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Neutral gas depletion through high electron pressures in dense plasmas[1] DEBORAH O'CONNELL, TIMO GANS, DRAGOS CRINTEA, UWE CZARNETZKI, Institute for Plasma and Atomic Physics, CPST, Ruhr-University Bochum, Germany, NADER SADEGHI, Laboratoire de Spectrometrie Physique, University Joseph Fourier and CNRS, Grenoble, France — An inductively coupled radio-frequency (rf) magnetic neutral loop discharge (NLD) allows plasma operation at extremely low pressures, down to 10^{-2} Pa. In this pressure regime ohmic heating is inefficient and collisionless heating mechanisms become dominant. Temporal signatures in the electron energy distribution function (EEDF) are investigated using phase resolved optical emission spectroscopy (PROES) and Thomson scattering. As expected from global model predictions, both the degree of ionisation and the 'electron pressure' strongly increase with decreasing pressure. An interesting feature arises where the electron pressure can exceed the neutral gas pressure resulting in localised depletion of the neutral gas, in particular in the plasma production region around the neutral loop (NL). This depletion of neutral particles is investigated using spatially resolved LIF measurements on argon metastables and TALIF experiments on ground state krypton atoms. Diode laser absorption spectroscopy on metastable argon atoms is used to measure metastable densities and gas temperatures. The ratio of the metastables densities and ground state densities has been found to reflect the electron temperature.

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