BELLE2-NOTE-PL-2020-XXX
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Approved plots for $B \to \tau\nu$ study with 34.6 fb^{-1} of Phase III data

The Belle II Collaboration

Abstract

This note contains approved plots of $B \to \tau\nu_\tau$ analysis with ICHEP 2020 dataset, corresponding to an integrated luminosity of 34.6 fb^{-1}. Details of the analysis are documented in the supporting physics note BELLE2-NOTE-PH-2020-024.

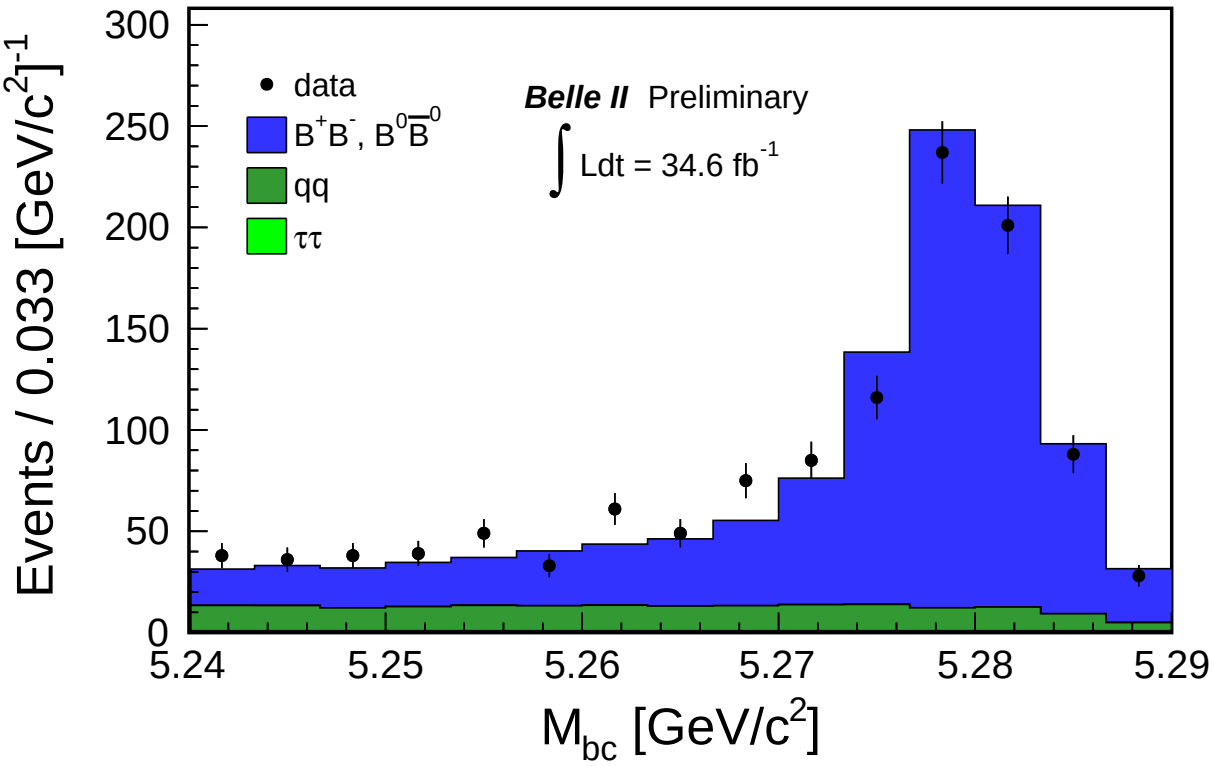

FIG. 1: M_{bc} distribution of the tag B candidate for the electron channel. We require a reconstructed tag B with a FEI discriminant output $p_{FEI} > 0.01$ and only one charged track on the signal side. The track is required to have momentum in the lab frame $p_{trk} > 0.5\,\mathrm{GeV}/c$ and to be identified as electron requiring $eid > 0.9$. A continuum suppression is applied requiring $\cos\Delta\theta_{\mathrm{thrust}} < 0.8$. MC distributions are scaled to data luminosity.

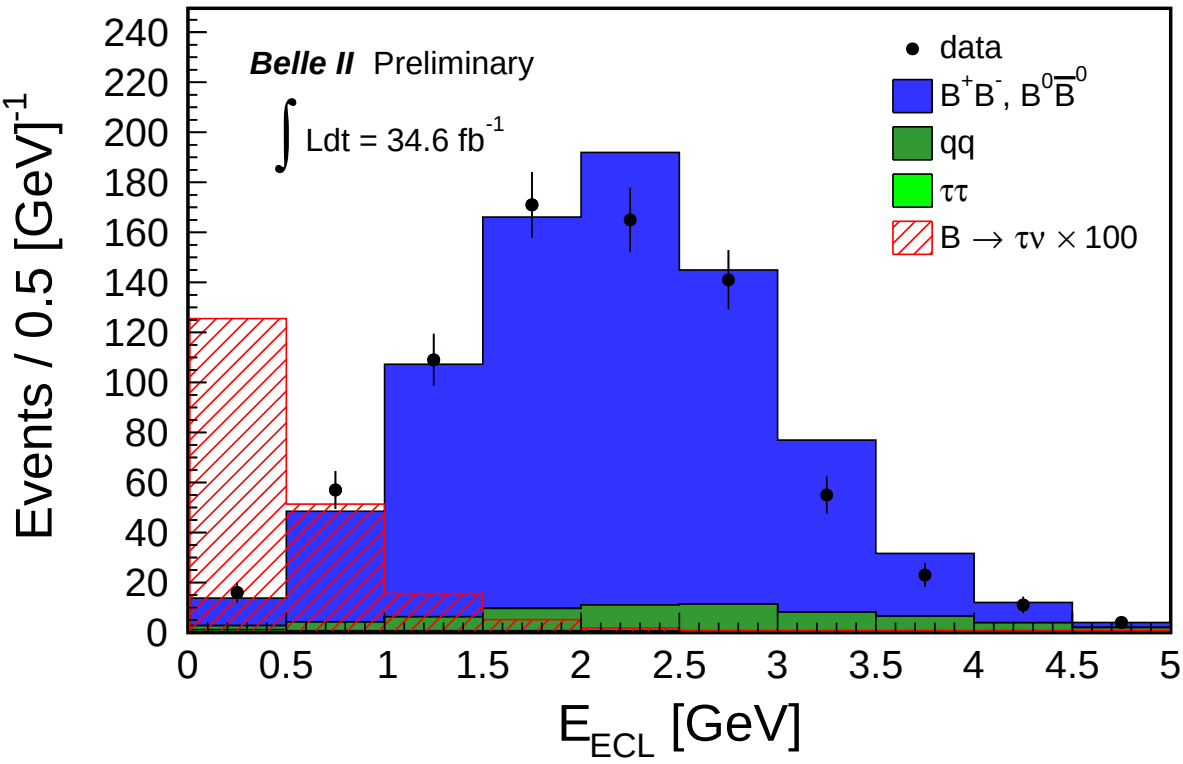

FIG. 2: Distribution of the residual energy in the ECL, E_{ECL}, for the electron channel. E_{ECL} is the sum of the energy deposited in the ECL by all neutral objects in the event that are not used to make the tag B candidate or the signal side. Energy deposits greater than 55 MeV are considered. We require a reconstructed tag B with a FEI discriminant output $p_{FEI} > 0.01$, $M_{bc} > 5.27\,\mathrm{GeV}/c^2$ and only one charged track on the signal side. The track is required to have momentum in the lab frame $p_{trk} > 0.5\,\mathrm{GeV}/c$ and to be identified as electron requiring $eid > 0.9$. A continuum suppression is applied requiring $\cos\Delta\theta_{\mathrm{thrust}} < 0.8$. MC distributions are scaled to data luminosity except for the signal which is enhanced by a factor of 100.

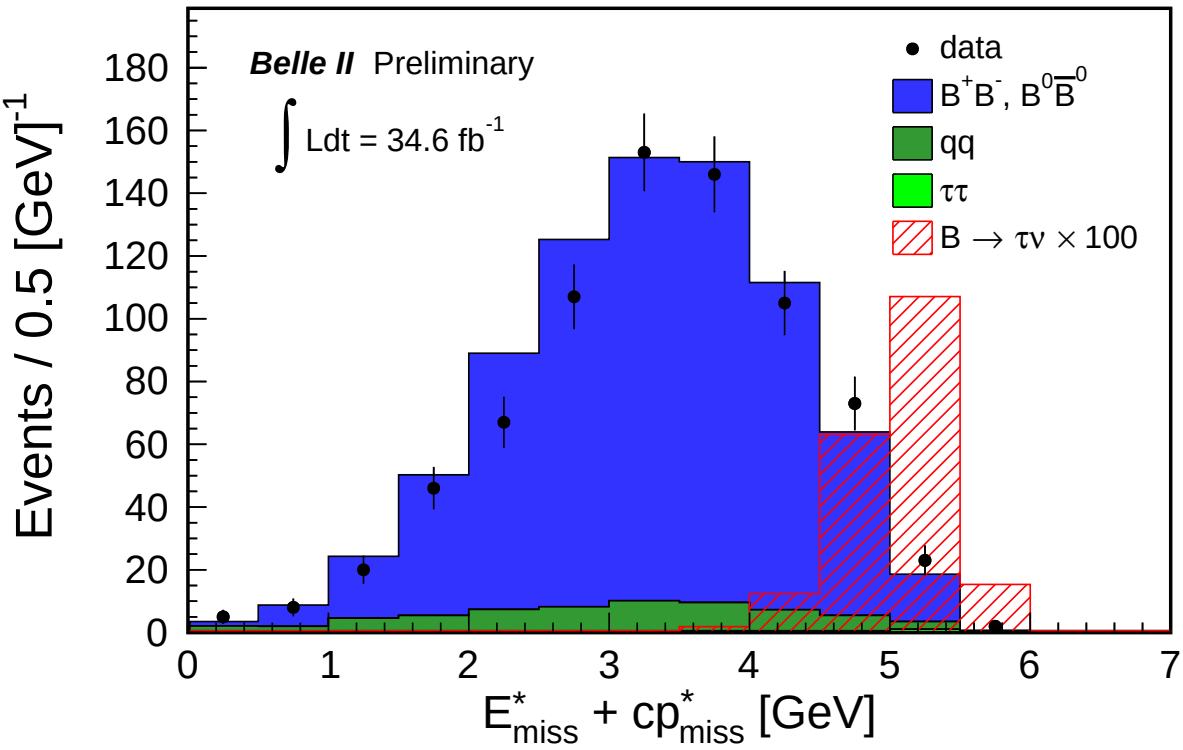

FIG. 3: Distribution of the sum of missing energy and missing momentum in the center-of-mass frame, $E^*_{\rm miss} + cp^*_{\rm miss}$, for the electron channel. We require a reconstructed tag B with a FEI discriminant output $p_{FEI} > 0.01$, $M_{bc} > 5.27\,\mathrm{GeV}/c^2$ and only one charged track on the signal side. The track is required to have momentum in the lab frame $p_{trk} > 0.5\,\mathrm{GeV}/c$ and to be identified as electron requiring $eid > 0.9$. A continuum suppression is applied requiring $\cos\Delta\theta_{\rm thrust} < 0.8$. MC distributions are scaled to data luminosity except for the signal which is enhanced by a factor of 100.

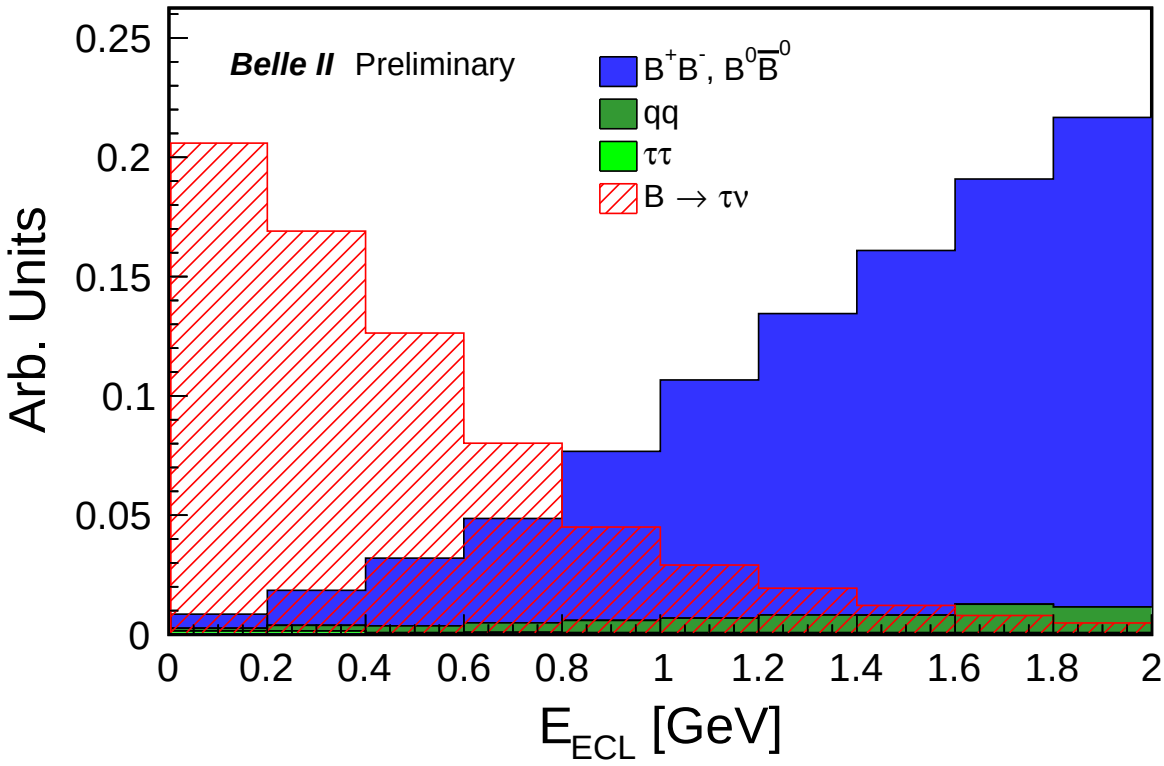

FIG. 4: Monte Carlo distribution of the residual energy in the ECL, E_{ECL}, for the electron channel in the range [0,2] GeV. E_{ECL} is the sum of the energy deposited in the ECL by all neutral objects in the event that are not used to make the tag B candidate or the signal side. Energy deposits greater than 55 MeV are considered. We require a reconstructed tag B with a FEI discriminant output $p_{FEI} > 0.01$, $M_{bc} > 5.27\,\mathrm{GeV}/c^2$ and only one charged track on the signal side. The track is required to have momentum in the lab frame $p_{trk} > 0.5\,\mathrm{GeV}/c$ and to be identified as electron requiring $eid > 0.9$. A continuum suppression is applied requiring $\cos\Delta\theta_{\mathrm{thrust}} < 0.8$.