Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Plasma spectroscopy using optical vortex laser[1] SHINJI YOSHIMURA, National Institute for Fusion Science, MITSUTOSHI ARAMAKI, Nihon University, KENICHIRO TERASAKA, Kyushu University, YASUNORI TODA, Hokkaido University, UWE CZARNETZKI, Ruhr University Bochum, YUTAKA SHIKANO, Institute for Molecular Science — Laser spectroscopy is a useful tool for nonintrusive plasma diagnostics; it can provide many important quantities in a plasma such as temperature, density, and flow velocity of ions and neutrals from the spectrum obtained by scanning the frequency of narrow bandwidth laser. Obtainable information is, however, limited in principle to the direction parallel to the laser path. The aim of this study is to introduce a Laguerre-Gaussian beam, which is called as optical vortex, in place of a widely used Hermite-Gaussian beam. One of the remarkable properties of the Laguerre-Gaussian beam is that it carries an angular momentum in contrast to the Hermite-Gaussian beam. It follows that particles in the laser beam feel the Doppler effect even in the transverse direction of the laser path. Therefore it is expected that the limitation imposed by the laser path can be overcome by using an optical vortex laser. The concept of optical vortex spectroscopy, the development of the laser system, and some preliminary results of a proof-of-principle experiment will be presented.

[1]This work is performed with the support and under the auspices of NINS young scientists collaboration program for cross-disciplinary study, NIFS collaboration research program (NIFS13KOAP026), and JSPS KAKENHI grant number 25287152.

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Date submitted: 10 Jul 2014 Electronic form version 1.4