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Title: DIODE PUMPED LASER IGNITION SYSTEM (DPLIS)

Abstract Text: Diode Pumped Solid State Laser (DPSSL) technology is inherently rugged, compact, and reliable for use as an ignition source for separately loaded large caliber artillery systems. In 2005, a bread board DPLIS was developed, fabricated, and tested in the laboratory at ARDEC and demonstrated that diode laser technology had progressed enough to make diode technology a viable alternative to existing and proposed ignition sources. In March 2007 and again in April 2008 and November 2009 a DPLIS was fired at Yuma Proving Ground on a 155 mm M777A2 Howitzer demonstrating its potential for further development. The presentation will review the current DPLIS and test results.

Current ignition systems used on the M777 lightweight howitzer and the Paladin self-propelled howitzer employ primers. A single gun will use thousands of primers over its lifetime, whose storage, handling and use create safety issues and concerns, operational inefficiencies, extensive training requirements and logistics burdens. Investigating artillery applications of laser ignition began almost 20 years ago with feasibility studies and lab tests. By 1992, a successful proof of principle test was conducted on the M198. In 1993, testing of a fiber coupled laser was initiated during development of the extended range 155 mm XM297 cannon. A fiber coupled laser was mounted in a Paladin and successfully tested, first at the U.S. Field Artillery School in 1995 and again in Kuwait in 1996. Flash lamp pumped laser igniters that were directly mounted to the breech were used for the life of the XM297 Crusader Program as well as the XM1002 Future Combat Systems-Non-Line-Of-Sight Cannon (FCS NLOS-C).

Advancements in laser technology have provided the ability to make solid state laser ignition design improvements that allowed the configuration to change from water-cooled flash lamp units that weighed upwards of 100 lbs to the current spindle mounted diode pumped laser configuration that weighs about 1 lb.

The DPLIS will increase soldier effectiveness and efficiency and will eliminate use of the primer and its associated safety issues/concerns and logistic burdens. Laser ignition is the United States Marine Corp (USMC) number 1 priority for improvement to the M777A2 LW155 howitzer as affirmed at the Field Artillery Conference in Mar 2008. The Office of the Secretary of Defense (OSD) and JPMO LW155 have committed funding under the Solid State Laser Ignition Technology Transition Initiative (TTI) to advance the diode laser technology and mature a solid state laser ignition system (SSLIS) that will replace the primer feed mechanism and primers used with the LW155 howitzer. Furthermore, the DPLIS technology, because of it its size, weight and efficiency, is also adaptable for use with the M109A6 Paladin, and may have applications in other military ignition applications.