Contribution ID: 9

Type: not specified

Resolution of R_D-R_{D^*} puzzle

One of the exciting results in flavor physics in recent times is the R_D/R_{D^*} puzzle. The measurements of these flavor ratios performed by the B-factory experiments, BaBar and Belle, and the LHCb experiment are about 4σ away from the Standard Model expectation. These measurements indicate that the mechanism of $b \to c\tau\bar{\nu}$ decay is not identical to that of $b \to c(\mu/e)\bar{\nu}$. This charge lepton universality violation is particularly intriguing because these decays occur at tree level in the Standard Model. In particular, we expect a moderately large new physics contribution to $b \to c\tau\bar{\nu}$. The different types new physics amplitudes, which can explain the R_D/R_{D^*} puzzle, have been identified previously. In this letter, we show that the polarization fractions of τ and D^* and the angular asymmetries A_{FB} and A_{LT} in $B \to D^*\tau\bar{\nu}$ decay have the capability to uniquely identify the Lorentz structure of the new physics. A measurement of these four observables will lead to such an identification.

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