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CP violation measurements in B decays with final state neutral kaons: how precise can we get?

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Measurements of CP violation in B decays are entering a high precision era, and with the increasing precision comes a need for an equally precise understanding of limiting uncertainties. I will present a recent, world-leading precision measurement of the CP-violating CKM phase γ , using data from the LHCb experiment. The measurement used $B \rightarrow DK$ decays, where the D meson decays to a neutral kaon and two pions. Sensitivity to the CP violating phase γ is obtained via interplay between γ and the phase of the D decay over the decay phase space.

The expected precision within the next five years requires the study of second-order physics effects. I will focus on phenomenological work on a potentially limiting systematic uncertainty due to the inherent CP violation in the neutral kaon system, as well as material dependent kaon regeneration effects that can mimic CP violation signatures. Earlier estimates have put the relative bias due to these effects as high as 4 %, which would soon limit the obtainable precision. Therefore, a detailed understanding of the effects is crucial. I will present arguments for why the effect on measurements in the LHCb Upgrade and Belle 2 is expected to be at the sub-percent level.

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