



$b \rightarrow s\gamma$ and $b \rightarrow s l^+ l^-$ at BaBar

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The inclusive decay $b \rightarrow s\gamma$, which in the standard model proceeds via the electroweak penguin process, is sensitive to contributions from physics beyond the standard model. Extensive theoretical literature discusses the contributions of new physics to the decay rate and CP asymmetry. While predictions for the exclusive decays such as $B \rightarrow K^* \gamma$ suffer from large hadronic uncertainties associated with form factors of the final-state hadrons, the inclusive decays are theoretically better understood, with partonic rates calculated to a precision of a few percent. We present new results of the inclusive decay $b \rightarrow s\gamma$ using both a fully inclusive technique and the sum of 38 exclusive modes. In both techniques we take advantage of the clean e^+e^- environment. We report the branching fraction, CP asymmetry, and photon energy spectrum for these decays.

In the standard model, the flavor-changing-neutral-current decays $b \rightarrow d l^+ l^-$ are suppressed by the electromagnetic coupling relative to the decay $b \rightarrow d \gamma$ and Cabibbo suppressed with respect to the decays $b \rightarrow s l^+ l^-$. Being very rare and proceeding via an electroweak penguin or box diagram, these decays are sensitive probes of new physics, which may significantly increase the branching fraction. Using the full BABAR data set, we study the decays $B^+ \rightarrow \pi^+ l^+ l^-$, $B^0 \rightarrow \pi^0 l^+ l^-$, and $B^0 \rightarrow \eta l^+ l^-$, where $l=e$ or μ . We present updated branching-fraction upper limits for the individual pion modes and for the combined $B \rightarrow \pi l^+ l^-$ decay. We also present the first upper limit on the branching fraction of the decay $B^0 \rightarrow \eta l^+ l^-$.

We study the rare decays $B \rightarrow K(l^+e^-)$ and $B \rightarrow K(l^+\mu^-)$ in a sample of 471 million BB events collected with the BABAR detector. We report measurements of the partial branching fractions, isospin asymmetry, K^* polarization, and lepton forward-backward asymmetry in seven bins of dilepton mass squared. We also present the CP and lepton-flavor asymmetries for dilepton mass below and above the J/Ψ resonance. Our results are compared with the standard-model predictions and those of other experiments.

The inclusive, flavor-changing-neutral-current decay $b \rightarrow s l^+ l^-$ provides a probe of new physics and stringent tests of the standard model, as it is theoretically better understood than individual exclusive decays. We present new measurements of the inclusive decay $B \rightarrow X_s l^+ l^-$, where X_s is a hadronic system consisting of one charged or neutral K and 0-3 pions with at most one π^0 , and l is an electron or muon. The measurement is based on the full BABAR Upsilon(4S) data set. We report the total branching fraction, partial branching fractions and CP asymmetries in five regions of dilepton mass using a sum-of-exclusive-modes technique.

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