

## RUBIDIUM ATOMS ON HELIUM DROPLETS: ANALYSIS OF AN EXOTIC RYDBERG COMPLEX

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Rubidium atoms on the surface of superfluid helium droplets have been excited into Rydberg states. The excitation spectrum of the Rb-He<sub>N</sub> system has been recorded from the 5<sup>2</sup>D state manifold up to the ionization threshold<sup>a</sup> by resonant three-photon-ionization time-of-flight spectroscopy<sup>b</sup>. The observation of droplet size dependent shifts of excited states with respect to bare atom states is explained by a decreased quantum defect and a lowered ionization threshold. Within the scope of a Rydberg model<sup>c</sup> we demonstrate that quantum defects and ionization thresholds are constant for each specific Rydberg series, which confirms the Rydberg character of excited Rubidium states on helium droplets. A set of six Rydberg series could be identified. Individual Rydberg states are observed with effective principle quantum numbers up to  $n^* \approx 19$  and  $l \leq 3$ , for which the expectation value of the electron orbital radius is about ten times larger than the droplet radius.

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<sup>a</sup>M. Theisen, F. Lackner, G. Krois, and W.E. Ernst, *J. Phys. Chem. Lett.*, 2, 2778-2782 (2011)

<sup>b</sup>F. Lackner, G. Krois, M. Theisen, M. Koch, and W.E. Ernst, *Phys. Chem. Chem. Phys.*, 13, 18781-18788 (2011)

<sup>c</sup>J.E. Murphy, J.M. Berg, A.J. Merer, N.A. Harris, and R.W. Field, *Phys. Rev. Lett.* 65, 1861 (1990)