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Overview of Inertial Electrostatic Confinement Plasma Physics Research at the University of Wisconsin[1] JOHN SANTARIUS, GILBERT EMMERT, GERALD KULCINSKI, RICHARD BONOMO, ERIC ALDERSON, GABRIEL BECERRA, LAUREN GARRISON, KARLA HALL, AARON MCEVOY, MATTHEW MICHALAK, CRAIG SCHUFF, University of Wisconsin — In inertial-electrostatic confinement (IEC) fusion devices, a voltage difference between nearly transparent electrodes accelerates ions to fusion-relevant velocities, typically in spherical geometry. University of Wisconsin IEC research has produced $\sim 10^8$ steady-state and $\sim 10^{10}$ pulsed DD neutrons per second, plus $\sim 10^8$ D^3He protons per second [1]. The neutrons have been used to detect highly enriched uranium (HEU) and C-4 explosives; the protons have produced radioisotopes for positron emission tomography at proof-of-principle levels [1]. A new 300 kV, 200 mA power supply will begin operation in 2012, which should increase fusion reaction rates. Presently, the investigation of IEC plasma physics issues at the University of Wisconsin comprises: (1) theoretical analysis of ion and neutral flow through atomic or molecular gases; (2) negative-ion production; (3) fusion of DD, D^3He, and $^3He^3He$; (4) converging ion beams; and (5) ion-surface interactions. Diagnostic development includes: (a) charged fusion product Doppler-shift and time-of-flight; (b) movable Faraday cup; and (c) double Langmuir probe.

[1] G.L. Kulcinski, et al., *Fusion Science and Technology* **56**, 493, (2009).

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