

UNCLASSIFIED

PE NUMBER: 0602890F
 PE TITLE: High Energy Laser Research

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2008
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BUDGET ACTIVITY 02 Applied Research	PE NUMBER AND TITLE 0602890F High Energy Laser Research
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Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	55.580	49.949	49.449	53.561	54.558	55.434	54.855	Continuing	TBD
5096 High Energy Laser Research	55.580	49.949	49.449	53.561	54.558	55.434	54.855	Continuing	TBD

(U) **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). 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 interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and the ultra-precision negation of targets in urban environments with no/little collateral damage. In general, efforts funded under this program are 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 chemical lasers, solid state lasers, free electron lasers, laser beam control, and laser lethality mechanisms. This program is part of an overall DoD HEL Science and Technology program. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

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

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Previous President's Budget	52.136	50.303	51.159
(U) Current PBR/President's Budget	55.580	49.949	49.449
(U) Total Adjustments	3.444	-0.354	
(U) Congressional Program Reductions		-0.035	
Congressional Rescissions		-0.319	
Congressional Increases			
Reprogrammings	4.850		
SBIR/STTR Transfer	-1.406		

(U) **Significant Program Changes:**
 Not Applicable.

C. Performance Metrics
 Under Development.

Exhibit R-2a, RDT&E Project Justification

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Cost (\$ in Millions)		FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
5096	High Energy Laser Research	55.580	49.949	49.449	53.561	54.558	55.434	54.855	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) 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). 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 interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and the ultra-precision negation of targets in urban environments with no/little collateral damage. In general, efforts funded under this program are 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 chemical lasers, solid state lasers, free electron lasers, laser beam control, and laser lethality mechanisms. This program is part of an overall DoD HEL Science and Technology program. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Advance solid-state laser development.	14.027	10.271	9.224
(U) In FY 2007: Participated in the 100 kilowatt Joint High Power Solid State Laser (JHPSSL) demonstrations. Analyzed successful efforts from applied research projects (e. g. long-life diode laser drivers, thin-disc amplifiers, and fiber laser amplifiers) for future advanced demonstration of solid state laser systems.			
(U) In FY 2008: Continue to participate in the 100 kilowatt JHPSSL project. Provide independent government-sponsored measurements of the 100 kilowatt lasers. Participate in planning for a joint high-power beam director suitable for mating with a JHPSSL device.			
(U) In FY 2009: Participate in the 100 kilowatt laboratory demonstrations. Continue participation in the joint development of a high-power beam director suitable for mating with a 100 kilowatt JHPSSL device.			
(U) MAJOR THRUST: Mature technologies that will provide system level performance commensurate with fieldable solid-state laser devices.	7.733	8.232	8.456
(U) in FY 2007: Developed technology that will lead to improved laser gain material and single mode fibers suitable for beam combination. Improved the efficiency and reliability of diode pump sources. Conducted Service and Agency proposal call for FY 2007, funded eight projects.			
(U) In FY 2008: Develop technology that will lead to improved fieldability, serviceability, and ruggedness. Develop power scaling architectures with good beam quality and suitable mass and weight. Conduct an industry proposal call			

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<u>B. Accomplishments/Planned Program (\$ in Millions)</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) for FY 2008.				
(U) In FY 2009: Develop technology that will lead to improved fieldability, serviceability, and ruggedness. Develop power scaling architectures with good beam quality and suitable mass and weight. Improve the efficiency and reliability of diode pump sources. Investigate eye-safer laser technologies. Conduct Service and Agency proposal call for FY 2009.				
(U)				
(U) MAJOR THRUST: Investigate new technologies that have revolutionary potential for HEL applications.		2.189	2.411	2.423
(U) In FY 2007: Explored novel laser technologies to increase efficiency and decrease mass/volume. Integrated short-pulse laser technology into this initiative. Conducted a Service and Agency proposal call for FY 2007, funded three projects.				
(U) In FY 2008: Explore novel laser technologies to increase efficiency and decrease mass/volume. Conduct an industry proposal call for FY 2008.				
(U) In FY 2009: Explore novel laser technologies to increase efficiency and decrease mass/volume. Conduct a Service and Agency proposal call for FY 2009.				
(U)				
(U) MAJOR THRUST: Explore free electron lasers (FEL) that have potential in future HEL weapons. Conduct system level technology development and trade studies to facilitate scaling FELs to weapons-class power levels and shipboard integration.		9.463	9.674	9.923
(U) In FY 2007: Demonstrated high average current photocathode and injector capability, suitable beam-breakup thresholds, and power scaling of the optical resonator. Continued component testing with the 14 kilowatt device to define a development path for scaling to 100 kilowatts. Conducted a Service and Agency proposal call for FY 2007, funded six projects.				
(U) In FY 2008: Continue to investigate the development path for scaling to a 100 kilowatt lab demonstration. Conduct an industry proposal call for FY 2008.				
(U) In FY 2009: Continue to investigate the development path for scaling to a 100 kilowatt lab demonstration. Conduct a Service and Agency proposal call for FY 2009.				
(U)				
(U) MAJOR THRUST: Conduct technology experiments to select promising chemical generator and chemical regeneration technologies that can be scaled for weapons application.		7.303	5.690	5.957
(U) In FY 2007: Demonstrated closed-cycle chemical oxygen-iodine laser device. Demonstrated electric-oxygen pumping schemes to minimize the chemistry. Developed electric-gas phase laser generation technologies.				

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		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) B. Accomplishments/Planned Program (\$ in Millions)				
Conducted a Service and Agency proposal call for FY 2007, funded four projects.				
(U) In FY 2008: Investigate closed-cycle chemical lasers. Explore novel concepts on electric-gas phase laser generation.				
Conduct an industry proposal call for FY 2008.				
(U) In FY 2009: Investigate closed-cycle chemical lasers. Explore novel concepts on electric-gas phase laser generation.				
Conduct a Service and Agency proposal call for FY 2009.				
(U)				
(U) MAJOR THRUST: Develop technology to support high performance beam control systems and integrated demonstrations.		8.918	9.615	9.460
(U) In FY 2007: Developed beam control technologies, such as an all-fiber laser with conformal apertures and active controls for boundary layer mitigation. Demonstrated atmospheric compensation technologies. Conducted a Service and Agency proposal call for FY 2007, funded eight projects.				
(U) In FY 2008: Develop/provide beam control technology options for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems). Conduct an industry proposal call for FY 2008.				
(U) In FY 2009: Participate in a joint high-power beam director development effort, suitable for mating with a 100 kilowatt JHPSSL laser device. Develop/provide beam control technology options for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems). Explore advanced component and control techniques for difficult environments such as high speed flight, high turbulence, and extended ranges. Conduct a Service and Agency proposal call for FY 2009.				
(U)				
(U) MAJOR THRUST: Develop a lethality database, and integrate it into a systems-level architecture plan.		3.814	4.056	4.006
(U) In FY 2007: Cataloged existing lethality databases for common use. Developed an architecture plan to consolidate and compare historical data. Initiated laser systems inputs for the Joint Munitions Effect Manual.				
(U) In FY 2008: Integrate lethality data into campaign-level HEL system models. Develop laser systems inputs for the Joint Munitions Effect Manual.				
(U) In FY 2009: Integrate lethality data into campaign-level HEL system models. Develop databases that will be accepted by the HEL community and integrate in validated models for laser systems designers. Develop laser systems inputs for the Joint Munitions Effect Manual.				
(U)				
(U) CONGRESSIONAL ADD: Air Laser Technology Development.		2.133	0.000	0.000
(U) In FY 2007: Investigated production of oxygen deltlets through electric pumping.				
(U) In FY 2008: Not Applicable.				

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(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2009: Not Applicable.			
(U) Total Cost	55.580	49.949	49.449

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u>	<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>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	
(U) PE 0601108F, High Energy Laser Research Initiatives.									
(U) PE 0603444F, Maui Space Surveillance System.									
(U) PE 0603605F, Advanced Weapons Technology.									
(U) PE 0603924F, High Energy Laser Advanced Technology Program.									
(U) PE 0603883C, Ballistic Missile Defense Boost Phase Segment.									
(U) PE 0602605F, Directed Energy Technology.									
(U) PE 0602307A, Advanced Weapons Technology.									
(U) PE 0602114N, Power Projection Applied Research.									
(U) PE 0602120A, Sensors and Electronic Survivability.									
(U) PE 0603004A, Weapons and Munitions Advanced Technology.									
(U) PE 0602702E, Tactical Technology.									
(U) PE 0603175C, Ballistic Missile Defense Technology.									

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BUDGET ACTIVITY

02 Applied Research

PE NUMBER AND TITLE

**0602890F High Energy Laser
Research**

PROJECT NUMBER AND TITLE

5096 High Energy Laser Research**(U) C. Other Program Funding Summary (\$ in Millions)**

(U) PE 0602651M, Joint Non-Lethal
Weapons Applied Research.

(U) PE 0603651M, Joint Non-Lethal
Weapons Technology
Development.

(U) This project has been
coordinated through the
Reliance process to harmonize
efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.