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Decoherence of high-ℓ Rydberg wave packets by collisions and electrical noise BRENDAN WYKER, S. YE, Rice University, T. MCKINNEY, University of California, Berkeley, F.B. DUNNING, Rice University, S. YOSHIDA, Vienna University of Technology, C.O. REINHOLD, Oak Ridge National Laboratory, J. BURGDÖRFER, Vienna University of Technology — Quantum revivals in very-high-n ($n \sim$300) high-ℓ Rydberg wave packets generated from parent np states are used to examine decoherence induced by collisions and by the application of "colored" noise from a random pulse generator. In the absence of external perturbations, the high-ℓ wave packets maintain their coherence for periods ~ 1 μs, i.e., for many hundreds of orbits. However, their coherence can be destroyed on submicrosecond timescales by the presence of even small amounts of electrical noise at a rate that depends markedly on the spectral characteristics of the noise. In contrast, measurements over similar timescales with CO_2 target gas at densities of $\sim 10^{11}$ cm^{-3} provide no evidence of collisional dephasing.

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