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Encoding and decoding information in high-n circular wave packets S. YOSHIDA, Vienna University of Technology, C.O. REINHOLD, Oak Ridge National Laboratory, J. BURGDÖRFER, Vienna University of Technology, B. WYKER, F.B. DUNNING, Rice University — Information can be encoded in a Rydberg wave packet comprising a superposition of stationary eigenstates by control of the complex expansion coefficients. Protecting the encoded information against decoherence is a major challenge for high-n states given the sensitivity to external perturbations and is necessary for information retrieval. We demonstrate theoretically and experimentally the extraction of detailed information on the density matrix of very-high-n (> 300) near-circular Rydberg wave packets through Fourier analysis of the quantum beat and quantum revival signals. The remarkably long coherence times, > 1 μs, associated with circular wave packets facilitate the preservation and read-out of information encoded in this matrix. We illustrate the power of the method by determining the angular localization of the components of the wave packet. Research supported by the NSF, the Robert A. Welch Foundation, the OBES, U.S. DoE to ORNL, and by the FWF (Austria).

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