**During 2001, we have the following goals for the use of beam:**

1) Study raw rates and multiplicities
2) Look at individual channels, looking for
   - verification of the channel map
   - dead wires
   - hot wires
3) Online data quality monitors
4) Online tracking (cell level only, no drift times)
5) Tune for high momentum pions, field off
   - Look for WC timing variations
   - Study chamber alignment
6) Stop muons throughout chambers, track positrons
7) Study muon stopping distribution
8) With field on, check that positrons spiral relative to B without bias
9) Obtain a Michel distribution which can be used for
   - determining energy calibrations
   - making preliminary measurements of $\rho$ and $\delta$.

**Effort will be directed according to the following table of systematic uncertainties with the indicated approximate start dates:**

**Non-surface muon contamination** **2000**

cloud muon flux: 9%
cloud muon polarization: 0.3 (opposite that of surface muons)
no systematic uncertainties introduced on the $\rho$, $\delta$, or $\eta$ measurement. +/- 0.5 x $10^{-4}$ on $P_\mu\xi$ Indeed the cloud muon flux will be used to produce an unpolarized beam which will be a useful tool in performing calibrations and in obtaining a cross check on $\rho$.

**Proton beam shift on the existing production target** **2000**

monitor under development. Beam is stable to within 2 mm at present. No effect on $\rho$, $\delta$, or $\eta$ measurement, +/- 0.5 x $10^{-4}$ on $P_\mu\xi$

**Instability of current in the M13 magnets** **2000**

monitoring done in 2000 led to upgrades in the readback for power supplies.
No effect on $\rho$, $\delta$, or $\eta$ measurement, +/- 0.1 x $10^{-4}$ on $P_\mu\xi$

**Positron backgrounds** **2000**

measured during beam studies in 2000. Anticipate effect of much less than 0.1 X $10^{-4}$

**Muon decay in flight (within the spectrometer)** **2001**

Muons decaying within the spectrometer must decay very near the stopping target, or else they will be rejected. Furthermore, muon decay times will be restricted to greater than 500 ns. The effect is expected to contribute less than 0.1 X $10^{-4}$.

**Deviation of average distances in PDC assembly** **2001**

The average wire spacing in the PDC assembly must be known to within 2 microns to avoid distortions of the spectrum. Expected uncertainty is a few parts in $10^{-5}$ for all Michel parameters.

**Random errors in sense wire positions** **2001**

Random errors do not appreciably distort the Michel distribution.

**Magnetic field mapping** **2001**

Field uniformity of one part in $10^4$ results in negligible distortions in the Michel distribution.

**Drift chamber time-zero** **2001**

Jitter of 1 ns will result in an uncertainty of $0.5 \times 10^{-4}$ in the Michel parameters.

**Non-uniformity of detector acceptance** **2001**

The acceptance from $0.3 < x < 1$ and for $0.34 < |\cos(\theta)| < 1$ is expected to be unity within one part in $10^4$. The effect on the Michel parameters is $< 0.1 \times 10^{-4}$.

**Positron energy calibration** **2001**

The energy scale is calibrated by fitting the endpoint of the Michel distribution. This can be done by using a roughly unpolarized beam of cloud muons mixed with surface muons. This beam will produce a distinct endpoint independent of decay angle, which can be fit to considerably better than 10 keV, resulting in a systematic uncertainty in the Michel parameters of less than $0.5 \times 10^{-4}$.

**Effect of incident muon trajectory** **2002**

The principle tool for study of the incident muon trajectories will be the TEC. This will be of importance for the $P_\mu\xi$ measurement.

**Misalignment of B with respect to the beam** **2002**

Supplementary detectors will be used to take MuSR data in the solenoidal field to determine the component of the beam polarization transverse to the field.

**Coulomb scattering of muons inside the production target** **2003**

Coulomb scattering results in depolarization in the production target. This depolarization is linear in the depth in the target. By taking data at increasing depth, we can confirm the calculations and limit depolarization to $\sim 1 \times 10^{-4}$. Again, knowledge of the polarization at this level is of concern only for the measurement of $P_\mu\xi$.

**Depolarization of thermal muon in metal at 2T** **2003**

High purity Al will be used for the final target (Fe, Co, Ni at less then 10 ppm). Sensitivity to target will be tested by using various targets and purities. As well, data can be binned by muon decay time to test for depolarization. This is of importance only for $P_\mu\xi$.