

PEN Experiment: a Precise Test of Lepton Universality

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$V-A$ helicity suppression of the $\pi^+ \rightarrow e^+ \nu(\gamma)$ decay (known as “ π_{e2} ”) amplifies the sensitivity to pseudoscalar terms by a factor of ~ 8000 , enabling indirect searches for non-SM pseudoscalar terms, as well as scalar and tensor terms, through loop effects, with good sensitivity to interesting regions of the beyond-SM parameter space (e.g., supersymmetric extensions). The ratio $R_{e/\mu}^\pi = [\Gamma(\pi \rightarrow e \bar{\nu}(\gamma))] / [\Gamma(\pi \rightarrow \mu \bar{\nu}(\gamma))]$ provides the current best limit on the universality of W coupling to the e and the μ , with broad implications, including in the neutrino sector. Recent LHCb data on $B^0 \rightarrow K_0^* \ell^+ \ell^-$ decays, coming on the heels of previous measurements from Belle and BaBar, have focused new interest on possible violation of lepton universality. The PEN collaboration is at the threshold of obtaining new results for $R_{e/\mu}^\pi$ at sub- 10^{-3} precision from measurements completed at PSI several years ago. We discuss the status of the PEN data analysis and the expected uncertainty limits, as well as complementarity with results of high-energy studies.

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