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Lumped Circuit Model of Multi-Pulse Laser Triggered Gas Switch with Braginskii Resistivity

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L3 Applied Technologies is developing series pulsed forming water transmission lines for Los Alamos National Laboratory. The Series Pulse-Line Integrated Test Stand (SPLITS) consists of a set of four, 5.5 ohm coaxial water pulse forming lines in series. Each water line is capable of producing a -300 kV pulse when driving a matched resistive load.

The University of New Mexico (UNM) is performing SPICE circuit modeling to simulate the performance of SPLITS. Microcap 10 is used as the SPICE program to model the first two, 120ns pulse forming lines with laser triggered, gas filled switches at varying currents and separation distance. One of the challenges of this effort is to model a time-varying resistance of the gas-filled switch. A solution to this is to implement Braginskii's gas arc resistance equation, which is time-varying, within the model. To further improve on the Braginskii model, a time-varying conductivity element will added in. Future work to understand the conductivity of a gas arc as it changes temporally may include time-resolved interferometry can be used to measure radial growth rates and densities. From there a relation can be made to the spitzer conductivity. Ongoing work is seeking to gain further understanding of this model and derive time-varying conductivity from time-resolve radial position measurements.

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