Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army											Date: February 2018	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602307A / *Advanced Weapons Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	52.766	22.785	29.502	-	29.502	24.457	26.190	26.780	27.316	0.000	209.796
042: *High Energy Laser Technology*	-	27.766	22.785	29.502	-	29.502	24.457	26.190	26.780	27.316	0.000	184.796
NA5: *Advanced Weapons Components (CA)*	-	25.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000

A. Mission Description and Budget Item Justification

This Program Element (PE) investigates enabling technologies for High Energy Laser (HEL) weapons. Project 042 develops component technologies such as efficient, high energy, solid state lasers; advanced beam control components; and lethality / effectiveness measurements that enable better models and simulations for future HEL weapon designs.

Work in this PE is related to, and fully complements, efforts in PE 0601101A (In-House Laboratory Independent Research), PE 0602120A (Sensors and Electronic Survivability) Project EM8, PE 0603004A (Weapons and Munitions Advanced Technology) Project L96 and Air Force PE 0602890F (HEL Research).

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) in Huntsville, AL, and the High Energy Laser Systems Test Facility at White Sands Missile Range, NM.

B. Program Change Summary ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**
Previous President's Budget	28.803	22.785	29.502	-	29.502
Current President's Budget	52.766	22.785	29.502	-	29.502
Total Adjustments	23.963	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	25.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.023	-			
• FFRDC	-0.014	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army	Date: February 2018
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602307A *I Advanced Weapons Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2017	FY 2018
Project: NA5: *Advanced Weapons Components (CA)*		
Congressional Add: *Congressional program increase*	25.000	-
Congressional Add Subtotals for Project: NA5	25.000	-
Congressional Add Totals for all Projects	25.000	-

Change Summary Explanation

Congressional increase in NA5 Advanced Weapons Components

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602307A / *Advanced Weapons Technology*	Project (Number/Name) 042 / *High Energy Laser Technology*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
042: *High Energy Laser Technology*	-	27.766	22.785	29.502	-	29.502	24.457	26.190	26.780	27.316	0.000	184.796

A. Mission Description and Budget Item Justification

This Project investigates and develops advanced technologies for High Energy Laser (HEL) weapon systems to enable more efficient laser systems with greater power output. This includes technologies to support development of alternate laser sources, precision optical pointing and tracking components, adaptive optics to overcome laser degradation due to atmospheric effects, and thermal management systems to remove excess heat. In addition, this effort validates laser lethality performance and conducts analyses against a variety of targets and investigates the impact of low-cost laser countermeasures. This project includes laboratory efforts for HEL applied research as well as concepts analysis for United States Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) Technical Center competencies in directed energy, missile defense, and space technical areas. Solid State Laser (SSL) efforts continue to leverage other funds provided by the HEL Joint Technology Office (JTO), the Air Force, and the Navy to develop multiple technical approaches that reduce program risk and maintain competition.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Solid State Laser Effects	3.429	3.674	4.200
Description: This effort provides the underlying data required to support high energy laser weapon system effectiveness analyses. This activity includes the full spectrum of lethality testing from fundamental physics investigations to the engagement of flying targets in relevant scenarios. This activity is primarily executed at the Solid State Laser Testbed (SSLT) facility at White Sands Missile Range, New Mexico.			
FY 2018 Plans: Assess laser countermeasure effectiveness to include hardened materials, optical countermeasures, and tactics. Begin assessment of advanced threats to include: Anti-Tank Guided Missiles, Radar Systems, Rocket-Propelled Grenades (RPGs), and ground vehicles.			
FY 2019 Plans: Will complete vulnerability modules and lethality database inputs for UAS Groups 1, 2, and 3. Will continue development of lethality database input for rocket, artillery, and mortar (RAM) threats supporting High Energy Laser Tactical Vehicle Demonstrator (HEL TVD). Will begin investigating lethal/aimpoint on manned fixed- and rotary-wing aircraft.			
FY 2018 to FY 2019 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602307A / *Advanced Weapons Technology*	**Project (Number/Name)** 042 / *High Energy Laser Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Increase due to initiation of laser vulnerability data collection to support new Future Vertical Lift effort			
Title: Advanced Beam Control Component Development ***Description:*** This effort investigates technologies to enable lighter, more agile beam control systems that are robust enough to be used in Army platforms. This work is done in collaboration with the High Energy Laser (HEL) Joint Technology Office (JTO) and other Services. ***FY 2018 Plans:*** Complete the risk-reduction effort on adaptive optics performance in degraded atmospheric conditions. Validate performance requirements and the initial design of the beam control system (BCS) for the Preliminary Design Review for the next generation High Energy Laser system for an Army platform. This BCS will support an integrated demonstration of a laser weapon system prototype for potential transition into a Program of Record. This applied research on BCS components is part of the HEL technology demonstration. ***FY 2019 Plans:*** Will complete Critical Design Review (CDR) for the BCS for the High Energy Laser Tactical Vehicle Demonstrator (HEL TVD). Will validate performance of a state-of-the-art adaptive optics (AO) subsystem on a test range using the Mobile Beam Control System Integration Laboratory (MBC SIL), a key knowledge point for HEL TVD development. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase is due to development of the High Energy Laser Tactical Vehicle Demonstrator beam control system (BCS). A part of this is increased emphasis on atmospheric compensation and enhanced tracking technologies.	3.645	7.342	18.061
Title: High Efficiency Laser Development ***Description:*** This effort develops component technologies that increase Solid State Laser (SSL) efficiencies, which will lead to reductions in size and weight for multiple subsystems that greatly improve the ability to integrate SSL systems into Army weapon platforms. This work is done in collaboration with the High Energy Laser (HEL) Joint Technology Office (JTO) and other Services. Selected laser design will be fabricated and integrated onto an Army platform to demonstrate a high energy laser system functionality and is fully coordinated with PE 0603004A, Project L96. ***FY 2018 Plans:*** Complete the Preliminary Design Review of the next generation High Energy Laser system for an Army platform which includes validating performance requirements. Complete the majority of the work to hold the Critical Design Review of the laser system.	19.295	10.294	6.170

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602307A / *Advanced Weapons Technology*	**Project (Number/Name)** 042 / *High Energy Laser Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
This laser provides the required power in the size and weight compatible with the selected Army platform for next pre-prototype system demonstration. The laser development is part of the HEL technology demonstration. ***FY 2019 Plans:*** Will complete 100kW laser subsystem build in support of the High Energy Laser Tactical Vehicle Demonstrator (HEL TVD) effort. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease is due to the transition from development to for ruggedization of system under 63004/L96. Effort transitioning to Future Vertical Lift laser development. The majority of the laser system development for the High Energy Laser Tactical Vehicle Demonstrator will be completed in FY18.			
Title: HEL Research and Development and Concepts Analysis Laboratories ***Description:*** This effort focuses on developing in-house expertise through Solid State Laser (SSL) assessments and starting in Fiscal Year (FY) 2015, other USASMDC/ARSTRAT technical core competencies, including air and missile defense, responsive space, and small satellites. ***FY 2018 Plans:*** Complete investigation of candidates for suitability for Enhanced Tracking Sensor (ETS) to support the next generation beam control system (BCS). This sensor provides more capable acquisition and track of targets in degraded atmospheric conditions. Select candidate(s) and conduct laboratory level experiments to validate sensor performance satisfies requirements. Begin collecting field data to support model verification. ***FY 2019 Plans:*** Will complete analysis of laboratory level experiments to validate ETS performance against baseline requirements. Will complete collecting field data to support model verification. Will develop initial algorithms for advance adaptive optics. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease due to funding shifted from labs to support Future Vertical Lift effort.	1.397	1.475	1.071
Accomplishments/Planned Programs Subtotals	27.766	22.785	29.502

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602307A / *Advanced Weapons Technology*	**Project (Number/Name)** 042 / *High Energy Laser Technology*

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602307A / *Advanced Weapons Technology*	Project (Number/Name) NA5 / *Advanced Weapons Components (CA)*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
NA5: *Advanced Weapons Components (CA)*	-	25.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000

Note

Congressional increase for Program increase

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Weapons Components applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018
Congressional Add: Congressional program increase	25.000	-
FY 2017 Accomplishments: N/A		
Congressional Adds Subtotals	25.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A