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Probing BSM Physics in $B \to D^{*+}\ell^-\bar{\nu}$ Using Monte Carlo Simulation

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Several experimental measurements of b-decays have suggested the presence of physics beyond the Standard Model (BSM). One set of such measurements are the decay modes $B \to D^{*+}\ell^-\bar{\nu}$ with $\ell = e, \mu$, and τ. A recent analysis of 2019 Belle data found $\Delta A_{FB} = A_{FB}(B \to D^*\mu\nu) - A_{FB}(B \to D^*e\nu)$ to be 4.1σ away from the SM prediction. Improved simulation and analysis tools are needed in order to more effectively probe these new physics (NP) possibilities. We have developed a Monte-Carlo event generator tool based on the EVTGEN framework to simulate NP signatures in $B \to D^{*+}\ell^-\bar{\nu}$, which arise due to the interference between the SM and NP amplitudes. We have also simulated several example NP scenarios which are able to explain the ΔA_{FB} anomaly, while remaining consistent with experimental constraints. We also show that Δ-type observables allow for definite signals of NP by removing most QCD uncertainties from the form factors, and introduce several correlated observables that allow for more sensitivity to NP.

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