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Cavity Enhanced Thomson Scattering for Low Temperature Plasmas AZER YALIN, ADAM FRISS, BRIAN LEE, ISAIAH FRANKA, Colorado State University, Fort Collins, CO, 80523, USA — This contribution describes the design, simulation, and initial experimental development of a novel laser Thomson scattering (LTS) system for measurement of weakly-ionized low temperature plasmas. The LTS approach uses a high power intra-cavity beam of power ~10-100 kW to provide increased scattered photon counts and sensitivity as compared to conventional LTS experiments that use light sources with orders of magnitude lower average power. The high power intra-cavity beam is generated by locking a narrow linewidth source laser to a high-finesse optical cavity via Pound-Drever-Hall locking. The plasma (to be studied) is housed with the high-finesse optical cavity. The high-power source is combined with a detection system comprised of a high-suppression triple monochromator and a low-noise photomultiplier tube used in photon counting mode. We present simulations of signal strengths and scattering spectra including elastic scatter background, detector dark counts, and random (counting) noise contributions. Expected experimental performance is assessed from fits to the simulated data. The number density and electron temperature of a 10^{10} cm^{-3} plasma should be accurately measurable with standard deviation of $<5\%$ in a measurement time of 5 minutes per wavelength channel. We also present experimental development including characterization of laser locking, and initial Rayleigh and Raman signals which will be used to calibrate the Thomson system.

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