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Simulation of a laser triggered vacuum switch[1] ANDREW FIERRO, CHRISTOPHER MOORE, WENG CHOW, LAURA BIEDERMANN, MATTHEW HOPKINS, Sandia National Laboratories — Laser triggered vacuum switches (LTVS) use input laser energy to inject electrons, ions, and neutral material from a trigger target into an electrically stressed vacuum gap. The reliability, power, and high output power of lasers make the LTVS an appealing approach for low-jitter, high voltage switching applications. Modeling of a LTVS allows for optimization of both laser and trigger material parameters for efficient operation. Essential to the laser triggering process is the injection of charged and neutral species at the trigger material surface. As such, a material supply model has been developed and is a function of the input laser intensity, wavelength, and pulse shape. This material model serves as an input flux boundary condition for into a particle-in-cell (PIC), direct simulation Monte Carlo (DSMC) code which simulates plasma growth and gap closure. Two hemispherical electrodes with a gap distance of 500 micron are simulated with the laser propagating axially towards the cathode through a small hole in the anode. An applied potential of several kV establishes an electrostatic potential. Plasma formation for various laser energies and wavelengths are compared to establish general trends of the LTVS.

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