Abstract Submitted
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Argon microplasma diagnostics by diode laser absorption NAOTO MIURA, JUN XUE, JEFFREY HOPWOOD, Tufts University — Argon kinetic gas temperature and line integrated resonance state ($1s_4$) density in argon microplasma at 1-760 Torr were estimated by diode laser absorption. A 900 MHz microstrip split ring resonator (MSRR) was used as the microplasma generator. An argon atomic transition at 810.4 nm ($1s_4$-$2p_7$) was chosen as the absorption line. The wavelength of a single-mode laser diode was tuned by changing the diode case temperature. The absorption line was scanned by modulating the laser driving current. The laser output was collimated and passed through a 0.5 mm hole drilled between the MSRR electrodes where the microplasma was sustained. The absorption profile was fit with a Voigt function. The gas temperature was estimated from the broadening, and the line integrated density of the argon resonance state ($1s_4$) was obtained from the integral of the absorption profile. The line integrated densities of argon $1s_4$ were $1.7x10^{15}$ m^{-3} m at 1 Torr and $1.4x10^{15}$ m^{-3} m at 760 Torr with 1W of input power. The visually observed length of plasma decreased from 1 cm at 1 Torr to a few hundred microns at 760 Torr. The measured gas temperature increased from 350 K at 1 Torr to 750 K at 760 Torr. The microplasma was also simulated using a fluid model, which will be compared with experimental measurements.

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