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 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602230D8Z / *Defense Technology Innovation (Beyond 5G)*

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	-	17.075	19.067	55.160	-	55.160	72.186	47.451	37.710	37.987	Continuing	Continuing
230: *Defense Technology Innovation (Beyond 5G)*	-	17.075	19.067	55.160	-	55.160	72.186	47.451	37.710	37.987	Continuing	Continuing

Note

New Start (Y/N): No

A. Mission Description and Budget Item Justification

This program supports the Department's initiatives to Build a Sustainable and Long-Term Advantage, and Build a resilient Joint Force and Defense Ecosystem.

This effort builds upon the technology foundation that underpins fifth-generation cellular network (5G) systems as a basis to create the next generation of wireless cellular network and security technologies for military applications. Working in concert with other U.S. Government science and technology agencies, we will enable the U.S. to regain leadership in upcoming wireless technology standards including sixth generation (6G) and beyond by investing in research and workforce development in critical technologies. The execution of a defined engagement plan with other Departments, agencies, industry, and universities in collaboration with the Sec Def 5G Cross Functional Team will ensure continued U.S. influence in both the international commercial marketplace as well as Government sectors.

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	17.428	20.634	10.339	-	10.339
Current President's Budget	17.075	19.067	55.160	-	55.160
Total Adjustments	-0.353	-1.567	44.821	-	44.821
• Congressional General Reductions	-	-1.567			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.350	-			
• Program Adjustments	-0.003	-	-0.179	-	-0.179
• FutureG	-	-	45.000	-	45.000

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Change Summary Explanation

FY 2024 funding increase is comprised of a $45 million for FutureG, and realignment of $0.179 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)), as well as, other departmental priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense											Date: March 2023	
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602230D8Z / *Defense Technology Innovation (Beyond 5G)*				Project (Number/Name) 230 / *Defense Technology Innovation (Beyond 5G)*			
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**
230: *Defense Technology Innovation (Beyond 5G)*	-	17.075	19.067	55.160	-	55.160	72.186	47.451	37.710	37.987	Continuing	Continuing

A. Mission Description and Budget Item Justification

This effort builds upon the technology foundation that underpins fifth-generation cellular network (5G) systems as a basis to create the next generation of wireless cellular network and security technologies for military applications. Working in concert with other U.S. Government science and technology agencies, we will enable the U.S. to regain leadership in upcoming wireless technology standards including sixth generation (6G) and beyond by investing in research and workforce development in critical technologies. The execution of a defined engagement plan with other Departments, agencies, industry, and universities in collaboration with the Sec Def 5G Cross Functional Team will ensure continued U.S. influence in both the international commercial marketplace as well as Government sectors.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Beyond 5G	17.075	19.067	55.160
Description: This effort builds upon the technology foundation that underpins fifth-generation cellular network (5G) systems as a basis to create the next generation of wireless cellular network and security technologies for military applications. Working in concert with other U.S. Government science and technology agencies, we will enable the U.S. to regain leadership in upcoming wireless technology standards including sixth generation (6G) and beyond by investing in research and workforce development in critical technologies. The execution of a defined engagement plan with other Departments, agencies, industry, and universities in collaboration with the Sec Def 5G Cross Functional Team will ensure continued U.S. influence in both the international commercial marketplace as well as Government sectors. ***FY 2023 Plans:*** Continued investment in technology testbeds, novel hardware and software components, and fellowship/training programs with new and existing partners; Continued initiatives from FY 2022, specifically Radio Frequency (RF) and massive MIMO technology, spectrum reuse/network resource utilization based on novel machine learning concepts, and highly dynamic spectrum sharing using multiple degrees of freedom in contested/congested scenarios; Furthered work in robust, reconfigurable, and secure software defined networking, as well as edge computing for ultra-reliable, low latency applications; Continued to adapt R&D investment strategy/award mix based on the companion Prototyping and Experimentation testbed deployments. This plan was supported by FY 2023 research projects in the following areas: 1. Dynamic spectrum management/engineering to improve the efficiency, reliability, resiliency, and dual-use coexistence of DoD operation of limited electromagnetic spectrum within frequency bands licensed for 5G and FutureG mobile telecom applications; 2. The use of mobile distributed multi-input multi-output schema and architectures to enable high-value operational mission CONOPS relying on mobile wireless ad-hoc tactical networks within operationally relevant DoD domains within which adversary			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
interception and jamming can be pervasive (e.g., intra-/inter-squad and squad-to-command post networking, long range networking, terrestrial/airborne networking, etc.); 3. Exploitation of emerging 5G features such as open radio access networks, integrated access and backhaul, and non-terrestrial networks to enable a next generation of DoD tactical networks that integrate a commercial terrestrial 5G network with an airborne network segment in order to leverage the ubiquity and cost advantage of commercially available network infrastructure and user equipment for DoD mission benefit by servicing critical objectives such as autonomous, reliable, secure, and resilient low-latency operations. ***FY 2024 Plans:*** Through ongoing projects and planned FY 2023 solicitations, DoD will respond to DoD 5G strategy doctrine by continuing to invest in applied research in next generation wireless cellular network and security technologies for military applications and by executing fellowship/training programs to grow national workforce capability in this critical technology domain. Additionally, DoD will continue ongoing contracts to invest in analytically oriented research efforts to support participation in the 3rd Generation Partnership Program (3GPP) standards process to evolve FutureG standards in dual-use directions that will benefit DoD missions and strategies. Continue executing projects awarded in FY 2023 in the following topic areas: 1. Dynamic spectrum management/engineering to improve the efficiency, reliability, resiliency, and dual-use coexistence of DoD operation of limited electromagnetic spectrum within frequency bands licensed for 5G and FutureG mobile telecom applications; 2. The use of mobile distributed multi-input multi-output schema and architectures to enable high-value operational mission CONOPS relying on mobile wireless ad-hoc tactical networks within operationally relevant DoD domains within which adversary interception and jamming can be pervasive (e.g., intra-/inter-squad and squad-to-command post networking, long range networking, terrestrial/airborne networking, etc.); 3. Exploitation of emerging 5G features such as open radio access networks, integrated access and backhaul, and non-terrestrial networks to enable a next generation of DoD tactical networks that integrate a commercial terrestrial 5G network with an airborne network segment in order to leverage the ubiquity and cost advantage of commercially available network infrastructure and user equipment for DoD mission benefit by servicing critical objectives such as autonomous, reliable, secure, and resilient low-latency operations. These areas of applied research link directly to DoD 5G strategy doctrine and have been instantiated in a portfolio of multi-phase programs being executed across a diverse set of industry, FFRDC, and academic performers. In FY 2024, this portfolio will be augmented with additional programs in the thrust areas above via new solicitations and contract actions, and current active programs will be funded for follow-on phase options where warranted by early phase execution excellence and the establishment of a strong value proposition requiring additional work and funding.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
In FY 2024, the Beyond 5G portfolio will also pursue applied research in next generation cellular network systems in three additional strategic technology development focus areas deemed to provide the potential for revolutionary improvements in next generation cellular network systems: 1. The development of Unlimited Software defined Radio (SDR) technologies which remove hardware and prior generation architectural and implementation constraints by enabling full programmability of wireless signal generation and control for spectrum dominance; 2. The development of Hyper-Dimensional Software Defined Networks (SDN) to enable autonomous management of wireless network operations in environments that will be required to accommodate far more heterogeneity in technologies than current constructs, mixing in numerous different wireless modalities across numerous disparate networks; 3. The development of Mobile Internet Protocol advances such as time and location-aware protocols, named data networking, and next generation encryption schema which overcome limitations of current static internet protocols to support the dynamics and mobility required for low-power discriminating future DoD capabilities while improving operational security and resiliency. Through these developments, Beyond 5G will build a foundation for the technologies required to support US leadership in the global information infrastructure with embedded US principles and make the DoD more effective, more survivable, and improve readiness in the following ways: Unlimited SDR: - Benefit to the US: Tailored access to more wireless resources for new commercial markets - Benefit to the DoD: Improved spectrum management capabilities at all levels of DoD activities Hyper-Dimensional SDN: -Benefit to the US: Improved deployment models for public and private networks -Benefit to the DoD: Distributed and easy to maintain networks Mobile IP: -Benefit to the US: Lower power, improved performance; trusted, secure, and privacy-enhancing networks -Benefit to the DoD: Improved cyberspace capabilities; EMS and network signature management Building upon a well-established paradigm of program execution processes and controls, multi-phase programs added to the Beyond 5G portfolio in these applied research areas via FY 2023 solicitations will be managed to maximize the probability of beneficial outcomes. Collectively, the applied research focus areas described above represent a body of technology development that promises the evolutionary and revolutionary transformation of wireless cellular network systems which can enable enormous DoD mission benefit while also servicing DoD 5G Strategy dual-use objectives. In developing the applied research portfolio as			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
described, Beyond 5G will continue to adapt the investment strategy and program mix based on the companion Prototyping and Experimentation testbed deployments, driving towards an integrated overall technology maturation process that maximizes the probability of successful technology transition into operations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The funding increase from FY 2023 to FY 2024 reflects the Department's commitment to ensuring that DoD maintains the ability to drive next generation wireless communication technology development. Additional funding will be directed to support ideation, design, prototyping, and integration of novel FutureG & 5G network concepts and components, leading to demonstration of new capabilities that will allow US DOD operations to dominate the future networked battlespace and create an asymmetric advantage over our adversaries. The additional funds will enable the following efforts: 1. Transition of ongoing analytical and lab-based technology developments through efforts that will verify, validate, and codify developmental technologies into demonstrations and deliverables. These demonstrations and deliverables enable technology maturation through mission level prototyping and experimentation, and eventually into operational transition and are supported by tasks including detailed demonstration planning, hardware procurements and integration/verification activities, test site support personnel and facility operations, test and demo operations, and detailed documentation creation, review, and release. 2. The solicitation and execution of additional projects that provide critical revolutionary FutureG capabilities through development of Unlimited SDR, Hyperdimensional SDN, and Mobile Internet Protocol technologies. The efforts described above will collectively accomplish the breadth of evolutionary and revolutionary technology developments required to fully support future US strategic interests in this domain.			
Accomplishments/Planned Programs Subtotals	17.075	19.067	55.160

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A