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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force										Date: February 2019		
Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 1: Basic Research					R-1 Program Element (Number/Name) PE 0601108F I High Energy Laser Research Initiatives							
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	-	13.462	13.016	14.795	0.000	14.795	15.090	15.397	15.708	16.022	Continuing	Continuing
615097: High Energy Laser Research Initiatives	-	13.462	13.016	14.795	0.000	14.795	15.090	15.397	15.708	16.022	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program funds basic research aimed at developing fundamental scientific knowledge to support future Department of Defense Directed Energy Weapon systems through the Joint Directed Energy Transition Office. This program funds multi-disciplinary research institutes to conduct research on laser and beam control technologies. In addition, this program supports educational grants to stimulate student interest in directed energy and encourage graduate research in topics related to high energy lasers and high power microwaves. These educational grants are used for educational tools, scholarships, and summer intern employees in military laboratories. 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, 0602602F, 0602605F, 0602788F, 1206601F, and 0602298F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

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B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total		
Previous President's Budget		14.417	14.506	14.795	0.000	14.795		
Current President's Budget		13.462	13.016	14.795	0.000	14.795		
Total Adjustments		-0.955	-1.490	0.000	0.000	0.000		
• Congressional General Reductions		0.000	-0.040					
• Congressional Directed Reductions		0.000	-1.450					
• 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		-0.522	0.000					
• Other Adjustments		-0.433	0.000	0.000	0.000	0.000		
Change Summary Explanation Decrease in FY 2019 due to a Congressional directed reduction in the Department of Defense Appropriation Act 2019 for under-execution.								
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Directed Energy Sources and Devices				6.272	6.020	6.766	0.000	6.766
Description: Improve the fundamental understanding and modeling of high energy laser and high power microwave sources and devices.								
In FY 2019, this effort was named High Energy Laser Sources and Devices. The effort name was changed to reflect the direction in the 2017 and 2018 National Defense Authorization Acts.								
FY 2019 Plans: Investigate innovative laser technologies in diode-pumped alkali lasers, short-pulse, fiber, and solid state laser technologies. Leverage international technology advancements.								
FY 2020 Base Plans: Continue investigations into innovative laser technologies in diode-pumped alkali lasers, short-pulse, fiber, and solid state laser technologies. Continue overseas efforts to leverage international technology advancements. Initiate investigations into innovative high power microwave technologies.								
FY 2020 OCO Plans:								

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Not Applicable						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.746 million. Justification for the increase is described in the plans above.						
Title: Directed Energy Propagation technologies Description: Improve the fundamental understanding and modeling of beam control technologies as they relate to High Energy Laser applications and High Power Microwaves. Conduct research in atmospheric characterization, metrology, control systems, algorithms, waveguides, antennas and beam control component technology. In FY 2019, this effort was named High Energy Laser Beam Control. The effort name was changed to reflect the direction in the 2017 and 2018 National Defense Authorization Acts. FY 2019 Plans: Research innovative high energy laser beam control architectures. Leverage international research developments and technology advancements. FY 2020 Base Plans: Continue to research innovative high energy laser beam control architectures. Continue to leverage international research developments and technology advancements. FY 2020 OCO Plans: Not Applicable. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.906 million. Justification for the increase is in the plans above.		6.069	5.873	6.779	0.000	6.779
Title: Directed Energy Education Description: Fund educational grants to stimulate student interest in directed energy. In FY 2019, this effort was named High Energy Laser Education. The effort name was changed to reflect the direction in the 2017 and 2018 National Defense Authorization Acts. FY 2019 Plans:		1.121	1.123	1.250	0.000	1.250

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Provide scholarships and internships to support college students studying in fields related to high energy lasers and high power microwaves. Provide grants to Service Academies to stimulate studies related to directed energy among military cadets. Fund publication of journals and support continuing education for professionals in the directed energy field.</p> <p>FY 2020 Base Plans: Continue to provide scholarships and internships to support college students studying in fields related to high energy lasers and high power microwaves. Continue to provide grants to Service Academies to stimulate studies related to directed energy among military cadets. Continue to fund publication of journals and support continuing education for professionals in the directed energy field.</p> <p>FY 2020 OCO Plans: Not Applicable</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.127 million. Justification for the increase is described in the plans above.</p>						
Accomplishments/Planned Programs Subtotals		13.462	13.016	14.795	0.000	14.795
D. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
E. Acquisition Strategy N/A						
F. 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.						