic photomixer-based focal plane development.<br>- Continue relaxed III-nitride channel mm-wave N-polar device development.<br>- Continue low-cost substrate GaN technology for ubiquitous mm-wave transceivers deployment.<br>- Complete efforts into the flexible manufacturing of High Power Amplifiers using MicroElectronics Transfer-printed Assembly (META). (NRL)<br>- Initiate development of high figure of merit Nitrogen-polar GaN Transmit/Receive (T/R) switches.<br>- Initiate evaluation of epitaxial High overtone Bulk Acoustic Resonators (epi-HBARs) integrated in metal nitride and III-Nitride Heterostructures.<br>- Initiate in Quantum Information Technologies. The goal of this area is to exploit the quantum principles of superposition, entanglement, and nonclassical correlation to provide sensors, communications technologies, and computation/simulation techniques that are superior to those available with conventional technologies. Areas of research include but are not limited to sensors that provide calibration-free and/or quantum-limited | | | | | |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| measurement of fields, forces, motion, and time; communications and networking technologies based on nonclassical electromagnetic fields; and methods for employing quantum information processing to address computational challenges that are infeasible for classical computers. (NRL)<br><br>***FY 2025 OCO Plans:***<br>N/A<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>There is no significant funding change from FY 2024 to FY 2025. | | | | | |
| ***Title:*** Surveillance Technology<br><br>***Description:*** The overarching objective of this activity is to develop 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, affordable apertures, distributed sensing systems, and includes modeling and simulation required to support the development of these technologies. The current specific objectives are: 1) Radar Architectures, Sensors, and Software which address Ballistic Missile and Littoral Requirement Shortfalls: Develop radar architectures, sensors, and software, which address Ballistic Missile and Littoral requirement shortfalls including: sensitivity; clutter rejection; and flexible energy management. 2) Algorithms, Sensor Hardware, and Signal Processing Techniques for Automated Radar Based Contact Mensuration and Feature Extraction: Develop algorithms, sensor hardware, and signal processing techniques for automated radar based contact mensuration and feature extraction in support of asymmetric threat classification and persistent surveillance to address naval radar performance shortfalls caused by man-made jamming and Electronic Counter Measures (ECM), unfavorable maritime conditions, and atmospheric and ionosphere propagation effects. 3) Software and Hardware for a Multi-Platform, Multi-Sensor Surveillance System: Develop software and hardware for a multi-platform, multi-sensor surveillance system for extended situational awareness of the battlespace.<br><br>***FY 2024 Plans:***<br>Surveillance Technology:<br>- Complete development of low-cost components for High Frequency (HF) sensor systems with reduced size, weight, and power needs.<br>- Complete development low-cost dielectric lens antennas and material resilience in high power transmitters. | 13.808 | 15.744 | 16.058 | 0.000 | 16.058 |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue development of front-end components and phased array architectures that enable concurrent wideband radar and Electronic Support (ES) functions.<br>- Continue efforts to develop affordable and scalable advanced antenna apertures.<br>- Continue efforts to develop electronics and signal processing to enable Radio Frequency (RF) agility and waveform diversity to provide enhanced capability to find, fix, track, target, and assess targets and threats as well as provide automatic target identification.<br>- Continue research in the use of interferometric, polarimetric, Radio-Frequency (RF) agility, and sophisticated signal processing algorithms to enable the detection, geolocation, tracking, and identification of targets in harsh natural and man-made clutter and interference.<br>- Continue efforts on methods to mitigate Electronic Attack (EA) and Electromagnetic Interference (EMI) to RF sensors and networks.<br>- Continue development of hardware and software for arbitrary waveform generation for agile radar systems.<br>- Continue development of distributed aperture radar systems with improved spatial and waveform agility.<br><br>- Initiate development of novel field sensors and transducers for future radar architectures.<br>- Initiate effort focused on novel signal processing architectures for phased array radar systems that efficiently implement non-traditional radar algorithms.<br><br>Electromagnetic Warfare:<br>- Complete development of radar techniques for detection and identification of small Unmanned Autonomous Vehicles (UAV) and to develop classification and identification techniques for addressing evolving DHS/USMC requirements for assessing this type of threat in tactical environments.<br>- Complete validation of algorithms using innovative concepts from discrete mathematics to accurately predict ship Radar Cross Section (RCS) so as better assess platform vulnerability. (NRL)<br>- Complete the development of innovative target detection and clutter suppression algorithms for Ultra-High Frequency (UHF) SAR that exploits fluctuation and motion within the scene to provide wide-area, automated detection of small targets at long ranges. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Navy | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| - Continue applied research into technology base for RF surveillance using active and passive monostatic and distributed sensor concepts. Current efforts seek to contribute to this objective by developing and demonstrating improved planar antennas and cylindrical. | | | | | |
| ***FY 2025 Base Plans:***<br>Surveillance Technology:<br>- Continue development of front-end components and phased array architectures that enable concurrent wideband radar and Electronic Support (ES) functions.<br>- Continue efforts to develop affordable and scalable advanced antenna apertures.<br>- Continue efforts to develop electronics and signal processing to enable Radio Frequency (RF) agility and waveform diversity to provide enhanced capability to find, fix, track, target, and assess targets and threats as well as provide automatic target identification.<br>- Continue efforts on methods to mitigate Electronic Attack (EA) and Electromagnetic Interference (EMI) to RF sensors and networks.<br>- Continue development of hardware and software for arbitrary waveform generation for agile radar systems.<br>- Continue development of distributed aperture radar systems with improved spatial and waveform agility.<br>- Continue development of novel field sensors and transducers for future radar architectures.<br>- Continue effort focused on novel signal processing architectures for phased array radar systems that efficiently implement non-traditional radar algorithms.<br>- Complete research in the use of interferometric, polarimetric, RF agility, and sophisticated signal processing algorithms to enable the detection, geolocation, tracking, and identification of targets in harsh natural and man-made clutter and interference.<br><br>Electromagnetic Warfare:<br>- Continue research into Radar Technologies. The goal is to conduct applied research to broadly expand the state-of-the-art capabilities of radar systems across the RF spectrum, from High Frequency (HF) Over the Horizon (OTH) radars to Millimeter Wave (MMW) radars, and encompasses enabling technologies, architectures, and algorithms. Further, it develops concepts, techniques, and technologies to advance critical capabilities in radar signal processing, waveform design, environmental characterization & adaptation, and provide robust electronic protection of radar systems from adversary electronic attack This is an expansion on previous efforts into the technology base for RF surveillance white using active and passive monostatic and distributed sensor concepts. (NRL) | | | | | |
| ***FY 2025 OCO Plans:*** | | | | | |

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|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| N/A<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>There is no significant funding change from FY 2024 to FY 2025. | | | | | |
| ***Title:*** Vacuum Electronics Power Amplifiers<br><br>***Description:*** The overarching objective of this activity is to develop Millimeter Wave (MMW) and sub-MMW 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, electronic warfare and high-power radar applications at Millimeter Wave (MMW) and upper-MMW regime. The emphasis is placed on achieving high power at high frequency in a compact form factor. Technologies include utilization of spatially distributed electron beams in amplifiers, such as sheet electron beams and multiple-beams, and creation of simulation based design methodologies based on physics-based and geometry driven design codes.<br><br>The current specific objectives are:<br>- High Power Millimeter and Upper Millimeter Wave Amplifiers: Develop science and technology for high power millimeter and upper millimeter wave amplifiers including high current density diamond cathodes, sheet and multiple electron beam formation and mode suppression techniques in overmoded structures.<br>- Lithographic Fabrication Techniques: Develop lithographic fabrication techniques for upper-millimeter wave amplifiers.<br>- Accurate and Computationally Effective Device-Specific Multi-Dimensional Models for Electron Beams: Develop accurate and computationally effective device-specific multi-dimensional models for electron beam generation, large-signal and stability analysis to simulate device performance and improve the device characteristics.<br><br>***FY 2024 Plans:***<br>- Continue the development of Millimeter Wave and sub-MMW power amplifiers for use in Naval all-weather radar, surveillance, reconnaissance, electronic attack, and communications systems. Efforts are focused on | 1.992 | 1.396 | 0.945 | 0.000 | 0.945 |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>0000 / *Electromagnetic Systems Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| the development of technologies for high-data-rate communications, electronic warfare and high-power radar applications at MMW and sub-MMW regimes.<br>***FY 2025 Base Plans:***<br>- Continue the development of Radio Frequency (RF) Vacuum Technologies. The goal of this thrust is to develop high-performance vacuum electron devices to enable future Navy RF systems and ensure Navy electromagnetic spectrum dominance across the microwave and millimeter-wave frequency bands, nominally 3 GHz - 300 GHz. These systems are important for defense applications such as electronic warfare, high-resolution radar, high-data-rate communications, and RF power beaming. This is an expansion of efforts towards the development of Millimeter Wave and sub-MMW power amplifiers for use in Naval all-weather radar, surveillance, reconnaissance, electronic attack, and communications systems. Efforts are focused on the development of technologies for high-data-rate communications, electronic warfare and high-power radar applications at MMW and sub-MMW regimes.<br>***FY 2025 OCO Plans:***<br>N/A<br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>There is no significant funding change from FY 2024 to FY 2025. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 90.463 | 92.473 | 91.441 | 0.000 | 91.441 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 2 | | | | | R-1 Program Element (Number/Name)<br>PE 0602271N / *Electromagnetic Systems Applied Research* | | | | Project (Number/Name)<br>9999 / *Congressional Adds* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2023** | **FY 2024** | **FY 2025 Base** | **FY 2025 OCO** | **FY 2025 Total** | **FY 2026** | **FY 2027** | **FY 2028** | **FY 2029** | **Cost To Complete** | **Total Cost** |
| 9999: *Congressional Adds* | 0.000 | 37.649 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 37.649 |

**A. Mission Description and Budget Item Justification**

Congressional Interest Items not included in other Projects.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 |
|---|---|---|
| ***Congressional Add:*** Submerged electro-optical adaptive littoral sensor (SEALS) system prototypes<br>***FY 2023 Accomplishments:*** Conduct submerged electro-optical adaptive littoral sensor (SEALS) system prototypes research.<br>***FY 2024 Plans:*** N/A | 4.827 | 0.000 |
| ***Congressional Add:*** Advanced antenna technology<br>***FY 2023 Accomplishments:*** Develop dual-band antenna technologies and electronics to support additional functionality for E-2D.<br>***FY 2024 Plans:*** N/A | 5.792 | 0.000 |
| ***Congressional Add:*** Dark swarm in degraded and denied enviorments<br>***FY 2023 Accomplishments:*** Conduct dark swarm in degraded and denied environments research.<br>***FY 2024 Plans:*** N/A | 5.792 | 0.000 |
| ***Congressional Add:*** Mini-full spectrum hyperspectral sensors for IEDs<br>***FY 2023 Accomplishments:*** Conduct effort to develop and deliver a full-spectrum hyperspectral imagery (HSI) collection and analysis suite applicable for use from small unmanned aerial vehicles (UAVs)<br>***FY 2024 Plans:*** N/A | 6.757 | 0.000 |
| ***Congressional Add:*** Open systems architecture for electronic warfare chiplets<br>***FY 2023 Accomplishments:*** Conduct open systems architecture for electronic warfare chiplets research.<br>***FY 2024 Plans:*** N/A | 14.481 | 0.000 |
| **Congressional Adds Subtotals** | 37.649 | 0.000 |

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| **Appropriation/Budget Activity**<br>1319 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602271N / *Electromagnetic Systems Applied Research* | **Project (Number/Name)**<br>9999 / *Congressional Adds* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A