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Doppler-free spectra of Balmer-α line of atomic hydrogen measured by saturation spectroscopy in a linear magnetized plasma source KOICHI SASAKI, Hokkaido University, RENGE ASAKAWA, Nagoya University, MOTOSHI GOTO, National Institute for Fusion Science, NADER SADEGHI, LIPhy, Universite Joseph Fourier — The resolution of conventional laser absorption spectroscopy is limited by Doppler broadening. Saturation spectroscopy is a technique to obtain a Doppler-free resolution, and is widely used in fundamental spectroscopy. However, applications of saturation spectroscopy to plasma diagnostics are rather limited. In this work, we developed a system of saturation spectroscopy at the Balmer-α line of atomic hydrogen with the intention of applying it to diagnostics of the Large Helical Device at the National Institute for Fusion Science. A probe beam (< 1 mW) and a pump beam (< 200 mW) were injected into a hydrogen plasma produced in a linear magnetized plasma source from the counter axial directions. We observed many dip components in the absorption spectrum of the probe beam. The dips were assigned to fine-structure components of the Balmer-α line with Zeeman splitting and their cross-over signals. The saturated absorption spectrum had broadband components in addition to the dips. We examined the depths of the dip and broadband components as functions of the pump laser power, the discharge power, and the discharge pressure.

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