

Measurement of γ (ϕ_3) and CP violation first results at Belle II

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The CKM angle γ is the least well known of the angles of the unitarity triangle and the only one that is accessible with tree-level decays in a theoretically clean way. The key method to measure γ is through the interference between $B^+ \rightarrow D^0 K^+$ and $B^+ \rightarrow \bar{D}^0 K^+$ decays which occurs if the final state of the charm-meson decay is accessible to both the D^0 and \bar{D}^0 mesons. 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 $8 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$ and the Belle II experiment aims to record 50 ab^{-1} of data, a factor of 50 more than its predecessor. Main operation of SuperKEKB has started in March 2019 and a results from a data sample corresponding to an integrated luminosity of $\mathcal{O}100 \text{ fb}^{-1}$ will be presented. To achieve the best sensitivity, a large variety of D and B decay modes is required, which is possible at Belle II experiment as almost any final state can be reconstructed including those with photons. With the ultimate Belle II data sample of 50 ab^{-1} , a determination of γ with a precision of 1 degree or better is foreseen. This talk will explain the details of the planned measurement at Belle II and include results related to these measurements obtained with the data already collected, including the first studies of the golden mode for ϕ_3 at Belle II: $B^+ \rightarrow D(K_S^0 \pi^+ \pi^-) K^+$.

The Belle II Experiment started its first Physics Run in Spring 2019 and continued to collect data in 2020. The integrated luminosity collected with the Belle detector including vertex detectors is used to establish the performance of the detector in terms of reconstruction efficiency of final states of interest for the measurement of time-dependent CP violation, both for charm (such as $J/\psi K(^*)0$) and charmless (such as $\eta' K0$). We will present the first results based on samples of B mesons that decays to the CP-eigenstates for time dependent analysis, along with a first assessment of the B Flavor Tagging capabilities, together with estimates of the Belle II sensitivity to the CKM angles.

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