Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Concepts for unique laboratory astrophysics experiments on NIF[1]

BRUCE REMINGTON, LLNL — The ability to experimentally study scaled aspects of the explosion dynamics of core- collapse supernovae (massive stars that explode from the inside out) or the radiation kinetics of accreting neutron stars or black holes on high energy density (HED) facilities, such as the new National Ignition Facility (NIF), is an exciting scientific development. ["Experimental astrophysics with high power lasers and Z pinches," B.A. Remington, R.P. Drake, D.D. Ryutov, Rev. Mod. Phys. 78, 755 (2006)] Additional areas of research that could become accessible on NIF are studies of fundamental properties of matter in conditions relevant to the cores giant planets and stars, protostellar jet dynamics, radiatively driven molecular cloud dynamics, hyper-velocity (10-100 km/s) dust-dust collisions, and combined with ultraintense short-pulse lasers, pair plasma generation and dynamics, possibly relevant to gamma-ray burst physics. With the added tool of thermonuclear ignition on the National Ignition Facility, excited state ("multi-hit") nuclear physics studies, and burn physics studies also become possible. Techniques and methodologies for studying aspects of the physics of such extreme phenomena of the universe in submillimeter scale parcels of matter on NIF will be discussed.

[1]This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Bruce Remington
LLNL

Date submitted: 20 Jul 2008 Electronic form version 1.4