

HINTS FOR NEW PHYSICS IN B-CP ASYMMETRIES: MAY BE WE ARE EIGHT NOW?

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“B-CP anomalies, “4th” generation and the LHC

Abstract Although the CKM-paradigm works approximately to $O(20\%)$, there are by now several indications that suggest the need for beyond the Standard Model CP-odd phase(s). The value of $\sin 2\beta$ measured via the goldplated (tree) mode, $B \rightarrow \psi K_s$ is smaller than the value deduced by using improved lattice matrix elements. The value of $\sin 2\beta$ measured via ‘penguin-dominated’(loop) decays tends to be even smaller still. There is also a rather large difference between the direct CP asymmetries in $B \rightarrow K - \pi^+$ and $B^- \rightarrow K - \pi^0$ that is rather difficult to understand. Also recently, CDF and D0 are finding about a signal of CP asymmetry $B_s \rightarrow \psi\phi$. If true, this would be consistent with the indications of new CP-phase in penguin $b \rightarrow s$ transitions seen at B-factories. We emphasize that the data are quite suggestive of a fourth family with $m_{t'}$ in the range of 400–600 GeV as perhaps the simplest BSM candidate which ‘naturally’ explains the data. This picture leads to significant repercussions for the LHC which will be explored.

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