Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense	Date: February 2020
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	52.000	200.000	449.000	-	449.000	376.000	333.000	133.000	200.000	Continuing	Continuing
724: *Dual Use 5G Use Cases*	-	32.000	102.500	227.000	-	227.000	72.000	54.000	20.000	51.000	Continuing	Continuing
725: *Congested/Congested Spectrum*	-	14.000	90.000	207.000	-	207.000	285.000	260.000	103.000	139.000	Continuing	Continuing
726: *External Engagement*	-	6.000	7.500	15.000	-	15.000	19.000	19.000	10.000	10.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) Next Generation (NextG) Information Communications Technologies (ICT) program will conduct large-scale experimentation and prototyping of dual-use (military and commercial) fifth-generation of cellular network (5G) technology for military uses. The program will develop and deploy ultra-reliable low latency communication (URLLC) 5G networks at DoD sites to evaluate and enhance 5G systems and technologies for domestic and expeditionary DoD missions. This will include both the direct use of commercially available capabilities and DoD-specific technology enhancements that highly leverage commercial capabilities. The program will also develop, test, and evaluate technology solutions to identify and mitigate the security challenges that 5G and NextG technologies will present in order to enable the military to operate through zero-trust networks. The program will:

• Deploy flexible 5G infrastructure at approximately eight U.S. military facilities to enable varied applications and networking prototypes
• Evaluate at least sixteen different DoD 5G applications at DoD facilities across the Services
• Invest in DoD-focused 5G tactical, operational and strategic networking prototypes to expand the utility of commercial technologies for DoD missions
• Demonstrate the capacity to “operate through” in contested environments using dynamic spectrum utilization and by learning how to both defend and exploit 5G networks through security vulnerability assessment

The program will deliver fieldable prototype capabilities that will remain in place at designated DoD locations as well as lessons learned to promulgate 5G knowledge and tradecraft. This will ensure that both near-term and future generations of information and communications technologies will be capable of supporting US military and national security objectives.

The program will be executed through established support agreements with DoD Service laboratories and through existing DoD and Government-Wide Acquisition Contracts (GWACs) (including General Services Administration (GSA) contracts) that are suitable and cost-effective for 5G technology prototyping and telecommunications network equipment procurement and integration.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense	Date: February 2020
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604011D8Z *I Next Generation ICT (5G)*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	52.000	200.000	449.000	-	449.000
Total Adjustments	52.000	200.000	449.000	-	449.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	200.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	52.000	-			
• SBIR/STTR Transfer	-	-			
• Increase for NextG Information Communications Technology	-	-	449.000	-	449.000

Change Summary Explanation

FY 2020 Congressional Add of $200.000 million for Next Generation Information Communications Technology.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense			Date: February 2020
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 724 / *Dual Use 5G Use Cases*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
724: *Dual Use 5G Use Cases*	-	32.000	102.500	227.000	-	227.000	72.000	54.000	20.000	51.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Develop and experiment with "dual-use" applications that demonstrate direct use of commercial systems and applications that use a large fraction of commercial capabilities that are augmented with DoD enhancements. Dual-use applications will be evaluated within a deployed 5G infrastructure with operationally relevant numbers of users and geographic scale. These use cases include:

• Mission Planning/Training: Develop and experiment with ultra-high reliability, low latency, high bandwidth, as well as augmented and virtual reality technologies that enable high fidelity mission planning and training in realistic adversarial environments over 5G networks.
• Depot Operations: Leverage 5G technologies to upgrade depots for "smart" operations including autonomous repair and maintenance activities as well as warehouse movement via driverless forklifts, pallets, and tactical trucks.
• Global Asset/Supply Chain Management: Leverage emerging 5G enterprise solutions to provide real time, optimum, continuous asset visibility and movement tracking, supply status, movement and resupply, and reduce inventory control costs.
• Smart Installations (e.g., logistics bases, ports): Develop and experiment with 5G enabled massive machine-to-machine communications, cloud and edge computing, and autonomy to enhance installation operations to maximize logistics traffic throughput.

Dual Use 5G research, development, and experimentation activities will deliver fieldable prototype capabilities that will remain in place at designated DoD locations. Those that do not perform sufficiently well will still provide lessons learned to promulgate 5G knowledge and tradecraft. These deliverables will inform base/camp/station modernization and recapitalization investments as prototypes transition to enduring infrastructure.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Dual Use 5G Use Cases	32.000	102.500	227.000
Description: Demonstrate use cases of both commercial and military value, while also assessing and developing mitigations to their security vulnerabilities.			
FY 2020 Plans: DoD will initiate Smart Warehouse prototyping and experimentation projects at Marine Corps Logistics Base Albany, Georgia, and at Naval Base San Diego, California. DoD will also initiate an Augmented/Virtual Reality (AR/VR) Mission Training prototyping and experimentation project at Joint Base Lewis-McChord, Washington.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the prototyping and experimentation activities at each site. The output of the project will be capabilities (e.g. fieldable equipment and control systems) and processes to demonstrate the designated dual-use military 5G applications. ***FY 2021 Plans:*** DoD will continue Smart Warehouse prototyping and experimentation activities at MCLB-A, and NBSD; and will continue AR/ VR Mission Training prototyping and experimentation activities at JBLM. Construction of localized full scale 5G mobile cellular networks will be expanded and interfaced with base networks in order to conduct further development and experimentation of autonomous warehouse operations and AR/VR mission training activities. DoD will initiate approximately four additional dual-use prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the dual-use military application experimentation at designated DoD Service sites. DoD will initiate approximately four additional dual-use prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the dual-use military application experimentation at designated DoD Service sites. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021.			
Accomplishments/Planned Programs Subtotals	32.000	102.500	227.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense			Date: February 2020
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 724 / *Dual Use 5G Use Cases*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dual Use 5G Use Cases	MIPR	Army, Navy, Air Force, etc. : Various	-	32.000	Jan 2020	102.500	Jun 2020	227.000	Mar 2021	-		227.000	Continuing	Continuing	-
		Subtotal	-	32.000		102.500		227.000		-		227.000	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	32.000		102.500		227.000		-		227.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

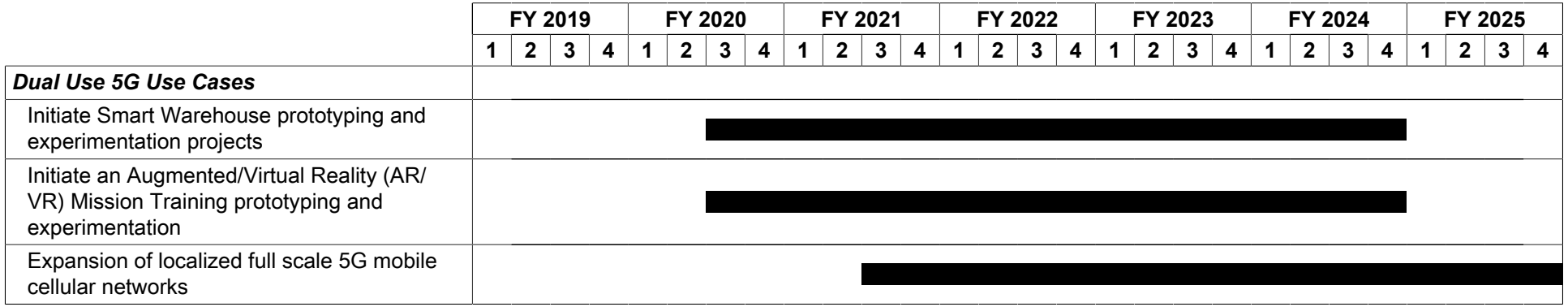

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Dual Use 5G Use Cases				
Initiate Smart Warehouse prototyping and experimentation projects	3	2020	4	2024
Initiate an Augmented/Virtual Reality (AR/VR) Mission Training prototyping and experimentation	3	2020	4	2024
Expansion of localized full scale 5G mobile cellular networks	3	2021	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense			Date: February 2020
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 725 / *Congested/Congested Spectrum*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
725: *Congested/Congested Spectrum*	-	14.000	90.000	207.000	-	207.000	285.000	260.000	103.000	139.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Demonstrate the capacity to “operate through” in contested environments using dynamic spectrum utilization and controlled exploitation of 5G network security architectures. These capabilities will be based on technologies such as multi-networking across wired and wireless systems, network monitoring including new AI and firewall techniques, and dynamic spectrum utilization. Develop tactical, operational, and strategic networking prototypes to demonstrate capabilities to dynamically share congested spectrum between military systems and commercial wireless networks.

Capabilities will be prototyped and evaluated at-scale within highly dynamic and contested RF environments. The Congested/Contested Spectrum research, development, and experimentation activities will deliver fieldable prototype capabilities that will remain in place at designated DoD locations. Those that do not perform sufficiently well will still provide lessons learned to promulgate 5G knowledge and tradecraft. These deliverables will inform base/camp/station modernization and recapitalization investments as prototypes transition to enduring infrastructure.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Congested/Contested Spectrum	14.000	90.000	207.000
Description: Demonstrate the capacity to “operate through” in congested/contested environments using dynamic spectrum utilization and by prototyping technologies to both defend and exploit 5G networks. ***FY 2020 Plans:*** Initiate congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah. A localized full scale 5G mobile cellular network will be designed and initially constructed in order to evaluate the impact of the 5G network on the airborne radar systems and the radar’s impact on the 5G network, employing both active and passive techniques to enable sharing or coexistence. The output of the project will be capabilities (e.g., fieldable equipment and control systems) and processes to allow spectrum sharing or coexistence with cooperating and non-cooperating 5G networks. Invest in key technologies such as resilient networking protocols, trusted edge devices, cognitive gateways, homomorphic encryption, and secure 5G ASICs. ***FY 2021 Plans:*** Continue congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah. Construction of a localized full scale 5G mobile cellular network will be expanded in order to evaluate the impact of the 5G network on the airborne			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
radar systems and the radar's impact on the 5G network, employing both active and passive techniques to enable sharing or coexistence. Initiate approximately three additional congested/contested spectrum prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to evaluate the impact of the 5G network on selected military systems. Continue investments in key technologies, such as: resilient networking protocols, trusted edge devices, cognitive gateways, homomorphic encryption, and secure 5G ASICs. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021.			
Accomplishments/Planned Programs Subtotals	14.000	90.000	207.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense			Date: February 2020
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 725 / *Congested/Congested Spectrum*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Congested/Contested Spectrum	MIPR	Army, Navy, Air Force, Marine Corps, etc. : Various	-	14.000	Jan 2020	90.000	Mar 2020	207.000	Mar 2021	-		207.000	Continuing	Continuing	-
		Subtotal	-	14.000		90.000		207.000		-		207.000	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	14.000		90.000		207.000		-		207.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

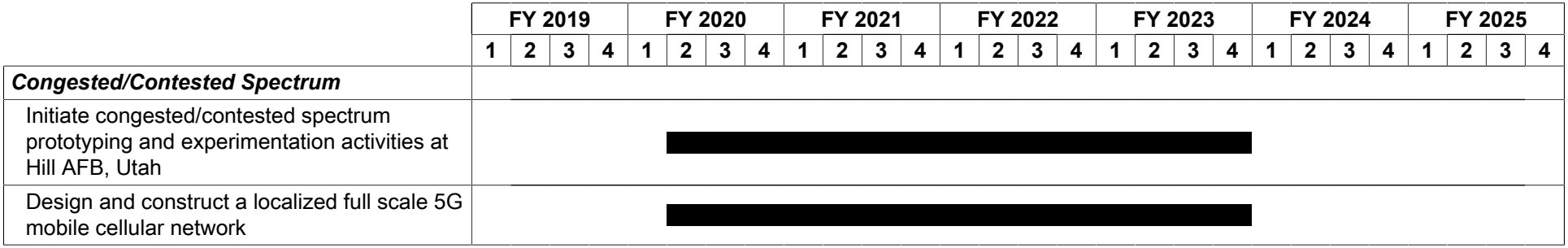

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Congested/Contested Spectrum				
Initiate congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah	2	2020	4	2023
Design and construct a localized full scale 5G mobile cellular network	2	2020	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense											Date: February 2020	
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*				Project (Number/Name) 726 / *External Engagement*			
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
726: *External Engagement*	-	6.000	7.500	15.000	-	15.000	19.000	19.000	10.000	10.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding from this project will be used to conduct external engagements across Government and beyond to influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies for the global deployment and use of 5G to Next G technologies. DoD will conduct active and passive security vulnerability assessments of 5G prototypes in order to support zero-trust security designs for military 5G applications.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: External Engagement	6.000	7.500	15.000
Description: Develop policies, regulations, and standards for streamlined deployment of protected, resilient Government and commercial networks. Conduct active and passive security vulnerability assessments to support 5G security capabilities. ***FY 2020 Plans:*** Engage across government and beyond to inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies. Through a support agreement with the Army Threat Systems Management Office (TSMO) and with the support of DoD laboratory experts, DoD will conduct security vulnerability assessments of designated Dual-Use and Congested/Contested Spectrum experimentation efforts during FY 2020. ***FY 2021 Plans:*** Continue to engage across government and beyond to inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies. DoD will continue to conduct security vulnerability assessments of an increased number of Dual-Use and Congested/Contested Spectrum experimentation efforts during FY 2021. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021.			
Accomplishments/Planned Programs Subtotals	6.000	7.500	15.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense			Date: February 2020
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 726 / *External Engagement*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
External Engagement	MIPR	Army, Navy, Air Force, Marine Corps, etc. : Various	-	6.000	Jan 2020	7.500	Mar 2020	15.000	Mar 2021	-		15.000	Continuing	Continuing	-
		Subtotal	-	6.000		7.500		15.000		-		15.000	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	6.000		7.500		15.000		-		15.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 726 / *External Engagement*

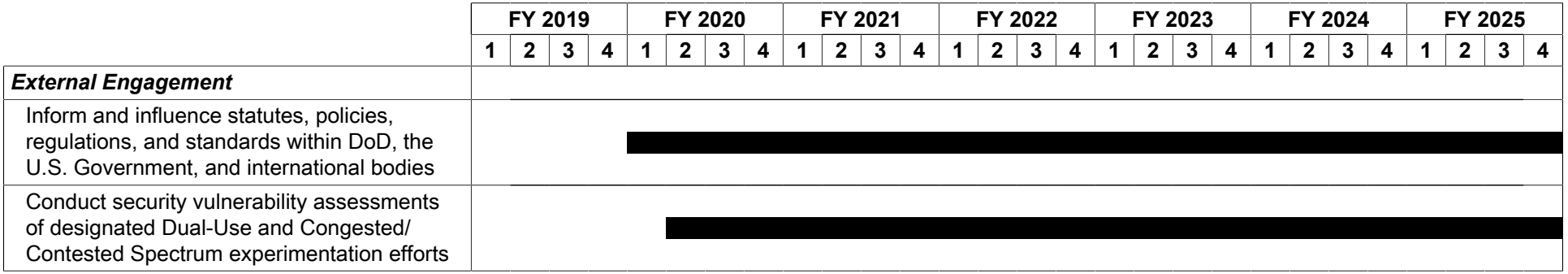

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense		Date: February 2020
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 726 / *External Engagement*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
External Engagement				
Inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies	1	2020	4	2025
Conduct security vulnerability assessments of designated Dual-Use and Congested/ Contested Spectrum experimentation efforts	2	2020	4	2025