Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Selective Measurement of Rayleigh-Brillouin Scattering in Weakly Ionized Plasmas Using Dispersion from a Mercury Vapor Prism[1]
ANUJ REKHY, Texas A&M University, MIKHAIL SHNEIDER, Princeton University, RICHARD MILES, Texas A&M University — We present here an approach to the instantaneous measurement of the local temperature and density in a weakly ionized plasma through spectral dispersion of the Rayleigh-Brillouin Scattering (RBS) by mercury vapor. A mercury atomic vapor cell in the form of a single or multiple prisms causes light near resonances to be strongly refracted, so the RBS spectrum is dispersed and can be imaged onto a camera or detector array. Mercury has seven stable isotopes and, due to hyperfine splitting, there are 10 distinct absorption lines in the vicinity of 253.7 nm. High dispersion can be achieved by increasing the vapor pressure in the cell containing mercury, and, at relatively high vapor pressure, those lines merge into a single absorption feature of 30 GHz. By selecting a narrow linewidth laser with the wavelength tuned just within the edge of the mercury vapor absorption feature, direct scattering from particles, windows and walls is blocked. However, the wing of the RBS spectrum extends into the transparent region and is refracted by the mercury vapor, and provides a spatial image of the RBS spectrum on a detector placed at a distance from the prism. The linewidth of the RBS yields the kinetic temperature of the weakly ionized gas and the integrated line strength yields the density.

[1]NASA ULI program

Anuj Rekhy
Texas A
M University

Date submitted: 01 Jun 2019 Electronic form version 1.4