Approved plots of untagged $B \rightarrow D^* l \nu_l$ decays with 5.15 fb^{-1} Proc9 and bucket7 early Phase III Data

The Belle II Collaboration

Abstract

We report the plots approved for Beauty 2019 conference for untagged $B \rightarrow D^* l \nu_l$ result using 5.15 fb^{-1} of early phase III DATA. Details are in the internal note BELLE2-NOTE-PH-2019-019.
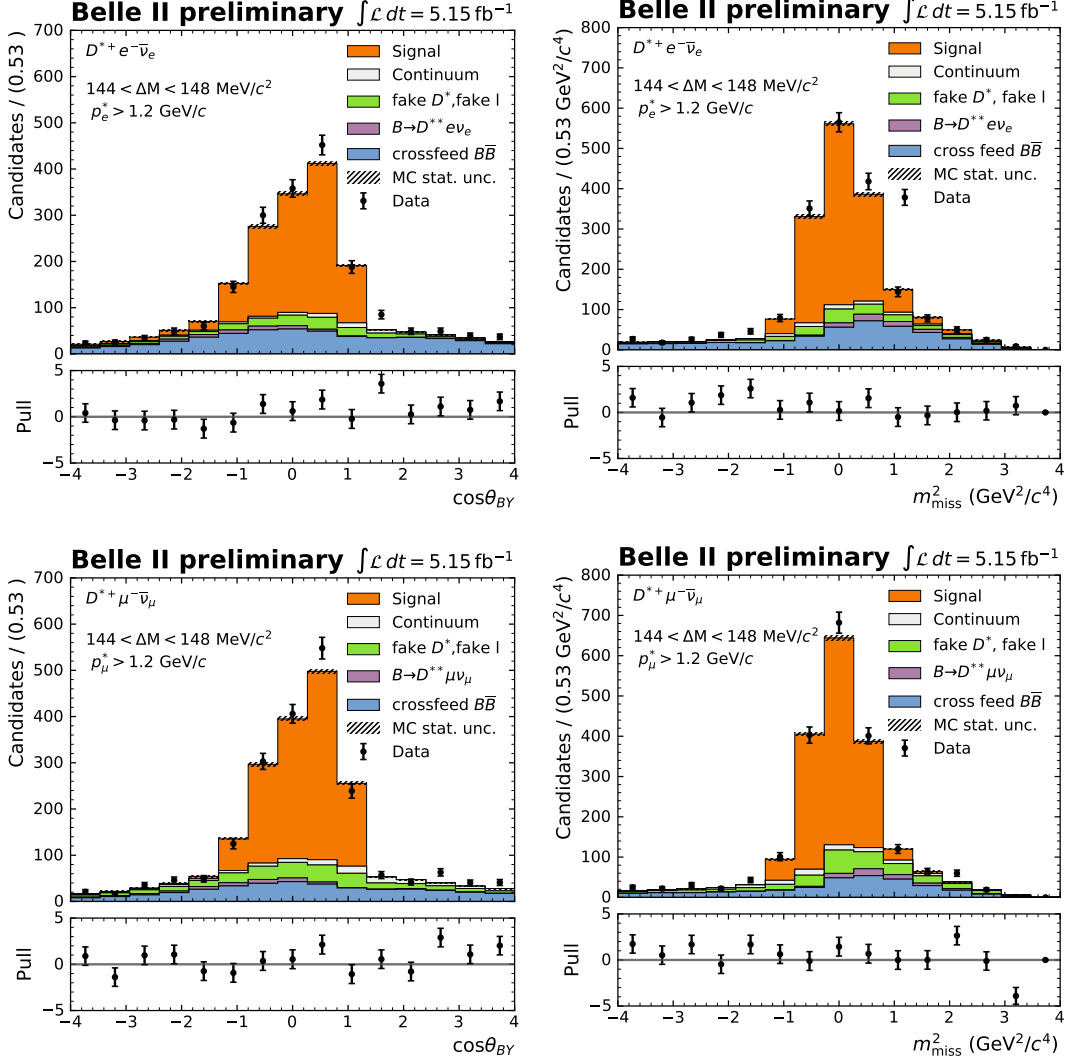
FIG. 1: The Maximum likelihood fit to $\cos\theta_{BY} = \frac{2E_B^* E_Y^* - M_B^2 - m_Y^2}{2p_B^* p_Y^*}$ and $m_{miss}^2 = \left(\frac{P_{ee}}{2} - P_Y^*\right)^2$ distributions of untagged $\bar{B}^0 \to D^{*+}l^-\bar{\nu}_l$ (charge conjugate modes taken in to account) candidates using 5.15 fb^{-1} 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 overlaid 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 < Δm < 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. We observe O(1100) $\bar{B}^0 \to D^{*+}e^-\bar{\nu}_e$ and O(1200) $\bar{B}^0 \to D^{*+}\mu^-\bar{\nu}_\mu$ events.
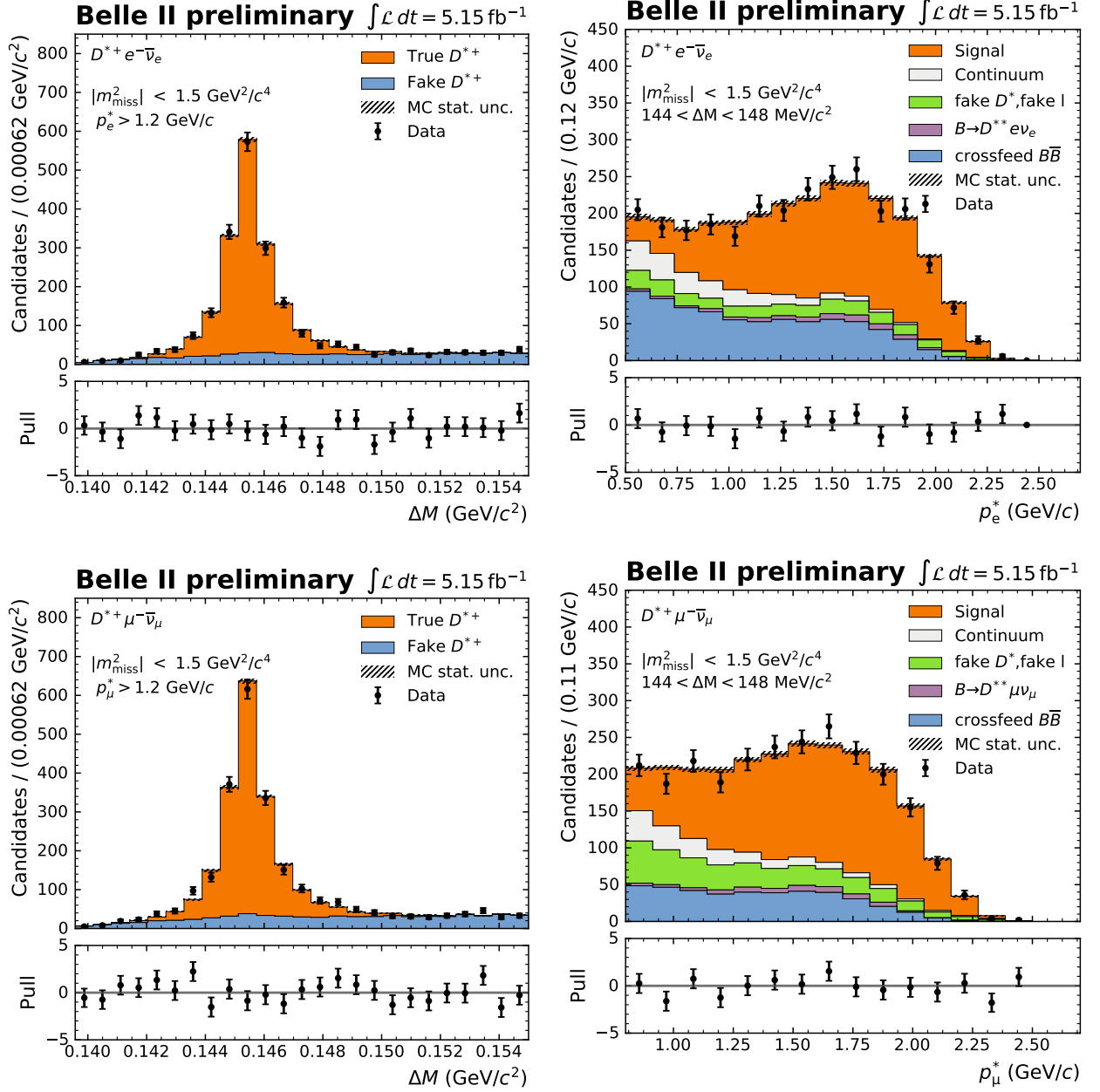
FIG. 2: Projection of ΔM and p_l^* in the signal enhanced region of $|m_{miss}^2| < 1.5$ GeV/c. Here Data are shown with points with error bars with different components overlaid for $\bar{B}^0 \to D^{*+} e^- \bar{\nu}_e$ (top) and $\bar{B}^0 \to D^{*+} \mu^- \bar{\nu}_\mu$ (bottom) channels.