Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Office of the Secretary Of Defense	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*

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	540.321	245.366	297.586	150.436	-	150.436	144.963	117.134	121.783	125.524	Continuing	Continuing
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	420.347	128.017	226.170	95.331	-	95.331	87.678	64.621	67.083	69.234	Continuing	Continuing
903: *Access to Advanced Packaging and Testing - Demonstration*	81.112	96.171	44.391	30.221	-	30.221	31.012	26.284	27.375	28.172	Continuing	Continuing
905: *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*	38.862	21.178	27.025	24.884	-	24.884	26.273	26.229	27.325	28.118	Continuing	Continuing

Note

New Start (Y/N): No

FY 2024: An Errata was approved to realign $50.000 million to Procurement, DW, Major Equipment, OSD to support the Accelerate Procurement and Fielding of Innovative Technologies (APFIT) program. These funds are realigned from Project 902, Access to State-of-the-Art (SOTA) Microelectronics - Demonstration. The current plan of $226.170 million will decrease to $176.170 million.

A. Mission Description and Budget Item Justification

This effort supports the Department's initiatives to Build Sustainable and Long-Term Advantage, Defend the Homeland, and Deter Aggression.

This program supports microelectronics modernization activities that enable defense systems to keep pace with commercial microelectronics technological advances, reduce reliance on obsolete microelectronics, and mitigate the Department’s reliance on sole source foundries for assured state-of-the-art (SOTA) microelectronics. It addresses the challenges of 1) having enduring access to a multiplicity of modern manufacturing processes that require commercial volumes to maintain long term viability and 2) protecting the intellectual property (IP) of the microelectronic parts that are manufactured.

Microelectronics technology is a critical enabler for the development of new systems and sustainment of fielded systems required for all four 2022 National Defense Strategy (NDS) priorities. In addition, this program directly supports the NDS priority of building a resilient Joint Force and defense ecosystem through modernization of key capabilities and fostering pathways to adapt SOTA commercial and dual-use technologies to Defense needs. The program also supports the NDS objective of Making the Right Technology Investments by supporting the domestic microelectronics innovation ecosystem and partnering with industry to quickly incorporate market-driven commercial advances with military-relevant capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Office of the Secretary Of Defense	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*

This program supports the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Microelectronics Modernization Roadmap. The primary areas of focus of this roadmap include the following: access to SOTA microelectronics technology, access to advanced packaging and test; access to radiation hardened microelectronics; access to non-complementary metal oxide semiconductor (CMOS) SOTA microelectronics for radio frequency and optoelectronic applications; disruptive research and development; education and workforce development; trusted foundry and obsolescence.

Recognizing that an assured supply of microelectronics is a U.S. Government-wide concern, this activity will interface with interagency partners to account for interagency requirements, opportunities for collaboration, and strategic decisions that can be made to limit the overall cost of these requirements to the USG.

This activity is being led by the Under Secretary of Defense for Research and Engineering.

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	252.963	297.586	220.678	-	220.678
Current President's Budget	245.366	297.586	150.436	-	150.436
Total Adjustments	-7.597	0.000	-70.242	-	-70.242
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-7.572	-			
• Program Adjustments	-	0.000	-70.242	-	-70.242
• Cancelled Account	-0.025	-	-	-	-

Change Summary Explanation

FY 2024: An errata was submitted and approved to realign $50.000M to Procurement, DW, Major Equipment, OSD to support the Accelerate Procurement and Fielding of Innovative Technologies (APFIT) program.

FY 2025 funding decrease of $70.242 million consists of:

1) Realignment of $50.000 million to Procurement, Defense-Wide, Major Equipment, OSD in Program Element 0901388D8Z to support the Accelerate Procurement and Fielding of Innovative Technologies (APFIT) program.
2) Realignment of $4.548 million to the Multi-Domain Joint Operations (MDJO) Program Element 0604791D8Z, to identify and transition emerging technologies that close time-critical joint gaps in multi-domain missions.
3) Realignment of $4.567 million to the Mission Engineering and Integration (ME&I) Program Element 0603142D8Z, to better analyze recommended technologies that eliminate or disrupt adversary kill chains.

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Office of the Secretary Of Defense	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605294D8Z *I Trusted and Assured Microelectronics*

4) Realignment of $1.338 million to the Foreign Comparative Testing (FCT) Program Element 0603133D8Z to bolster international engagement and collaboration with allies and partners.
5) Realignment of $3.978 million to the Defense Innovation Acceleration (DIA) Program Element 0603838D8Z due to higher departmental priorities.
6) Defense wide reduction of $1.565M.
7) Internal realignment to support PE 0603379D8Z of $4.550.
8) Increase of $.304M for economic adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense			Date: March 2024
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	

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
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	420.347	128.017	226.170	95.331	-	95.331	87.678	64.621	67.083	69.234	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New Start (Y/N): No

FY 2024: An Errata was approved to realign $50.000 million from this project to Procurement, DW, Major Equipment, OSD to support the Accelerate Procurement and Fielding of Innovative Technologies (APFIT) program. The current plan of $226.170 million will decrease to $176.170 million.

A. Mission Description and Budget Item Justification

This project establishes multiple strategic partnerships with existing commercial state-of-the-art (SOTA) domestic foundries to develop a data-driven, risk-based approach to supply chain protection and demonstrate the assured manufacture of advanced electronic components.

Successful implementation will transition these technologies to use in DoD programs, obtain access to multiple commercial microelectronics facilities, establish secure design capabilities, and solidify a data-driven approach to supply chain protection. It also includes keeping pace with the rapid advancements in microelectronics technology and the globalization of this industry sector. It will provide the basics for updating and strengthening the DoD assurance policy and includes collaborating with industry to develop data driven evidence-based standards.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Access to State-of-the-Art (SOTA) Microelectronics - Demonstration	128.017	226.170	95.331
Description: Foundry Access: This project implements multiple foundries process design kit (PDK) environments ensuring the government is not dependent on one single source for critical components. Demonstrate hardware through dedicated and multi-project wafer runs at multiple foundries. Commercial foundries generate enormous amounts of data on their processes as a best practice for quality assurance to improve reliability and increase yield. The Foundry program collects and utilizes this data to generate and allow quantitative comparison of performance and security metrics in the design and test stage of the microelectronics lifecycle, thereby mitigating risk.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Rapid Access to Microelectronic Prototypes (RAMP): This activity includes demonstrating the ability to fabricate classified and/or export-controlled designs in on-shore commercial foundries. Funding will establish multiple strategic partnerships with existing commercial domestic microelectronics design vendors and foundries to develop a data-driven, risk-based approach to supply chain protection and demonstrate the assured manufacture of advanced electronic components. This project demonstrates the technical means for protecting intellectual property (IP) and obfuscating the final user function from the supply chain will be realized using personalization, programmability and software, following application specific integrated circuit (ASIC) manufacturing. Efforts are on-going to update International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR) policy in this area. Funding supports activities to enhance the export control regime so that it maintains or strengthens current protections while enabling access to commercial capabilities, products, and IP. Rapid Access to Microelectronic Prototypes – Commercial (RAMP-C): This project enables the DoD and the defense industrial base to collaborate with the commercial microelectronics industry to increase prototype development, demonstration, and address the war fighter's need to maintain and modernize weapon systems as the threat landscape shifts. This project enables T&AM program to demonstrate, by FY 2025, full access to U.S. commercial state-of-the-art (SOTA) design, foundry, and advanced packaging capability and meet DoD's unique needs within two to three years for modernization, including for RH and photonics applications. The capability will reduce the time needed to replace microelectronics components that are generations behind the commercial sector, move away from off-shore sources for SOTA commercial integrated circuits, and accelerate the demonstration and adoption of evidence-based assurance methods throughout the microelectronics lifecycle and supply chain. Reducing the timeline by up to two years not only benefits export control and classified system protection, but also the requirements of the FY 2020 National Defense Authorization Act Section 224 for the DoD to implement commercial standards for the acquisition of assured microelectronics products. ***FY 2024 Plans:*** Foundry Access: • Continue to enhance access to SOTA fabrication ecosystem. • Maintain program of record access to assured fabrication flow and fund multi-project wafer production runs at multiple SOTA domestic sources.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Rapid Assured Microelectronics Prototypes (RAMP): Continue to mature the RAMP operational capability that will: • Continue to enhance secure design and cloud capability with new tools/techniques • Continue to utilize traceability and provenance mechanisms to verify and vet data sources in a zero-trust architecture and enhance ability of DoD/Defense Industrial Base to design state-of-the-art (SOTA) microelectronics. • Continue to quantify transition of designs to prototypes and programs of record and maintain persistence in lifecycle assurance data and intellectual property. • Continue to demonstrate rapid transition of DoD-relevant field programmable gate array-based capabilities to structured • Application-specific integrated circuits (ASICs), with security capabilities to protect DoD intellectual property (IP) during manufacture. Rapid Access to Microelectronic Prototypes – Commercial (RAMP-C): A leading edge (<7 nanometer), commercially-viable, U.S.-located domestic wafer foundry ecosystem access is established. The ecosystem will have capability on the order of > 26,000 wafer starts per month for design and manufacturing of evidence-based assured, dual-use commercial and DoD custom integrated circuits. A successful project WILL enable the following: • Access to a SOTA U.S. wafer foundry • Access to commercial and critical evidence-based assured dual-use commercial off-the-shelf (COTS) integrated circuits • Access to capabilities necessary to develop and demonstrate evidence-based assured custom DoD integrated circuits • The jump-start in commercial use of the domestic foundry by key U.S. fabless companies • Establishment and demonstration of a viable design ecosystem including access to 3rd party design modules • The reduction in the cost differential of building a U.S.-located wafer foundry verses off-shore • The enablement of commercially-supported and enduring U.S. logic foundry capability • Development of the DoD prototype demonstrator designs with the defense industrial base (DIB) to accelerate technology transition • Leverage the expertise of commercial industry to develop and demonstrate novel capabilities for design of SOTA with assurance. Cloud/Electronic Design Automation (EDA): • Continue activities for prototype demonstration of an emulation based evidence-based assurance design flows			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
• Continue efforts to raise the technology readiness level (TRL) of pilot emulation efforts to production readiness by standardizing the cloud based emulation workflows, enhancing the robustness of the flows, and bringing them up to IL-4 Design Acceleration and Transition: • Continue activities with Design Acceleration Centers to leverage commercial intellectual property (IP), Electronics Design Automation (EDA), and processes enabling prototype transition acceleration • Continue to expand and accelerate development and insertion of IP for application-specific integrated circuit (ASIC) and Chiplet security including authentication, Firmware Attestation and Decryption and system-on-chip (SOC) Interface encryption. • Continue to develop and insert tools and techniques for Protect of silicon IP during manufacturing and test phase, including multi-chip package (MCP). • Continue demonstration of using commercial off-the-shelf (COTS) parts in more critical DoD applications utilizing the inherent personalization features ***FY 2025 Plans:*** Foundry Access: • Continue to enhance access to SOTA fabrication ecosystem. • Maintain program of record access to assured fabrication flow and fund multi-project wafer production runs at multiple state-of-the-art (SOTA) domestic sources. Rapid Access to Microelectronic Prototypes – Commercial (RAMP-C): A leading edge (<7 nanometer), commercially-viable, U.S.-located domestic wafer foundry ecosystem access is established. The ecosystem will have capability on the order of > 26,000 wafer starts per month for design and manufacturing of evidence-based assured, dual-use commercial and DoD custom integrated circuits. This project will enable the following: • Access to a state-of-the-art (SOTA) U.S. wafer foundry. • Access to commercial and critical evidence-based assured dual-use commercial off-the-shelf (COTS) integrated circuits. • Access to capabilities necessary to develop evidence-based assured custom DoD integrated circuits. • The jump-start in commercial use of the domestic foundry by key U.S. fabless companies. • Establishment of a viable design ecosystem including access to 3rd party design modules. • The reduction in the cost differential of building a U.S.-located wafer foundry verses off-shore. • The enablement of commercially-supported and enduring U.S. logic foundry capability. • Leverage the expertise of commercial industry to develop and demonstrate novel capabilities for design of SOTA with assurance.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Cloud/Electronic Design Automation (EDA): • Continue activities for prototype demonstration of an emulation based evidence-based assurance design flows • Continue efforts to raise the technology readiness level (TRL) of pilot emulation efforts to production readiness by standardizing the cloud based emulation workflows, enhancing the robustness of the flows, and bringing them up to IL-4 Design Acceleration and Transition: • Continue activities with Design Acceleration Centers to leverage commercial intellectual property (IP), EDA, and processes enabling prototype transition acceleration • Continue to expand and accelerate development and insertion of IP for application-specific integrated circuit (ASIC) and Chiplet security including authentication, Firmware Attestation and Decryption and system-on-chip (SOC) Interface encryption. • Continue to develop and insert tools and techniques for Protect of silicon IP during manufacturing and test phase, including multi-chip package (MCP). • Continue demonstration of using COTS parts in more critical DoD applications utilizing the inherent personalization features ***FY 2024 to FY 2025 Increase/Decrease Statement:*** A decrease of $50M in FY 2024 was for approved Errata. The Revised Plan for FY 2024 is $176.170M, not $226.170M The decrease of -$81.032 million between FY 2024 and FY 2025 is due to realignments totaling $14.431 million to 0604791D8Z Multi-Domain Joint Operations (MDJO), 0603133D8Z Foreign Comparative Testing, 0603142D8Z Mission Engineering & Integration (ME&I), and 0603838D8Z Defense Innovation Acceleration (DIA) due to higher departmental priorities as described in Program Change Summary above, and a planned $66.691 million reduction due to the maturation of activities on the Rapid Assured Microelectronics Prototypes (RAMP) and Rapid Assured Microelectronics Prototypes – Commercial (RAMP-C) projects.			
Accomplishments/Planned Programs Subtotals	128.017	226.170	95.331

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Access to State-of-the-Art (SOTA) Microelectronics - Demonstration	MIPR	Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various	420.347	128.017	Mar 2023	226.170	Mar 2024	95.331	Mar 2025	-		95.331	Continuing	Continuing	-
		Subtotal	420.347	128.017		226.170		95.331		-		95.331	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	420.347	128.017		226.170		95.331		-		95.331	Continuing	Continuing	N/A

Remarks

1) Updated FY 2023 Actuals, incorporating PB25 changes that include cancelled account and SBIR/STTR Transfers.
2) Funding increase of $.193 million FY 2025 for Economic Assumptions.

Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

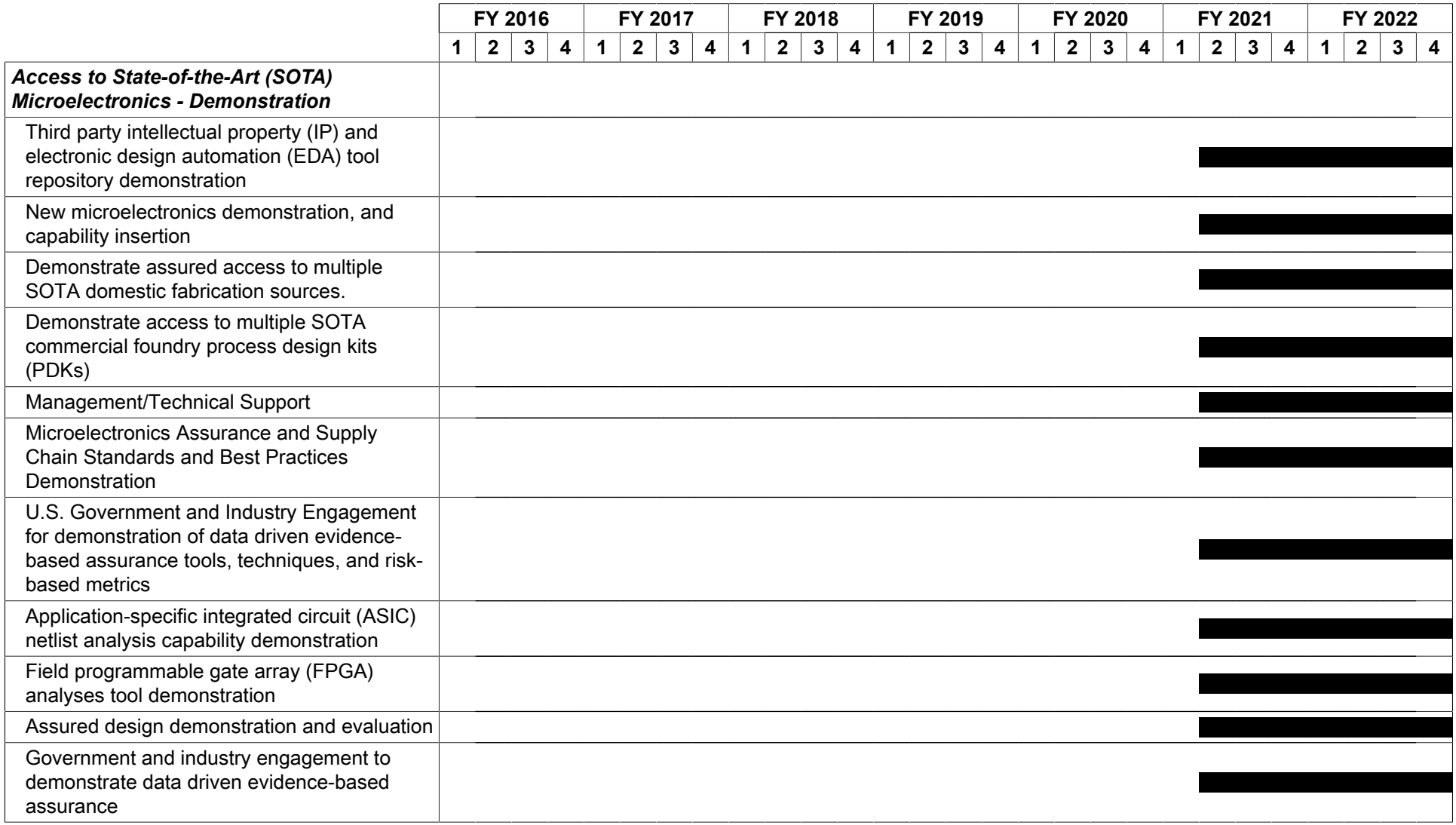


Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

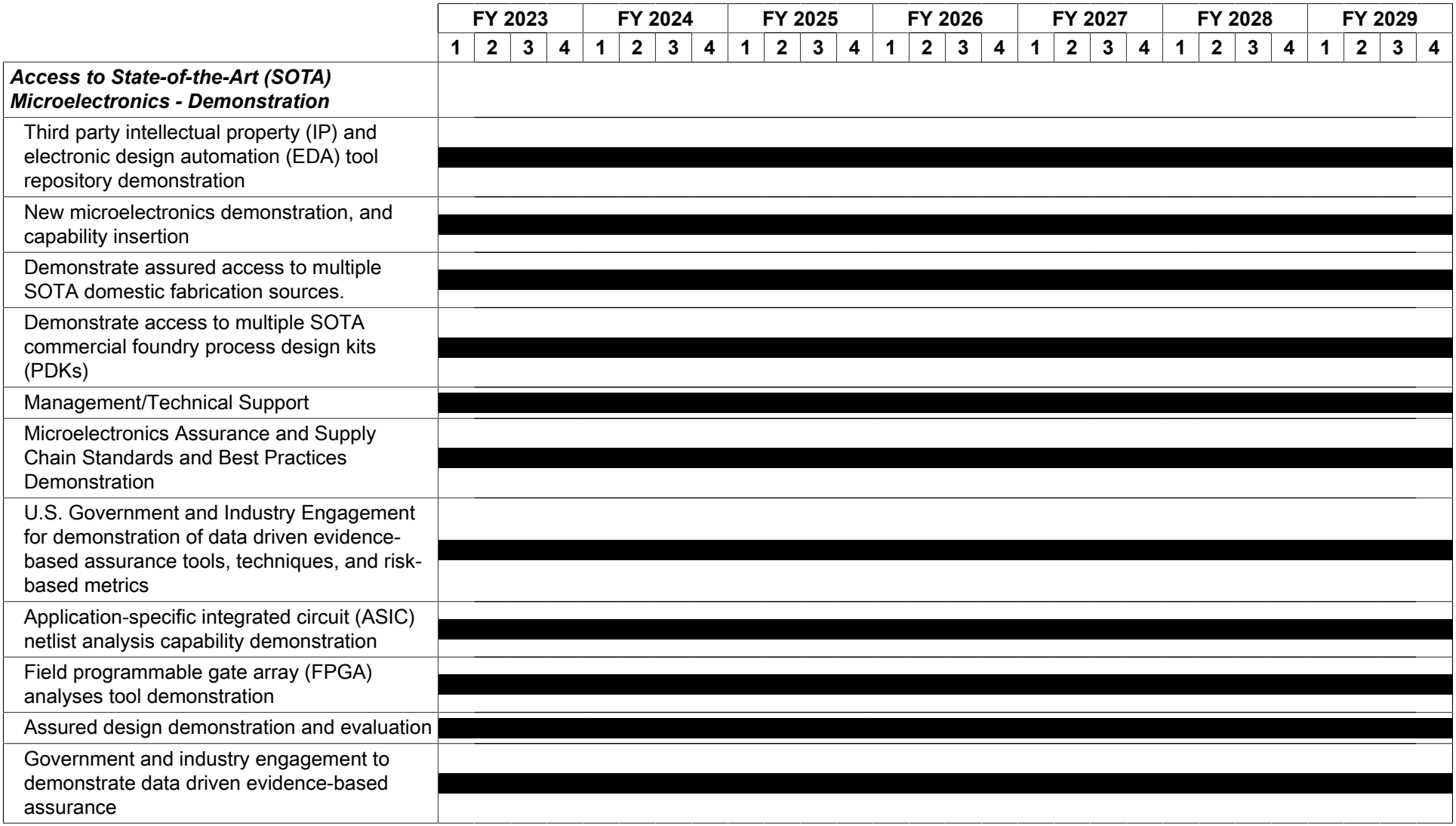


Exhibit R-4A, RDT&E Schedule Details: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Access to State-of-the-Art (SOTA) Microelectronics - Demonstration				
Third party intellectual property (IP) and electronic design automation (EDA) tool repository demonstration	2	2021	4	2029
New microelectronics demonstration, and capability insertion	2	2021	4	2029
Demonstrate assured access to multiple SOTA domestic fabrication sources.	2	2021	4	2029
Demonstrate access to multiple SOTA commercial foundry process design kits (PDKs)	2	2021	4	2029
Management/Technical Support	2	2021	4	2029
Microelectronics Assurance and Supply Chain Standards and Best Practices Demonstration	2	2021	4	2029
U.S. Government and Industry Engagement for demonstration of data driven evidence-based assurance tools, techniques, and risk-based metrics	2	2021	4	2029
Application-specific integrated circuit (ASIC) netlist analysis capability demonstration	2	2021	4	2029
Field programmable gate array (FPGA) analyses tool demonstration	2	2021	4	2029
Assured design demonstration and evaluation	2	2021	4	2029
Government and industry engagement to demonstrate data driven evidence-based assurance	2	2021	4	2029

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense			Date: March 2024
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 903 / *Access to Advanced Packaging and Testing - Demonstration*	

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
903: *Access to Advanced Packaging and Testing - Demonstration*	81.112	96.171	44.391	30.221	-	30.221	31.012	26.284	27.375	28.172	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New Start (Y/N): No

A. Mission Description and Budget Item Justification

This project will leverage existing commercially available expertise and capability to deliver self-sustaining digital and radio frequency (RF) state-of-the-art (SOTA) heterogeneous integrated packaging (SHIP), assembly, and test capability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Access to Advanced Packaging and Testing - Demonstration	96.171	44.391	30.221
Description: This project will deliver an on-shore SHIP assembly and test capability. It will demonstrate access to, personalization of, and customization for supporting the DoD programs. It will enable a revolutionary leap in system performance that will greatly reduce size, weight and power (SWaP) by incorporating the immense advances in SOTA commercial off the shelf (COTS) processing technologies, such as field programmable gate arrays (FPGAs), microprocessors, and graphics processing units (GPUs). Leading-edge semiconductor design and manufacturing technology forms the basis for many of the DoD modernization priorities. Most dual-use COTS parts used for modernization priorities are currently manufactured in Asian facilities that do not provide measurable assurance. This program enhancement demonstrates the DoD access to leading-edge semiconductor technology through domestic U.S.-located sources of custom and dual-use leading edge integrated circuits utilizing heterogeneous integration and advanced packaging. This enables implementation of complex, computation intensive artificial intelligence (AI) algorithms for DoD AI and Autonomy applications. It will also facilitate use of integrated cyber-security methods/cryptography in the DoD hardware and utilization of the complex computational capability required for active electronically scanned array (AESA) phase array radar system and electronic warfare (EW) and communications including 5G radio access network (RAN) systems. The proposed large constellations of			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
networked satellites will also require leading-edge semiconductor components to enable real time communication and on-satellite computation. The program prototypes will transition to military systems through strategic efforts based on collaboration with the DoD acquisition community, program offices, and the Defense Industrial Base. ***FY 2024 Plans:*** • Continue to demonstrate enhanced secure design and secure packaging with new tools and techniques. • Continue to demonstrate heterogeneous integration for secure packaging and test. • Demonstrate prototype hardware and additional program-driven designs of increasing complexity and capability/performance. • Continue Secure Assembly & Test environment maturation with prototypes • Continue Advanced Packaging technologies maturation with prototypes • Continue Advanced Packaging prototype targeted transition projects • Continue Advanced Packaging reliability and qualification risk reduction projects • Accelerate and expand the development of multi-chip packaging (MCP) prototype demonstrators in collaboration with DoD Programs and the defense industry for process intensive applications and radio frequency (RF) such as active electronically scanned array (AESA) radar, cognitive electronic warfare (EW) and autonomy, while enhancing security for protecting intellectual property (IP) and critical program information (CPI). • Expand and accelerate demonstration of prototype hardware and additional program-driven designs of increasing complexity and capability/performance: Layered approach for IP & CPI protection Enhanced resistance to security and cyber threats Customized personalization per Program or MCP Risk reduction by much greater visibility into the supply chain and assembly process, including quantifiable data for material tracking, meteorology and process control ***FY 2025 Plans:*** • Continue sub-system/system demonstrations leveraging heterogeneous integrated packaging targeting DoD transitions • Continue advanced packaging prototypes targeting DoD transitions • Continue advanced packaging reliability and qualification risk reduction projects • Demonstrate prototype hardware and additional program-driven designs of increasing complexity and capability/performance. • Accelerate and expand the development of multi-chip packaging (MCP) prototype demonstrators in collaboration with DoD Programs and the defense industry for process intensive applications and RF such as AESA Radar, cognitive EW and autonomy, while enhancing security for protecting IP and CPI.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
• Expand and accelerate demonstration of prototype hardware and additional program-driven designs of increasing complexity and capability/performance: Layered approach for IP & CPI protection Enhanced resistance to security and cyber threats Customized personalization per Program or multi-chip package (MCP) Risk reduction by much greater visibility into the supply chain and assembly process, including quantifiable data for material tracking, meteorology and process control • Continue to demonstrate enhanced secure design and secure packaging with new tools and techniques. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The decrease of -$14.231 million between FY 2024 and FY 2025 follows the establishment of the initial advanced packaging and testing capability, which will continue to deliver prototype designs and hardware for accelerating program adoption and for qualification, and further develop the infrastructure and process that supports International Traffic in Arms Regulations (ITAR)/ Export Administration Regulations (EAR), proprietary and security requirements.			
Accomplishments/Planned Programs Subtotals	96.171	44.391	30.221

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Access to Advanced Packaging and Testing - Demonstration	MIPR	Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various	81.112	96.171	Mar 2023	44.391	Mar 2024	30.221	Mar 2025	-		30.221	Continuing	Continuing	-
		Subtotal	81.112	96.171		44.391		30.221		-		30.221	Continuing	Continuing	N/A

Remarks

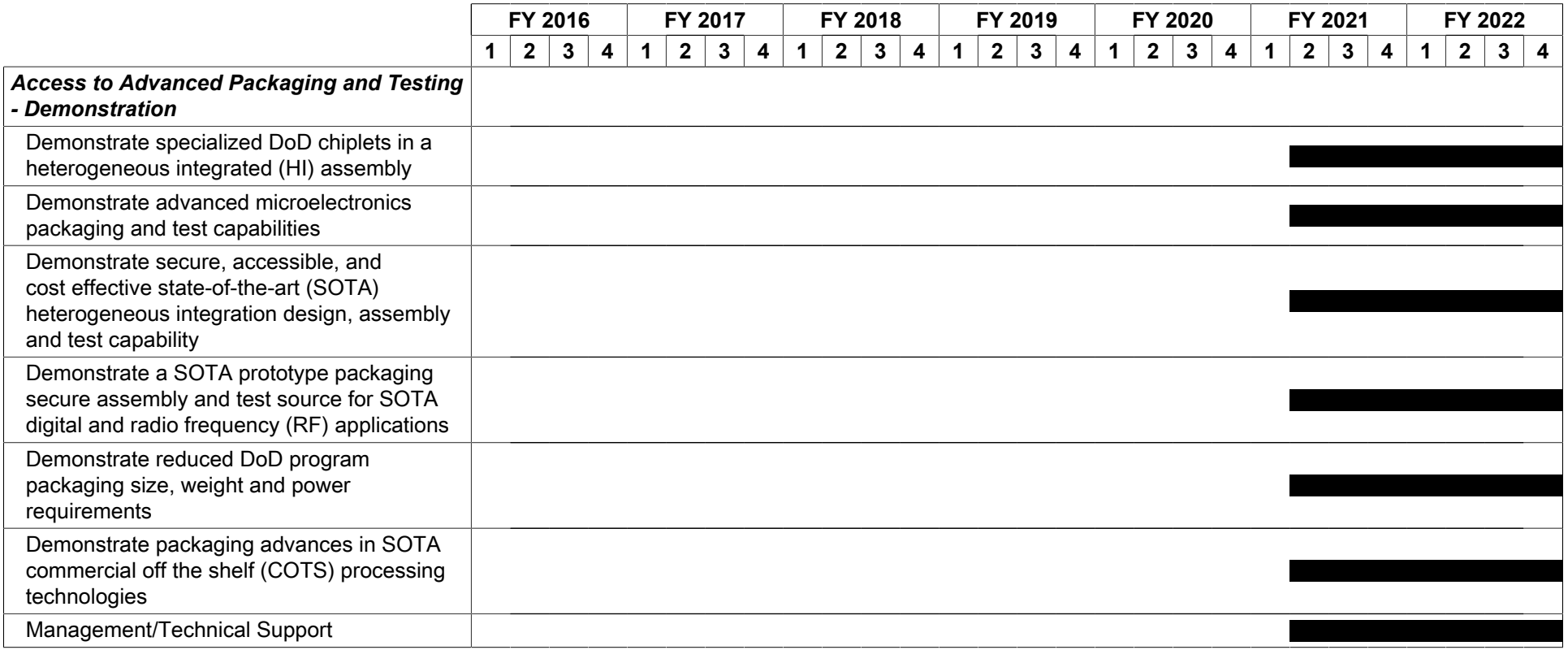
1) Updated FY 2023 Actuals, incorporating PB25 changes that include cancelled account and SBIR/STTR Transfers
2) A reduction of -$2.826M in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact.
3) Funding increase of $.061 million FY 2025 for Economic Assumptions.

	Prior Years	FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	81.112	96.171		44.391		30.221		-		30.221	Continuing	Continuing	N/A

Remarks

1) Updated FY 2023 Actuals, incorporating PB25 changes that include cancelled account and SBIR/STTR Transfers
2) A reduction of -$2.826M in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact.
3) 2) Funding increase of $.061 million FY 2025 for Economic Assumptions.

Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*



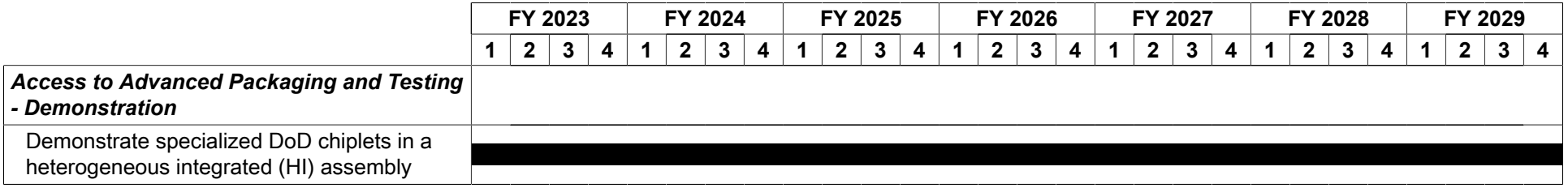


Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

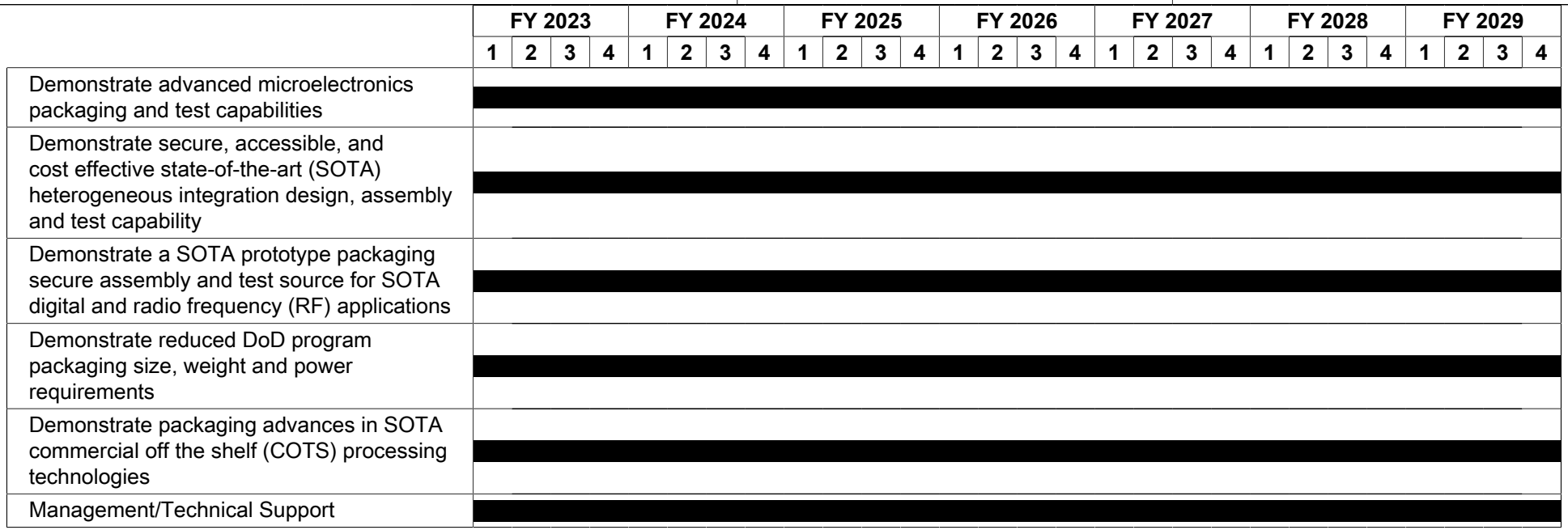


Exhibit R-4A, RDT&E Schedule Details: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Access to Advanced Packaging and Testing - Demonstration				
Demonstrate specialized DoD chiplets in a heterogeneous integrated (HI) assembly	2	2021	4	2029
Demonstrate advanced microelectronics packaging and test capabilities	2	2021	4	2029
Demonstrate secure, accessible, and cost effective state-of-the-art (SOTA) heterogeneous integration design, assembly and test capability	2	2021	4	2029
Demonstrate a SOTA prototype packaging secure assembly and test source for SOTA digital and radio frequency (RF) applications	2	2021	4	2029
Demonstrate reduced DoD program packaging size, weight and power requirements	2	2021	4	2029
Demonstrate packaging advances in SOTA commercial off the shelf (COTS) processing technologies	2	2021	4	2029
Management/Technical Support	2	2021	4	2029

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense			Date: March 2024
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*	

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
905: *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*	38.862	21.178	27.025	24.884	-	24.884	26.273	26.229	27.325	28.118	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New Start (Y/N): No

A. Mission Description and Budget Item Justification

This project addresses the dual problems of commanding only a small market share while requiring an expansive range of unique microelectronics needs, from boutique and legacy components to state-of-the-art (SOTA) technologies. The Government must sustain specialty suppliers, given their criticality to national security. In particular, DoD needs access to a diverse microelectronics ecosystem to develop and acquire the application specific integrated circuit (ASICs) and personalized commercial off the shelf (COTS) components required for military radiation hardened and radio frequency and optical needs.

The Department frequently relies on commercial suppliers to optimize performance and reduce costs for sophisticated weapon system and secure network functionality. It is critical that the DoD has future access to subject matter expertise, technology, and manufacturing.

In addition to radiation hardened microelectronics needs, the DoD requires access to radio frequency (RF) and opto-electronic materials, foundries, and packaging facilities, to enable next generation sensors and communications. The DoD must leverage state-of-the-art microelectronic technologies driven by mega-trends such as 5G wireless and datacenters to combat emerging threats and provide overmatch technology to the warfighter. At the same time, the DoD must fill the gaps which are left unaddressed these dual-use mega-trends to satisfy mission requirements. Partnering in the maturation of state-of-the-art material sources, foundries, and packaging facilities, enables DoD to tailor process development towards unique DoD interests and encourage open access design, stimulating innovation and driving affordability. Additionally, critical investments must be made in the domestic supply chains supporting both RF Gallium Nitride (GaN) and integrated photonics to maintain the integrity and security of the Defense Industrial Base.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration	21.178	27.025	24.884
Description: Government-unique trusted design and manufacturing flows have been developed to enable a tier of trust for select ASIC parts; however, this approach addresses only a small subset of DoD microelectronics requirements (e.g., processors, memory, microcontrollers, field programmable gate arrays (FPGAs), and radiation-tolerant processors). The DoD will partner with the intelligence community, the Department of Energy, and the National Aeronautics and Space Administration to demonstrate radiation hardened components that permit systems to operate in space and other harsh			

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025

environments. State-of-the-practice (SOTP) and SOTA technologies will be characterized and developed in support of Radiation Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support the DoD modernization programs with radiation hardened requirements.

Beyond complementary metal-oxide semiconductor (CMOS) and radiation hardened microelectronics, radio frequency (RF)- and opto-electronic (RF/OE) technologies represent critically enable asymmetric DoD capabilities as well as domestic dual-use industrial base capabilities. RF/OE investments will demonstrate RF Gallium Nitride (GaN) and integrated photonic material sources, foundries, and packaging facilities. These investments will break microelectronics bottlenecks which directly enable compact millimeter wave transceivers and artificial intelligence training for edge compute.

FY 2024 Plans:
Planned activities are as follows:

• Continue to demonstrate state-of-the-practice (SOTP) and state-of-the-art (SOTA) technologies utilizing RHBP and RHBD activities in support of DoD modernization programs with radiation hardened requirements.
• Transition developed RH technologies into space and strategic programs.
• Continue to mature large-diameter Nitrogen-Polar RF GaN material source and off-axis Silicon Carbide substrate. Foundries will assess epiwafers and provide feedback critical to baselining the N-Polar recipe.
• Continue to mature multiple manufacturing readiness level (MRL)-6 state-of-the-art RF GaN foundries offering open access to millimeter wave device design and advanced interconnect services, progressing toward MRL-7.
• Act upon industrial base assessment of the integrated photonics foundry ecosystem and mature strategic components of the domestic integrated photonics supply chain.
• Demonstrate access to state-of-the-art RF GaN and integrated photonic foundries via advanced prototype demonstrators.
• Increase capacity for RHBD technologies to support additional DoD programs

FY 2025 Plans:
Planned activities are as follows:

• Continue to demonstrate SOTP and SOTA technologies utilizing RHBP and RHBD activities in support of DoD modernization programs with radiation hardened requirements.
• Transition developed RH technologies into space and strategic programs.
• Increase capacity for RHBD technologies to support additional DoD programs
• Continue to mature multiple MRL-7 state-of-the-art RF GaN foundries offering open access to millimeter wave device design and advanced interconnect services

Exhibit R-2A, RDT&E Project Justification: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
• Continue to mature manufacturing readiness level (MRL)-6 multiple co-packaged optical chiplets and multi-chip packages offering high-bandwidth data transfer capabilities. • Continue to mature MRL-6 advanced semiconductor material production and baseline for insertion into multiple millimeter wave foundries. • Continue workforce development program for radio frequency (RF), power, and photonics. • Continue demonstration of next generation RF Gallium Nitride (GaN) power technologies to increase RF power efficiency and dramatically improve thermal efficiency and management, decreasing the power load on DoD platforms. • Continue demonstration of next generation RF GaN prototypes with improved performance at an affordable cost for drop in Line Replaceable Units (LRUs) in existing systems potentially without major architectural and structural redesign. Leverage commercial developments in next generation RF GaN power technologies to adapt for DoD applications. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** 1) A reduction of -$2.327M in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact.			
Accomplishments/Planned Programs Subtotals	21.178	27.025	24.884

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration	MIPR	Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various	38.862	21.178	Mar 2023	27.025	Mar 2024	24.884	Mar 2025	-		24.884	Continuing	Continuing	-
		Subtotal	38.862	21.178		27.025		24.884		-		24.884	Continuing	Continuing	N/A

Remarks

1) Updated FY 2023 Actuals, incorporating PB25 changes that include cancelled account and SBIR/STTR Transfers
2) A reduction of -$2.327M in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact.
3) Funding increase of $.05 million FY 2025 for Economic Assumptions.

	Prior Years	FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	38.862	21.178		27.025		24.884		-		24.884	Continuing	Continuing	N/A

Remarks

1) Updated FY 2023 Actuals, incorporating PB25 changes that include cancelled account and SBIR/STTR Transfers
2) A reduction of -$2.327M in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact.
3) Funding increase of $.05 million FY 2025 for Economic Assumptions.

Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*

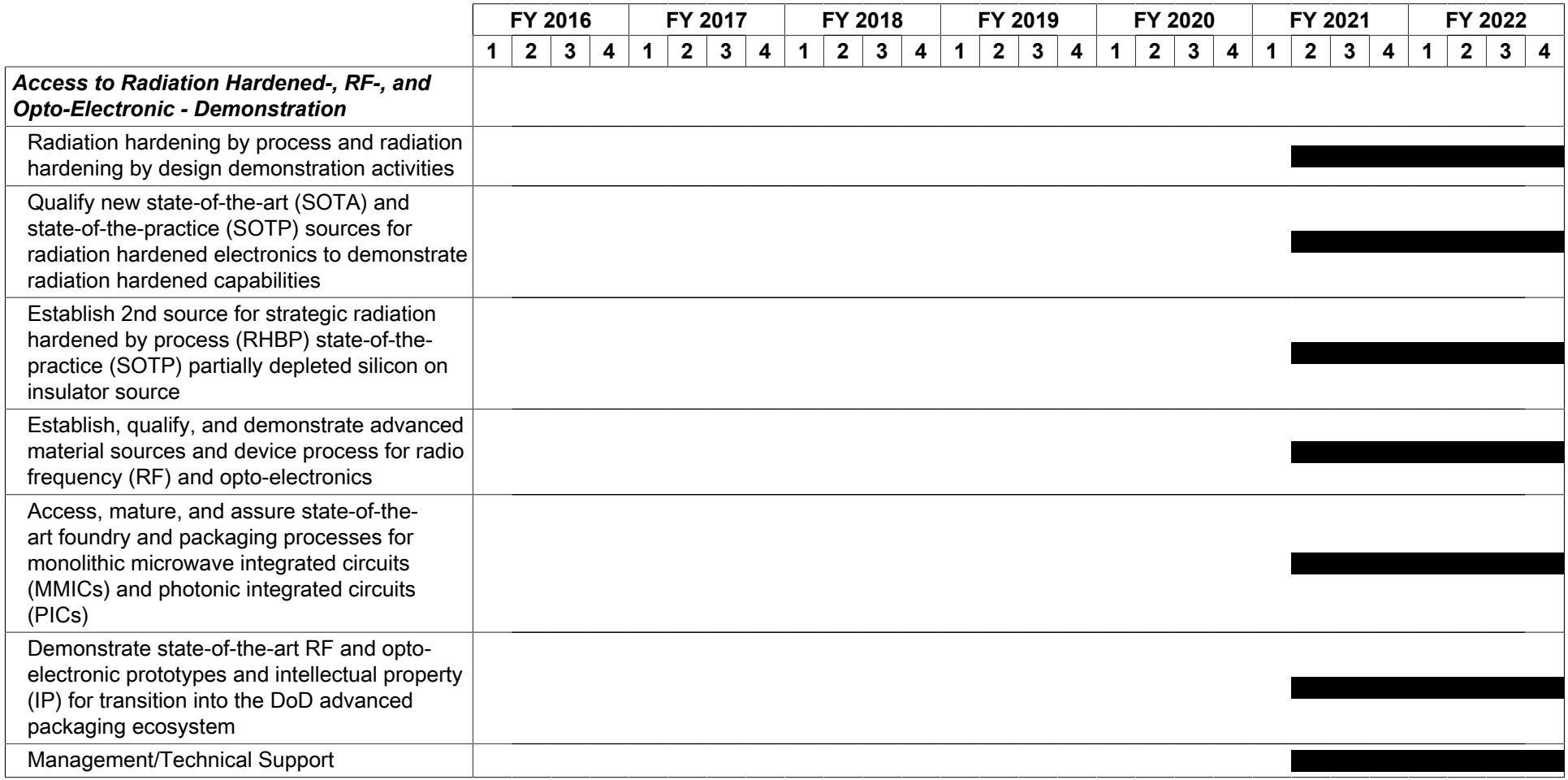


Exhibit R-4, RDT&E Schedule Profile: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*

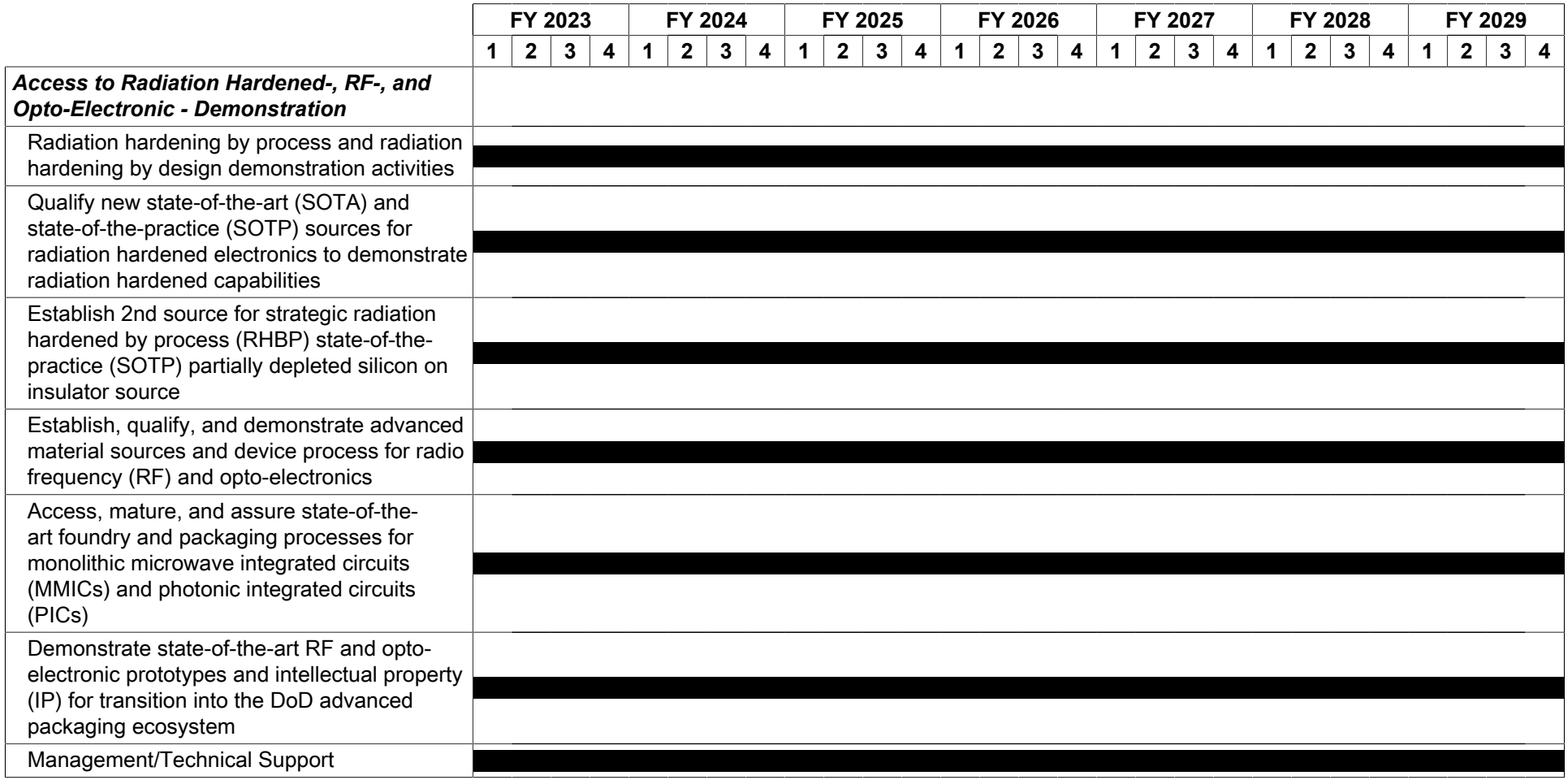


Exhibit R-4A, RDT&E Schedule Details: PB 2025 Office of the Secretary Of Defense		Date: March 2024
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Access to Radiation Hardened-, RF-, and Opto-Electronic - Demonstration				
Radiation hardening by process and radiation hardening by design demonstration activities	2	2021	4	2029
Qualify new state-of-the-art (SOTA) and state-of-the-practice (SOTP) sources for radiation hardened electronics to demonstrate radiation hardened capabilities	2	2021	4	2029
Establish 2nd source for strategic radiation hardened by process (RHBP) state-of-the-practice (SOTP) partially depleted silicon on insulator source	2	2021	4	2029
Establish, qualify, and demonstrate advanced material sources and device process for radio frequency (RF) and opto-electronics	2	2021	4	2029
Access, mature, and assure state-of-the-art foundry and packaging processes for monolithic microwave integrated circuits (MMICs) and photonic integrated circuits (PICs)	2	2021	4	2029
Demonstrate state-of-the-art RF and opto-electronic prototypes and intellectual property (IP) for transition into the DoD advanced packaging ecosystem	2	2021	4	2029
Management/Technical Support	2	2021	4	2029