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**Exhibit R-2, PB 2010 Air Force RDT&E Budget Item Justification** **DATE:** May 2009

<b>APPROPRIATION/BUDGET ACTIVITY</b>					<b>R-1 ITEM NOMENCLATURE</b>					
3600 - Research, Development, Test & Evaluation, Air Force/BA 1 - Basic Research					PE 0601108F High Energy Laser Research Initiatives					
<b>COST (\$ in Millions)</b>	<b>FY 2008 Actual</b>	<b>FY 2009 Estimate</b>	<b>FY 2010 Estimate</b>	<b>FY 2011 Estimate</b>	<b>FY 2012 Estimate</b>	<b>FY 2013 Estimate</b>	<b>FY 2014 Estimate</b>	<b>FY 2015 Estimate</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	12.221	13.389	12.834						Continuing	Continuing
615097: High Energy Laser Research Initiatives	12.221	13.389	12.834						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 (DoD) high energy laser (HEL) systems. The HEL Joint Technology Office (JTO) sends these funds to multi-disciplinary research institutes (MRIs) for projects on laser and beam control technologies. In addition, funding supports educational grants which are designed to stimulate interest in HELs. These educational grants are used for educational tools, scholarships, and summer intern employees in military laboratories. These funds are also used for modeling and simulation projects for the research of physics-based models of HEL systems. This program is in Budget Activity 1, Basic Research, because it funds scientific study and experimentation. Through this program, the DoD invests in research directed toward increasing knowledge and understanding in those fields of science and engineering related to long-term national security needs.

**B. Program Change Summary (\$ in Millions)**

	<u><b>FY 2008</b></u>	<u><b>FY 2009</b></u>	<u><b>FY 2010</b></u>	<u><b>FY 2011</b></u>
Previous President's Budget	12.556	13.425	13.030	
Current BES/President's Budget	12.221	13.389	12.834	
Total Adjustments	-0.335	-0.036	0.000	
Congressional Program Reductions	0.000	0.000		
Congressional Rescissions	0.000	-0.036		
Total Congressional Increases	0.000	0.000		
Total Reprogrammings	0.000	0.000		
SBIR/STTR Transfer	-0.335	0.000		

**Change Summary Explanation**

Not Applicable.

C. Performance Metrics  
Under Development.

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<b>Exhibit R-2a, PB 2010 Air Force RDT&amp;E Project Justification</b>								<b>DATE:</b> May 2009		
<b>APPROPRIATION/BUDGET ACTIVITY</b> 3600 - Research, Development, Test & Evaluation, Air Force/BA 1 - Basic Research				<b>R-1 ITEM NOMENCLATURE</b> PE 0601108F High Energy Laser Research Initiatives					<b>PROJECT NUMBER</b> 615097	
<b>COST (\$ in Millions)</b>	<b>FY 2008 Actual</b>	<b>FY 2009 Estimate</b>	<b>FY 2010 Estimate</b>	<b>FY 2011 Estimate</b>	<b>FY 2012 Estimate</b>	<b>FY 2013 Estimate</b>	<b>FY 2014 Estimate</b>	<b>FY 2015 Estimate</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
615097: High Energy Laser Research Initiatives	12.221	13.389	12.834						Continuing	Continuing
<b>A. Mission Description and Budget Item Justification</b> N/A										
<b>B. Accomplishments/Planned Program (\$ in Millions)</b>							<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>	<b>FY 2011</b>
<p>MAJOR THRUST: Improve the fundamental understanding of high-power laser sources, to include solid-state, free electron, and gas laser technologies.</p> <p>In FY 2008: Conducted fiber laser research focused on single aperture scaling single-mode fibers and organization of multiple fibers. Conducted fundamental research of optically-pumped atomic and molecular gas lasers. Initiated efforts in the solid state laser field including the development of an optically-pumped semiconductor laser and a new approach for high power eye-safe lasers. Initiated efforts in free electron laser research exploring robust photocathode technology and high brightness cathodes and their relationship to high-power free electron lasers. Investigated diode pumped alkali lasers operating at very high intensities.</p> <p>In FY 2009: Complete efforts to conduct fiber laser research focused on single aperture scaling single-mode fibers, and organization of multiple fibers. Complete fundamental research of optically-pumped atomic and molecular gas lasers. Continue research on awarded topics in diode-pumped alkali, free electron, and solid state laser technologies. Initiate interaction to look at promising technology development overseas.</p> <p>In FY 2010: Continue research on awarded topics in diode-pumped alkali, free electron, and solid state laser technologies. Initiate a new call for fiber-based solid state laser technologies. Establish overseas efforts to leverage international technology advancements.</p>							7.341	8.244	8.677	
							2.580	2.545	3.418	

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<b>APPROPRIATION/BUDGET ACTIVITY</b> 3600 - Research, Development, Test & Evaluation, Air Force/BA 1 - Basic Research	<b>R-1 ITEM NOMENCLATURE</b> PE 0601108F High Energy Laser Research Initiatives		<b>PROJECT NUMBER</b> 615097	
<b>B. Accomplishments/Planned Program (\$ in Millions)</b>	<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>	<b>FY 2011</b>
<p>MAJOR THRUST: Improve the fundamental understanding of beam control technologies as they relate to high power laser applications. Conduct research in atmospheric characterization and beam control component technology.</p> <p>In FY 2008: Completed negative thermal expansion research. Initiated efforts to mitigate aero-optic effects in order to enhance tactical HEL architectures and to reduce weight, size and complexity of the beam control systems while maximizing performance.</p> <p>In FY 2009: Continue mitigation of aero-optic effects to enhance tactical HEL architectures and to reduce weight, size and complexity of the beam control system. Establish overseas efforts to leverage international technology advancements.</p> <p>In FY 2010: Continue mitigation of aero-optic effects to enhance tactical HEL architectures and to reduce weight, size, and complexity of the beam control system. Establish overseas efforts to leverage international technology advancements.</p>				
<p>MAJOR THRUST: Maintain and evaluate high-fidelity models for incorporation into HEL systems scenario evaluations and the HEL toolkit. Provide for HEL systems level modeling into mission-level wargaming activities. Note: In FY 2010, modeling and simulation efforts transition to PE 0602890F, High Energy Laser Research.</p> <p>In FY 2008: Merged the developed models into a common architecture through verification and validation techniques. Conducted mission-level HEL engagement scenarios.</p> <p>In FY 2009: Initiate development of a solid state laser model to allow parameterization of components with the laser system. Develop a high-fidelity model for HEL system scenario evaluation.</p> <p>In FY 2010: Not Applicable.</p>	1.650	1.850	0.000	

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<b>B. Accomplishments/Planned Program (\$ in Millions)</b>	<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>	<b>FY 2011</b>
<p>MAJOR THRUST: Fund educational grants, through the Directed Energy Professional Society, intended to simulate interest in HEL technologies among students.</p> <p>In FY 2008: Provided scholarships and internships to support college students studying HEL degrees. Provided grants to Service Academies to stimulate HEL studies among military cadets. Provided support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Funded publication of journals and continuing education for professionals in the HEL field.</p> <p>In FY 2009: Provide scholarships and internships to support college students studying HEL degrees. Provide grants to Service Academies to stimulate HEL studies among military cadets. Provide support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Fund publication of journals and continuing education for professionals in the HEL field. Conduct a proposal call for FY 2010 for execution and coordination of the Educational Grant program.</p> <p>In FY 2010: Provide scholarships and internships to support college students studying HEL degrees. Provide grants to Service Academies to stimulate HEL studies among military cadets. Provide support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Fund publication of journals and continuing education for professionals in the HEL field.</p>	0.650	0.750	0.739	

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<b>C. Other Program Funding Summary (\$ in Millions)</b>										
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<b>Cost To Complete</b>	<b>Total Cost</b>
PE 0602890F/ High Energy Laser Research.	0.000	0.000							Continuing	Continuing
PE 0603444F/ Maui Space Surveillance System.	0.000	0.000							Continuing	Continuing
PE 0603605F/ Advanced Weapons Technology.	0.000	0.000							Continuing	Continuing
PE 0603924F/ High Energy Laser Advanced Technology Program.	0.000	0.000							Continuing	Continuing
PE 0602605F/ Directed Energy Technology.	0.000	0.000							Continuing	Continuing
PE 0602120A/ Sensors and Electronic Survivability.	0.000	0.000							Continuing	Continuing
PE 0602307A/ Advanced Weapons Technology.	0.000	0.000							Continuing	Continuing
PE 0602624A/ Weapons and Munitions Technology.	0.000	0.000							Continuing	Continuing
PE 0603004A/ Weapons and Munitions Advanced Technology.	0.000	0.000							Continuing	Continuing
PE 0602114N/ Power Projection Applied Research.	0.000	0.000							Continuing	Continuing
PE 0602702E/ Tactical Technology.	0.000	0.000							Continuing	Continuing
	0.000	0.000							Continuing	Continuing

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PE 0603175C/ Ballistic Missile Defense Technology.	0.000	0.000	Continuing Continuing
PE 0603883C/ Ballistic Missile Defense Boost Phase Segment.	0.000	0.000	Continuing Continuing
PE 0602651M/ Joint Non-Lethal Weapons Applied Research.	0.000	0.000	Continuing Continuing
PE 0603651M/ Joint Non-Lethal Weapons Technology Development.	0.000	0.000	Continuing Continuing
Activity Not Provided/ This project has been coordinated through the Reliance process to harmonize efforts and eliminate du	0.000	0.000	Continuing Continuing
<b>D. Acquisition Strategy</b>			
Not Applicable.			
<b>E. Performance Metrics</b>			
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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