Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Office of the Secretary Of Defense	Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	429.162	111.159	252.963	297.586	0.000	297.586	220.678	214.337	185.464	189.535	Continuing	Continuing
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	364.461	55.886	150.061	226.170	0.000	226.170	160.531	153.046	129.966	132.823	Continuing	Continuing
903: *Access to Advanced Packaging and Testing - Demonstration*	39.040	42.072	76.149	44.391	0.000	44.391	32.986	33.180	27.773	28.377	Continuing	Continuing
905: *Address DoD Unique Needs Radiation Hardening and non-CMOS - Demonstration*	25.661	13.201	26.753	27.025	0.000	27.025	27.161	28.111	27.725	28.335	Continuing	Continuing

Note

New Start (Y/N): No

A. Mission Description and Budget Item Justification

This program 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 PE 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. This PE 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.

This Program Element 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 state-of-the-art (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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Office of the Secretary Of Defense	Date: March 2023
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*

Recognizing that an assured supply of microelectronics is a U.S. Government-wide concern, this activity will interface with interagency partners to take into account 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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	113.536	302.963	302.818	-	302.818
Current President's Budget	111.159	252.963	297.586	-	297.586
Total Adjustments	-2.377	-50.000	-5.232	-	-5.232
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-50.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.377	-			
• Program Adjustments	-	-	-5.232	-	-5.232

Change Summary Explanation

FY 2024 reduction of $5.232 million is comprised of a realignment of $6.590 million to support the Historically Black Colleges and Universities/Minority Serving Institutions program, which is a priority of the Under Secretary of Defense for Research and Engineering (USD(R&E)), $0.316 million to support departmental priorities and an economic assumption increase of $1.674 million.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	364.461	55.886	150.061	226.170	0.000	226.170	160.531	153.046	129.966	132.823	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 quantifiable standards.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Access to State-of-the-Art (SOTA) Microelectronics - Demonstration	55.886	150.061	226.170
Description: Foundry Access: This activity 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. Rapid Access to Microelectronic Prototypes (RAMP): This activity includes verifying 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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 2022	FY 2023	FY 2024
This project demonstrates the technical means for protecting 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 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 quantifiable 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 2023 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. RAMP: Complete the RAMP prototype and establish a RAMP system operator that will allow Government acquisition programs access to a secure design and cloud capability. The RAMP operational platform will: • Continue to enhance secure design and cloud capability with new tools/techniques.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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 2022	FY 2023	FY 2024
• 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 SOTA microelectronics. • Continue to quantify transition of designs to prototypes and programs of record and maintain persistence in lifecycle assurance data and intellectual property. RAMP-C: Continue to develop and mature a leading edge, commercially-viable, domestic U.S.-located wafer foundry ecosystem capability, on the order of more than 26,000 wafer starts per month for design and manufacturing of quantifiably assured, dual-use commercial and DoD custom integrated circuits. A successful WILL enable the following: • Access to a SOTA U.S. wafer foundry • Access to commercial and critical quantifiably assured dual-use COTS integrated circuits • Access to capabilities necessary to develop and demonstrate quantifiably 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 DIB to accelerate technology transition ***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. 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 SOTA microelectronics. • Continue to quantify transition of designs to prototypes and programs of record and maintain persistence in lifecycle assurance data and intellectual property.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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 2022	FY 2023	FY 2024
• Continue to demonstrate rapid transition of DoD-relevant field programmable gate array-based capabilities to structured ASICs, with security capabilities to protect DoD intellectual property (IP) during manufacture. RAMP-C: A leading edge (<7nm), 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 quantifiably 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 quantifiably assured dual-use COTS integrated circuits • Access to capabilities necessary to develop and demonstrate quantifiably 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 DIB to accelerate technology transition • Leverage the expertise of commercial industry to develop and demonstrate novel capabilities for design of State-of-the Art (SOTA) with assurance. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This increase of $76.109 million between FY 2023 and FY 2024 enables the RAMP and RAMP-C programs within the T&AM program to demonstrate by FY 2025 full access to U.S. commercial 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 quantifiable 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 2020 National Defense Authorization Act Section 224 for the DoD to implement commercial standards for the acquisition of assured microelectronics products by 2023.			
Accomplishments/Planned Programs Subtotals	55.886	150.061	226.170

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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*

C. Other Program Funding Summary ($ in Millions)

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Office of the Secretary Of Defense			Date: March 2023
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 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 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	364.461	55.886	Mar 2022	150.061	Mar 2023	226.170	Mar 2024	-		226.170	Continuing	Continuing	-
		Subtotal	364.461	55.886		150.061		226.170		-		226.170	Continuing	Continuing	N/A

	Prior Years	FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	364.461	55.886		150.061		226.170		-		226.170	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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*

	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Access to State-of-the-Art (SOTA) Microelectronics - Demonstration																												
Third party intellectual property (IP) and electronic design automation (EDA) tool repository demonstration																												■
New microelectronics demonstration, and capability insertion																												■
Demonstrate assured access to multiple SOTA domestic fabrication sources.																												■
Demonstrate access to multiple SOTA commercial foundry process design kit's (PDK's)																												■
Management/Technical Support																												■
Microelectronics Assurance and Supply Chain Standards and Best Practices Demonstration																												■
U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics																												■
ASIC netlist analysis capability demonstration																												■
Field programmable gate array (FPGA) analyses tool demonstration																												■
Assured design demonstration and evaluation																												■
Government and industry engagement to demonstrate data driven quantifiable assurance																												■

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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*

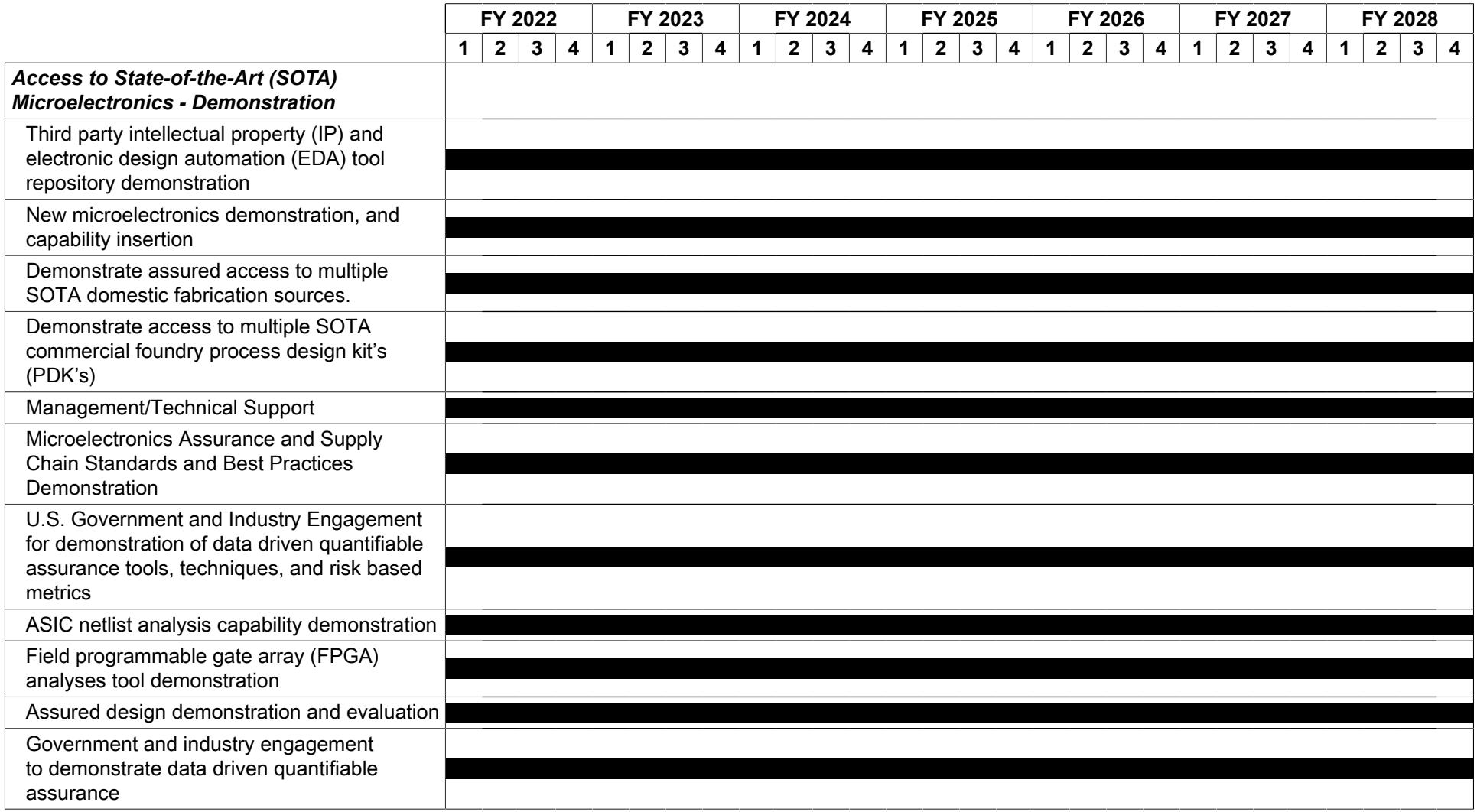


Exhibit R-4A, RDT&E Schedule Details: PB 2024 Office of the Secretary Of Defense		Date: March 2023
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - 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	2028
New microelectronics demonstration, and capability insertion	2	2021	4	2028
Demonstrate assured access to multiple SOTA domestic fabrication sources.	2	2021	4	2028
Demonstrate access to multiple SOTA commercial foundry process design kit's (PDK's)	2	2021	4	2028
Management/Technical Support	2	2021	4	2028
Microelectronics Assurance and Supply Chain Standards and Best Practices Demonstration	2	2021	4	2028
U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics	2	2021	4	2028
ASIC netlist analysis capability demonstration	2	2021	4	2028
Field programmable gate array (FPGA) analyses tool demonstration	2	2021	4	2028
Assured design demonstration and evaluation	2	2021	4	2028
Government and industry engagement to demonstrate data driven quantifiable assurance	2	2021	4	2028

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
903: *Access to Advanced Packaging and Testing - Demonstration*	39.040	42.072	76.149	44.391	0.000	44.391	32.986	33.180	27.773	28.377	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2022	FY 2023	FY 2024
Title: Access to Advanced Packaging and Testing - Demonstration	42.072	76.149	44.391

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 Graphic 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 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 networked satellites will also require leading-edge semiconductor components to enable real time communication and on-satellite computation.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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 2022	FY 2023	FY 2024
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 2023 Plans:*** • Demonstrate DIB and DoD maturation leveraging commercial design using developed PDKs and ADKs to design custom devices. • Demonstrate DoD access to SOTA MCP products utilizing commercial packaging, assembly, and test and efficiencies gained in IP/design re-use to lower cost, risk and shorten schedules: Demonstrate the use of a catalog of designs, die, chiplets, package types, etc. Ensure Reuse and Standardization for sustainability and costs. • 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. • Demonstrate prototype hardware and additional program-driven designs of increasing complexity and capability/performance. • Demonstrate the application of microelectronics quantifiable assurance guidance applied to microelectronics packaging to ensure product integrity and ensure confidentiality of critical IP. • Continue to demonstrate enhanced secure design and secure packaging with new tools, processes, and techniques. • Continue to demonstrate heterogeneous integration for secure packaging and test. • Continue to collaborate with the DoD acquisition community, program offices, and the Defense Industrial Base to ensure transition of the prototype devices into military systems. • 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 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			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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 2022	FY 2023	FY 2024
• 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 RF such as AESA Radar, cognitive EW and autonomy, while enhancing security for protecting IP and 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 2023 to FY 2024 Increase/Decrease Statement:*** The decrease of $31.758 million between FY 2023 and FY 2024 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 ITAR/EAR, proprietary and security requirements.			
Accomplishments/Planned Programs Subtotals	42.072	76.149	44.391

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Office of the Secretary Of Defense			Date: March 2023
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*	

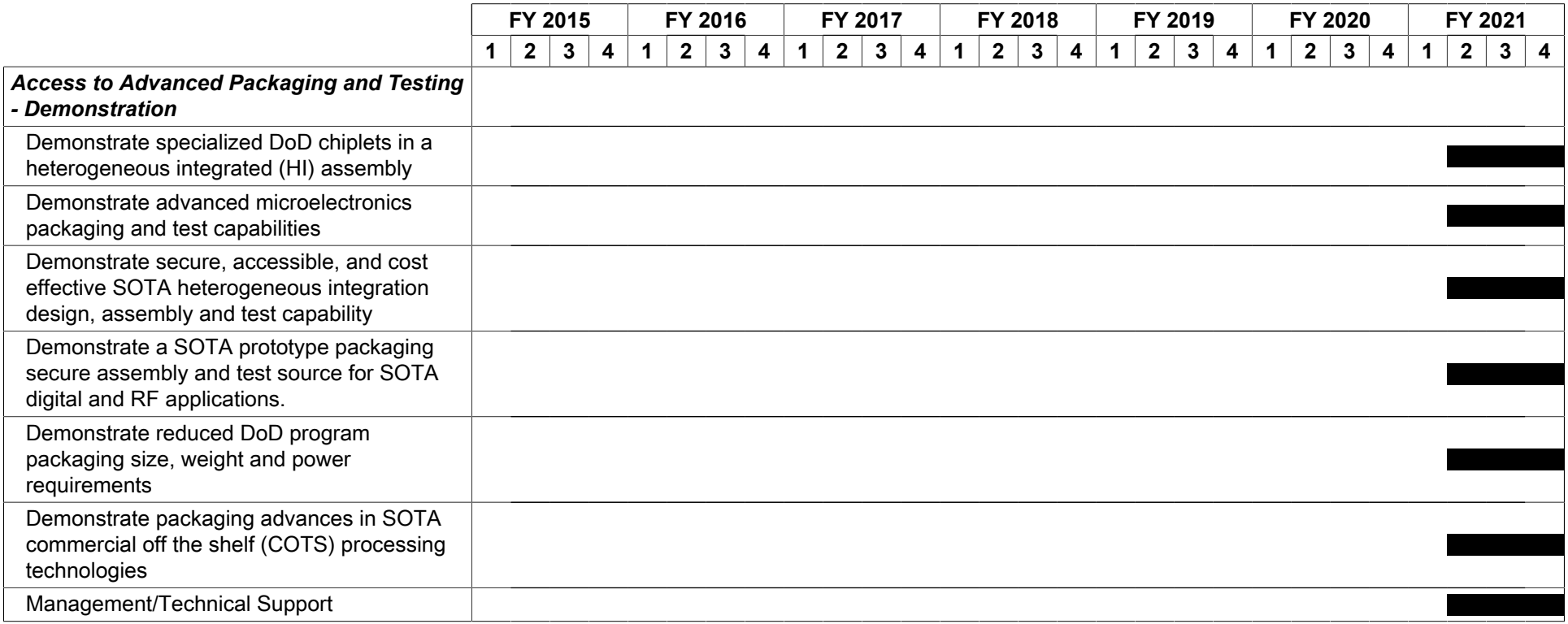
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 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	39.040	42.072	Mar 2022	76.149	Mar 2023	44.391	Mar 2024	-		44.391	Continuing	Continuing	-
		Subtotal	39.040	42.072		76.149		44.391		-		44.391	Continuing	Continuing	N/A

	Prior Years	FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	39.040	42.072		76.149		44.391		-		44.391	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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*



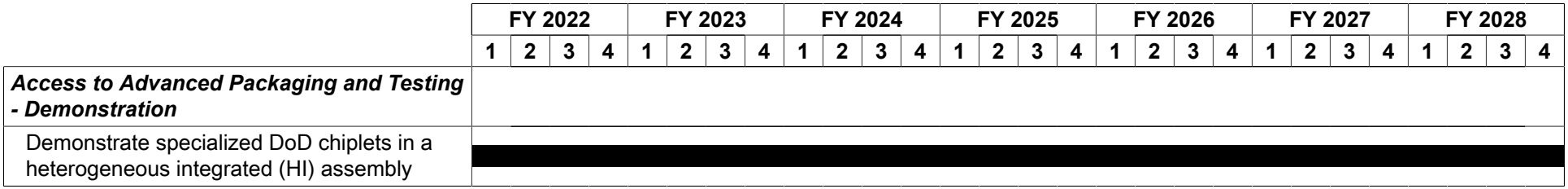


Exhibit R-4, RDT&E Schedule Profile: PB 2024 Office of the Secretary Of Defense		Date: March 2023
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

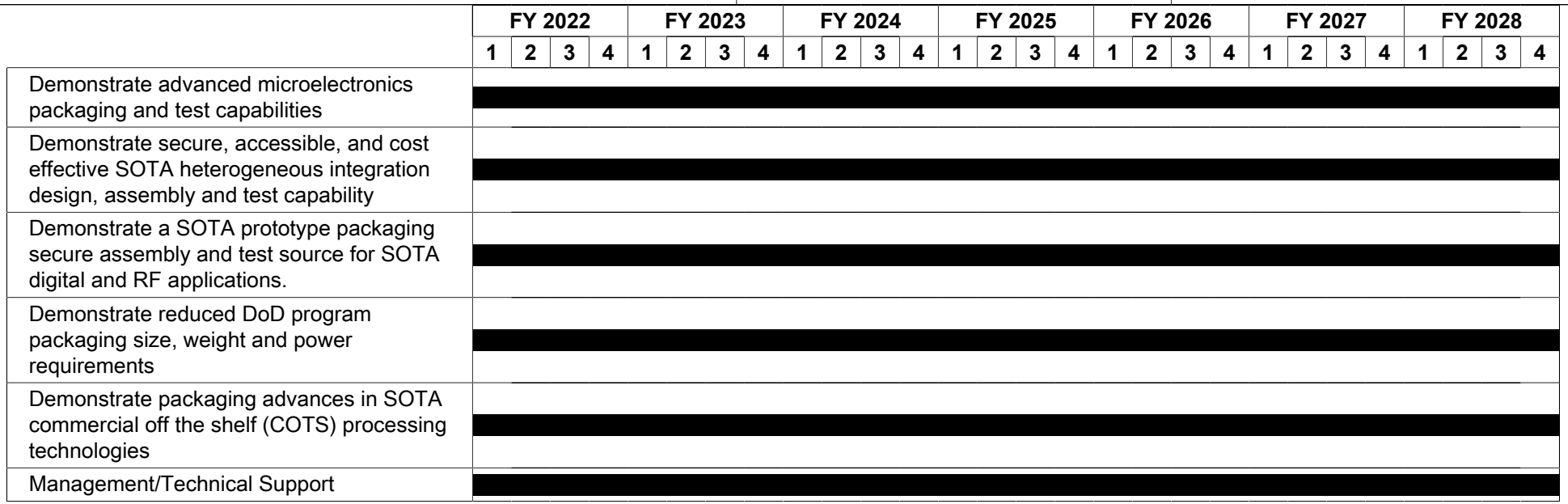


Exhibit R-4A, RDT&E Schedule Details: PB 2024 Office of the Secretary Of Defense		Date: March 2023
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - 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	2028
Demonstrate advanced microelectronics packaging and test capabilities	2	2021	4	2028
Demonstrate secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability	2	2021	4	2028
Demonstrate a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications.	2	2021	4	2028
Demonstrate reduced DoD program packaging size, weight and power requirements	2	2021	4	2028
Demonstrate packaging advances in SOTA commercial off the shelf (COTS) processing technologies	2	2021	4	2028
Management/Technical Support	2	2021	4	2028

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense			Date: March 2023
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 905 / *Address DoD Unique Needs Radiation Hardening and non-CMOS - Demonstration*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
905: *Address DoD Unique Needs Radiation Hardening and non-CMOS - Demonstration*	25.661	13.201	26.753	27.025	0.000	27.025	27.161	28.111	27.725	28.335	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 Rad Hard needs, the DoD requires access to RF and opto-electronic materials, foundries, and packaging facilities, in order 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 in order 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 in order to satisfy mission requirements. By partnering in the maturation of state-of-the-art material sources, foundries, and packaging facilities, the DoD is able to tailor process development towards unique DoD interests and encourage open access design, which stimulates innovation and drives affordability. Additionally, critical investments must be made in the domestic supply chains supporting both RF Gallium Nitride (GaN) and integrated photonics in order to maintain the integrity and security of the Defense Industrial Base.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Address DoD Unique Needs - Radiation Hardening and non-CMOS - Demonstration	13.201	26.753	27.025
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 environments. State-of-the-practice (SOTP) and SOTA technologies will be characterized and developed in support of Radiation			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support the DoD modernization programs with radiation hardened requirements. A similar situation exists for radio frequency and optical applications. These two applications reflect only a small market with unique costs and specifications, which does not inherently create incentive for industrial investment. Within RF and opto-electronics, investments will be made in RF GaN and integrated photonic material sources, foundries, and packaging facilities in order to enable low-size, weight, and power devices which broadly access the millimeter wave spectrum, while providing high-bandwidth data transmission. ***FY 2023 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. • 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 towards MRL-6 multiple state-of-the-art RF GaN foundries offering open access to millimeter wave device design and advanced interconnect services. • 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. ***FY 2024 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. • 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 towards MRL-6 multiple state-of-the-art RF GaN foundries offering open access to millimeter wave device design and advanced interconnect services. • Act upon industrial base assessment of the integrated photonics foundry ecosystem and mature strategic components of the domestic integrated photonics supply chain.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense		Date: March 2023
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Radiation Hardening and non-CMOS - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
• 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 2023 to FY 2024 Increase/Decrease Statement:*** The increase of $0.272 million supports revised economic assumptions.			
Accomplishments/Planned Programs Subtotals	13.201	26.753	27.025

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Office of the Secretary Of Defense		Date: March 2023
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Radiation Hardening and non-CMOS - Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Address DoD Unique Needs - Demonstration	MIPR	Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various	25.661	13.201	Mar 2022	26.753	Mar 2023	27.025	Mar 2024	-		27.025	Continuing	Continuing	-
		Subtotal	25.661	13.201		26.753		27.025		-		27.025	Continuing	Continuing	N/A

	Prior Years	FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	25.661	13.201		26.753		27.025		-		27.025	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Office of the Secretary Of Defense		Date: March 2023
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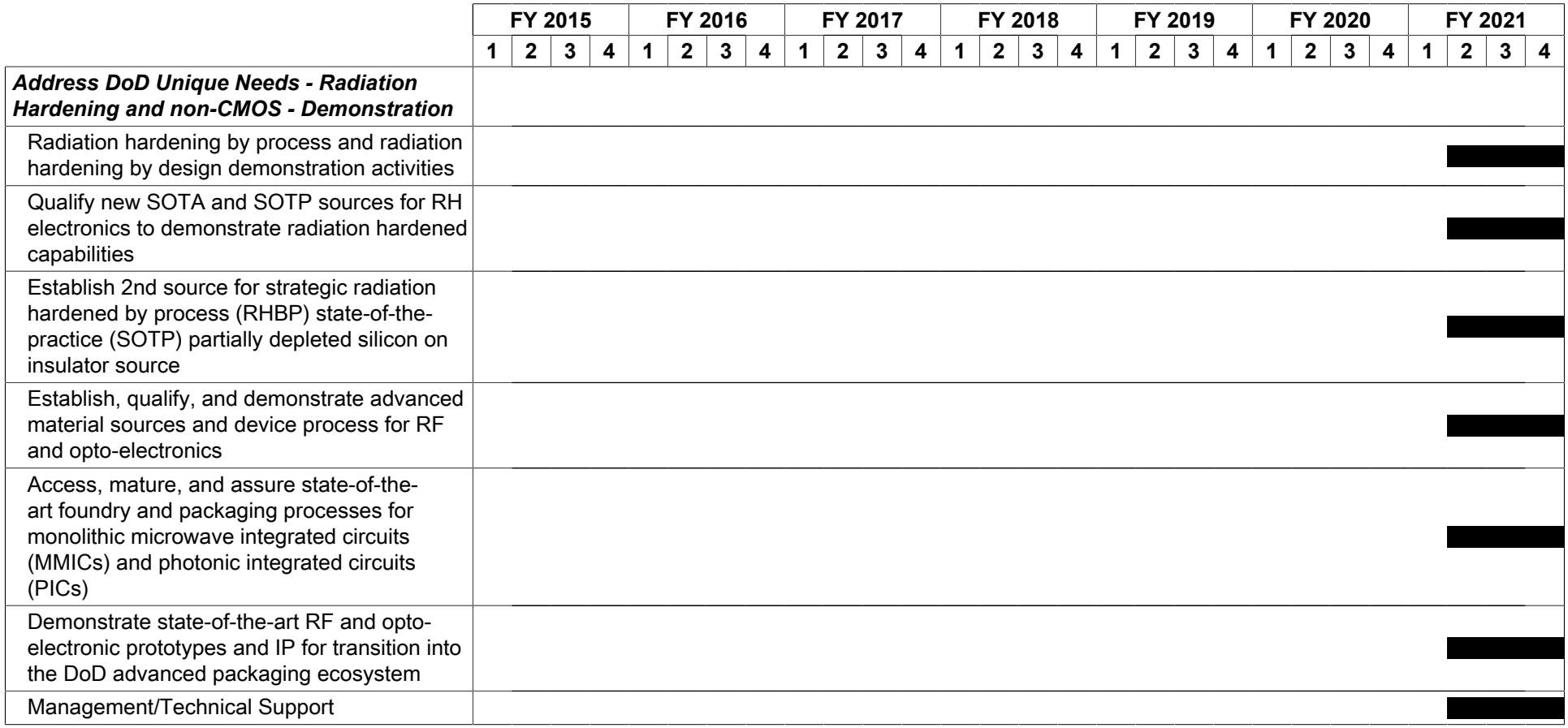

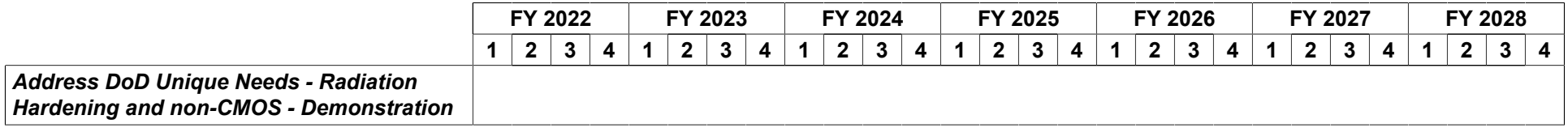

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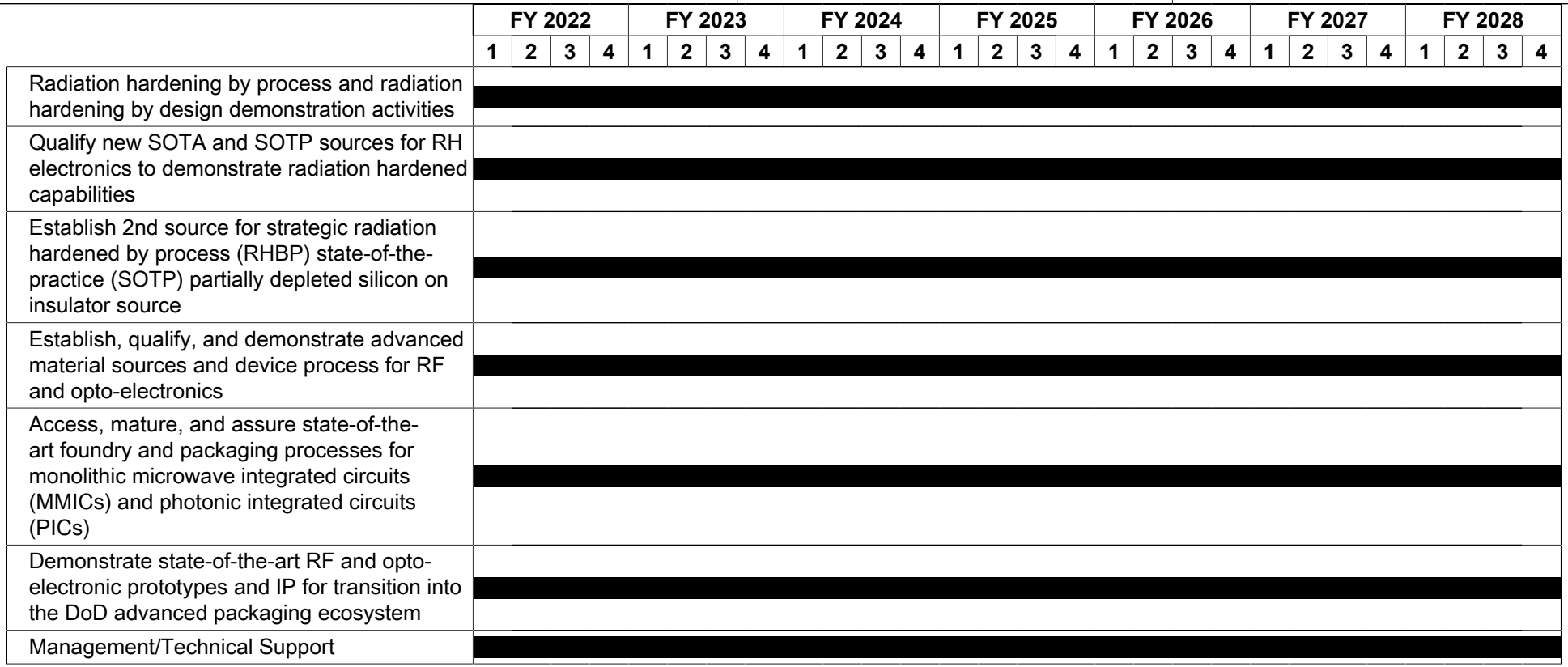

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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Address DoD Unique Needs - Radiation Hardening and non-CMOS - Demonstration				
Radiation hardening by process and radiation hardening by design demonstration activities	2	2021	4	2028
Qualify new SOTA and SOTP sources for RH electronics to demonstrate radiation hardened capabilities	2	2021	4	2028
Establish 2nd source for strategic radiation hardened by process (RHBP) state-of-the-practice (SOTP) partially depleted silicon on insulator source	2	2021	4	2028
Establish, qualify, and demonstrate advanced material sources and device process for RF and opto-electronics	2	2021	4	2028
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	2028
Demonstrate state-of-the-art RF and opto-electronic prototypes and IP for transition into the DoD advanced packaging ecosystem	2	2021	4	2028
Management/Technical Support	2	2021	4	2028