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Investigations of Ion Confinement by Direct Current Coaxial Glow Discharge

Alaa Abu-Hashem[1,2], Mohamed Ali Hassouba[1,3], Mohamed Mahmoud Masoud[4]
[1]Physics Department, Faculty of Science, Benha University, Benha, Egypt
[2] Physics Department, Education College of Afif City, Shaqra University, Riyadh, KSA
[3]Applied Physics Department, Faculty of Applied Sciences, Taibah University, Madinah, KSA
[4]Plasma Physics Department, Atomic Energy Authority, Cairo, Egypt
Email: hassouba@yahoo.com

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ABSTRACT

A cylindrical dc coaxial glow discharge system with inner grid cathode was designed for ion confinement, and successfully operated with low discharge current. The plasma is formed inside the cylindrical grid cathode. The discharge cur- rent-voltage characteristic curves and Paschen curve are obtained at different gas pressures. Langmuir probes are used to determine the electron temperature and the plasma density. The electron energy distribution functions indicated that, two groups of electrons, appear in radial interval from r = 12 mm up to r = 5 mm. One group of electrons with most probable energy around 1 eV appeared from r = 5 mm up to r = 0 mm. The electron temperature T_e is increased with in- creasing the current and also with moving from the center toward the grid cathode. Poisson's equation is used to calculate the plasma density at different radial positions. The plasma density measured by the single probe is around 10^{15} m^{-3}. A comparison is obtained between calculated plasma density and that measured by Langmuir probes. Experimental and calculated results have the same profile.

Keywords: Inertial Electrostatic Confinement; Virtual Anode; Coaxial Glow Discharge