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Spin Orbit States of Neutron Beams

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Neutrons are important probes of matter and they are particularly powerful at characterizing magnetic structures. In order to extend the applications of neutron physics we have developed methods for preparing orbital and spin-orbit states of neutrons. Such states may be prepared for the beam as a whole, or with reference to the coherence length of the neutron wavepacket, which is much smaller than the width of useful beams. I will describe experiments to prepare and characterize neutron beams with specific orbital and spin-orbit structure based on neutron interferometry. The preparation methods of the neutron spin-orbit states induce orbital angular momentum via spin-orbit coupling. The characterization of the spin orbit states is done by directly measuring the correlation between spin and linear momenta.

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