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Semileptonic B -meson decay phenomenology with lattice QCD

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We present Standard Model predictions for phenomenologically interesting observables for the rare decays $B \rightarrow K \ell^+ \ell^-$, $B \rightarrow \pi \ell^+ \ell^-$, $B \rightarrow K \nu \bar{\nu}$, and $B \rightarrow \pi \nu \bar{\nu}$, as well as for $B \rightarrow \pi \tau \nu$. All of these processes are sensitive to new physics effects, and there are a number of tensions between experimental measurements and Standard Model expectations of these and similar processes. We recently completed lattice calculations of the form factors for the semileptonic $B \rightarrow \pi$ and $B \rightarrow K$ transitions. Here we use these form factors to explore the phenomenology

of these decays with quantitative control over the theoretical uncertainties.

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