Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Defense Advanced Research Projects Agency	**Date:** March 2019

Appropriation/Budget Activity	**R-1 Program Element (Number/Name)**
0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	PE 0603739E *I ADVANCED ELECTRONICS TECHNOLOGIES*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	73.673	111.099	128.616	-	128.616	196.405	220.893	206.678	218.629	-	-
MT-15: *MIXED TECHNOLOGY INTEGRATION*	-	73.673	67.838	58.279	-	58.279	123.405	153.993	154.678	166.629	-	-
MT-16: *BEYOND SCALING ADVANCED TECHNOLOGIES*	-	0.000	43.261	70.337	-	70.337	73.000	66.900	52.000	52.000	-	-

A. Mission Description and Budget Item Justification

The Advanced Electronics Technologies Program Element is budgeted in the Advanced Technology Development Budget Activity because it seeks to design and demonstrate state-of-the-art manufacturing and processing technologies for the production of various electronics and microelectronic devices, sensor systems, integrated photonic-electronic components that have military applications and potential commercial utility. Introduction of advanced product design capability and flexible, scalable manufacturing techniques will enable the commercial sector to rapidly and cost-effectively satisfy military requirements.

The Mixed Technology Integration project funds the advanced development and demonstration of selected basic and applied electronics research programs. Examples of technologies with funded development and demonstration activities include, but are not limited to: (1) self-contained laser weapon systems to protect airborne platforms from emerging surface-to-air missiles; (2) integrated photonic-electronic components for positioning, navigation and timing in GPS-denied environments; (3) flexible, software-defined cameras that enable real-time image analysis of complex scenes to provide more actionable information; and (4) component programs that integrate mixed signal (analog and digital) or mixed semiconductor technology to substantially improve the capability of existing components and/or reduce their size, weight and power. Funding under this project is intended to advance transitioning novel technologies to use, providing advanced components compatible with mid-term and other future warfighting requirements.

The Beyond Scaling Advanced Technologies project is a continuation of DARPA's basic and applied research in this area and will support activities in large scale co-development with leading industry players to enable and accelerate transformative computing interactions with industry. Additionally, funding under this project will include establishing access to commercial state-of-the-art (SOTA) and state-of-the-practice (SOTP) foundries for DoD microelectronics fabrication runs, developing a manufacturable photonics and wide bandgap process, creating a microelectromechanical systems (MEMS) multi-project wafer flow, and establishing an application center to capture DoD microelectronics requirements.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Defense Advanced Research Projects Agency	**Date:** March 2019
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603739E / *ADVANCED ELECTRONICS TECHNOLOGIES*

B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	79.173	111.099	145.159	-	145.159
Current President's Budget	73.673	111.099	128.616	-	128.616
Total Adjustments	-5.500	0.000	-16.543	-	-16.543
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-5.500	0.000			
• TotalOtherAdjustments	-	-	-16.543	-	-16.543

Change Summary Explanation

FY 2018: Decrease reflects SBIR/STTR transfer.
FY 2019: N/A
FY 2020: Decrease reflects rephasing of several Mixed Technology Integration programs.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Defense Advanced Research Projects Agency		**Date:** March 2019
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603739E / *ADVANCED ELECTRONICS TECHNOLOGIES*	**Project (Number/Name)** MT-15 / *MIXED TECHNOLOGY INTEGRATION*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MT-15: *MIXED TECHNOLOGY INTEGRATION*	-	73.673	67.838	58.279	-	58.279	123.405	153.993	154.678	166.629	-	-

A. Mission Description and Budget Item Justification

The Mixed Technology Integration project funds the advanced development and demonstration of selected basic and applied electronics research programs. Examples of technologies with funded development and demonstration activities include, but are not limited to: (1) self-contained laser weapon systems to protect airborne platforms from emerging surface-to-air missiles; (2) integrated photonic-electronic components for positioning, navigation and timing in GPS-denied environments; (3) flexible, software-defined cameras that enable real-time image analysis of complex scenes to provide more actionable information; and (4) component programs that integrate mixed signal (analog and digital) or mixed semiconductor technology to substantially improve the capability of existing components and/or reduce their size, weight and power. Funding under this project is intended to advance transitioning novel technologies to use, providing advanced components compatible with mid-term and other future warfighting requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Precise Robust Inertial Guidance for Munitions (PRIGM) ***Description:*** The Precise Robust Inertial Guidance for Munitions (PRIGM) program aims to develop inertial sensor technologies for positioning, navigation, and timing (PNT) in GPS-denied environments. These inertial sensors can provide autonomous PNT information when GPS is unavailable. The program will exploit recent advances in integrating photonic (light-manipulating) components into electronics and in employing microelectromechanical systems (MEMS) as high-performance inertial sensors for use in extreme environments. Whereas conventional MEMS inertial sensors suffer from inaccuracies due to factors such as temperature sensitivity, photonics-based PNT techniques have demonstrated the ability to mitigate these inaccuracies. PRIGM will focus on two areas: (1) By 2020, it aims to develop and transition a Navigation-Grade Inertial Measurement Unit (NGIMU), a state-of-the-art MEMS device, to DoD platforms; and (2) By 2030, it aims to develop Advanced Inertial MEMS Sensors (AIMS) that can provide gun-hard, high-bandwidth, high dynamic range navigation for GPS-free munitions. These advances should enable navigation applications, such as smart munitions, that require low-cost, size, weight, and power (SWaP) inertial sensors with high bandwidth, precision and shock tolerance. PRIGM will advance state-of-the-art MEMS gyros from TRL-3 devices to a TRL-6 transition platform, eventually enabling the Service Laboratories to perform TRL-7 field demonstrations. The ultimate goal is to develop a complete MEMS-based NGIMU with a mechanical/electronic interface identical to existing DoD-standard tactical-grade MEMS IMUs, providing a drop-in replacement for existing DoD systems. Service laboratories have been actively involved throughout program development and remain engaged to facilitate transition of NGIMU prototypes, which will be delivered at the program conclusion. This program has basic research efforts funded in PE 0601101E, Project ES-01 and applied research efforts funded in PE 0602716E, Project ELT-01. ***FY 2019 Plans:***	20.500	16.600	8.000

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
- Deliver two MEMS-based, navigation-grade, integrated IMU prototypes for government evaluation. - Commence development of MEMS-based, navigation-grade, integrated IMU meeting program-defined SWaP, performance metrics, environmental requirements, and shock survival. ***FY 2020 Plans:*** - Deliver ten MEMS-based, navigation-grade, integrated IMU prototypes for government evaluation. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 decrease reflects a transition from development to completion and characterization of IMU prototypes.			
Title: Reconfigurable Imaging (ReImagine) ***Description:*** The Reconfigurable Imaging (ReImagine) program aims to create multi-functional readout integrated circuits (ROICs) that fundamentally change the way camera systems collect, process and relay image information. This is accomplished by adding multifunctional flexibility in the ROIC. Today, most cameras are designed to capture high quality imagery at standard frame rates. These traditional camera architectures collect a single type of data across the full image frame. Specialty cameras can be used to capture different spatial, spectral or temporal data but are rarely deployed because of the cost and complexity of adding imaging subsystems for niche measurements. Although these measurements are typically only desired for specific features or regions of interest (ROIs) in a scene, the cameras collect the specialized data over the full image frame. The ReImagine architecture, conversely, would enable a single, real-time reconfigurable, software-defined camera system with the ability to collect different data in different ROIs. Depending on the need, a ReImagine imager would be able to selectively collect and simultaneously process data from a specific ROI, for example, at a higher resolution (i.e., foveated imaging), at a higher frame rate or with 3-D depth information. The system would interface with virtually any sensor and could therefore be used in any spectral band. By demonstrating more efficient data collection and computation across ROIs, ReImagine ROICs should enable real-time analysis of much more complex scenes and provide more actionable information than has ever been possible. Technologies from this program are intended for transition to the Air Force, Navy and Army. ***FY 2019 Plans:*** - Begin the fabrication of a Gen-1 prototype camera integrating the Gen-1 ROIC. - Develop a detailed operational description and simulation for the ReImagine Gen-2 multi-functional digital ROIC, mapping applications and demonstrating enhanced operation and capability. - Initiate design and layout of the ROIC interface and focal plane array layers to operate with the Gen-2 multi-functional digital ROIC for enhanced programmable functionality. - Develop a detailed plan for a Gen-2 multi-functional digital ROIC camera prototype.	23.173	27.738	21.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Defense Advanced Research Projects Agency		Date: March 2019
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603739E / *ADVANCED ELECTRONICS TECHNOLOGIES*	**Project (Number/Name)** MT-15 / *MIXED TECHNOLOGY INTEGRATION*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
- Complete the design of the ReImagine Gen-2 reconfigurable ROIC, updated and augmented based on Gen-1 performance and experience, and release the design for fabrication. ***FY 2020 Plans:*** - Demonstrate the ReImagine imaging system using the Gen-1 reconfigurable ROIC, fully demonstrating ReImagine reconfigurable sensing system concept. - Complete the ReImagine multi-functional digital ROIC camera prototype system design integrating multiple tier 3D implementation and Gen-2 reconfigurable ROIC. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 decrease reflects a shift from development of a multi-functional digital ROIC camera prototype to conducting final demonstrations.			
Title: Rapid Array Development (RAD) ***Description:*** The Rapid Array Development (RAD) program seeks to build an immersive electromagnetic environment for use by the warfighter to understand the effects of electronic maneuvers and to develop new electronic maneuver warfare (EMW) techniques. In order to accomplish this, the program will leverage recent developments in flexible and adaptive radio frequency (RF) hardware, access to a larger variety of more powerful computing platforms, and advances in software virtualization to radically change the development and deployment cycle for EMW techniques. Currently, the development cycle for EMW algorithms is long and costly. However, they must be able to evolve rapidly in order to adapt to new modes of operation and changing operating parameters associated with modern military threats. The programmed RAD testbeds will ultimately train warfighters on how to deal with legacy and emerging threats in the RF spectrum through maneuvers, signal jamming tactics, signal intelligence gathering, and other missions. The outcome of RAD will be better tactics, techniques, and procedures for handling EMW as well as the identification of new technology assets for deploying EMW capabilities. Technologies developed under the RAD program are planned for transition to the Services through a series of demonstrations proving a radically shorter time scale of development. ***FY 2019 Plans:*** - Initiate development of a compute engine to optimize the implementation of electromagnetic (EM) algorithms on a system of heterogeneous processors. - Explore use of toolchains and toolsets for programming on heterogeneous computing systems. - Explore new models of machine learning and supervisory controls to manage complex allocation of processing resources. - Initiate development of flexible array technology to be the common hardware platform for an immersive applications development environment. ***FY 2020 Plans:***	-	18.500	19.779

Exhibit R-2A, RDT&E Project Justification: PB 2020 Defense Advanced Research Projects Agency		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
- Initiate development of a processing platform capable of executing EMW algorithms, array configuration, data flow, and end-user interactions. - Develop a software framework for rapidly developing new EMW applications. - Initiate development of a full EMW mission control system to include electromagnetic spectrum monitoring and management. - Initiate plans for a testbed installation at a military base or radar test range and begin electromagnetic spectrum monitoring. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase reflects the shift from exploring and initiating development to developing RAD software and the testbed environment.			
Title: Advanced PNT Capability Demonstrations (APCD) ***Description:*** Both the Microelectromechanical Systems (MEMS) and the atomic physics communities have done foundational research on new capabilities that will impact the ability to keep and transfer precision timing and navigation information across the battlefield. The Advanced PNT Capability Demonstrations (APCD) program will choose among the most promising of the new physics developments and demo their potential in realistic warfighting scenarios. One scenario will leverage advances in inertial sensors to enable Inertial Measurement Unit (IMU)-only operation over mission timeframes of twenty minutes. The MEMS-based demo will enable munitions navigation in a GPS-denied world, maintaining U.S. munition and missile capability to accurately navigate in future battlespace environments. Another scenario is the storing of time and position information with high performance yet compact, low power atomic physics. This will enable advanced Positioning, Navigation, and Timing (PNT) capabilities for example in a Low Earth Orbit (LEO) constellation, or an Unmanned Air Vehicle (UAV) from which the atomic based information can be distributed. Technologies developed under the APCD program are planned for transition to the Services. ***FY 2020 Plans:*** - Determine the most sophisticated demonstration highlighting the recent advances in MEMS and atomic physics. - Initiate design of the demonstrator and the subcomponents needed to perform the demonstration. - Develop IMU packaging and support circuitry with emphasis on program metrics including size, weight, stability, and power consumption. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase reflects program initiation.	-	-	9.500
Title: Efficient Ultra-Compact Laser-Integrated Diodes (EUCLID) ***Description:*** The Efficient Ultra-Compact Laser-Integrated Diodes (EUCLID) program aims to significantly reduce the size of laser diode pump modules (DPMs) while increasing their electrical-to-optical efficiency. DPMs are a critical component of fiber-laser array weapons systems, which combine light from many lower-power lasers to engage targets at tactically-relevant distances.	5.000	5.000	-

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603739E / *ADVANCED ELECTRONICS TECHNOLOGIES*	Project (Number/Name) MT-15 / *MIXED TECHNOLOGY INTEGRATION*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Commercial DPMs, which cater to the laser manufacturing industry, feature large cooling systems and are too cumbersome for integration into many small DoD platforms. EUCLID plans to leverage advances in thermal management components to design, build, test, and demonstrate densely packageable, prototype DPMs that are less than half the size of their commercial counterparts. The program will also pursue improved optical components that can more efficiently focus light from individual laser diodes. The resulting EUCLID DPMs are intended to be available for procurement and integration into ultra-low size, weight, and power fiber-laser array weapons systems, enabling integration into a variety of Air Force, Navy, Army, and Missile Defense Agency platforms. ***FY 2019 Plans:*** - Build and test prototype DPMs which produce >4 kW of optical power and >58% efficiency and are suitable for powering a coherently combinable fiber laser amplifier assembly. - Generate detailed designs of a compact, packaged 4 kW diode pump assembly based on the prototype DPMs. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 decrease reflects program completion.			
Title: Millimeter Wave Digital Arrays (MIDAS) ***Description:*** The Millimeter Wave Digital Arrays (MIDAS) program will develop a common millimeter wave phased-array tile that is scalable to large arrays to provide wideband frequency agility from 18-50 GHz with element-level digital beamforming. Millimeter wave systems are used today to achieve physical security through the use of narrow antenna beams in a small form-factor. We see this applied to satellite communications and tactical line-of-sight communications such as in the F-22 and F-35. One of the challenges of using directional communications in mobile applications is the problem of knowing where to point the antenna when both platforms are mobile. This can be solved with digital beamforming to enable a mobile platform to listen in all directions with many antenna beams to facilitate neighbor discovery when transmitting. Digital beamforming also enables multiple beams to communicate with several neighbors simultaneously. This capability will increase the network throughput and robustness that will be tolerant to unexpected outages. To achieve these goals, the program will develop a common digital phased array tile that can be used to build large arrays from this common block. The program will be executed in two primary technical areas. First, advanced complementary metal oxide semiconductor (CMOS) will be used to develop the core transceiver elements at a size and power consumption that is required to fit in the small size required by current millimeter wave systems. Second, a combination of advanced packaging and high-performance semiconductors will be used to build the wideband antenna and front-end amplifiers necessary to make a complete system. The MIDAS program moves to Project MT-16, Beyond Scaling Advanced Technologies, in FY 2019.	12.000	-	-
Title: Endurance	13.000	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: The Endurance program developed laser technology to protect airborne platforms from emerging and legacy electro-optical/infrared (EO/IR) guided surface-to-air missiles. Endurance has an open architecture, granting the flexibility to integrate different subsystems with varying capabilities. Endurance is an early application of technology developed through DARPA's Excalibur program. The advanced technology component of the program focused on developing and field testing various subsystems for laser beam generation, command and control, threat missile warning, target acquisition and tracking, beam control, energy storage and delivery, and thermal management. It also developed subsystem interfaces and integrated the components into a packaged system for field testing. Technologies from this program have transitioned to the Air Force.			
Accomplishments/Planned Programs Subtotals	73.673	67.838	58.279

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Specific programmatic performance metrics are listed above in the program accomplishments and plans section.

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Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603739E / *ADVANCED ELECTRONICS TECHNOLOGIES*	**Project (Number/Name)** MT-16 / *BEYOND SCALING ADVANCED TECHNOLOGIES*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MT-16: *BEYOND SCALING ADVANCED TECHNOLOGIES*	-	0.000	43.261	70.337	-	70.337	73.000	66.900	52.000	52.000	-	-

A. Mission Description and Budget Item Justification

The Beyond Scaling Advanced Technologies Project is a continuation of DARPA's basic and applied research in this area and will support activities in large scale co-development with leading industry players to enable and accelerate transformative computing interactions with industry. Additionally, funding under this project will include establishing access to commercial state-of-the-art (SOTA) and state-of-the-practice (SOTP) foundries for DoD microelectronics fabrication runs, developing a manufacturable photonics and wide bandgap process, creating a microelectromechanical systems (MEMS) multi-project wafer flow, and establishing an application center to capture DoD microelectronics requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Beyond Scaling - Access	-	30.200	51.137

Description: The Beyond Scaling - Access program will demonstrate the design and fabrication of advanced electronics through collaborations with leading industry players. Although the United States has led the development of advanced electronics since its inception and is home to three of the five leading-edge foundries, recent investments by foreign competitors are threatening this leadership. Additionally, the fabrication cost of next generation microelectronics has increased at an alarming rate. While the commercial sector is able to spread these costs over a large volume of products, the low volumes used by the DoD has led to a cost barrier in meeting its future technology needs. In some cases, the inability to place orders in volume has created a lack of access to advanced technology nodes entirely. To address this, the DoD must participate in more industry partnerships that not only leverage investments in the commercial industry but also provide access to SOTA facilities in the U.S. This program will build on existing relationships and forge forward-looking collaborations among the commercial electronics community, defense industrial base, university researchers, and the DoD. Activities include establishing access to commercial SOTA and SOTP foundries for DoD microelectronics fabrication runs, developing a manufacturable photonics and wide bandgap process, creating a microelectromechanical systems multi-project wafer flow, and establishing an application center to capture DoD microelectronics requirements. Technologies from this program are intended for transition to the Services.

FY 2019 Plans:
- Establish SOTA and SOTP microelectronics fabrication runs for DoD designs at leading-edge commercial foundries.
- Identify mixed-mode integrated circuit technologies for agile ultra-wide band systems.
- Initiate development of advanced process flows for multi-project wafer (MPW) runs at commercial MEMS manufacturers.
- Initiate implementation of a framework to capture applications requirements from DoD users.

FY 2020 Plans:

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
- Demonstrate fabrication of DoD microelectronic designs from leading-edge commercial foundries. - Demonstrate high-speed, low latency mixed-mode integrated circuit components. - Demonstrate laser operation of an integrated photonic circuit using a manufacturable photonics process flow. - Demonstrate novel MEMS sensor, actuator, or filter designs through commercial MPW manufacturing processes. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase reflects demonstration of multiple technologies fabricated through various commercial process flows.			
Title: Millimeter Wave Digital Arrays (MIDAS) ***Description:*** The Millimeter Wave Digital Arrays (MIDAS) program will develop a common millimeter wave phased-array tile that is scalable to large arrays to provide wideband frequency agility from 18-50 GHz with element-level digital beamforming. Millimeter wave systems are used today to achieve physical security through the use of narrow antenna beams in a small form-factor. We see this applied to satellite communications and tactical line-of-sight communications such as in the F-22 and F-35. One of the challenges of using directional communications in mobile applications is the problem of knowing where to point the antenna when both platforms are mobile. This can be solved with digital beamforming to enable a mobile platform to listen in all directions with many antenna beams to facilitate neighbor discovery when transmitting. Digital beamforming also enables multiple beams to communicate with several neighbors simultaneously. This capability will increase the network throughput and robustness that will be tolerant to unexpected outages. To achieve these goals, the program will develop a common digital phased array tile that can be used to build large arrays from this common block. The program will be executed in two primary technical areas. First, advanced complementary metal oxide semiconductor (CMOS) will be used to develop the core transceiver elements at a size and power consumption that is required to fit in the small size required by current millimeter wave systems. Second, a combination of advanced packaging and high-performance semiconductors will be used to build the wideband antenna and front-end amplifiers necessary to make a complete system. Technologies from this program are intended for transition through commercial industry to the Services. The MIDAS program moved from Project MT-15, Mixed Technology Integration, in FY 2019. ***FY 2019 Plans:*** - Continue preliminary design review and initiate critical design review for fabricating a low-power, 16-element, element-level digital phased array at millimeter wave frequencies in advanced CMOS. - Develop and demonstrate a wideband and efficient power amplifier, low-noise amplifier and transmit/receive switch co-packaged with a wideband antenna array. - Explore more fundamental technical innovations relevant to millimeter wave digital arrays in the areas of converters, filters, oscillators, and broadband apertures. ***FY 2020 Plans:***	-	13.061	19.200

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
- Begin design of a millimeter wave 64-element digital phased array in advanced CMOS with integrated power amplifiers and wideband aperture. - Demonstrate advancements in the fundamental technologies relevant to millimeter wave digital arrays in the areas of converters, filters, oscillators, and broadband apertures. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase reflects the program going from exploring to demonstrating advancements in the fundamental technologies relevant to the millimeter wave digital arrays.			
Accomplishments/Planned Programs Subtotals	-	43.261	70.337

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Specific programmatic performance metrics are listed above in the program accomplishments and plans section.