

A next-generation rare pion decay experiment to study LFUV and CKM unitarity

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I will briefly review the interesting collection of flavor anomalies that continue to accumulate from various experiment campaigns. What are they trying to tell us and, might there be connections? To add evidence to the experimental findings, a group of us is forming to develop a next-generation rare pion decay experiment. We aim to improve on the lepton flavor universality violation (LFUV) test in the electron – muon sector with a 10-fold or higher precision measurement of the ratio $R_{\pi} = \frac{\Gamma(\pi^0 \rightarrow e^+ e^- \gamma)}{\Gamma(\pi^0 \rightarrow \mu^+ \mu^- \gamma)}$; the Standard Model theory for this process is already known extremely well. We further aim to improve the measurement of pion beta decay $\pi^+ \rightarrow \pi^0 e^+ \nu_e$ by a factor of 10. Even with a 3-fold improvement, the ratio of this process to the related decay $\pi^+ \rightarrow \pi^0 \mu^+ \nu_\mu$ will already shed light on the question of 1st-row CKM unitarity. A 10-times better measurement will produce the cleanest stand-alone determination of V_{ud} . I will describe our experimental concept, which is based on state-of-the-art detector and electronics concepts, and lessons learned from previous rare pion decay experiments.

What is your topic?

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