Abstract Submitted
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**Atomic Engineering: Production of Very-High-n Quasi-1D Atoms**[1] J.J. MESTAYER, W. ZHAO, J.C. LANCASTER, F.B. DUNNING, Department of Physics and Astronomy, Rice University, C.O. REINHOLD, Oak Ridge National Laboratory, S. YOSHIDA, J. BURGDORFER, Vienna University of Technology — Quasi-one-dimensional (quasi-1D) atoms can be produced by photoexciting selected Stark states in the presence of a weak dc field. For $n \geq 500$, such direct excitation of quasi-1D atoms becomes problematic because stray fields and effective laser linewidths lead to creation of a range of Stark states with no preferred orientation. We show here that very-high-$n$ quasi-1D atoms can be produced by a multi-step process in which lower-$n$ ($n \sim 350$) quasi-1D atoms are first produced. The excited electron is then localized in phase space near the outer classical turning point at which time it is transferred to a highly-elongated very-high-$n$ orbit using a half-cycle pulse (HCP). This leads to population of a broad distribution of final $n$states centered at $n \sim 580$ which it is shown can be dramatically narrowed by subsequent application of further HCPs. The factors that govern the final $n$ distribution are discussed with the aid of classical simulations. The availability of very-high-$n$ quasi-1D atoms allows the dynamics of the periodically kicked atom to be examined at high scaled frequencies, $\nu_0 \approx 15$. Novel behavior, such as local increases in survival probability with increasing number of kicks, is observed.

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J.J. Mestayer

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