Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Effect of Atomic and Spatial processes on Implosion of Plasma Liners for Magneto-Inertial Fusion[1] ROMAN SAMULYAK, Stony Brook University / BNL, HEUNGKEUN KIM, LINA ZHANG, Stony Brook University, PAUL PARKS, General Atomics — The effect of ionization and oblique shock waves generated by the merger of high Mach number plasma jets in the concept of plasma liner driven magneto-inertial fusion have been investigated using the FronTier code. For deuterium liners, an analytic EOS containing Saha equations for dissociation and ionization has been used. For high-Z materials such as argon and xenon, an average ionization EOS model that reduces the system of coupled Saha equations to a differential equation has been developed and validated. Energy sinks due to atomic processes caused the increase of the Mach number and the stagnation pressure. In some simulations, the fusion energy gain increased by 30%. 3D simulations of the merger of plasma jets have demonstrated a strong effect of oblique shock waves heating the liner and reducing the Mach number. The stagnation pressure in 3D liners have been reduced by up to two orders of magnitude compared with 1D liners. An influence of non-ideal vacuum in the chamber on the self-implosion of liners has also been investigates.

[1]Supported by DOE HEDLP grant 55906.

Roman Samulyak
Stony Brook University / BNL

Date submitted: 21 Jul 2011 Electronic form version 1.4