Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Ultralong-range Rydberg Molecules: Investigation of a Novel Binding Mechanism BJÖRN BUTSCHER, VERA BENDKOWSKY, JOHANNES NIPPER, JONATHAN BALEWSKI, Physikalisches Institut, Universität, Stuttgart, Germany, JAMES P. SHAFFER, Physikalisches Institut, Universität and Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma, ROBERT LÖW, TILMAN PFAU, Physikalisches Institut, Universität, Stuttgart, Germany — For highly excited Rydberg atoms, the scattering of the Rydberg electron from a nearby polarizable ground state atom can generate an attractive mean-field potential which is able to bind the ground state atom to the Rydberg atom within the Rydberg electron wave function at binding energies ranging from a few MHz to hundreds of MHz[1]. We present spectroscopic data on the observation of various bound states including the vibrational ground and excited states of rubidium dimers Rb(5S)-Rb(nS) as well as those of trimer states. Furthermore, we show calculations that reproduce the observed binding energies remarkably well and reveal that some of the excited states are purely bound by quantum reflection at a shape resonance for p-wave scattering [2]. To further characterize the coherent excitation of the molecular states, we performed echo experiments.
[1] V. Bendkowsky, B. Butscher, J. Nipper, J. P. Shaffer, R. Löw, T. Pfau, *Nature* ***458****, 1005 (2009)*; [2] V. Bendkowsky, B. Butscher, J. Nipper, J. Balewski, J. P. Shaffer, R. Löw, T. Pfau, W. Li, J. Stanojevic, T. Pohl,and J. M. Rost, *arXiv:0912.4058 (2009)*

Abstract APS

Date submitted: 22 Apr 2010 Electronic form version 1.4