ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602307A - ADVANCED WEAPONS TECHNOLOGY**

	COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
	Total Program Element (PE) Cost	25996	32705	19664	19499	20218	20669	21134
042	HIGH ENERGY LASER TECHNOLOGY	21252	19194	19664	19499	20218	20669	21134
NA5	Advanced Weapons Components (CA)	4744	13511					

A. Mission Description and Budget Item Justification: This applied research program element (PE) investigates advanced technologies for Future Force High Energy Laser (HEL) weapons technology. The major effort under this PE is the development of multi-hundred kilowatt (kW) Solid State Laser (SSL) laboratory device technologies as part of the Joint High Power Solid State Laser (JHPSSL) effort that can be integrated into HEL weapon systems to provide increased ground force protection. The JHPSSL effort is co-funded by the Army, Air Force, and the High Energy Laser Joint Technology Office (HEL JTO). HEL systems are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems. At 100 kW weapon system power levels, SSL technology has the potential to address the following Army capability gaps: 1) Defeat In-Flight Projectiles such as rockets, artillery, mortars, unmanned aerial systems, anti-tank guided missiles, and man-portable surface-to-air missiles; 2) Ultra-Precision Strike with little to no collateral damage; 3) Disruption of Electro-Optical (EO) and Infra-Red (IR) sensors; 4) Neutralizing surface-laid mines and other ordnance from a stand-off distance; and 5) Ultra precise lethal / non-lethal effects against a wide variety of targets. This SSL technology effort addresses technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser effects degradation due to atmospheric effects; lethality against a variety of targets; and effectiveness against low-cost laser countermeasures. Project NA5 funds congressional special interest items. Work in this PE is related to, and fully coordinated with, efforts in PE 0602890F and PE 0603924F (HEL JTO), PE 0605605A (DoD High Energy Laser Systems Test Facility (HELSTF)), PE 0602120A (Army Research Lab Laser Work), and PE 0603004 (Weapons and Munitions Advanced Technology), Project L96. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy and the Army Science and Technology Master Plan. Work is performed by the U.S. Army Space and Missile Defense Command (SMDC), in Huntsville, AL, and the High Energy Laser Systems Test Facility, White Sands Missile Range, NM.

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B. Program Change Summary	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	24061	19342	19791
Current BES/President's Budget (FY 2009)	25996	32705	19664
Total Adjustments	1935	13363	-127
Congressional Program Reductions		-237	
Congressional Rescissions			
Congressional Increases		13600	
Reprogrammings	2613		
SBIR/STTR Transfer	-678		
Adjustments to Budget Years			-127

FY 2007 +2.6M reprogramming for High Energy Laser Technology Demonstrator

Four FY08 congressional adds totaling $13600 were added to this PE.

($1000) Remote Video Weapn Sight, USSOCOM Phase III
($1600) Unmanned Systems Technology Development
($5000) Army Missile and Space Technology Initiative
($6000) Missile Aero-propulsion Computer System (MACS) Modernization

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602307A - ADVANCED WEAPONS TECHNOLOGY**	**042**

COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
042 HIGH ENERGY LASER TECHNOLOGY	21252	19194	19664	19499	20218	20669	21134

A. Mission Description and Budget Item Justification: This applied research project investigates advanced technologies for Future Force High Energy Laser (HEL) weapons technology. The major effort under this project is the development of multi-hundred kilowatt (kW) Solid State Laser (SSL) laboratory device technologies as part of the Joint High Power Solid State Laser (JHPSSL) effort that can be integrated into HEL weapon systems to provide increased ground force protection. This SSL technology effort addresses technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser effects degradation due to atmospheric effects; lethality testing and analysis against a variety of targets; and effectiveness against low-cost laser countermeasures. Initially, a 100 kW SSL and additional HEL technology components will be refined and upgraded to transition into an integrated SSL weapons system demonstrator that will be developed in PE 0603004A, project L96. A secondary effort in this project assesses future laser designs that utilize eye-safe fiber optic lasers. Fiber optic lasers provide excellent beam quality, greater than 35 percent electrical to optical efficiency, and allow for compact packaging that enables integration on 20-30 ton combat vehicles. This effort is also developing adaptive optics technologies and advanced components to increase the defended area that a HEL weapon system could protect. This project also supports laser lethality and propagation assessments against various targets in different environments at tactical ranges both at the High Energy Laser Systems Test Facility (HELSTF) and other laser test facilities, using appropriate lasers and existing assets to support validation of performance and propagation models for SSL simulations. SSL efforts continue to leverage other funds provided by the Office of the Secretary of Defense (OSD) HEL Joint Technology Office (JTO), the Air Force, and the Navy to develop multiple technical approaches to reduce program risk and maintain competition. Work in this project is related to, and fully coordinated with, efforts in PE 0602890F and PE 0603924F (High Energy Laser Joint Technology Office), PE 0605605A DOD High Energy Laser Systems Test Facility (HELSTF), PE 0602120A (Army Research Lab Laser Work), and to PE 0603004 (Weapons and Munitions Advanced Technology), Project L96. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy and the Army Science and Technology Master Plan. Work is performed by the US Army Space and Missile Defense Command (SMDC), in Huntsville, AL, and the High Energy Laser Systems Test Facility (HELSTF), White Sands Missile Range, NM.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
Solid State Laser Effects: In FY07, laser lethality assessments were conducted on an expanded target set representative of identified capability gaps. Began integration of validated models into approved Army war-gaming models. In FY08, perform lethality studies of advanced fuses of candidate Rockets, Artillery, and Mortar (RAM) targets. In FY09, will perform lethality studies of advanced warhead and fuses and Unmanned Aerial System (UAS) components.	1437	1500	1500
Solid State Laser (SSL) Development, Phase 3 - 100 kW: The goal of this Joint High Power Solid State Laser (JHPSSL) Phase 3 effort is to develop and demonstrate 100-kW-class, near-diffraction-limited diode-pumped solid-state lasers that have architectures that are favorable in terms of size, weight, efficiency, affordability, reliability, maintainability, supportability, environmental acceptability (air, land, and maritime), and ruggedness for tactical weapon applications. In FY07, fabricated remaining components, integrated subsystems into laser breadboards, and conducted preliminary performance tests towards integration of two complete 100 kW SSL breadboards. Analyzed best mix of directed energy and kinetic energy technologies against rocket, artillery, and mortar (RAM) targets. Completed the system engineering activities for a System Functional Review of multiple SSL designs that will be incorporated into the High Energy Laser Technology Demonstrator. In FY08, continue laboratory performance testing and increase power output in order to evaluate laser	19815	17156	12164

characteristics and achieve medium power (25 to 50 kW) laser output. In FY09, leveraging joint and other Service funding, as well as technology progress, will complete integration and testing in order to achieve 100 kW performance for evaluation; will select the most promising laser and component technologies for the High Energy Laser Technology Demonstrator (HEL TD); and support systems engineering and ruggedization of the selected SSL Phase 3 technology for use on the mobile HEL TD platform. In FY09, a JHPSSL Phase 3 device will be utilized with an existing beam director at HELSTF to continue evaluation of high power SSL performance at tactical ranges of interest.			
Adaptive Optics and Advanced Component Development: In FY09, the Army, in cooperation with the HEL Joint Technology Office (JTO) and other Services, will research and demonstrate Adaptive Optic (AO) components that would be suitable as a candidate technology for integration into an existing beam control system. This includes development of deformable mirrors (DMs) with high stroke and bandwidth, high power eye-safe illuminators, low-absorbing HEL window and mirror coatings at eye-safe wavelengths, shared aperture optics, and on and off-axis beam director concepts specifically designed for high energy fiber optic laser systems.			5000
High Power Fiber Laser Development: In FY09, will design components for a 25 kW high fidelity fiber laser breadboard. This will be the basis for developing high efficiency (>35%) SSLs that are compatible for integration on future combat system class tactical vehicles, with a goal of demonstrating greater than 100 kW of power in the lab by FY16 at eye-safe wavelengths.			1000
Small Business Innovative Research/Small Business Technology Transfer Programs		538	
Total	21252	19194	19664