Contribution ID: **444** Type: **Parallel Talk**

A New Tool for Detecting BSM Physics in $B \to K^* \ell\ell$ Decays

Saturday, 9 July 2022 17:00 (17 minutes)

Flavor-changing neutral current (FCNC) processes such as $b \to s\ell\ell$ do not occur at tree-level in the Standard Model (SM), which makes them sensitive probes of physics beyond the standard model (BSM). Intriguing BSM hints in $b \to s$ transitions have been observed by multiple flavor physics experiments, LHCb, Belle, BaBar, and Belle II. We have upgraded the event generator EvtGen to model $B \to K^* \ell^+ \ell^-$ with improved SM decay amplitudes and amplitudes for possible BSM physics contributions, implemented in the operator product expansion in terms of Wilson coefficients; this upgraded event generator can then be used to investigate the experimental sensitivity to the most general BSM signal resulting from dimension-six operators with properly simulated BSM scenarios, interference between SM and BSM amplitudes, resonance effects, and correlations between different BSM observables as well as acceptance bias. We demonstrate the prospects for improved measurements with $B \to K^* \ell\ell$ decays from the expected 50 ab^{-1} dataset of the Belle II experiment with a four-dimensional unbinned maximum likelihood fit. We show that Δ-observables mitigate uncertainties due to QCD effects and appear ideally suited for Belle II with the large data sets expected in the next decade. Belle II also has excellent sensitivity to New Physics (NP) in the Wilson coefficients C_7 and C_7', which appear at low q^2 in the di-electron channel.

In-person participation

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Session Classification: Quark and Lepton Flavour Physics

Track Classification: Quark and Lepton Flavour Physics