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Title:	Measurements of partial branching fractions of inclusive $B \rightarrow X u \ell + v \ell$ decays with hadronic tagging
Authors:	Patra, Sourav (/jspui/browse?type=author&value=Patra%2C+Sourav) Bhardwaj, Vishal (/jspui/browse?type=author&value=Bhardwaj%2C+Vishal)
Keywords:	Particle data analysis Precision measurements
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Abstract:	We present measurements of partial branching fractions of inclusive semileptonic $B \rightarrow X u \ell$ decays using the full Belle dataset of 711 fb^{-1} of integrated luminosity at the $\Upsilon(4S)$ resonance and for $\ell = e, \mu$. Inclusive semileptonic $B \rightarrow X u \ell$ decays are Cabibbo-Kobayashi-Maskawa (CKM) suppressed and measurements are complicated by the large background from CKM favored $B \rightarrow X c \ell$ transitions, which have a similar signature. Using machine learning techniques, we reduce this and other backgrounds effectively, while retaining access to a large fraction of the $B \rightarrow X u \ell$ phase space and high signal efficiency. We measure partial branching fractions in three phase-space regions covering about 31% to 86% of the accessible $B \rightarrow X u \ell$ phase space. The most inclusive measurement corresponds to the phase space with lepton energies of $E_B \ell > 1 \text{ GeV}$, and we obtain $\mathcal{B}(B \rightarrow X u \ell) = 1.59 \pm 0.07 \pm 0.16 \times 10^{-3}$ from a two-dimensional fit of the hadronic mass spectrum and the four-momentum-transfer squared distribution, with the uncertainties denoting the statistical and systematic error. We find $\mathcal{B}(B \rightarrow X u \ell) = 1.10 \pm 0.09 \pm 0.22 \pm 0.15 \times 10^{-3}$ from an average of four calculations for the partial decay rate with the third uncertainty denoting the average theory error. This value is higher but compatible with the determination from exclusive semileptonic decays within 1.3 standard deviations. In addition, we report charmless inclusive partial branching fractions separately for B_p and B_0 mesons as well as for electron and muon final states. No isospin breaking or lepton flavor universality violating effects are observed.
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