Abstract Submitted
for the APR08 Meeting of
The American Physical Society

Toward a 0.5 ppm measurement of G_F[1] DAVID WEBBER, University of Illinois at Urbana-Champaign, MULAN COLLABORATION — The weak coupling constant, G_F, is determined most precisely from the mean life of the positive muon, τ_μ. Advances in theory have reduced the theoretical uncertainty on G_F as calculated from τ_μ to a few tenths of a ppm. The remaining uncertainty on G_F is entirely experimental, and is dominated by the uncertainty on τ_μ. The MuLan experiment is designed to measure the muon lifetime to a precision of 1 ppm, a twenty-fold improvement over the previous generation of experiments. We report an intermediate result, $\tau_\mu = 2.197013(24)$ μs (11 ppm), which is in excellent agreement with the previous world average. The mean life was measured using a pulsed surface muon beam stopped in a ferromagnetic target, surrounded by a symmetric scintillator detector array. The new world average $\tau_\mu = 2.197019(21)$ μs determines the Fermi constant $G_F = 1.166371(6) \times 10^{-5}$ GeV^{-2} (5 ppm). Since the intermediate measurement, the detector was instrumented with waveform digitizers, the muon beam rate and beam extinction were increased, and two data sets were acquired on different targets, each containing over 10^{12} muon decays. These data will lead to a new determination of G_F to 0.5 ppm.

[1]This work is supported in part by the U.S. D.O.E., the U.S. N.S.F., and N.C.S.A.

David Webber
University of Illinois at Urbana-Champaign

Date submitted: 11 Jan 2008 Electronic form version 1.4