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Laser Induced Fluorescence (LIF) Measurement System for Neutral Argon (Ar I) Dynamics in the HelCat Plasma Device at UNM[1]
RALPH KELLY, MARK GILMORE, ALAN LYNN, TIFFANY DESJARDINS, NICK BOYNTON, LUAN NGUYEN, ANDREW SCRUGGS, JORGE ROMERO, Univ of New Mexico — When neutral and ion densities are spatially nonuniform, neutral-ion collisions can exert a torque on a magnetized plasma column via the FxB force, where F is the force exerted on ions by neutrals. This FxB force may have a significant effect on the dynamics of plasma instabilities and flows. In order to investigate the role of neutral dynamics in helicon discharges in the HelCat (Helicon-Cathode) plasma device at U. New Mexico, an Ar I Laser Induced Fluorescence (LIF) system is being developed. Previous passive spectroscopic measurements of Ar I and Ar II lines indicate that the neutral density profile is hollow (higher n_n at larger radius). Additionally, we have not been able to reconcile azimuthal flows measured by Mach probes with those expected from ExB and diamagnetic torques. It is hypothesized that neutrals play an important role in the plasma flow. The LIF system is based on a >250 mW, tunable solid state laser. The laser will pump the metastable $(2P^0_{3/2})4s^2$ level to the $(2P^0_{1/2})4p^2$ level using 696.543 nm light, and observe fluorescence radiation from decay to the $(2P^0_{1/2})4s^2$ level at 772.42 nm. The system design and initial results will be presented.

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