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Investigation On Gap Arrangements For Pseudo Spark Based High Current Density Electron Beam Generation K. SINGHAL, S. JAIN, VISHANT ., CSIR-Central Electronics Engineering Research Institute, Pilani, Rajasthan-333031 — In recent time, Pseudo spark (PS) discharge driven devices have been used for strategic applications like millimetre-wave generation and switching. The PS discharge generally operates in the range of 50-500 mTorr gas pressure to create plasma inside the hollow cathode cavity by applying electric field. The formation of plasma inside the hollow cathode cavity depends upon different geometrical design parameters like aperture size and shape, number of gap insulator and arrangement of the inter electrode gap etc. Researchers have worked on the role of aperture, beam shape, aspect ratio, etc. More attention is needed in the direction of gap arrangement for PS based high current density electron beam generation. Therefore, in the present work, analysis of inter-electrode gap structure inside the PS based electron beam source has been performed. Simulation study has been performed for multi gap structures using COMSOL Multiphysics. The delayed breakdown behaviour has been analysed using different multi-gap structures. The number of gaps has been varied between 3 to 8 for different applied gap voltages ranging between 20 kV-40 kV. The simulation studies have been carried out to analyse effects of gap structure on the generation of energetic and high current density electron beam. Comparative analysis has also been performed using self-breakdown experiments by applying gap voltage similar to the simulation studies. These studies will be helpful for design and development of high power sub-THz oscillator.

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