5A

The TWIST is a high precision experiment. Lot of estimations has been done to confirm the declared accuracy of Michel parameters and to estimate an influence of possible imperfections of M13 line, TWIST detector, and mutual alignments on the above accuracy. It is clear for us that the experiment can be done during a short time, if we remove the imperfections. But, a measurement of the imperfections requires a long time running with the real beam, and, after that, an understanding of possible imperfections and reducing of them. We are absolutely sure that will be done with needed accuracy, but we understand also that we would do it at the first time. Some our concerns enumerated below:

$P_\mu\xi$ parameter:

M13 line quality can contributes systematic errors:

• Muon source from 1AT1 production target has a long tail in horizontal direction and therefore a surface muon beam has not so small emittance. A muon depolarization of the beam by fringe field is about $7\cdot10^{-4}$ according to GEANT calculations. It means we need to know the real muon beam emittance and its changes during a run to provide systematic error $< 10^{-4}$. The proposed TEC counter allows register each muon trajectory with needed accuracy before the fringe field area, and calculate the $P_\mu\xi$ depolarization with needed accuracy if we know the fringe field space distribution with accuracy of 10%.

• A shift of proton beam position on the 1AT1 target in horizontal plane will shift surface muon beam momentum and muon stops distribution in stopping target in Z direction. This effect will change a positron energy calibration of the spectrometer and contribute a systematic error to all Michel parameters. The proposed rotation of the 1AT1 target on 45° in horizontal plane allows removing of the influence on muon momentum. The proposed TEC counter registers each muon trajectory and excludes an influence of possible proton shift position in vertical plane. Besides, the new 1AT1 target design provides smaller beam emittance in horizontal plane.

• Magnetic field instabilities of M13 line elements (specially the bending magnet instabilities) change both the momentum and the angle of the beam, and contribute an additional systematic error. Additional current stabilization of M13 elements is needed, together with TEC control, to decrease the error.

• We hope to reduce sufficiently a cloud muon contamination and a possible $P_\mu\xi$ shift with using the above new 1AT1 target design.

•• Conclusion: We will be able to measure the $P_\mu\xi$ parameter with accuracy of 10^{-3} (world value of the error is $8.5\cdot10^{-3}$ (Phys. Let. B194 (1987) 326) without the above upgrades. The upgrade will provide the proposed accuracy of the $P_\mu\xi$ parameter.

ρ and δ parameters:

By contrast with $P_\mu\xi$ parameter an accuracy of ρ and δ practically does not depend on the muon beam quality and defined by the TWIST detector quality and alignment. Some our concerns about possibility to reach the errors of $\cong 10^{-4}$ without some upgrade of the TWIST spectrometer:

• Mutual alignment beam – magnetic field and chamber assembly – magnetic field systems can request a long time running with surface beam and some upgrade of the alignment procedures to reach the accuracy of $\cong 10^{-4}$. On other side, we are sure that we can reach accuracy of $\cong 10^{-3}$ including a $P_\mu\xi$ error without the upgrade (world value of the errors is $2.6\cdot10^{-3}$ and $3.9\cdot10^{-3}$ for ρ and δ correspondingly).
• Chamber assembly inaccuracy gives a contribution to systematic errors of all Michel parameters. Distances inaccuracy between wires is +/- 3μm (requirement is < +/- 20μm). Average distance between wires in a plane is 4mm with precision of < 0.5μm (requirement is < 2μm). Scale nonidentity between Z-axis of the detector (distance between planes) and X, Y-axis (distance between wires) is $< 1.3\cdot10^{-4}$ (requirement is $\leq 5\cdot10^{-4}$). We have not problem with the inaccuracies to reach the proposed accuracy of Michel parameters. Inaccuracy between wire and cathode plane must be < +/- 20μm. Tool for measurement is underway. A possible cathode offset can be reduced for selected removable cathode design.
•• Conclusion: We have a suspicion that above upgrades of the detector will be needed to reach the proposed accuracy of ρ, δ and $P_\mu\xi$ parameters. Accuracy of $\cong 10^{-3}$ can be reached without the above upgrades.

<u>η parameter:</u>
The proposed accuracy of η can be restricted by the above possible detector imperfections also.

<u>**5B**</u>

The role of the TEC is a 2D measurement event-by-event of each muon trajectory to measure and control an influence of beam movements on muon spin depolarization in fringe field first of all. Each muon track in reference Phys. Rev. D34 (1986) 1967-1990 registered by PCs with normal gas pressure. It contributes a systematic error of $5\cdot10^{-4}$ for $P_\mu\xi\delta/\rho$ parameter. The proposed TEC contributes the error of $< 10^{-4}$ according to GEANT calculations.