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Precision measurement of the n-4He scattering length using neutron interferometry M.G. HUBER, M. ARIF, D.L. JACOBSON, D.A. PUSHIN, NIST, M.O. ABUTALEB, MIT, T.C. BLACK, UNC-Wilmington, C.B. SHAHI, F.E. WIETFELDT, Tulane U. — The NIST neutron interferometer and optics facility (NIOF) is currently performing a precision measurement of the n-4He scattering length to less than 0.3% relative uncertainty. A neutron interferometer consists of a perfect silicon crystal machined such that there are three separate blades on a common base. Neutrons entering the interferometer are Bragg diffracted in the blades to produce two spatially separate yet coherent beam paths much like an optical Mach-Zehnder interferometer. A sample placed in one of the beam paths of the interferometer causes a phase difference between the two paths. This phase difference is directly related to the sample's scattering length. Neutron scattering lengths are one parameter that can be predicted using advanced theoretical models describing two and three nucleon interactions. In an effort to provide tests and/or benchmarks of these theoretical models, the NIOF has already performed precision measurements of neutron scattering lengths to less than 1% relative uncertainty in several low Z gases: H, D, 3He, and polarized 3He. A preliminary result of this work will be given.

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