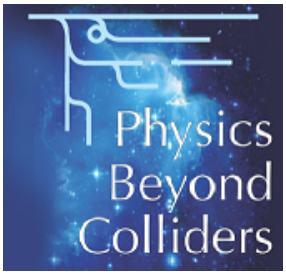

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Prospects for an experiment to measure BR(K_L to pi0nubarnu) at the CERN SPS

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Precise measurements of the branching ratios (BRs) for the flavor-changing neutral current decays $K \to \pi\nu\bar{\nu}$ can provide unique constraints on CKM unitarity and, potentially, evidence for new physics. It is important to measure both decay modes, $K^+ \to \pi^+\nu\bar{\nu}$ and $K_L \to \pi^0\nu\bar{\nu}$, since different new physics models affect the rates for each channel differently. The NA62 experiment at the CERN SPS is currently collecting data and should measure BR($K^+ \to \pi^+\nu\bar{\nu}$) to within 10% by 2018; there are plans to measure BR($K_L \to \pi^0\nu\bar{\nu}$) with similar precision at a successor to the KOTO experiment at J-PARC using a low-energy secondary beam, but no official proposal has yet been made. We are investigating the feasibility of performing a measurement of BR($K_L \to \pi^0\nu\bar{\nu}$) using a high-energy secondary neutral beam at the CERN SPS in a successor experiment to NA62.
The planned experiment would reuse some of the NA62 infrastructure, including possibly the NA48 liquid-krypton calorimeter; the measurement technique is complementary to that of KOTO Step 2 and would provide comparable sensitivity. The mean momentum of K_Ls decaying in the fiducial volume is 70 GeV. This causes decay products to be boosted forward, so that less demanding performance is required from the large-angle photon veto detectors. On the other hand, the layout poses particular challenges for the design of the small-angle vetoes, which must reject photons from K_L decays escaping through the beam pipe amidst an intense background from soft photons and neutrons in the beam. We present some preliminary conclusions from our feasibility studies, with an emphasis on the design challenges faced and the sensitivity obtainable for the measurement of BR($K_L \to \pi^0\nu\bar{\nu}$).

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