Measurements of Parity-Odd Gamma Asymmetries from Polarized Neutron Capture

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As part of a long-term program to measure parity violation in polarized neutron capture in the n-p and n-d systems [1], the NPDGamma collaboration has searched for parity violation in several nuclei. In some cases the motivation was to discover a nucleus with a large P-odd gamma asymmetry to act as a monitor for the very small (~10^{-8}) asymmetries expected for n-p and n-d. In other cases nuclei present in the apparatus were studied to ensure that they do not produce an unwanted background asymmetry. We have confirmed the presence of large P-odd γ asymmetries in ^{35}Cl (A_γ=-25.7±6.5 ×10^{-6}) and ^{139}La (A_γ=-17.0±6.1 ×10^{-6}) [2], both consistent with previous measurements. The ^{35}Cl result is furthermore consistent with estimates based on a statistical theory of parity violation in intermediate-mass nuclei. In addition, we have placed upper bounds on P-odd γ asymmetries in ^{27}Al, ^{6}Li, and ^{10}B, which, together with recent ^{10}B results from the ILL [3], suffice to ensure that P-odd backgrounds will be negligible for the sensitivity goal (4×10^{-8}) of the first phase of the search for the P-odd asymmetry in n-p capture, planned at LANSCE in 2005. Figure 1 shows the raw (=uncorrected) asymmetry data for ^{35}Cl of 15±1.6×10^{-6}, accumulated in 4 hours of running at LANSCE.

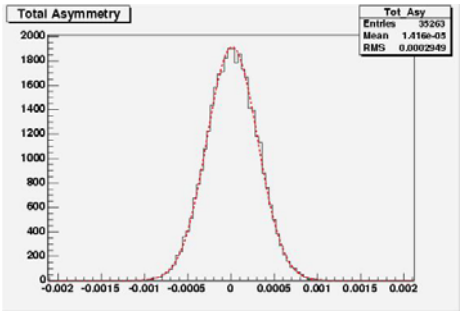

Figure 1. *Distribution of parity-odd angular correlations from polarized neutron capture in ^{35}Cl using the apparatus constructed for the n-p weak interaction experiment at LANSCE.*

1. W.M. Snow *et al.*, Nucl. Instrum. Methods A **440**, 729 (2000); W.M. Snow *et al.*, Nucl. Instrum. Methods A **515**, 563 (2003); and W.M. Snow, J. Res. NIST (2004), in press.
2. G.S. Mitchell *et al.*, Nucl. Instrum. Methods A **521**, 468 (2004).
3. V.A. Vesna *et al.*, Izvestija Acad. Nauk, Ser. Phys. **67**, 118 (2003).