LASER TARGET TRIGGERING OF GAS SWITCHES

Dustin L. Sullivan

Dr. Scott Kovaleski, Thesis Adviser

ABSTRACT

Laser target triggering has been investigated at the University of Missouri as a method to reduce the laser energy required to trigger a laser triggered gas switch. Laser targets were solid materials embedded into the cathode of a LTGS that acted as a source of plasma when struck by a triggering laser. The expanding plasma altered the electric field in the switch, resulting in switch closure. Aluminum, graphite and tungsten were chosen as laser target materials based on several criteria including the results of measuring the liberated charge as a function of laser energy in a vacuum. Triggering was performed on the Tiger pulsed power machine which pulse charged a LTGS containing a laser target to between 185 kV and 330 kV. The LTGS was triggered by directing a laser pulse from a Nd:YAG laser onto the laser target. Experiments varied laser energy, spot size on the laser target surface, target material and laser wavelength. The project successfully demonstrated reliable triggering with less than 1 mJ of laser energy with both 1064 and 266 nm wavelength laser pulses. Findings will be used in the design of switches for LTD-based pulsed power accelerators.