Abstract

The asymmetry of the positron distribution in polarised muon decay provides confirmation that the weak interaction maximally violates parity. Since 1957 the quantity $P_\mu \xi$ has been measured with increasing precision, where P_μ is the polarisation of the muon, and ξ is a parameter describing the asymmetry. Thus far the results have been consistent with the standard model using a $(V - A)$ interaction.

A new measurement of $P_\mu^\pi \, \xi$ using the TRIUMF Weak Interaction Symmetry Test (TWIST) spectrometer is presented in this thesis. The result is a factor of 3.2 more precise than a previous TWIST direct measurement, and a factor of 7.1 more precise than the pre-TWIST value of $P_\mu^\pi \, \xi$. New limits are set on physics beyond the standard model, including the weak decay of right-handed muons, and left-right symmetric models where a $(V + A)$ current is introduced to conserve parity at higher energies.