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Final results for muon decay parameters from TWIST

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Muon decay offers an opportunity to test the Standard Model of particle physics in a purely leptonic low-energy situation where more ambiguous strong interaction processes are essentially absent. The TRIUMF Weak Interaction Symmetry Test (TWIST) was designed specifically to improve by an order of magnitude the precision of the decay parameters rho, delta, and Pmu*xi derived from energy and angle distributions of positrons from polarized positive muon decay. It tests the V-A structure of the decay by comparing the parameters to those predicted by the Standard Model in an analysis permitting more general Lorentz-invariant local terms.

Since the completion of data taking in 2007, a careful analysis has been carried out with the aim of improving upon earlier intermediate results, by reducing systematic uncertainties, estimating residual biases, and evaluating consistency checks. The total uncertainties for rho, delta, and Pmu*xi, representing improvements of 9, 12, and 7 respectively when compared to pre-TWIST experiments, are dominated by systematics. The analysis was blind with respect to the central values of the parameters. The hidden parameters were recently revealed and final results are now available.

The talk will describe muon decay and the way in which we measure it. The experimental apparatus and analysis procedures will be reviewed, with particular attention to the reduction of leading systematic uncertainties. The final results and their uncertainties will be presented along with implications and limitations for physics beyond the Standard Model. Interpretations in terms of left-right-symmetric extensions are shown to be complementary to those from high-energy experiments.

Summary

(representing the TWIST collaboration)

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