

DPP16-2016-000391

Abstract for an Invited Paper
for the DPP16 Meeting of
the American Physical Society

Building a laboratory foundation for interpreting spectral emission from x-ray binary and black hole accretion disks.

GUILLAUME LOISEL, Sandia National Laboratories, New Mexico, USA

Emission from accretion powered objects accounts for a large fraction of all photons in the universe and is a powerful diagnostic for their behavior and structure. Quantitative interpretation of spectrum emission from these objects requires a spectral synthesis model for photoionized plasma, since the ionizing luminosity is so large that photon driven atomic processes dominate over collisions. This is a quandary because laboratory experiments capable of testing the spectral emission models are non-existent. The models must predict the photoionized charge state distribution, the photon emission processes, and the radiation transport influence on the observed emission. We have used a decade of research at the Z facility to achieve the first simultaneous measurements of emission and absorption from photoionized plasmas. The extraordinary spectra are reproducible to within +/- 2% and the E/dE ~2500 spectral resolution has enabled unprecedented tests of atomic structure calculations. The absorption spectra enable determination of plasma density, temperature, and charge state distribution. The emission spectra then enable tests of spectral emission models. The emission has been measured from plasmas with varying size to elucidate the radiation transport effects. This combination of measurements will provide strong constraints on models used in astrophysics. Sandia is a multi-program laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.