Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Office of the Secretary Of Defense	Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	61.084	-	61.084	15.481	15.943	25.911	25.910	Continuing	Continuing
P812: *Trusted Mask Trust Approach*	-	0.000	0.000	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing
P809: *New Trust Approach Demonstration*	-	0.000	0.000	59.084	-	59.084	13.481	13.943	23.911	23.910	Continuing	Continuing

A. Mission Description and Budget Item Justification

Baseline efforts for this Program Element (PE) were previously funded in PE 0605140D8Z BA 5 and have been transferred to this BA 5 PE to: (1) change the title from "Trusted Foundry" to "Trusted and Assured Microelectronics"; and (2) correctly align funding in support of the mission. Additional funds were added in FY 2018 to enable secure design environments with intellectual property (IP) for access to advanced node processes and field programmable gate array (FPGA) Assurance engagement and co-development with commercial vendors.

This PE supports activities to ensure critical and sensitive integrated circuits are available to meet the DoD's needs. It refines strategies and management planning activities that will (1) provide support to acquisition programs to address trusted microelectronics supply needs; (2) improve capability to evaluate and validate trust of microelectronic parts and advance standards to incentivize the commercial marketplace to recognize trust as a competitive design standard; and (3) develop and demonstrate alternative approaches to assuring the trust of the microelectronics supply chain in order to enable broader DoD access to commercial state-of-the-art (SOTA) microelectronics technology.

This activity will be coordinated by the Office of the Assistant Secretary of Defense for Research and Engineering, and will include performers from the DoD Components, the Defense Microelectronics Activity (DMEA), the Joint Federated Assurance Center (JFAC), the Defense Advanced Research Programs Agency (DARPA), other DoD and Intelligence Community science and technology (S&T) organizations and laboratories, defense industry, and the broader commercial industrial base. It will integrate the functions of the DoD Trusted Foundry Program, the Trusted Supplier accreditation program, JFAC, and related S&T activities.

This activity implements, maintains and updates the DoD's long-term microelectronics strategy. Recognizing that trusted and assured supply of microelectronics is a 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 government.

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Office of the Secretary Of Defense	Date: May 2017
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*

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	61.084	-	61.084
Total Adjustments	0.000	0.000	61.084	-	61.084
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Funds transfer from PE 0605140D8Z	-	-	6.084	-	6.084
• Other	-	-	55.000	-	55.000

Change Summary Explanation

Beginning in FY 2018, funds transferred from Trusted Foundry BA 5 PE 0605140D8Z to allow more efficient execution of development and prototyping activities. An additional $55.000 million was added to support secure design environments with IP for access to advanced node processes and FPGA Assurance engagement and co-development with commercial vendors.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense			Date: May 2017
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) P812 / *Trusted Mask Trust Approach*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
P812: *Trusted Mask Trust Approach*	-	0.000	0.000	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project staffs and supports operation of a new secure (SECRET-level) photomask manufacturing capability down to 14 nanometers (nm) at an existing SOTA commercial photomask manufacturing supplier to secure the masks and design intellectual property (IP) of acquisition programs when using commercial microelectronic fabrication facilities other than the Trusted Foundry. This capability can be used in conjunction with one or more leading-edge commercial foundries. This capability will address trusted masks at technology node sizes < 130nm.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Trusted Mask Trust Approach	-	-	2.000
FY 2018 Plans: DMEA will continue management and technical support, as required, to procure secure mask data parsing services for the Department, as well as other Federal entities, by upgrading an existing SOTA commercial photomask manufacturing supplier with a Trusted photomask capability to ensure the integrity of the tape-in/mask release, mask manufacturing, and authentication process for photomasks. Over the FYDP, a SOTA commercial photomask manufacturing supplier will be equipped with a new secure (SECRET-level) photomask manufacturing capability ($7.200 million is planned as a FY 2017 Defense Production Act (DPA) Title III project) and staffed to provide the required critical Trusted photomask capabilities.			
Accomplishments/Planned Programs Subtotals	-	-	2.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance for this project is monitored in the following ways:

- Number of photomasks created using the secure photomask manufacturing capability.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P812 / *Trusted Mask Trust Approach*

- Number of acquisition programs using the secure photomask manufacturing capability.
- Number of technology node sizes supported by the secure photomask manufacturing capability.
- Number of foundries supported by the secure photomask manufacturing capability.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense											Date: May 2017	
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*				Project (Number/Name) P809 / *New Trust Approach Demonstration*			
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
P809: *New Trust Approach Demonstration*	-	0.000	0.000	59.084	-	59.084	13.481	13.943	23.911	23.910	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds a program of research to develop, and demonstrate the next generation, technology-driven approach to microelectronics trust and assurance, to include SOTA microelectronics, to ensure continued access to SOTA microelectronic technologies, while maintaining the required level of trust in all environments. DoD's ability to access commercial technology for its custom secure, trusted and assured needs is diminishing as SOTA suppliers become fewer and more focused on serving the global commercial market. DoD's technology needs are broad, and relying on a single source supplier is not feasible. Alternative, advanced manufacturing methods, technologies, and design tools are needed to produce secure, trusted and assured SOTA parts from commercial sources and to preserve access to these advanced nodes while protecting DoD and Defense Industrial Base IP from exploitation. It also is intended to dramatically improve the capabilities of the JFAC with regard to verification and validation of microelectronics trust and assurance.

This program of research will demonstrate innovative design, manufacturing, imaging, tagging, and control and assessment approaches for protecting DoD's microelectronics supply chain and intellectual property (IP), including alternatives for trusted, strategic radiation-hardened electronics in advanced technology nodes for next-generation strategic systems, obfuscation and disaggregation technologies, and other assurance mitigations. It will develop advanced imaging technologies and forensics, Design for Trust techniques, active hardware trust control, electronic component markers, and a data and analysis capability to enable auditing and independent verification and validation of commercial designs. It also demonstrates, and implements concepts for the cost-effective production of custom microelectronics in low volumes and protection of sensitive IP from exploitation.

Technologies that provide trust and assurance in a broad range of trusted and commercial environments can mitigate the risks associated with sole-source suppliers, and increase the Government's ability to leverage commercial capabilities. The suite of demonstrated technologies, e.g., alternative manufacturing methods and design tools, would enable DoD to obfuscate the purpose of sensitive devices, verify their origin and function, and protect sensitive IP from exploitation even while using the global supply chain for most hardware. In cases where the risk involved precludes that level of commercial collaboration, low-volume manufacturing technologies demonstrated under this project would permit DoD to more cheaply produce low volumes of sensitive microelectronics in trusted environments. The project would also support using a repository of third-party IP to expedite circuit design and transition promising technologies to use.

This project will also support the following: 1) secure design environments, including high-performance computation environments, for collaboration across the U.S. Government and with private innovators to jointly conduct research on areas such as secure verification of hardware; 2) electronic design automation (EDA) tools and cell libraries; 3) persistent expertise to engage with innovation teams and sponsors to develop business models, IP articles and licensing agreements, architectures, and standards that align with U.S. Government interests in assurance and security strategy; and 4) assured field programmable gate array (FPGA) development and product demonstration for commercial FPGAs.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P809 / *New Trust Approach Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: New Trust Approach Demonstration	-	-	59.084
FY 2018 Plans: FY 2018 primary activities will include demonstration of acquisition program pilots and technology demonstrations, followed by transition of these capabilities to new programs in the following fiscal years. FY18 activities will mature and evaluate trust technologies and techniques through efforts that may include the conduct of studies and Broad Agency Announcements (BAAs) and other efforts to coordinate research programs across government research and development (R&D) organizations, academia and industry. Assess and report technical progress. Will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles and beta versions of tools, intellectual property (IP), techniques, methods, etc. and their use in operationally-realistic scenarios.			
Accomplishments/Planned Programs Subtotals	-	-	59.084

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance for this project is monitored in the following ways:
- Effectiveness of developed technologies, as measured by:
o The speed and reliability of new validation and verification techniques in identifying known microelectronics issues (e.g. tampering) in laboratory and non-laboratory situations;
o Successful testing of advanced, alternative manufacturing techniques such as disaggregated manufacturing; and
o Resilience of microelectronics protected by new trust approach technologies in red teaming exercises.
- Adoption of next-generation trust technologies, as measured by:
o The number of DoD and other Government programs employing these trust technologies, design approaches, or best practices, possibly as facilitated by the provision of use models;
o The volume and criticality of components employing these technologies, design approaches, or best practices; and

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P809 / *New Trust Approach Demonstration*

o Promulgation in DoD guidance and program protection plans.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P809 / *New Trust Approach Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
New Trust Approach Demonstration Program Support	MIPR	Various (DARPA, Air Force, Army, Navy, NSA) : Various	-	-		-		59.084	Mar 2018	-		59.084	Continuing	Continuing	-
		Subtotal	-	-		-		59.084		-		59.084	-	-	-

Remarks

NA

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		59.084		-		59.084	-	-	-

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P809 / *New Trust Approach Demonstration*

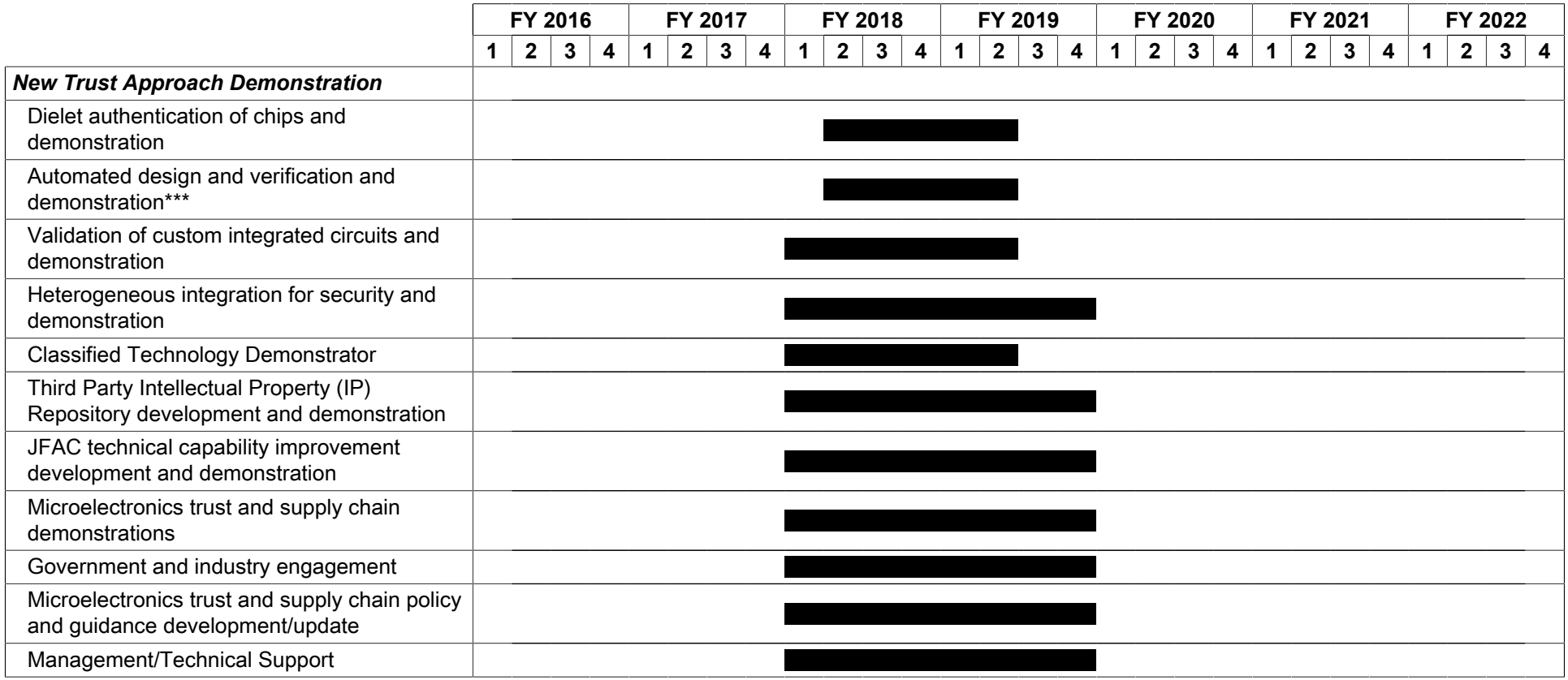

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** P809 / *New Trust Approach Demonstration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
New Trust Approach Demonstration				
Dielet authentication of chips and demonstration	2	2018	2	2019
Automated design and verification and demonstration***	2	2018	2	2019
Validation of custom integrated circuits and demonstration	1	2018	2	2019
Heterogeneous integration for security and demonstration	1	2018	4	2019
Classified Technology Demonstrator	1	2018	2	2019
Third Party Intellectual Property (IP) Repository development and demonstration	1	2018	4	2019
JFAC technical capability improvement development and demonstration	1	2018	4	2019
Microelectronics trust and supply chain demonstrations	1	2018	4	2019
Government and industry engagement	1	2018	4	2019
Microelectronics trust and supply chain policy and guidance development/update	1	2018	4	2019
Management/Technical Support	1	2018	4	2019