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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force **Date:** February 2018

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603605F / <i>Advanced Weapons Technology</i>							
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	-	47.358	45.502	43.368	0.000	43.368	37.467	31.258	32.386	42.771	Continuing	Continuing
633151: <i>High Power Solid State Laser Technology</i>	-	20.847	24.635	28.200	0.000	28.200	19.244	13.150	13.419	23.422	Continuing	Continuing
633152: <i>High Power Microwave Development and Integration</i>	-	26.511	20.867	15.168	0.000	15.168	18.223	18.108	18.967	19.349	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration, and detailed assessment of directed energy weapon technologies for potential application on Air Force platforms. These include high energy laser, high power microwaves, and other unconventional weapon generation and transmission technologies, which can support a wide range of Air Force applications. The program develops a corresponding susceptibility, vulnerability, and lethality database for directed energy weapons. This program also develops laser-enabled atmospheric-compensated optical imaging for space situational awareness. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602601F, 0602602F, 0602605F, 0602788F, 1206601F, and 0602298F.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

<u>B. Program Change Summary (\$ in Millions)</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2019 Base</u>	<u>FY 2019 OCO</u>	<u>FY 2019 Total</u>
Previous President's Budget	39.064	45.502	45.271	0.000	45.271
Current President's Budget	47.358	45.502	43.368	0.000	43.368
Total Adjustments	8.294	0.000	-1.903	0.000	-1.903
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	10.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.706	0.000			
• Other Adjustments	0.000	0.000	-1.903	0.000	-1.903

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<u>Congressional Add Details (\$ in Millions, and Includes General Reductions)</u>		FY 2017	FY 2018
Project: 633152: <i>High Power Microwave Development and Integration</i>			
Congressional Add: <i>Program Increase</i>		9.652	0.000
Congressional Add Subtotals for Project: 633152		9.652	0.000
Congressional Add Totals for all Projects		9.652	0.000
<u>Change Summary Explanation</u> Decrease in FY 2019 due to realignment of funds to focus on Directed Energy Game Changer efforts			

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force										Date: February 2018		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603605F / Advanced Weapons Technology				Project (Number/Name) 633151 / High Power Solid State 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
633151: High Power Solid State Laser Technology	-	20.847	24.635	28.200	0.000	28.200	19.244	13.150	13.419	23.422	Continuing	Continuing
A. Mission Description and Budget Item Justification												
This project provides for the development, integration, demonstration, and detailed technical assessment of high energy laser devices, advanced imaging and beam control technologies needed for applications such as force protection, force application, precision engagement, and aircraft self-protection. Laser system concept assessments to include vulnerability assessments and target effect testing are performed. This project also exploits the synergy between high energy laser beam control and advanced optical imaging for space situational awareness.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2017	FY 2018	FY 2019	
Title: High Energy Laser/Beam Control									20.847	24.635	27.709	
Description: Develop and demonstrate advanced beam control technologies, integrated laser systems, and aircraft self-protection laser technologies. Demonstrate beam control components integrated with high energy lasers for Air Force utility.												
FY 2018 Plans: Continue the integration of a low power laser system into a pod for Phase 1 aircraft self-protect demonstration. In addition to the laser source, continue with integration of the laser control subsystem for directing the laser onto the target for aircraft self-protect demonstration. Continue development of ground support and aircraft interface.												
FY 2019 Plans: Demonstrate the integration of a low power laser system into a pod for Phase 1 aircraft self-protect demonstration. Begin integration of a medium power laser system into the pod for Phase 2 aircraft self-protect demonstration. Continue with integration of the laser control subsystem for directing the laser onto the target for aircraft self-protect demonstration. Continue development of the ground support and aircraft interface.												
FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 increased compared to FY 2018 by \$3.074 million. Justification for this increase due to the increased emphasis of the high energy laser demonstration.												
Title: Optical Space Situational Awareness and Satellite Vulnerability									-	0.000	0.491	
Description: Mature development of advanced, long-range, electro-optical technologies that support ground-based optical space situational awareness. Develop and demonstrate technologies that accurately assess the vulnerability of blue satellite systems to lasers. Manage and operate research assets in support of development, demonstration, and integration of ground-based optical space situational awareness technologies.												

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603605F / <i>Advanced Weapons Technology</i>	Project (Number/Name) 633151 / <i>High Power Solid State Laser Technology</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2017	FY 2018
<i>FY 2018 Plans:</i> N/A <i>FY 2019 Plans:</i> Demonstrate 24/7 real-time optical imaging of near-earth satellites to allow characterization on tactical timelines. Continue development of full-dark imaging using laser illumination. Continue development of real-time daylight imaging of near-earth satellites. <i>FY 2018 to FY 2019 Increase/Decrease Statement:</i> FY 2019 increased compared to FY 2018 by \$0.491 million. Justification for this increase is described in the plans above.			
Accomplishments/Planned Programs Subtotals		20.847	24.635
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.			

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Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603605F / Advanced Weapons Technology				Project (Number/Name) 633152 / High Power Microwave Development and Integration			
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
633152: High Power Microwave Development and Integration	-	26.511	20.867	15.168	0.000	15.168	18.223	18.108	18.967	19.349	Continuing	Continuing
A. Mission Description and Budget Item Justification												
This project develops and demonstrates high power microwave and other unconventional weapon generation and transmission technologies that support a wide range of Air Force missions such as air base defense or the damage/destruction of an adversary's electronic infrastructure. It also provides non-lethal antipersonnel weapon capabilities and inputs to the susceptibility, vulnerability, and lethality databases used across the Department of Defense to understand thresholds for scalable non-lethal effects.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2017	FY 2018	FY 2019	
Title: HPM Technologies									16.859	20.867	15.168	
Description: Develop and evaluate high power microwave and other unconventional weapon technologies for various platforms, including aerial, for applications such as counter-electronics. Develop and evaluate high power microwave technologies for non-lethal, anti-personnel weapon applications.												
FY 2018 Plans: Finalize design and evaluation of the utility of a class of reusable, multi-pulse, multi-target counter-electronics payloads capable of being hosted in various advanced platforms. Characterize, model, test and evaluate current and projected blue directed energy threats on red assets. Begin the joint high power microwave flight demonstration with the Navy. Verify enhancements to high power microwave missiles for aircraft compatibility testing during captive carry flight.												
FY 2019 Plans: Develop a class of reusable, multi-pulse, multi-target counter-electronics payloads capable of being hosted in various advanced platforms. Characterize, model, test and evaluate current and projected blue directed energy threats on current red assets. Design and develop the high power microwave payload for the joint flight demonstration with the Navy. Conduct captive carry flight testing of the high power microwave missiles.												
FY 2018 to FY 2019 Increase/Decrease Statement: FY 2019 decreased compared to FY 2018 by \$5.585 million. Justification for this decrease is due an increased emphasis in the speed-up of the high energy laser/beam control demonstrations in the high energy laser program.												
Accomplishments/Planned Programs Subtotals									16.859	20.867	15.168	

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		FY 2017	FY 2018
Congressional Add: Program Increase		9.652	0.000
FY 2017 Accomplishments: Conducted congressionally directed effort.			
FY 2018 Plans: N/A			
Congressional Adds Subtotals		9.652	0.000
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.			