Experimental Investigation For Switching Characteristics Of Plasma Switches

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Abstract

The Pseudospark switch is able to control high voltage and high current discharges and operates at low pressure like thyratron but much simpler in construction and does not suffer in electrodes wear. This switch is bipolar and has 100 % reverse current capability, much faster than thyratron and has applications in pulse power modulators, linear accelerators, laser systems etc. These switches have the capability to hold voltages up to 100kV and more & conduct peak current up to 100kAmp and more for pulse widths ranging from hundreds of nanoseconds to tens of microseconds [1, 2]. Such switch has been developed at CEERI Pilani. Electrodes shaping and high voltage gap has been simulated in ESTAT and designed accordingly. The PSS works on the left branch of the Paschen curve [3]. It consists of two hollow electrodes that are Anode and Cathode that communicates through an axial borehole or several holes and a dielectric trigger unit, which provides charge carriers to initiate discharge in the main gap.

Activity on development of such plasma switches started in India at Central Electronics Engineering Research Institute (CEERI) in 1995, with first objective being development of a hydrogen thyratron with 25 kV hold off voltage, 1kA peak current, 1-5 nanoseconds Jitter, and 5-10 kA/microsecond di/dt and up to 10 kHz PRF capability for use in copper vapor laser systems. Subsequently, development of 40 kV, 3 kA deuterium Thyratron was initiated in 1999. The work on Pseudospark switch (PSS) was also started in 1999. Presently, CEERI is engaged in Testing of 25 kV/5 kA sealed-off Pseudospark switch (PSS).

This paper present simulation by ANSYS for temperature distribution at different electrodes and introduction with characterization of 25 kV, 5kA sealed off Pseudospark switch.

Switching behavior has been observed at 25.2 kV and 5.0 kA in hydrogen atmosphere (37 Pa). Thermal expansion at different electrodes with varying temperature observed by using ANSYS simulator tools.

References:

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