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**Measurement of velocity distribution functions of heavy species in weakly ionized plasma flows via single shot coherent Rayleigh-Brillouin scattering.**[1]

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We experimentally demonstrate the use of single shot coherent Rayleigh-Brillouin scattering (CRBS) for the measurement of the velocity distribution function (VDF) of neutral flows, from which macroscopic quantities, such as the flow velocity, density and translational temperature can be extracted. We suggest the use of CRBS for the measurement of the VDF of heavy species in a weakly ionized plasma and report the progress towards that goal. In CRBS, a four-wave mixing technique, a high energy optical lattice of precisely tailored chirped frequency interacts with the medium, such as neutral or ionized gas. The variation of the CRBS signal intensity at different optical lattice phase velocities allows for the restoration of the VDF and the resulting CRBS lineshape is a direct mapping of the medium's VDF. CRBS has already been demonstrated to be the coherent analogue of spontaneous Rayleigh-Brillouin scattering in measuring the temperature, pressure, bulk and shear viscosity, speed of sound and polarizability of a stagnant gas or gas mixture, in a single laser shot [1]. Nanoparticles produced in an arc discharge at atmospheric pressure have also been measured in situ using CRBS [2]. We will discuss the recent progress of single shot CRBS as a gas flow measurement technique and its use in a weakly ionized plasma flow. 1. Gerakis, A., Shneider, M.N. and Barker, P.F., "Single-shot coherent Rayleigh–Brillouin scattering using a chirped optical lattice", Optics Letters, 38(21), pp.4449-4452, (2013). 2. Gerakis, A., Yeh, Y.W., Shneider, M.N., Mitrani, J.M., Stratton, B.C. and Raitses, Y., "Four-wave-mixing approach to in situ detection of nanoparticles", Physical Review Applied, 9(1), p.014031, (2018).

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