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Evaluation of the Impact of Drive Impedance on the Performance of Spark Gap Switches

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Spark gap switch resistance and inductance are important parameters in pulsed power systems. However, the variation of switch resistance can be a difficult parameter to measure in very high voltage environments where the arc resistance is a small fraction of the total impedance. To improve our ability to model spark gap switches, we built a coaxial geometry system and tested switches with a range of drive impedance. The switch is pressurized with dry air. Testing includes evaluation of switch breakdown when connected to DC charged coaxial cables up to 60-ohms. When the switch closes, the system is discharged through a matched impedance cable into a matched resistance. The relatively simple switch geometry when fielded in a coaxial system allows for setup of a simple, yet accurate circuit model of the system. Circuit models are then compared with the experimental results and adjustments are made to the switch arc resistance model to improve agreement with experimental results. Simulation and experimental results will be presented for a range of switch arc length (1.5-10.0 mm) and cable impedance (11-60 ohms).

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