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High resolution measurement of magnetic field by using Lamb-dip LIF spectroscopy KOHEI OGIWARA, YUTA ITOH, YOSHIYUKI KATO, MASAYOSHI TANAKA, Kyushu university, MITSUTOSHI ARAMAKI, Nagoya university, SHINJI YOSHIMURA, National Institute for Fusion Science — Since magnetic field is one of important physical quantities in plasma, several kinds of diagnostics for magnetic field have been developed. The measurements utilizing the Zeeman effect have an advantage of measuring the magnetic field directly from the Zeeman shifted frequency. In addition, the disturbance to the plasma can be minimized by using LIF technique. We have developed a measurement system utilizing Lamb-dip LIF spectroscopy, a kind of saturation spectroscopy, for the precise measurement of the magnetic field. A laser beam of a diode laser, is introduced to a plasma and excites metastable argon atoms in the $4s[3/2]_2^o$ state. The transmitted laser beam is reflected by a mirror and counter-propagates the plasma exactly along the same path. According to the hole burning effect, Lamb dips are observed on the LIF spectrum. The Lamb dip is Doppler-free and has a narrow spectral width ($\sim$50 MHz). By measuring the Zeeman shift of the LIF spectrum with the Lamb dips, we measured the magnetic field of 10^{-1} T with an accuracy of 10^{-4} T. It is found that the Lamb-dip LIF system is capable of determining the magnetic field more precisely than the conventional procedure, in which the LIF spectrum is decomposed into the sub-level distributions using a fitting tool.

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