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Characterization of charge-induced optical bistability in thermal Rydberg vapor DANIEL WELLER, NICO SIEBER, ALBAN URVOY, TILMAN PFAU, ROBERT LOEW, HARALD KUEBLER, 5th Institute of Physics, University of Stuttgart — Rydberg spectroscopy in thermal vapor has gained an increased popularity due to its promising applicability for integrated devices, e.g. in the context of sensing applications. Under certain conditions, the EIT-like excitation to Rydberg state features a bistable behavior [1]. By performing two experiments with rubidium and cesium vapor, we are able to shed light on the underlying interaction mechanism causing the nonlinear behavior [2]: Due to different properties of these two atomic species, we conclude that the large polarizability of Rydberg states in combination with electric fields of ionized Rydberg atoms is the relevant interaction mechanism. In rubidium, we directly measure the electric field in a bistable situation via two-species spectroscopy, thereby exploiting the DC-Stark-shift on a second Rydberg state. In cesium, we make use of the different sign of the polarizability for different l-states, and apply electric fields. In contrast to previous interpretations [1,3], these experiments allow us to rule out dipole-dipole interactions, and support our hypothesis of a charge-induced bistability. Here, we also discuss our follow-up experiments, studying the plasma properties of the charged vapor that is created. [1] PRL 111, 113901, [2] PRA 94, 063820 [3] PRA 93, 06386

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