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Missing energy and electroweak penguin modes in early Belle II data

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The Belle II experiment at the SuperKEKB energy-asymmetric e^+e^- collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is 8×10^{35} cm^{-2}s^{-1} and the Belle II experiment aims to record 50 ab^{-1} of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of 5.5×10^{33} cm^{-2}s^{-1}, and Belle II has recorded a data sample of about 0.5 fb^{-1}. Main operation of SuperKEKB has started in March 2019.

In this presentation we show first results from studying missing energy signatures, such as leptonic and semileptonic B meson decays based on early Belle II data. We report first studies on re-measuring important standard candle processes, such as the abundant inclusive $B \to X\ell\nu$ and $B \to D^*\ell\nu$ decays. Furthermore, we will also present an overview of the semileptonic B decays that will be measured in the upcoming years at Belle II and discuss prospects for important B-anomalies like R(D) and R(D*), as well as other tests of lepton flavor universality. Early physics goals of the Belle II physics program are also to rediscover rare B decays. Especially radiative $b \to s\gamma$ decays can be measured on a small dataset and in the near future Belle II can provide independent tests of anomalies in $b \to s\ell\ell$ decays. Ultimately, the clean Belle II environment will allow to study modes with large missing energy such as $B \to K^*\nu\bar{\nu}$.

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