Abstract Submitted
for the HAW09 Meeting of
The American Physical Society

Design of a high-precision β-telescope[1] R.H. TERBEEK, REU student from Hillsdale College, Hillsdale, MI, USA, S. BEHLING, D. MELCONIAN, Cyclotron Institute, Texas A&M University, College Station, TX, USA — The question is raised of whether or not parity is maximally violated in the weak interaction, focusing on β decay. Efforts to measure the neutrino asymmetry parameter, B_ν, and how it will provide limits on the existence of a new right-handed W boson are described. In this experiment, a magneto-optical trap is used to laser-cool and confine ^{37}K atoms, which are then polarized using optical pumping techniques. A β-telescope will be used to detect the energy and direction of the e^+s emitted from the decay. This detector will be used in coincidence with a microchannel plate which observes the momentum of the recoiling ^{37}Ar nucleus. The kinematics of the decay allow us to deduce the neutrino's momentum event-by-event, and so by correlating the neutrino's momentum with the initial nuclear spin, we will be able to make a precision measurement of B_ν. The physics of positron detection and constraints on β-telescope design are covered in detail, as well as research into computer simulation methods for the analysis of response functions and the optimization of certain parameters of a β-telescope.

[1]Funded by DOE and NSF-REU program.

R.H. TerBeek
REU student from Hillsdale College, Hillsdale, MI, USA

Date submitted: 03 Aug 2009 Electronic form version 1.4