

Studying ion-atom interaction with Rydberg atoms —

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We report on our new experimental setup, which aims to extend the methods for observing ion-atom collisions to the ultra-cold quantum regime [1]. Rydberg atoms and molecules will be created by photoassociation and ionized by a novel near-threshold V-type photoionization scheme to initiate the ion-atom interaction [1,2]. First measurements of the long-range interaction between a single rubidium ion and Rydberg atom and the observation of the ion-induced Rydberg excitation blockade are presented [2]. The blockade mechanism is studied over a range of different principle quantum numbers by precisely controlling the ions motion with small electric fields. Further, the ion is used as a highly sensitive single-atom electric field sensor.

[1] T. Schmid et al.: *arXiv* 1709.10488 (2017).

[2] F. Engel et al.: *arXiv* 1809.00993 (2018).

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