

ELECTRON BEAM ANALYSIS OF PSEUDOSPARK SOURCED ELECTRON GUN

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Recently, the pseudospark (PS) discharge is recognized for producing electron beams with the highest combined current density and brightness of any known type of electron sources¹. In the PS discharge there is fast voltage breakdown together with fast current rise and development of complex discharge with different discharge phases useful for high power plasma switches, EUV radiation, high density electron beam generation, etc². In this type of discharge there is self consistent formation of electron beam during the breakdown process¹⁻². We have recently designed and developed a PS discharge based plasma cathode electron gun (PCE-Gun)³. Experimental investigations are carried out using this electron gun at different operating conditions in argon and hydrogen atmospheres. Studies of the production and propagation of the electron beam from the PS discharge has also been carried out. The electron beam profile is investigated in axial and radial direction with the help of circular ring arrangement inside the drift region. It is observed that the electron beam propagates more than 250 mm without external guiding magnetic field. The current density estimation of the focusing and defocusing point of electron beam is also analyzed which is helpful for the development of plasma assisted microwave sources. The PIC simulation complements the results. The plasma generation process by impact ionization is examined from the simulations, showing the effect on supplying the electrons that determine the density of the beam.

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