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Approved plots: Early Phase III Data performance through reconstruction of untagged $B \to D^* l \nu_l$ decays with 0.41 fb^{-1} Data

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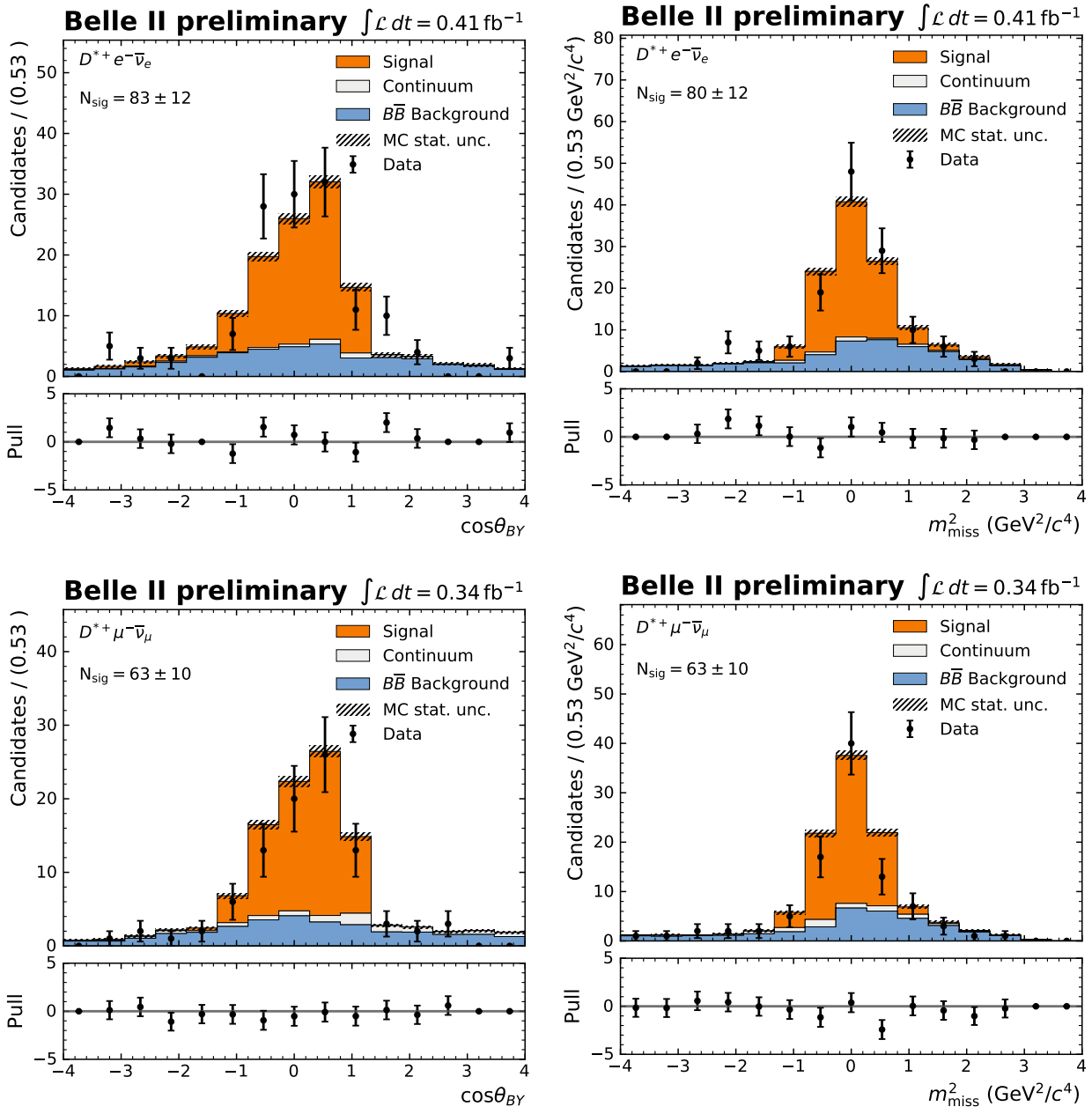

FIG. 1: The Maximum likelihood fit to $\cos\theta_{BY} = \frac{2E^*_B E^*_Y - M^2_B - m^2_Y}{2p^*_B p^*_Y}$ and $m^2_{\text{miss}} = \left(\frac{P_{ee}}{2} - P^*_Y\right)^2$ distributions of untagged $\bar{B}^0 \to D^{*+}l^-\bar{\nu}_l$ candidates using 0.41 fb^{-1} of collision Data, where E^*_Y, p^*_Y, P^*_Y,and m_Y are the center-of-mass (CM) energy, three momentum, four momentum and invariant mass of the D^*l system, P_{ee} is the four momentum of the beam particles, M_B is the nominal B mass, and E^*_B, p^*_B are the CM energy and momentum of the B, inferred from the CM machine energy. For correctly reconstructed B candidates, ignoring detector resolution effects and the spread in machine energy, θ_{BY} is the CM angle between the B and D^*l momenta. Here Data are shown with points with error bars with different components shown online for $\bar{B}^0 \to D^{*+}e^-\bar{\nu}_e$ (top) and $\bar{B}^0 \to D^{*+}\mu^-\bar{\nu}_\mu$ (bottom) channels. D^0 candidates are reconstructed from $K^-\pi^+$ pairs, selected without particle identification requirements, within the invariant mass range 1.85 GeV/$c^2 < m_{K\pi} <$ 1.88 GeV/c^2. D^{*+} candidates are reconstructed from a D^0 candidate and a π^+ candidate track, with the invariant-mass difference between D^{*+} and D^0 candidates in the range 0.144 GeV/$c^2 < \Delta m <$ 0.148 GeV/c^2. The CM momentum of the D^{*+} candidate is required to satisfy $p^*_{D^{*+}} <$ 2.5 GeV/c. Continuum $e^+e^- \to q\bar{q}$ background is suppressed with the Fox-Wolfram moment ratio $R2 < 0.25$. The CM momentum of the lepton candidate is required to be in the range 1.2 GeV/$c < p^*_l <$ 2.4 GeV/c. Electron and muon candidates are selected with requirements on the combined variables, electronID > 0.85 and muonID > 0.9 respectively. The internal document reference is BELLE2-NOTE-PH-2019-019.