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Exciting and probing polarized strontium Rydberg atoms[1]
MORITZ HILLER, SHUHEI YOSHIDA, JOACHIM BURGDOERFER, Vienna University of Technology, SHUZHEN YE, XINYUE ZHANG, F. BARRY DUNNING, Rice University — Today, Rydberg wave packets in effective one-electron systems can be engineered with high precision. However, the same manipulation schemes are considerably harder to realize in many-electron systems. A typical starting point for the control protocols is an optically accessible state such as a low-ℓ state or a polarized Stark state. Here, we examine the photoexcitation of strontium Rydberg states in an applied dc field and examine their polarization for this two-electron system. In strontium the "nd" states possess high two-photon excitation rates, display a large quantum defect, and are well isolated from their neighboring Stark manifolds. With increasing dc field, the "nd" states mix with this manifold of highly-polarized states. Initially the "nd" states suffer only a very small Stark shift, indicating their weak polarization. However, in fields approaching the n-mixing regime, sizable shifts are seen pointing to strong mixing and creation of strongly-polarized states. A very sensitive probe of their polarization is described which can detect even the weak polarization induced in small dc fields.

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