Abstract Submitted
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Detection of beam-crossing Doppler shift using an optical vortex beam[1] MITSUTOSHI ARAMAKI, Nihon University, SHINJI YOSHIMURA, National Institute for Fusion Science, YASUNORI TODA, Hokkaido University, TOMOHIRO MORISAKI, National Institute for Fusion Science, KENICHIRO TERASAKA, MASAYOSHI TANAKA, Kyushu University — Optical vortex (OV) beams are a set of solutions of the paraxial Helmholtz equation in the cylindrical coordinates, and its wave front has a spiral shape. The observer in the OV beam feels a three-dimensional Doppler effect, since the OV beam has the three-dimensional spiral wave front. We intend to improve the flexibility of the traditional Doppler spectroscopy using the OV beam. Since the multi-dimensional Doppler shifts are mixed into a single Doppler spectrum, we performed a modified saturated absorption spectroscopy to separate the Doppler components. The OV and plane wave are used as a probe beam and pump beam, respectively. The three-dimensional OV-beam's Doppler shifts define a tilted excitation volume in the velocity space. Therefore, the excitation volume of the plane-wave pump beam slices the tilted excitation volume of the OV beam. Since the configuration of the excitation volume depends on the location in the beam cross-section, the excitation volumes in the velocity space is mapped in the beam cross-section. The beam-crossing Doppler shift was observed as a local absorption dip in the probe-beam cross-section. The detail of optical vortex spectroscopy will be discussed in the presentation.

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