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Performing an accurate measurement of \Delta b_i of ^{3}He using NSE

Tuesday, 21 March 2023 16:00 (2 hours)

We recently performed measurements of the neutron incoherent scattering lengths for ^{129}Xe and ^{131}Xe. As a part of those measurements the Δb_i of ^{3}He was also measured for a short time, only 6 hours, as a calibration. The results of this measurement indicate a very precise value could be obtained for a typical length experiment on NSE. Theories which take the data from measurements in three-body nuclear systems and predict what should be seen in a 4-body system like ^{4}He or n-^{3}He, which is an essential step needed to check the internal consistency of the three-body force extraction from systems with only three bodies, do not quite agree with the data by amounts too large to be explained only by 4-body forces. Furthermore, in the specific case of the n-^{3}He system, the two best measurements of the n-^{3}He incoherent scattering length differ by 3σ. During the course of our test measurement we found several important experimental and theoretical factors relevant to a measurement with precision beyond the error of the current measurements. We estimate that we could obtain a 1% measurement for b_i of ^{3}He in one week.

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