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Pulse-Sharpening Circuit for Explosive Emission Cathode

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Explosive Emission Cathodes (EEC), used for the generation of relativistic electron beams, require short risetime high voltage pulses in order to reduce the extraction of off-energy electrons. To this end a risetime sharpening circuit has been developed at the Los Alamos National Laboratory. The circuit consists of a ~7.8nF water filled peaking capacitor with an integrated self-breakdown switch designed to operate down to -300kV. This unit is intended to reduce the rise time of a 4-stage type E PFN Marx Generator and was used to study the operational characteristics of a planar carbon fiber velvet cathode with respect to varying voltage turnon time. Simulations of the peaking circuit in situ show a reduction in voltage risetime from over 100ns to roughly 20ns. This paper details the simulation, design, and testing of the peaking circuit.

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