STUDY OF DIPOLE-ASSISTED INERTIAL ELECTROSTATIC CONFINEMENT

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A potential opportunity to enhance Inertial Electrostatic Confinement (IEC) fusion exists by augmenting it with a magnetic dipole configuration. The theory is that the dipole fields will enhance the plasma density in the center region of the IEC and the combined IEC and dipole confinement properties will reduce plasma losses. To demonstrate that a hybrid Dipole-IEC configuration can provide an improved neutron source vs. a stand alone IEC, a first model Dipole-IEC experiment was benchmarked against a reference IEC. A triple Langmuir probe was used to find the electron temperature and density. It was found that the magnetic field increases the electron density by a factor of 16, the electron temperature decreases in the presence of a magnetic field while the discharge voltage decreases in the presence of a magnetic field. The electric potential of the dipole can be adjusted to control space charge build-up in the center as the ion density increases. The experimental set-up and plasma diagnostics will be discussed in detail, as well as the results, and the developmental issues. These results are very encouraging for a next step scale-up experiment.