TRIUMF E614: Determination of Michel Parameters in Normal μ-decay

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Detector construction and software development have been the major thrusts for TRIUMF E614 during the past year. Considerable progress has been made in both areas as indicated below.

A pre-production prototype chamber consisting of two wire planes was completed in the spring of '99 and tested during the summer. The original plan called for beam tests with surface muons. However, a leak developed in the beam stop for the meson lines before the run was carried out. Thus we used the radiation therapy line where proton beams up to a maximum energy of 70 MeV are available. By using range degraders, we were able to map out the performance of the detector over a broad range of ionization energy loss, including that appropriate to the energy loss of surface muons moving through the detector.

The beam tests, and subsequent bench tests, were extremely valuable as they allowed us to find and fix a few problems before going into mass production of chambers. One of the main problems that we discovered was crosstalk among wires. We found that the effect could be substantially reduced by a rather simple change in the lamel which routes signals to the preamplifier boards. With this fix, the cross talk effect has been reduced to a level well below our target value. All preparations for assembling the detector chambers are now complete and most of the parts needed to begin mass construction are in place. Our present goal is to have one half of the drift chamber stack running by late fall.

While the detector construction has been proceeding, mechanical design work has continued on the magnet yoke and detector cradle. The yoke is in the final design stage and is scheduled to be sent out for construction bids in late spring. We anticipate that it will be shipped to TRIUMF during the latter part of the summer. Then the magnet and yoke will be installed in the M13 beam line during September. The detector cradle is the other major piece of hardware that is needed in order to assemble a partial detector stack in the magnet for testing. The conceptual design of the cradle has been completed this year following a major change in the design. The final design for the system is scheduled to be done by June and then it will be sent out for construction. We hope to have it available in September so that half of the detector can be mounted on it and placed in the magnet for a full engineering test run this coming fall.

Software development for pattern recognition has been the main activity of our group during the past year. The decision was made in '99 to use FORTRAN 90 as our operating system. With this in place, a series of pattern recognition algorithms have been developed at TAMU to sort chamber hits into groups, according to the arrival time of the hits, and do the first level of track finding. The effort has focused on Monte Carlo simulated events since we have not yet had our chambers in a solenoidal field. Pattern recognition ultimately will include tracking the incoming muon and the outgoing positron. Much of the code needed to sort positron events is now working with Monte Carlo generated events. The next step is to insure that the code does not get confused from noise and cross talk. These effects must be simulated in the Monte Carlo, which is now underway, in order to test the codes prior to a fall run.