

Mini-workshop on $D(^*)$ tau nu and related topics

Contribution ID : 9

Upsilon and psi leptonic decays as probes of solutions to the $R(D(^*))$ puzzle

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Content :

Experimental measurements of the ratios $R(D(^*)) = \Gamma(B \rightarrow D(^*) \tau \nu) / \Gamma(B \rightarrow D(^*) l \nu)$ ($l=e, \mu$) show a 3.9 sigma deviation from the Standard Model prediction. In the absence of light right-handed neutrinos, a new physics contribution to $b \rightarrow c \tau \nu$ decays necessarily modifies also $b\text{-bar} b \rightarrow \tau^+ \tau^-$ and/or $c\text{-bar} c \rightarrow \tau^+ \tau^-$ transitions. These contributions lead to violation of lepton flavor universality in, respectively, Upsilon and psi leptonic decays. We analyze the constraints resulting from measurements of the leptonic vector-meson decays on solutions to the $R(D(^*))$ puzzle. Available data from BaBar and Belle can already disfavor some of the new physics explanations of this anomaly. Further discrimination can be made by measuring $\text{Upsilon}(1S,2S,3S) \rightarrow \tau \tau$ in the upcoming Belle II experiment.

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