M4-C4 (5:15 pm)

aCORN: A New Measurement of the Electron-antineutrino Correlation Coefficient in Neutron Decay

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The aCORN collaboration plans to measure the electron-antineutrino correlation coefficient ("little a") in neutron decay. "a" is the least well known of the neutron decay coefficients. It's value, when combined with other neutron decay parameters, can be used to determine the weak vector and axial vector coupling constants and to test the validity and self-consistency of the Electroweak Standard Model.

The present accepted value for "a" is -0.103 +/- 0.004. Previous experiments that measured it relied on precise proton spectroscopy and were limited by systematic effects at about the 4% level. We propose a new approach to measuring "a" that uses an experimental asymmetry for which systematic uncertainties promise to be much smaller. The aCORN collaboration plans to reduce the uncertainty in "a" to less than 1%.

The experiment will be constructed and tested at the new LENS pulsed neutron source at IUCF. After commissioning in the spring and summer of 2007 it will be moved to the NG6 beamline at NIST where production running will occur. Detailed design and optimization results of the experimental apparatus will be presented

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M4-C5 (5:30 pm)

Search for the Electric Dipole Moment of the Neutron at SNS

T. M. Ito (Los Alamos National Laboratory)
(The listed author is giving the presentation representing the EDM collaboration)

Physicists have been trying for 50 years now to detect the possible separation of positive and negative electric charges inside the neutron. This quantity, called the Electric Dipole Moment (EDM), is known to violate some of the basic symmetries, and if found to have a finite value, has a large implication for the fundamental theory of elementary particle physics. A new experiment to search for the neutron EDM with a sensitivity more than 2 orders of magnitude higher than the present limit is planned to run at the Fundamental Neutron Physics Beamline at SNS. In this talk, the principle of the experiment, and the status of ongoing R&D will be reviewed and discussed.

M4-C6 (5:45 pm)

Neutron-proton Scattering and Quantum Entanglement

R. Moreh (Ben-Gurion University, Beer-Sheva, Israel), R. Block, Y. Danon, M. Neuman (Gaerttner LINAC Laboratory, Rensselaer Polytechnic Institute, Troy, New York 12180)

Recently, several experiments were reported concerning the observation of a strong anomalous drop, ~ 40%, in the n-p scattering cross section compared to conventional values. The anomalies were reported in ~10 different H-containing samples (such as H_2O, etc.), at room temperature, using 10 eV - 200 eV neutrons. All samples revealed more or less the same effect. This anomaly was explained in terms of short lived (10^{-15} to 10^{-16}s) quantum entanglement of protons. It was suggested that during the very short times of the scattering process, no quantum decoherence is expected to take place. To test the above findings, we used neutrons generated from the RPI electron Linac and the final energy of the scattered neutrons was fixed at 24.3 keV using a pure iron filter. The scattering intensity ratios from H_2O and D_2O were found to agree with conventional values and no anomaly was observed [1]. In another experiment, the n-scattering intensities from CH_2 and C (graphite) were compared at several discrete final energies, of narrow widths between 64 eV and 3 keV. The final energies were selected using a ^{238}U filter. Here we searched for an anomaly in the n-p scattered intensities from CH_2 caused by the neutron coherence length. At such energies and short scattering times (10^{-17} to 10^{-18}s), decoherence is not likely to occur, and proton quantum entanglement was expected to show up clearly. Here again the scattering intensity ratios were found to conform to conventional values and no anomaly was observed [2]. Possible reasons for the above results will be discussed.

[1] *R. Moreh, R. C. Block, Y. Danon, and M. Neuman, Phys. Rev. Lett.* ***94****, 185301 (2005).*

[2] *R. Moreh, R. C. Block, Y. Danon, and M. Neuman, Phys. Rev. Lett.* ***96****, 055301 (2006).*