Contribution ID: **535** Type: **Poster**

ICC/P6-02: Recent Magneto - Inertial Fusion Experiments on FRCHX

Thursday, 11 October 2012 14:00 (4h 45m)

Magneto-Inertial Fusion (MIF) approaches take advantage of embedded magnetic field to improve plasma energy confinement by reducing thermal conduction relative to conventional inertial confinement fusion (ICF). MIF reduces required precision in the implosion and the convergence ratio. Since 2008, AFRL and LANL have developed one version of MIF. We have (1) reliably formed, translated, and captured Field Reversed Configurations (FRCs) in magnetic mirrors inside metal shells or liners in preparation for subsequent compression by liner implosion; (2) imploded a liner with interior magnetic mirror field, obtaining evidence for compression 1.36 T field to 540 T; (3) performed a full system experiment of FRC formation, translation, capture, and imploding liner compression operation; (4) identified by comparison of 2D-MHD simulation and experiments factors limiting the closed- field lifetime of FRCs to about half that required for good liner compression of FRCs to multi-keV, 10ˆ19 ion/cmˆ3, high energy density plasma (HEDP) conditions; and (5) designed and prepared hardware to increase that closed field FRC lifetime to the required amount. Those lifetime extension experiments are now underway, with the goal of at least doubling closed-field FRC lifetimes and performing FRC implosions to HEDP conditions this year. These experiments have obtained imaging evidence of FRC rotation, and of initial rotation control measures slowing and stopping such rotation.
1). G. A. Wurden, T. P. Intrator, et al, LA-UR-08-0796, "FRCHX Magnetized Target Fusion Experiments", IC/P4-13, IAEA 2008 Fusion Energy Conference, Geneva, Switzerland, Oct. 13-18, 2008.

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Session Classification: Poster: P6

Track Classification: ICC - Innovative Confinement Concepts