UNITED STATES ARMY
SPACE AND MISSILE
DEFENSE COMMAND

SMD–TC
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Technical Center

SSL

Solid State Laser

Summary

- The SSL will be compact, lightweight, all-electric and have excellent atmospheric propagation
- The SSL will enhance the Future Combat System's survivability by defeating Precision Guided Munitions
- A demonstration of intermediate scale hardware will be completed
- The subscale system laser device is being upgraded to a weapons level device

SSL development centers on design and fabrication of a compact, lightweight, all-electric proof-of-principle weapons-level laser device with excellent atmospheric propagation.

The SSL program will develop diode-pumped laser technology to produce a weapons-level laser device. This device will be capable of protecting the Future Force against a variety of threats such as, but not limited to, Anti-Tank Guided Missiles (ATGM's), rockets, artillery, and mortars. Initially the baseline program defined a heat capacity SSL system, identified laser technology risks, and performed risk reduction experiments. Currently, the subscale system device is being upgraded to a weapons level laser device. The SSL will ultimately be tested against dynamic threats at the High Energy Laser Systems Test Facility at White Sands Missile Range, N.M.

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Overview

The Solid State Laser (SSL) program is developing and integrating diode-pumped laser technology and fabricating a proof-of-principal compact weapons-level laser device. The SSL will ultimately be integrated at the High Energy Laser Systems Test Facility at White Sands Missile Range, N.M., where it will be tested against dynamic threats.

Benefits For Tomorrow's Defense

The SSL program directly supports the U.S. Army Air Defense Artillery School's Enhanced Area Air Defense of the Joint Theater Air and Missile Defense Mission Needs Statement dated July 7, 1999. This mission requires laser power levels within a few hundreds of kW's. In addition, the SSL has the potential to directly support the Future Combat System (FCS) Operational Requirements Document (ORD) by enhancing the FCS's survivability by defeating Precision Guided Munitions, rockets, mortars, artillery, and Unmanned Aerial Vehicles.

Technical Concept

Initially, the SSL program defined a baseline heat capacity system, identified laser technology risks, and performed risk reduction experiments. As a part of this risk reduction, a flashlamp pumped single prototype module was designed and built to evaluate illumination uniformity, edge cladding, and wavefront correction subsystems and techniques.

A demonstration of intermediate scale hardware was completed. The single module design was upgraded and replicated to produce a subscale prototype system consisting of multiple flashlamp pumped modules capable of lasing at over 10 kW average power. The next major step involves upgrading the subscale system device to a weapons level by replacing the flashlamp-pumping source with a laser emitting diode-pumping source. This process has been demonstrated on a single disk and on a single module. The single module output power currently averages over 11 kW. This module will soon be upgraded with another disk to produce 15 kW and ultimately with larger disks to produce more than 20 kW. The final step in the process is to replace the flashlamps with diodes on a multimodule device to increase the power and repetition rate by an order of magnitude.

Because the SSL's operational characteristics require it to be compact, lightweight, all-electric and to have excellent atmospheric propagation, the SSL weapon will be demonstrated on highly mobile, lightweight platforms such as the Hybrid Electric High Mobility Multi-purpose Wheeled Vehicle (HE-HMMWV). The recently developed HE-HMMWV (XM1124) offers not only an effective platform, but its diesel-fueled motor/electric generator combination provides a cost-effective power source for a near-term SSL vehicle demonstrator.

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