Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Frontiers in plasma science: a high energy density perspective[1]
BRUCE REMINGTON, Lawrence Livermore National Laboratory — The potential for ground-breaking research in plasma physics in high energy density (HED) regimes is compelling. The combination of HED facilities around the world spanning microjoules to megajoules, with time scales ranging from femtoseconds to microseconds enables new regimes of plasma science to be experimentally probed. The ability to shock and ramp compress samples and simultaneously probe them allows dense, strongly coupled, Fermi degenerate plasmas relevant to planetary interiors to be studied. Shock driven hydrodynamic instabilities evolving into turbulent flows relevant to the dynamics of exploding stars are being probed. The physics and dynamics of magnetized plasmas relevant to astrophysics and inertial confinement fusion are also starting to be studied. High temperature, high velocity interacting flows are being probed for evidence of astrophysical collisionless shock formation. Turbulent, high magnetic Reynolds number flows are being experimentally generated to look for evidence of the turbulent magnetic dynamo effect. And new results from thermonuclear reactions in dense hot plasmas relevant to stellar interiors are starting to emerge. A selection of examples providing a compelling vision for frontier plasma science in the coming decade will be presented.

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

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Date submitted: 24 Jul 2015 Electronic form version 1.4