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Electric field measurements by fluorescence-dip Stark spectroscopy ERIK WAGENAARS, GERRIT KROESEN, Eindhoven University of Technology, The Netherlands, MARK BOWDEN, The Open University, United Kingdom — We used Stark spectroscopy with fluorescence-dip detection to quantitatively measure electric field strengths in the sheath region of a dc glow discharge in xenon. Our laser spectroscopic technique is based on the observation of Stark mixing of Rydberg energy levels in an atom due to external electric fields. In order to quantify the electric field strength, the measured spectra are matched to a theoretical calculation. A 2+1 photon excitation scheme is used to excite xenon atoms from the ground state, through an intermediate 6p state, to high-lying Rydberg levels. During this two-step process, fluorescence light at 828 nm is measured. When scanning the wavelength of the second laser, a reduction (dip) of the fluorescence intensity indicates excitation to a Rydberg state. The theoretical calculation of the Stark shifts and splitting of xenon energy levels is based on solving the Schrödinger equation of a system with a perturbation due to the dipole interaction of the atom with an electric field. In order to test our experimental arrangement we used a simple dc glow discharge. This consisted of two parallel electrodes separated by a 1 cm gap in 800 Pa xenon gas. The applied dc voltage was about 300 V. Axial profiles of the electric field strength in the sheath region were determined by measuring Stark spectra of several *ns* and *nd* levels of xenon atoms in the discharge.

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