

Fundamental symmetries with stopped muons at PSI and TRIUMF - Overview

- EXPTS: μ LAN, TWIST, PIBETA, μ CAP, μ SUN
- US GROUPS: Boston Univ, Univ of Illinois, James Madison Univ, Univ of Kentucky, Pomona College, Texas A&M, Valporaiso Univ and Univ of Virginia
- SCIENCE: fundamental constants, basic symmetries within the Standard Model, higher symmetries beyond the Standard Model, and neutrinos and astrophysics by low energy, high precision experiments.
- μ DECAY: pure leptonic weak process amenable to ultra-high precision measurements.
- μ CAPTURE: nucleon weak interaction complementary to neutron β -decay and nuclear β -decay.

Fundamental symmetries with stopped muons at PSI and TRIUMF - Experiments

- **μLAN:** muon lifetime, Fermi constant, by sequence of accumulating and measuring a “radioactive” μ source, goal of twenty-fold improvement in GF.
- **TWIST:** $\mu \rightarrow e \nu \bar{\nu}$ decay, ρ , δ , ξ parameters, by low mass, high acceptance spectrometer, goal of approx ten-fold improvements in ρ , δ , ξ .
- **PIBETA:** includes $\mu \rightarrow e \nu \bar{\nu} \gamma$ decay, $\bar{\eta}$ parameter, by 4π CsI photon spectrometer, goal of approx ten-fold improvements in $\bar{\eta}$.
- **μCAP:** μ-H lifetime, induced coupling g_p , by innovative high-pressure hydrogen time projection chamber, goal of g_p to $<7\%$ without $p\mu p$ molecular uncertainties.
- **μSUN:** $\mu\text{-D} \rightarrow n \nu \bar{\nu}$ capture, by innovative high-pressure deuterium time projection chamber, $pp \rightarrow \text{dev}$ fusion, νd reactions and calibration of SUN and SNO.

Fundamental symmetries with stopped muons at PSI and TRIUMF - Status

- μ LAN: μ^+ lifetime ± 10 ppm soon \rightarrow goal ± 1 ppm
- TWIST: $\Delta\rho, \Delta\delta, \Delta\xi$ $1-4 \times 10^{-3}$ now \rightarrow goal x3-5 improv.
- PIBETA: includes η $< 3 \times 10^{-2}$ now \rightarrow goal x2-3 improv
- μ CAP: coupling g_p 6.95 ± 1.09 now \rightarrow goal x2 improv.

J. Musser et al., Phys.Rev.Lett.94:101805,2005.

A. Gaponenko et al, Phys.Rev.D71:071101,2005.

B. Jamieson et al., Phys.Rev.D74:072007,2006

D. Pocanic et al, Fall 06 APS meeting, Nashville.

P. Kammel et al, Fall 06 APS meeting, Nashville.