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A dual-color, frequency-agile, single-shot CRBS laser system for the measurement of neutral species velocity distribution function in weakly ionized plasmas JUNHWI BAK, ROBERT RANDOLPH, ALEXANDROS GERAKIS, Texas AM University — Resolving the velocity distribution function (VDF) of neutral species in weakly ionized plasmas can expand our understanding of physical interactions between charged and neutral particles. Towards this goal, we present a custom built, dual-color, frequency-agile, single-shot coherent Rayleigh-Brillouin scattering (CRBS) laser system, which is designed specifically to obtain remote, direct measurements of the VDF of neutral particles [1]. CRBS is a four-wave mixing technique in which the interference of two pump beams in a medium generates a moving optical lattice. A third probe beam is Bragg-scattered from the lattice, generating a fourth CRBS signal beam. By scanning the velocity of the lattice within a single laser pulse [2], single-shot CRBS can restore the VDF of neutral particles from the variation of the signal intensity per velocity component. The system is designed to maximize signal-to-noise level in a low-pressure plasma environment, being capable of measuring the VDF at pressures as low as 0.1 Torr. To achieve this, we adopt a three dimensional and two-color phase-matching scheme, details of which and of laser system will be presented in this work. [1] Gerakis, A., Bak, J., and Randolph, R., "A frequency agile, high intensity, two color laser system for single-shot coherent Rayleigh-Brillouin scattering,"Manuscript in Preparation,2020. [2] Gerakis, A., Shneider, M. N., and Barker, P. F., "Single-shot coherent Rayleigh-Brillouin scattering using a chirped optical lattice,"Opt. Lett., Vol. 38, No. 21, Nov 2013, pp. 4449–4452.

Junhwi Bak
Texas A
M University

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