

Precise Measurement of μ^+ Transverse Polarization in the J-PARC TREK Experiment

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In the planned J-PARC experiment TREK [1], a violation of time reversal invariance (T) is searched for in a measurement of the μ^+ transverse polarization (P_T) in the K meson decay of $K^+ \rightarrow \pi^0 \mu^+ \nu$. If we observe a non-zero P_T value this would imply a violation of T and hence a violation of charge conjugation and parity, *ie.* CP violation. Moreover, this quantity is a sensitive probe of CP violation beyond that contained in the Standard Model. A sensitivity of $\Delta P_T \sim 10^{-4}$ is expected. P_T will be determined in active muon polarimeters by measuring emission angle asymmetry from the muons stopped in a metal absorber. The material of the stopper is an issue in the TREK experiment, since the muon polarization should be preserved without significant depolarization.

In the TRIUMF E1120 experiment [2], we performed both transverse and longitudinal field μ SR measurements using commercially available light element alloys and also pure metals in order to find suitable candidates for the stopper materials which should also function as the drift chamber ground electrodes. Although the relaxation characteristics in several alloys had been previously studied [3], little was known about the commercial alloys which are required for construction of a large polarimeter. It turned out that almost all the Al and Mg alloys tested had relaxation characteristics good enough to be adopted for the stopper material of our TREK polarimeter.

[1] J-PARC TREK proposal; http://www-ps.kek.jp/imazato/E06_proposal.pdf

[2] TRIUMF E1120 proposal; http://www-ps.kek.jp/imazato/E06_muon.pdf

[3] K.W. Kehr *et al.*, Phys. Rev. B26, 567(1982); O. Hartmann *et al.*, Phys. Rev. B37, 4425(1988); J.H. Brewer and K.M. Crow, Ann. Rev. part. Sci. 28, 239 (1978); W.J. Kossler *et al.*, Phys. Rev. Lett. 44, 1558 (1978).