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Lepton Universality Violations by Kaluza-Klein Neutrinos in $b \to c\tau\nu$ Transition

A new world average calculated using the data from Belle, BaBar, and LHCb collaborations in 2022 yielded $R_D^{ave} = 0.358 \pm 0.028$ and $R_{D^*}^{ave} = 0.285 \pm 0.013$. The combined new world average has the largest pull of 4.1σ from SM predictions after incorporating all the recent developments in $B \to D^{(*)}$ that include form factors for predicting $R_{D^{(*)}}^{SM}$. However, even if we include the most recent results from LHCb using the data collected in 2015 and 2016 the global picture of the most updated combined world average does not change. In this paper, we show how the anomaly can be explained by the cumulative effects of three right-handed neutrinos Kaluza-Klein (KK) modes propagating in extra dimensions. In the presence of only two extra dimensions, the neutrino bounds for the size of extra dimensions are $R < 0.2\mu m$ and $R < 0.1\mu m$, for NO and IO, respectively. The lower limits for the fundamental scale M_F must be 110 TeV and 128 TeV for NO and IO, respectively, to satisfy these bounds. With Yukawa coupling strength $h_\tau = 5$, the predictions in KK model for R_D and R_{D^*} are 0.303 (0.301) and 0.258 (0.257), for NO and IO, respectively.

Secondary category for the parallel session (optional)

Flavor Physics

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