

Abstract Submitted
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Electric Dipole Echoes in Rydberg Atoms¹ SHUHEI YOSHIDA, Vienna University of Technology, CARLOS REINHOLD, Oak Ridge National Laboratory, JOACHIM BURGDORFER, Vienna University of Technology, WEI ZHAO, JEFFREY MESTAYER, JIM LANCASTER, F. BARRY DUNNING, Department of Physics and Astronomy, Rice University — We report the first observation of echoes in the electric dipole moment of an ensemble of Rydberg atoms precessing in an external electric field F . Quasi-one-dimensional Rydberg atoms oriented along the x axis are first produced and then subjected to a dc field $F = 20\text{mVcm}^{-1}$ that is suddenly applied in the z direction to create a Stark wavepacket whose evolution is monitored using a half-cycle probe pulse. The wavepacket contains states of different n that precess at different rates leading to dephasing. Rapid reversal of the field $F \rightarrow -F$ at $t = \tau$ is shown to play the role akin to that of a π -pulse in NMR in rephasing the dephased ensemble resulting in the build-up of an echo at $t \sim 2\tau$. The appearance of the echo is explained with the aid of classical trajectory Monte Carlo simulations.

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