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Anisotropic proton velocity distribution function in plasmas by means of polarization measurement on magnetic dipole transitions

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Polarization of emission lines from atoms or ions in plasma contains information of anisotropy of the electron velocity distribution function [1]. The intensity and the longitudinal alignment of helium emission lines have been used to estimate the anisotropic electron velocity distribution function in a plasma heated by an electron cyclotron resonance microwave[2]. In the magnetic confined plasma various heating mechanism may produce the anisotropy on electron and proton velocity distribution function. Proton impact excitation contributes the upper level population production of the magnetic dipole transitions in ground state configuration. Visible spectral emission lines from magnetic dipole transitions in highly charged argons are observed from plasmas heated by neutral beam injections (160 keV) in the Large Helical Device. The orthogonal linearly polarized components of the emission lines are separated and the line profiles are recorded. The observed polarization degree of the transitions is analyzed with population-alignment collisional-radiative model. The alignment production cross section by the proton impact excitation is scaled with that of the electron impact excitation calculated by means of flexible atomic code[3].

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