

Tau physics prospects at Belle II

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The Belle II experiment is a substantial upgrade of the Belle detector and will operate at the SuperKEKB energy-asymmetric e^+e^- collider. The design luminosity of the machine is $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$ 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 and main operation of SuperKEKB has started in March 2019. Belle II has a broad τ physics program, in particular in searches for lepton flavour and lepton number violations (LFV and LNV), benefiting from the large cross section of the pair wise τ lepton production in e^+e^- collisions. We expect that after 5 years of data taking, Belle II will be able to reduce the upper limits on LF and LN violating τ decays by an order of magnitude. Any experimental observation of LFV or LNV in τ decays constitutes an unambiguous sign of physics beyond the Standard Model, offering the opportunity to probe the underlying New Physics. In this talk we will review the τ lepton physics program of Belle II.

Using the Belle II data from the early Phase III data taking, we rediscover the tau leptons using the 3-prong τ decays. This decay mode is used for the tau-lepton mass measurement using the pseudomass technique developed by the ARGUS experiment. Though this measurement is expected to be limited by statistics and imperfect knowledge of the detector performance, we foresee that Belle II will provide the best pseudomass measurement once a larger data set with fully understood and operational detector components is available.

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