

Abstract Submitted
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Measuring the lifetime of the muon to 1 ppm with MuLan at PSI¹ DAVID HERTZOG, University of Illinois at Urbana-Champaign, MULAN COLLABORATION — The MuLan collaboration¹ will measure the positive muon lifetime to 1 ppm. This precision will determine the Fermi coupling constant G_F , which sets the strength of the weak interaction, to 0.5 ppm. In addition to its fundamental connection to the structure of the standard model, the μ^+ lifetime is needed as a normalization for muon capture experiments. A ± 12.5 kV electric kicker is used to impose a pulsed structure on the continuous muon beam at the Paul Scherrer Institute, with a bunch of ~ 50 muons arriving within a $5 \mu\text{s}$ beam-on time followed by a $22 \mu\text{s}$ beam-off measuring period. Muons are stopped in a depolarizing target, either amorphous sulfur or Arnokrone-3, to reduce the effects of spin rotation; an external magnetic field is applied to dephase the muons over the accumulation time. A scintillator hodoscope with 170 tile pairs arranged in a truncated icosohedral (“soccer ball”) geometry provides a high level of segmentation to minimize pulse pileup. Similarly, new waveform digitizers will resolve pulses at separations of 4 ns. A dataset is in hand that should provide an initial result with 7 to 10 ppm precision, a factor of ~ 2 better than the current world average, and major production running is scheduled in 2005 and 2006. MuLan is supported by the National Science Foundation and the Department of Energy ¹ U.C. Berkeley - Boston U. - U. Illinois - Istanbul Tech. U. - James Madison U. - U. Kentucky - KVI - PSI

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