Characterizing high-$n$ quasi-one-dimensional strontium Rydberg atoms

MORITZ HILLER, SHUHEI YOSHIDA, JOACHIM BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology, SHUZHEN YE, XINYUE ZHANG, F. BARRY DUNNING, Department of Physics and Astronomy, Rice University — The production of high-$n$, $n \sim 300$, quasi-one-dimensional strontium Rydberg atoms by two-photon excitation of selected extreme Stark states in the presence of a weak dc field is examined using a crossed laser-atom beam geometry. The polarization of the product states is probed using three independent techniques which are analyzed with the aid of classical-trajectory Monte Carlo simulations that employ initial ensembles based on quantum calculations using a two-active-electron model. Comparisons between theory and experiment demonstrate that the product states have large dipole moments, $\sim 1.0 - 1.2n^2$ a.u. and that they can be engineered using pulsed electric fields to create a wide variety of target states.

1Research supported by the NSF, the Robert A Welch Foundation, and the FWF (Austria).
2also affiliated with Physikalisches Institut, Albert-Ludwigs-Universität Freiberg