The primary focus of the TWIST Collaboration during the past year has been analysis of the data taken during the first physics run in Fall, 2002. The goal of that run was to determine the muon decay parameters $\rho$ and $\delta$ to $\sim 10^{-3}$, a factor of 3-4 improvement on the best previous measurements. This will be an important milestone on the path toward ultimate determinations of the muon decay parameters $\rho$, $\delta$, and $P_{\mu}\xi$ to a few parts in $10^4$. TWIST is a systematics-dominated experiment. Most of the beam time during Fall, '02, was devoted to measurements designed to amplify various systematic effects, and most of the analysis effort since then has been devoted to validating our GEANT simulation of the experiment and minimizing the sensitivity of our pattern recognition and event reconstruction codes to those systematic effects. The basic analysis scheme involves comparison of the measured positron energy-angle spectrum from normal muon decay to the sum of a “standard” spectrum obtained by analyzing Monte Carlo events and derivative spectra that measure deviations of the muon decay parameters from the values assumed by the standard. The muon decay parameters used to generate the Monte Carlo standard spectrum are hidden. This provides a way for TWIST to perform a blind analysis without hiding essentially the entire data set. Initially, progress was constrained by the computing available to TWIST at TRIUMF. In November, TWIST gained access to the Westgrid computer farm at the University of British Columbia for beta-testing. Westgrid, with over 1000 3.0 GHz Xeon processors, represented a dramatic increase in cpu resources. Since then, we’ve performed a broad range of data vs. data, data vs. Monte Carlo, and Monte Carlo vs. Monte Carlo comparisons in order to quantify the systematic uncertainties in the experiment and identify those parts of the Monte Carlo and analysis codes that need improvement.

Our group has continued to contribute to the pattern recognition effort. One of the data sets taken during Fall, '02, explored the impact of additional material mounted downstream of the detector in order to quantify the importance of the material that is located upstream of the detector during routine running. Early analyses indicated that interactions of the decay positrons with the extra material reduces the event reconstruction efficiency by several percent when $0.25 < \cos(\theta) < 0.4$. This is outside the fiducial region of the experiment. However, similar analyses of Monte Carlo events only reproduced approximately half of the observed efficiency loss. A number of significant improvements have been made to the pattern recognition codes while investigating this problem. The analysis codes now identify and remove many of the hits that arise from low-energy delta-ray tracks. They are also far better at identifying tracks that involve hard-scattered positrons. Finally, we are now able to track several different particles within the spectrometer simultaneously. Overall, these changes allow us to analyze events that are far more complex than was practical previously. Recent results with the revised analysis codes show much reduced sensitivity to the presence or absence of the extra material.

The current schedule anticipates the TWIST first physics results will be available in Summer to Fall, 2004.