Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Air Force											Date: February 2015	
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 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	-	38.853	37.441	42.037	-	42.037	42.300	43.049	43.685	44.553	Continuing	Continuing
625096: *High Energy Laser Research*	-	38.853	37.441	42.037	-	42.037	42.300	43.049	43.685	44.553	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 complimenting 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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Previous President's Budget	40.155	37.496	42.316	-	42.316
Current President's Budget	38.853	37.441	42.037	-	42.037
Total Adjustments	-1.302	-0.055	-0.279	-	-0.279
• Congressional General Reductions	-	-0.055			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.302	-			
• Other Adjustments	-	-	-0.279	-	-0.279

C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Title: Robust Electric Laser Initiative	9.030	5.870	6.436

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Description: Advance solid-state laser development. ***FY 2014 Accomplishments:*** Continued a joint high power electric laser product improvement program, as part of the Robust Electric Laser Initiative (RELI) effort. Monitored technical progress toward 60kW and 30kW laser source development for integration onto relevant military platforms. Analyzed trade space to understand performance and integration issues for other platforms. Continued investigation into other laser architectures for further development and scaling and initiate additional effort(s). Finalized preparations and equipment for government-sponsored measurements to validate performance. ***FY 2015 Plans:*** Continue the joint high power electric laser product improvement program, as part of the RELI effort. Initiate two additional major efforts for risk reduction and to explore other architectures for scalability. Monitor technical progress of the 60kW and the 30kW lasers and other sources. Monitor preparation for integration onto specific relevant military platforms. Continue analysis of trade space to understand performance and integration issues for other platforms. Perform government-sponsored measurements to validate performance. ***FY 2016 Plans:*** Continue 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 relevant military platforms. Continue analysis of trade space to understand performance, fielding, robustness and integration issues for future platforms. Complete government-sponsored measurements to validate performance.			
Title: Solid State Laser Technologies ***Description:*** Mature technologies that will provide system level performance commensurate with fieldable laser devices. ***FY 2014 Accomplishments:*** Developed highly efficient, compact, modular electric laser system component technologies that are scalable and robust. Develop high reliability/cost efficient diode pump sources. Scaled alternate laser wavelengths to militarily relevant power levels. Developed high power delivery fiber technologies. Conducted an industry proposal call for FY 2014 and awarded five new projects. ***FY 2015 Plans:***	6.103	5.281	6.090

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Develop high reliability, lower cost, efficient and high temperature diode pump sources. Scale alternate laser wavelengths to militarily relevant power levels. Develop high power delivery fiber technologies. Focus efforts on risk reduction for fielding of laser systems. Conduct 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. Develop high power delivery fiber technologies. Focus efforts on risk reduction for fielding of laser systems. Conduct a industry proposal call for FY16.			
Title: Free Electron Laser Technologies ***Description:*** Conduct system-level technology development to facilitate scaling of free electron lasers (FELs) to weapons-class power levels. ***FY 2014 Accomplishments:*** Demonstrated technologies that can support 100kW future FEL performance. Performed an orderly completion of all FEL efforts. ***FY 2015 Plans:*** Effort transitioned to Navy program 0602114N, Power Projection Applied Research, to be incorporated in ongoing Navy program. ***FY 2016 Plans:*** N/A	0.500	-	-
Title: Advanced High Energy Laser (HEL) Technologies ***Description:*** Investigate new technologies that have revolutionary potential HEL applications. ***FY 2014 Accomplishments:*** Explored novel laser technologies to improve efficiency and decrease mass/volume. Evaluated new materials for HEL applications, to include optics in a high-gain vacuum. Furthered understanding of short pulse laser technology to include material interaction and propagation. Establishd and began a Predictive Avoidance and Air Space Deconfliction (PAAD) program to develop a prototype standalone capability that will interface with aviation, surface and space situational awareness systems and an HEL weapons systems to demonstrate an initial capability. Conducted an industry proposal call for FY 2014 and awarded five new projects. ***FY 2015 Plans:*** Explore novel laser technologies to improve efficiency and decrease mass/volume. Evaluate new materials for HEL 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. Begin efforts to further characterize and understand the physics	8.540	7.490	8.181

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
of HEL propagation in adverse weather conditions such as fog, rain, smoke and dust. Continue development of the PAAD system and begin initial testing on HEL test range(s). Conduct a reduced Service and Agency call for FY15. ***FY 2016 Plans:*** Explore novel laser technologies to improve efficiency and decrease mass/volume. Evaluate new 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 PAAD system and begin initial testing on HEL test range(s). Conduct an industry proposal call for FY16.			
Title: Laser Beam Control Technologies ***Description:*** Develop technology to support high performance beam control systems and integrated demonstrations. ***FY 2014 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. Developed and began execution of a program for kill assessment technologies. Initiated a program plan for a joint beam control effort to develop hardware and technologies to improve throughput efficiency through the beam director, decrease component weight, and improve tracking and compensation through the atmosphere. Conducted an industry proposal call for FY14 and awarded nine new projects. ***FY 2015 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. Enhance execution of a program for kill assessment technologies. Continue execution of the program plan for joint beam control to develop hardware and technologies to improve throughput efficiency through the beam director, decrease component weight, and improve tracking and compensation through the atmosphere. Conduct 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 execution of the program plan for joint beam control to develop hardware and technologies to improve throughput efficiency through the beam director,	8.030	12.250	15.670

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
decrease component weight, and improve tracking and compensation through the atmosphere. Select programs for service specific applications. Conduct an industry proposal call for FY16.			
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 2014 Accomplishments:*** In close coordination with existing HEL models, integrated 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. ***FY 2015 Plans:*** In close coordination with existing HEL models, integrate new lethality data into campaign-level HEL system models. Conduct laser vulnerability experiments on materials, components, and targets. Continue development of an unmanned air vehicle vulnerability module for integration into the modeling and simulation toolkit. Support 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:*** In close coordination with existing HEL models, integrate new lethality data into campaign-level HEL system models. Conduct laser vulnerability experiments on materials, components, and targets. Complete development of a 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.	3.450	3.630	3.230
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 2014 Accomplishments:*** Provided maintenance, verification, validation, and accreditation for updated system level HEL models. Conducted mission-level HEL engagement scenarios and wargame HEL concepts. Incorporated additional predictive avoidance modeling into existing HEL toolkit. Continued development of a risk assessment for illumination of objects in space by tactical laser weapons. ***FY 2015 Plans:***	3.200	2.920	2.430

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Provide maintenance, verification, validation, and accreditation for updated system level HEL models. Continue validation and verification of HEL models. Conduct mission-level HEL engagement scenarios and wargame HEL concepts. 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. Continue 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 maintenance, verification, validation, and accreditation for updated system level HEL models. Conduct 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 of scenario conditions to understand relative gains in hardware developments.			
Accomplishments/Planned Programs Subtotals	38.853	37.441	42.037

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.