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Diode laser heterodyne interferometry for refractive index measurement of small-scale plasmas in high pressure gases[1] KEIICHIRO URABE, HITOSHI MUNEOKA, SVEN STAUSS, KAZUO TERASHIMA, The University of Tokyo — The electron density is one of the most important plasma parameters; however, the behavior of the electron density in high-pressure small-scale plasmas (so-called microplasmas) is still not well understood. We have studied the electron density in direct-current microplasmas operated at atmospheric pressure by using laser heterodyne interferometry and reported some results using CO_2 laser as a light source. By measuring the temporal evolutions of the refractive index of the plasmas by the interferometer, the temporal changes of the electron and gas number densities can be derived. Because of its shorter wavelength, using near-infrared diode laser (890 nm) as a light source allows improving the spatial resolution of the measurement over that obtained using a CO_2 laser (10.6 μm). Furthermore, by replacing a lock-in amplifier used in our previous CO_2-laser interferometry by a custom-made phase detecting module, the response time and temporal resolution of the measurements could be improved. Finally, we discuss potentials of the diode laser interferometry for the measurement of electron and gas number densities with the measurement results of pulsed microplasmas operated in atmospheric and higher pressure gases.

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