Approved B counting analysis results with ICHEP2020 dataset

The Belle II Collaboration

Abstract

We present approved numbers of $B\bar{B}$ pairs as measured in proc11 and buckets9-12 data collected in 2019 and the first part of 2020 (ICHEP2020 dataset), corresponding to an integrated luminosity of 8.8 fb^{-1} and 25.8 fb^{-1}, respectively:

$$N_{B\bar{B}} = (9.65 \pm 0.02(\text{stat.}) \pm 0.15(\text{syst.})) \times 10^6 \ (2019) \text{ and}$$
$$N_{B\bar{B}} = (28.06 \pm 0.05(\text{stat.}) \pm 0.45(\text{syst.})) \times 10^6 \ (2020).$$

We also present the plots of the event shape variable R_2, defined as the ratio of the second and zeroth Fox-Wolfram moment, for on-resonance and off-resonance data. The details of the analysis are reported in the physics note BELLE2-NOTE-PH-2019-025.

Contents

1. DATASET AND APPROVED PLOTS

The B counting analysis has been performed using the ICHEP dataset, consisting of:

- 2019 proc11, exp7+exp8+exp10 on-resonance: runs 909-4120 (exp7), runs 43-1022, 1036-1554, 1835-3123 (exp8), runs 3130-5902 (exp10) (integrated luminosity: $(8.7642 \pm 0.0015)\,\mathrm{fb}^{-1}$)

- 2019 proc11, exp8 off-resonance: runs 1703-1835 (integrated luminosity: $(828.2 \pm 0.4)\,\mathrm{pb}^{-1}$)

- 2020 bucket9+bucket10+bucket11, exp12 on-resonance: runs 0-1969 (bucket9) runs 2143-2890 (bucket10), runs 3103-3904 (bucket11) (integrated luminosity: $(25.8169 \pm 0.0033)\,\mathrm{fb}^{-1}$)

- 2020 bucket12, exp12 off-resonance: runs 4022-4191 (integrated luminosity: $(2.3996 \pm 0.0010)\,\mathrm{fb}^{-1}$)

Runs from the official `GoodRuns` list have been used. The uncertainties on the integrated luminosities are statistical only.
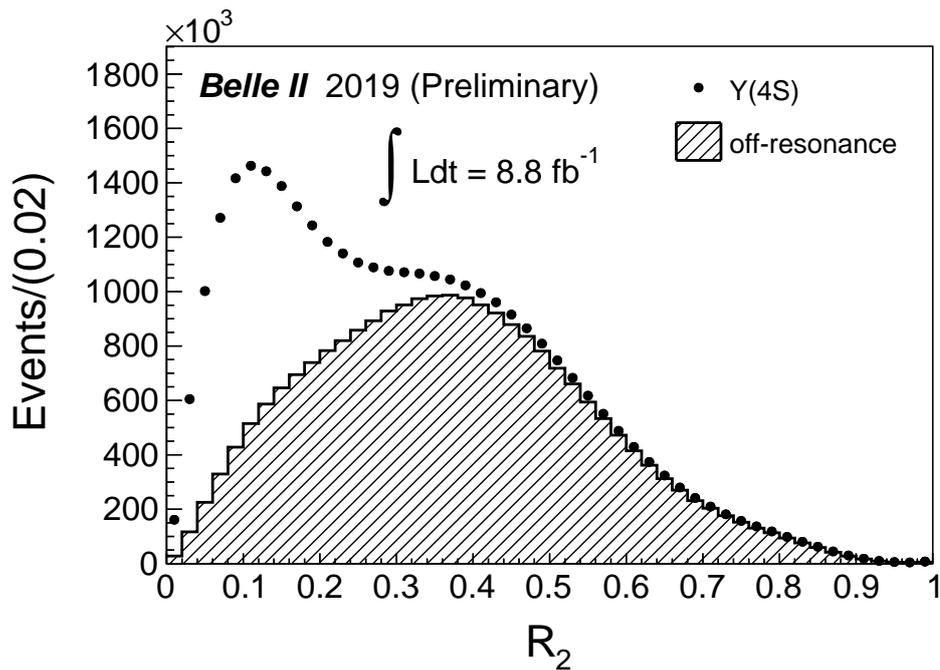
FIG. 1: Ratio of the second and zeroth Fox-Wolfram moment (R_2) distribution for $\Upsilon(4S)$ and off-resonance data collected in 2019. Event with at least three tracks with transverse momentum greater than 100 MeV/c and at least three clusters with energy greater than 100 MeV are selected. In order to reduce contamination from non-$B\overline{B}$ events additional requirements on tracks, clusters, and event variables are applied. The overall selection efficiency on the $B\overline{B}$ simulated sample is 94.2%. The continuum contribution is estimated using $0.8\,\mathrm{fb}^{-1}$ off-resonance data rescaled to the luminosity of the on-peak sample, which corresponds to $8.8\,\mathrm{fb}^{-1}$.
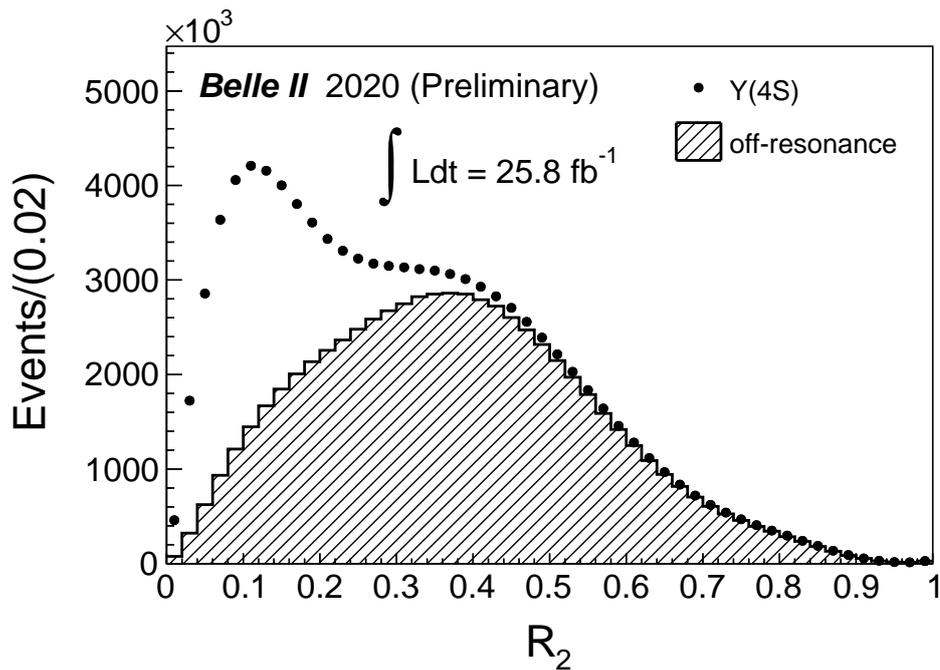
FIG. 2: Ratio of the second and zeroth Fox-Wolfram moment (R_2) distribution for $\Upsilon(4S)$ and off-resonance data collected in 2020. Event with at least three tracks with transverse momentum greater than 100 MeV/c and at least three clusters with energy greater than 100 MeV are selected. In order to reduce contamination from non-$B\bar{B}$ events additional requirements on tracks, clusters, and event variables are applied. The overall selection efficiency on the $B\bar{B}$ simulated sample is 94.2%. The continuum contribution is estimated using 2.4 fb^{-1} off-resonance data rescaled to the luminosity of the on-peak sample, which corresponds to 25.8 fb^{-1}.