Title: Electron Beam Radiography as a Proposed Plasma Diagnostic

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Intended for: APS Division of Plasma Physics Annual Meeting, Chicago, IL November, 2010
Abstract proposed for submittal to APS Division of Plasma Physics
Annual Meeting, 2010

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Several recent studies have shown that charged particle diagnostics of ICF implosions provide new and useful information on the capsule implosion and the E and/or B fields associated with the finite scale plasma structures [Rygg, Li, Petrasso, et.al. 2008-2010]. Possible mechanisms for the plasma self-generation of these fields have been discussed [e.g., Amendt, et.al., Plas. Phys. Contr. Fus. 2009] but are not fully clear. In the present study, an electron beam (eBeam) radiography system (30MeV in the initial configuration) is proposed which may have significant advantages over the existing methods which use 15 MeV nuclear-fusion driven protons as the charged particle diagnostic ‘point’ source. The relativistic electron beam has a greater penetration (cm2/g) and is predicted to have improved deflection from E or B relative to the scattering from multiple coulomb collisions. The scattering determines the plasma object density image but simultaneously contributes noise to the signal arising from E or B deflections. On-going studies focus on the forward calculation of the eBeam through simple plasma and field test objects. The self-consistent generation of the E or B fields in the dynamic transient plasma may require new computational tools and capabilities. Computations explicitly including multi-species plasma mixing in the presence of E or B fields may be essential to resolve the mixing structures expected at the fuel-capsule interface in ICF implosions.