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Experimental Characterization of a Laser-Triggered, Gas-Insulated, Spark-Gap Switch J.F. CAMACHO, D.J. BROWN, Leidos, M.T. DOMONKOS, E.L. RUDEN, A. SCHMITT-SODY, Air Force Research Laboratory, A.P. LUCERO, Boeing LTS, J.P. CANRIGHT, New Mexico Institute of Mining and Technology, R.L. MINER, University of Missouri — We have developed an experimental test bed to characterize the performance of a laser-triggered spark-gap switch as it transitions from photoionization to current conduction. The discharge of current through the switch is triggered by a focused 532-nm wavelength beam from a Q-switched Nd:YAG laser with a pulse duration of about 10 ns. The trigger pulse is delivered along the longitudinal axis of the switch, and the focal spot can be placed anywhere along the axis of the 5-mm, gas-insulated gap between the switch electrodes. The test bed is designed to support a variety of working gases (e.g., Ar, N_2, He, H_2) over a range of pressures. Electrical and optical diagnostics are used to measure switch performance as a function of parameters such as charge voltage, trigger pulse energy, insulating gas pressure, and gas species. Data from our experiments will be used to determine the minimum conditions necessary to induce the breakdown and conduction of a gas-insulated electrode gap in the presence of laser-induced photoionization. The electromagnetic particle-in-cell code ICEPIC will be used to produce numerical simulations of the laser-initiated arc discharge, and the experimental data will be used to validate the calculations.

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