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2P47 - Development and Switching Characterization Study of Hot Cathode Thyratron for Pulse Modulator Applications in Linear Accelerator

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High power plasma switches, such as, hot and cold cathode thyratrons have always been the key components of pulsed power systems including pulse modulators, linear accelerators, synchrotron sources, crowbar circuits, cargo scanning systems, sterilization, etc. These switches are classified by their unique pulse characteristics and performances. The unique features of hot cathode thyratron are long lifetime, higher efficiency, moderate rate of current rise (1010A/s), better jitter and high stability. The paper has represented the recent technological efforts made by CSIR-CEERI, India for the design, development and switching characterization of high power 35kV/3KA hot cathode thyratrons for their potential applications in pulse modulators in linear accelerator. The proposed thyratron is a multi-gridded geometry which mainly consists of oxide coated cathode, reservoir/getter, pre-ionize grid, control grid, cathode and anode. The characterization and emission study of the oxide coated cathode in the pre-ionize grid assembly have been performed at different operating conditions in a suitable diode assembly. This has assured for the proper and uniform emission of the electron from the cathode. Deuterium gas has been used in place of hydrogen to improve the hold-off voltage characteristics. The parts and assemblies of the pre-ionizing grid, control grid and anode are designed and fabricated in such a way to have low misfire and quenching free switching at the designed and operating parameters. The switching characterization of the thyratron have been performed for its maximum peak parameters (35kV, 3kA), pulse width of ˜5 µs at different operating conditions. The switching performances have been optimized for the range of different parameters, such as, pressure, cathode current/voltage, reservoir current/voltage, etc. It is showing less than 5 ns jitter which makes it suitable of above mentioned applications. The design, fabrication, processing, development and characterization issues of the thyratron plasma switch have also been presented.

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