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2P26 - Plasma Simulation and Modeling of Pseudospark Discharge for High Density and Energetic Electron Beam Generation

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Generation of high density and energetic electron beams of short duration are important in growing areas such as the generation of extreme ultraviolet/X-ray radiation, microwaves, THz radiation and for biomedical and radiography applications [1-2]. A pseudospark discharge (PSD) has the ability to produce the combined highest current density (>108A/m2) and brightness (˜1012Am−2rad−2) electron beams with fast current rise times (dI/dt ˜1011 A/s) [2]. Analysis of the PSD has been carried out for the generation of high density and energetic electron beams from single to multi-gap PSD configurations using plasma simulation codes OOPIC-PRO and COMSOL. The generated e-beams are strongly influenced by the gas pressures (20-80 Pa), electrode apertures (2-6 mm), number of gaps (1-4), trigger energy (1-4 kV) and applied voltages, etc. The generated e-beam currents decrease with the increase in electrode apertures while increase with increase in gas pressures. Detailed consideration is required in choosing suitable trigger energy for operation at higher gas pressures and lower cathode apertures in a multi-gap PSD arrangement [3-5]. It is found that there is a decrease in the breakdown voltage for increasing gas pressures and electrode apertures [3-4]. It has been found that potential distributions in the PSD source is very much responsible for confinement of the plasma and generation of high density and energetic e-beams of different peak currents and sizes.

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