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Probing and manipulating Rydberg atoms with large electric dipole moments

Highly excited Rydberg states of atoms and molecules can possess very large electric dipole moments, exceeding 10000 D for states with principal quantum numbers greater than 51. These electric dipole moments make samples in such states very well suited to (i) the sensitive detection of radio frequency electrical noise, (ii) studies of dipole-dipole interactions [1], and (iii) deceleration and trapping using inhomogeneous electric fields [2,3]. The results of recent experiments in each of these areas involving cold, dense beams of metastable helium atoms will be presented. This work has been performed in the context of the development of chip-based experimental architectures for probing and manipulating Rydberg atoms and molecules. These architectures have applications in studies of atom/molecule-surface interactions, low-energy scattering experiments, and hybrid approaches to quantum information processing [4]. Progress toward the implementation of similar techniques for the preparation of velocity controlled or trapped samples of positronium atoms will also be discussed [5].
[1] D. Comparat and P. Pillet, J. Opt. Soc. Am. B 27, A208 (2010) [2] E. Vliegen, H. J. Wörner, T. P. Softley and F. Merkt, Phys. Rev. Lett. 92, 033005 (2004) [3] P. Lancuba and S. D. Hogan, Phys. Rev. A, 90, 053420 (2014) [4] S. D. Hogan, J. A. Agner, F. Merkt, T. Thiele, S. Filipp and A. Wallraff, Phys. Rev. Lett. 108, 063004 (2012) [5] T. E. Wall, A. M. Alonso, B. S. Cooper, A. Deller, S. D. Hogan, and D. B. Cassidy, Phys. Rev. Lett., In Press (2015)

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