

Improved studies of $B \rightarrow D^{(*)} \tau \nu$ with vertexing at Belle II

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BABAR, Belle, and LHCb measure the rates for the decays $B \rightarrow D^{(*)} \tau \nu$ and $B_c \rightarrow J/\psi \tau \nu$ to be higher than the SM expectations, with a combined discrepancy of 4.1σ (for $B \rightarrow D^{(*)} \tau \nu$ only) or $\sim 4.3\sigma$ (including all modes). In the coming years, Belle II and LHCb will greatly improve the measurement precision, to the level that systematic uncertainties associated with the background $B \rightarrow D^{**} \ell \nu$ become critical. We show how to utilize Belle II's high spatial resolution to obtain a model-independent handle on this background and improve the overall signal-background. We also study the impact of vertexing on Belle II's capability to perform this measurement with the decay $\tau \rightarrow 3\pi \nu$, as already demonstrated by LHCb.

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