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Precision Neutron Scattering Length Measurements with Neutron Interferometry M.G. HUBER, M. ARIF, D.L. JACOBSON, NIST, D.A. PUSHIN, Waterloo U., M.O. ABUTALEB, MIT, C.B. SHAHI, F.E. WIETFELDT, Tulane U., T.C. BLACK, UNC-Wilmington — Since its inception, single-crystal neutron interferometry has often been utilized for precise neutron scattering length, b, measurements. Scattering length data of light nuclei is particularly important in the study of few nucleon interactions as b can be predicted by two + three nucleon interaction (NI) models. As such they provide a critical test of the accuracy 2+3 NI models. Nuclear effective field theories also make use of light nuclei b in parameterizing mean-field behavior. The NIST neutron interferometer and optics facility has measured b to less than 0.8% relative uncertainty in polarized ^{3}He and to less than 0.1% relative uncertainty in H, D, and unpolarized ^{3}He. A neutron interferometer consists of a perfect silicon crystal machined such that there are three separate blades on a common base. Neutrons are Bragg diffracted in the blades to produce two spatially separate (yet coherent) beam paths much like an optical Mach-Zehnder interferometer. A gas sample placed in one of the beam paths of the interferometer causes a phase difference between the two paths which is proportional to b. This talk will focus on the latest scattering length measurement for n-^{4}He which ran at NIST in Fall/Winter 2010 and is currently being analyzed.

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