# 05pE16P

## カスプ磁場配位ECRプラズマ中でのリチウム原子発光線の偏光分光計測

## Polarization spectroscopy of lithium atomic emission lines in an ECR plasma with a cusp magnetic field

四竈 泰一, 永溝 聡, 北岡 弘行, 藤井 恵介, 打田 正樹[1], 図子 秀樹[2], 岩前 敦[3], 田中 仁[1], 前川 孝[1], 蓮尾 昌裕

Taiichi Shikama, Satoshi Nagamizo, Hiroyuki Kitaoka, Keisuke Fujii, Masaki Uchida[1], Hiedeki Zushi[2], Atsushi Iwamae[3], Hitoshi Tanaka[1], Takashi Maekawa[1], and Masahiro Hasuo

京大院工, 京大院エネ科[1], 九大応力研[2], 福井大遠赤セ[3]

Dept. Eng. Kyoto Univ., Dept. Ene. Sci. Kyoto Univ.[1], RIAM Kyushu Univ.[2], FIR Fukui Univ.[3]

An investigation of the electron velocity distribution function (EVDF), in particular, as for the production and relaxation of anisotropy in the EVDF as a measure of the electron confinement and current-drive, is important to understand the detailed mechanisms of the tokamak plasma startup process assisted by electron cyclotron resonance (ECR) heating and how to optimize it. The diagnostic techniques of EVDF anisotropy—especially applicable in low temperature and density plasmas—have been investigated, *e.g.*, electrical probes, a directional energy analyzer, Thomson scattering, absorption of waves, and polarization in emission of atoms and ions. Among these techniques, the spectroscopy of polarized emission is non-perturbative and can be easily utilized under various plasma parameters by appropriately selecting the emission lines [1]. The degree and direction of the polarization depend on the magnitude and direction of the incident electron velocity. Anisotropy in the EVDF thus can be deduced in principle from the observed degree and direction of polarized emission.

In this paper, we develop a compact thermal lithium atom beam source for spatially resolved measurements of the EVDF anisotropy in ECR plasmas. The beam system is designed such that the ejected beam has a slab shape, and the beam direction is variable. The divergence and flux of the beam are evaluated by experiments and calculations. The developed beam system is installed in an ECR plasma device with a cusp magnetic field, and the LiI 2*s*–2*p* emission (670.8 nm) is observed in a low-pressure helium plasma. The two-dimensional distributions of the degree and direction of the polarization in the LiI emission are measured by a polarization imaging system. The evaluated polarization distribution suggests the spatial variation of the EVDF anisotropy [2].

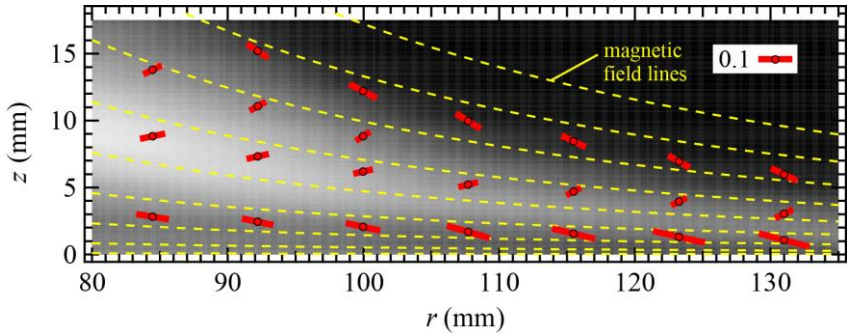


**Figure.** Spatial distribution of the polarization in LiI 2*s*-2*p* emission. The length and direction of the bars represent the degree and direction of the polarization, respectively. The dashed lines show the magnetic field lines ($z$ = 0: cusp axis).

[1] T. Fujimoto and A. Iwamae *ed.*, "Plasma Polarization Spectroscopy" *Springer* (2008).
[2] T. Nishioka, T. Shikama, S. Nagamizo, *et al.*, *Rev. Sci. Instrum.* **84**, 073509 (2013).