

Abstract Submitted
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Holography with a neutron interferometer DUSAN SARENAC, DAVID G. CORY, DMITRY A. PUSHIN, Institute for Quantum Computing, BENJAMIN HEACOCK, North Carolina State University, MICHAEL G. HUBER, M. ARIF, CHARLES W. CLARK, National Institute of Standards and Technology, CHANDRA B. SHAHI, University of Maryland, CFREF COLLABORATION — We demonstrate the first neutron hologram of a macroscopic object.¹ Using a Mach-Zehnder neutron interferometer in a configuration similar to the optical setup of Bazhenov *et al.*,² our reference beam passes through a fused silica prism that provides a linear phase gradient, and our object beam passes through an aluminum spiral phase plate with a topological charge of $\ell = 2$, which was recently used in studies of neutron orbital angular momentum.³ Interference of reference and object beams in a two-dimensional imaging detector produces the hologram, which is a fork dislocation structure similar to those used to generate atomic^{4,5} and electronic⁶ vortex beams. Our neutron hologram is made in an interferometer in which at most one neutron is present at any given time.

¹D. Sarenac, *et al.*, Optics Express **24**, 22528 (2016).

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⁴H. He, *et al.*, J. Mod. Opt. **42**, 217 (1995).

⁵M. F. Andersen, *et al.*, Phys. Rev. Lett. **97**, 170406 (2006).

⁶B. J. McMorran, *et al.*, Science **331**, 192 (2011).

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