

Tau polarizations in $B \rightarrow D\tau\nu$ decays from final-state kinematics

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The semileptonic decays $B \rightarrow D^{(*)}\tau\nu$ have received lots of attention recently, due to an observed discrepancy between standard-model predictions and measurements. Experimentally, these processes are challenging due to the fast decay of the tau lepton, which is indirectly observed through its decay products. From a theory perspective, the tau lepton is exactly what makes $B \rightarrow D^{(*)}\tau\nu$ decays interesting: The massive lepton offers the possibility to probe its polarization states individually and thereby learn about the details of its production process. I will show how to extract the tau polarizations from kinematics of the visible decay products in $\tau \rightarrow \pi\nu$, $\tau \rightarrow \rho\nu$, and $\tau \rightarrow \ell\nu\bar{\nu}$ decays. These new observables provide us with an analytical framework to fully explore the properties of $B \rightarrow D^{(*)}\tau\nu$ decays at BELLE II and LHCb.

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