

Abstract Submitted
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Fork

Dislocation

Hologram Created Using Neutron Interferometry¹ M G HUBER, NIST - Natl Inst of Stds Tech, D SARENAC, U. of Waterloo, B HEACOCK, NC State, M ARIF, C W CLARK, NIST - Natl Inst of Stds Tech, D G CORY, U. of Waterloo, C B SHAHI, Tulane U., D A PUSHIN, U. of Waterloo — We report creating a hologram of a fork dislocation image using macroscopic optical elements and a neutron beam. This experiment utilized a perfect-crystal neutron interferometer and our method was a simple adaptation of the two-beam wedge technique introduced by Leith and Upatnieks in the early 1960s. In our case, the object was a spiral phase plate (SPP) that had previously been used to impart orbital angular momentum to neutron waves. In this experiment, one path of the interferometer passes through our neutron-transparent-aluminum, centimeter-sized SPP. The other ‘reference’ path of the interferometer contains linear phase gradient imparted on the neutron’s wave function using a fused silica prism. The resulting interference between these two paths generates a hologram that is a fork dislocation image. Digital reconstruction of this hologram provided information about the phase generated by the SPP, and will be useful in the design of the next generation of neutron OAM experiments. This work paves the way for novel applications of neutron holography, diffraction and imaging.

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Michael Huber
NIST - Natl Inst of Stds
Tech

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