

Measurement of the branching fraction and CP asymmetry of $B^0 \rightarrow \pi^0 \pi^0$ decays

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We report measurements of the $B^0 \rightarrow \pi^0 \pi^0$ decay mode at Belle II using a data sample corresponding to $198 \times 10^6 B\bar{B}$ pairs or 189.8 fb^{-1} of integrated luminosity. We determine a branching fraction of $\mathcal{B}(B^0 \rightarrow \pi^0 \pi^0) = [1.32 \pm 0.25 \pm 0.17] \times 10^{-6}$ and a CP asymmetry $\mathcal{A}(B^0 \rightarrow \pi^0 \pi^0) = +0.14 \pm 0.46 \pm 0.07$, where the first uncertainty is statistical and the second is systematic. The results agree with previous determinations. We combine these results with world-averaged measurements [1] for $B^0 \rightarrow \pi^+ \pi^-$ and $B^\pm \rightarrow \pi^\pm \pi^0$ to exclude the CP -violating parameter ϕ_2 from the range $15.5^\circ < \phi_2 < 75.5^\circ$ at 95% confidence level.

[1] P. A. Zyla et al. (Particle Data Group), *PTEP* **2020**, 083C01 (2020).