Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Air Force											Date: February 2016	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602890F / *High Energy Laser Research*							
COST ($ in Millions)	**Prior Years**	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
Total Program Element	-	36.162	41.855	42.300	0.000	42.300	43.049	43.685	44.553	45.443	Continuing	Continuing
625096: *High Energy Laser Research*	-	36.162	41.855	42.300	0.000	42.300	43.049	43.685	44.553	45.443	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program funds Department of Defense (DoD) high energy laser (HEL) applied research through the HEL Joint Technology Office (JTO). This program is part of an overall DoD HEL Science and Technology (S&T) program. HEL weapon systems have many potential advantages including speed-of-light delivery, precision target engagement, significant magazine depth, low-cost per kill, and reduced logistics requirements. HELs have the potential to perform a wide variety of military missions including defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles and the ultra-precision negation of targets in urban environments with minimal collateral damage. Efforts funded under this program are generally chosen for their potential to have an impact on multiple HEL systems and multiple Service missions while complementing Service/Agency programs that are directed at specific Service needs. A broad range of technologies are addressed in key areas such as laser sources, laser beam control, modeling and simulation, and laser lethality mechanisms. Efforts in this program have been coordinated through the DoD S&T Executive Committee process to harmonize efforts and eliminate duplication.

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	37.441	42.037	42.300	0.000	42.300
Current President's Budget	36.162	41.855	42.300	0.000	42.300
Total Adjustments	-1.279	-0.182	0.000	0.000	0.000
• Congressional General Reductions	0.000	-0.182			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-0.030	0.000			
• SBIR/STTR Transfer	-1.249	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Robust Electric Laser Initiative	5.120	1.540	0.000

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Description: Advance solid-state laser development. ***FY 2015 Accomplishments:*** Continued the joint high power electric laser product improvement program, as part of the Robust Electric Laser Initiative (RELI) effort. Initiated two additional major efforts for risk reduction and to explore other architectures for scalability. Monitored technical progress of the 60kW and the 30kW lasers and other sources. Monitored preparation for integration onto specific relevant military platforms. Continued analysis of trade space to understand performance and integration issues for other platforms. Performed government-sponsored measurements to validate performance. ***FY 2016 Plans:*** Complete a joint high power electric laser product improvement program, as part of the RELI effort. Monitor technical progress of the four efforts and other sources. Monitor performance of the lasers as integrated onto relevant military platforms. Complete analysis of trade space to understand performance, fielding, robustness and integration issues for future platforms. Complete government-sponsored measurements to validate performance. ***FY 2017 Plans:*** In FY2016, the RELI effort completes.			
Title: Solid State Laser Technologies ***Description:*** Mature technologies that will provide system level performance commensurate with fieldable laser devices. ***FY 2015 Accomplishments:*** Developed high reliability, lower cost, efficient and high temperature diode pump sources. Performed scaling of alternate laser wavelengths to militarily relevant power levels. Developed high power delivery fiber technologies. Performed risk reduction analysis for fielding of laser systems. Conducted a reduced Service and Agency call for FY15. ***FY 2016 Plans:*** Develop high reliability, lower cost, efficient and high temperature diode pump sources. Scale alternate laser wavelengths to militarily relevant power levels. Investigate high power fiber technologies. Focus efforts on risk reduction for fielding of laser systems. ***FY 2017 Plans:*** Continue to develop high reliability, lower cost, efficient and high temperature diode pump sources. Scale alternate laser wavelengths to additional militarily relevant power levels. Investigate high power fiber technologies. Continue risk reduction in solid state lasers for their inclusion in future laser systems. Monitor performance of the RELI lasers as integrated onto relevant	5.220	7.107	7.650

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
military platforms. Conduct analysis of trade space to understand performance, fielding, robustness and integration issues for future platforms.			
Title: Advanced High Energy Laser (HEL) Technologies ***Description:*** Investigate new technologies that have revolutionary potential HEL applications. ***FY 2015 Accomplishments:*** Explored novel laser technologies to improve efficiency and decrease mass/volume for future laser devices. Evaluated new materials for HEL applications. Continued to improve understanding of short pulse laser technology to include material interaction and propagation. Continued to scale electrically pumped alkali lasers to KW-class power levels. Began efforts to further characterize and understand the physics of HEL propagation in adverse weather conditions such as fog, rain, smoke and dust. Continued development of the Predictive Avoidance and Air Space Deconfliction system and begin initial testing on HEL test range(s). Conducted a reduced Service and Agency call for FY15. ***FY 2016 Plans:*** Explore novel laser technologies to improve efficiency and decrease mass/volume for future laser weapon systems. Evaluate additional materials for high energy laser applications. Continue to improve understanding of short pulse laser technology to include material interaction and propagation. Continue to scale electrically pumped alkali lasers to KW-class power levels. Continue efforts to characterize and understand the physics of HEL propagation in adverse weather conditions such as fog, rain, smoke and dust. Continue development of the Avoidance and Air Space Deconfliction system and continue early-phase testing on HEL test range(s). ***FY 2017 Plans:*** Explore novel laser technologies to improve efficiency and decrease mass/volume for future laser weapon systems. Evaluate additional materials for high energy laser applications. Continue to improve understanding of short pulse laser technology to include material interaction and propagation. Continue to scale electrically pumped alkali lasers to higher KW-class power levels. Continue efforts to characterize and understand the physics of HEL propagation in adverse weather conditions such as fog, rain, smoke and dust. Continue testing of the Avoidance and Air Space Deconfliction system on HEL test range(s).	4.780	6.210	6.210
Title: Laser Beam Control Technologies ***Description:*** Develop technology to support high performance beam control systems and integrated demonstrations. ***FY 2015 Accomplishments:*** Continued development of beam control technologies for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems) in stressing environments. Continued development of a predictive avoidance fire control system for use on multiple platforms. Enhanced execution of a program for kill assessment technologies. Continued joint investigations of beam	14.572	19.638	21.080

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
control hardware and technologies to improve throughput efficiency through the beam director, decrease component weight, and improve tracking and compensation through the atmosphere. Conducted a Service and Agency call for FY15. ***FY 2016 Plans:*** Continue development of beam control technologies for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems) in stressing environments. Continue development of a predictive avoidance fire control system for use on multiple platforms. Continue execution of a program for kill assessment technologies. Further enhance joint beam control efforts to develop hardware and technologies to improve throughput efficiency through the beam director, decrease component weight, and improve tracking and compensation through the atmosphere. Select programs for Service specific applications. ***FY 2017 Plans:*** Continue development of beam control technologies for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems) in stressing environments. Continue development of a predictive avoidance fire control system for use on multiple platforms. Continue execution of a program for kill assessment technologies. Continue joint beam control efforts to develop hardware and technologies to improve throughput efficiency through the beam director, decrease component weight, and improve tracking and compensation through the atmosphere. Select additional programs for Service specific applications.			
Title: Lethality Research ***Description:*** Conduct laser vulnerability experiments on materials, components, and targets. Develop a lethality database, and integrate into a systems-level architecture plan and lethality models. ***FY 2015 Accomplishments:*** In close coordination with existing HEL models, integrated new lethality data into campaign-level HEL system models. Conducted laser vulnerability experiments on materials, components, and targets. Continued development of an unmanned air vehicle vulnerability module for integration into the modeling and simulation toolkit. Supported the development of a suite of directed energy weapon (DEW) tools to be used in a database from which the warfighter can assess target vulnerabilities and mission utility for a given DEW platform and engagement. ***FY 2016 Plans:*** Continue to integrate recent lethality data into campaign-level HEL system models. Conduct laser vulnerability experiments on materials, components, and targets. Complete development of an unmanned air vehicle vulnerability module for integration into the modeling and simulation toolkit. Continue the development of a suite of DEW tools to be used in a database from which the warfighter can assess target vulnerabilities and mission utility for a given DEW platform and engagement. ***FY 2017 Plans:***	3.060	3.720	3.720

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continue to integrate recent lethality data into campaign-level HEL system models. Conduct laser vulnerability experiments on additional materials, components, and targets. Continue the development of a suite of DEW tools to be used in a database from which the warfighter can assess target vulnerabilities and mission utility for a given DEW platform and engagement.			
Title: High Energy Laser (HEL) Modeling ***Description:*** Maintain and evaluate high-fidelity engineering models for HEL system scenario evaluation and incorporation into the HEL toolkit. Provide for HEL system modeling for mission-level war gaming activities. ***FY 2015 Accomplishments:*** Provided maintenance, verification, validation, and accreditation for updated system level HEL models. Continued validation and verification of HEL models. Conducted mission-level HEL engagement scenarios and wargame HEL concepts. Updated predictive avoidance modeling into existing HEL toolkit. Continued development of a risk assessment for illumination of objects in space by tactical laser weapons. Continued analysis of scenario conditions to understand relative gains in hardware developments. Continued development and refinement of the requirements for a suite of DEW tools to be used in an environment from which the warfighter can assess mission utility for a given DEW platform and engagement. ***FY 2016 Plans:*** Provide continued maintenance, verification, validation, and accreditation for updated system level HEL models. Conduct additional mission-level HEL engagement scenarios and wargame HEL concepts. Continue to update predictive avoidance modeling into existing HEL toolkit. Continue development of a risk assessment for illumination of objects in space by tactical laser weapons. Continue analysis of scenario conditions to understand relative gains in hardware developments. ***FY 2017 Plans:*** Provide continued maintenance, verification, validation, and accreditation for updated system level HEL models. Conduct additional mission-level HEL engagement scenarios and wargame HEL concepts. Continue to update predictive avoidance modeling into existing HEL toolkit. Continue development of a risk assessment for illumination of objects in space by tactical laser weapons. Develop Joint Munition Effects Manual (JMEM)-like modeling tools for future HEL weapon systems.	3.410	3.640	3.640
Accomplishments/Planned Programs Subtotals	36.162	41.855	42.300

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

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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.