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Measurement of the CKM angle γ in $B^{\pm} \to D^0(\to K^0_s\pi^+\pi^-\pi^0)K^{\pm}$ decays at LHCb

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The observable Universe is mainly made up of matter, while almost all the antimatter disappeared in the very early times. One explanation is that the Universe obeys the Sakharov conditions, which mean the existence of a C (charge) and CP (charge - parity) symmetry violation. An area of Particle Physics deals with the comprehension and measurement of this symmetry breaking and the potential discovery of a Physics beyond the Standard Model (SM).

In particular, the γ angle of the Cabibbo-Kobayashi-Maskawa (CKM) matrix sets a benchmark for CP violation, to be compared with the SM predictions. The accumulated statistics by the LHCb detector allows expecting an even more precise measurement of the γ angle. Its accuracy is currently around 4°, nevertheless, a precision around 1° is desirable to test SM up to dozens of TeV.

The golden mode for measuring γ is a $B^- \to DK^-$ decay, where D can be either a D^0 or an $\bar{D}^0$, by amplitude modulation in the interference between the processes $b \to c\bar{u}s$ and $b \to u\bar{c}s$. The purpose of this study is to take a model-independent measurement of this angle through the $B^{\pm} \to D^0(\to K^0_s\pi^+\pi^-\pi^0)K^{\pm}$ decays, using LHCb data from Runs 1 and 2 (2011-2018), thanks to a generalized GGSZ method. This measurement, with a tree-diagram decay, can typically be used for the direct γ measurement, setting a “standard candle”for the SM.

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