Contribution ID: **16** Type: **Poster**

Study of Ion Density Profile in Compact-IECF Device in the Presence of External Magnetic Field

The need for a small scale portable neutron source is always immense. The inertial electrostatic confinement (IEC) device is one such device which uses electric field to produce neutron through D-D or D-T fusion [1,2]. In CPP-IPR the maiden IECF device uses deuterium plasma to produce neutron in the order of 10^7 n/s in triple grid cylindrical geometry [3]. The electric field produced due to the high negative voltage applied to the cathode accelerates the deuterium ions to gain energy which can overcome the coulomb barrier and thereby fuse to form neutron as one of the by-product of nuclear reaction [4]. To further increase the neutron production rate (NPR) a small cylindrical geometry IEC device is fabricated and is wrapped with thick copper wire around the device to produce an external magnetic field which will confine the charge particles mainly electron and thus will increase the ion density inside the device. The I-V characteristics of the plasma created inside the device is studied using Langmuir probe diagnostics. The ion density increases when we apply an external magnetic field in comparison whereas it remains the same when no external magnetic field is present. Also the confinement of electrons is more prominent and distinct and gets more narrow as we increase the field strength.

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Session Classification: Technical Session 05

Track Classification: Track 04