Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Observation of quantum revivals in very-high-n atoms BRENDAN WYKER, J.J. MESTAYER, F.B. DUNNING, Rice University, C.O. REINHOLD, Physics Division, Oak Ridge National Laboratory, S. YOSHIDA, J. BURGDÖRFER, Vienna University of Technology — We demonstrate long-term quantum coherence extending over several hundred orbital periods in very-high-n near-circular wave packets. These are created from strongly-polarized quasi-one-dimensional $n \sim$306 Rydberg states by applying a short pulsed transverse electric field. The resulting wave packet undergoes strong transient localization forming a "Bohr-like" atom. This localization is rapidly lost due to dephasing. At late times, however, repeated quantum revivals are observed indicating that quantum coherence can be maintained over microsecond time scales and that even large mesoscopic systems can display quantum behavior. The experimental observations are well reproduced by quantized classical Monte Carlo simulations. Research supported by the NSF, the Robert A. Welch Foundation, the OBES, U.S. DoE to ORNL, and by the FWF (Austria).

Brendan Wyker
Rice University

Date submitted: 21 Jan 2009 Electronic form version 1.4