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Testing the Standard Model and beyond with $B \to PP$ decays

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The starting point to our discussion is the "$B \to K\pi$ puzzle".
We show, that although the "puzzle" can be resolved by a more detailed analysis, there is a more fundamental question that needs to be addressed:
Is New Physics necessary to describe the experimentally observed asymmetries and branching fractions of the $B \to PP$ decays?
We perform a phenomenological analysis based on fits of an model-independent New Physics parameterisation and obtain exclusion χ^2 plots of the two ad-hoc parameters (magnitude and a weak phase) sensitive to New Physics.
The results show that the Standard Model expectation value lies within 1σ with respect to the global minimum but the overall picture is not well constrained by the existing data. Our results are mostly sensitive to the time-dependent asymmetry and branching fraction of the $B^0 \to K^0\pi^0$ decay. New experimental outcomes are highly expected and results of this analysis provide strong hints for improvement of precision in current experiments LHCb and Belle II.
Although the Standard Model expectations seem fully consistent with the experimental data, our approach can be used to constrain New Physics models, \emph{e.g.} leading to limits on Wilson coefficients of four-quark SMEFT operators or specific Z' models.

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