

emiT: an apparatus to test time reversal invariance in polarized neutron decay

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The emiT experiment tests time-reversal symmetry in the beta decay of polarized free neutrons by searching for the time reversal-odd, parity-even triple correlation between the neutron spin and momentum of both the electron and proton. The detection of this correlation above the small calculable effect due to final state interactions would be a direct indication of time reversal symmetry violation, independent of charge conjugation-parity. In the experiment a beam of cold neutrons is polarized to better than 90% using a supermirror polarizer. Decays are observed using an alternating array of electron and proton detection paddles. The highly symmetric octagonal geometry both reduces systematic effects and increases the detection efficiency relative to many previous experiments. The emiT collaboration has published a result [1] from its first run. A highly successful second run of the emiT experiment has been completed at the NIST Center for Neutron Research. The analysis of this greatly improved data is nearing completion. All systematic effects appear to be well under control and could be reduced further, opening up the possibility of a third run. Such a run should once again be statistically limited and may be able to reach a sensitivity of 5×10^{-5} level depending on available neutron flux.

[1] Phys. Rev. C. 62, 055501, (2000).