mipse
Michigan Institute for Plasma Science and Engineering

Wednesday
October 23, 2013
4:00 pm
Room 1200
EECS Building

Dr. Hui Chen

Lawrence Livermore National Laboratory

Creating Electron-Positron Jets and Plasmas Using Lasers

High-flux jets of electron-positron antimatter with trillion degree temperatures have recently been produced in experiments using high-intensity laser facilities. These breakthrough experiments open up a novel area of experimental high-energy-density plasma astrophysics identified in several recent blue-ribbon assessments. These experiments are on a path toward the production of relativistic electron-positron "pair" plasmas, allowing for interactive study of a state of matter otherwise found only in exotic astrophysical systems such as active galaxies, quasars, gamma ray bursts and black holes – or shortly after the Big Bang. This presentation will begin with the physical processes for making pairs, followed by a summary of results from several large intense laser facilities worldwide in the past few years. The results include the pair jet energy, angular divergence and emittance; their temperature and density; the pair production scaling and collimation by external magnetic fields; their sensitivity to laser intensity (10^{18} – 10^{21} W/cm^2), contrast (10^6 – 10^{10}), and energy (100 – 2000 J). The presentation will conclude with a discussion of future possibilities for exploiting laser-produced pair jets and plasmas.

About the Speaker: Dr. Hui Chen conducts her research at Lawrence Livermore National Laboratory (LLNL). She specializes in experimental laser-plasma physics and x-ray spectroscopy for fusion and astrophysical applications. She earned her Ph.D. from Imperial College, London in 1999, and since then has been at LLNL on various topics. Dr. Chen is a member of the Institute of Physics and the American Physics Society. She earned the Overseas Research Student Award from the Committee of Vice Chancellors and Principals of the Universities of the UK and a fellowship from the International Atomic Energy Agency.