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News on Penguin Effects in CP Violation Benchmark Decays

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Measurements of CP violation in $B_d^0 \rightarrow J/\psi K_S^0$ and $B_s^0 \rightarrow J/\psi \phi$ decays play key roles in testing the quark-flavour sector of the Standard Model. The theoretical interpretation of the corresponding observables is limited by uncertainties from doubly Cabibbo-suppressed penguin topologies. With continuously increasing experimental precision, it is mandatory to get a handle on these contributions, which cannot be calculated reliably in QCD. In the case of the measurement of $\sin 2\beta$ from $B_d^0 \rightarrow J/\psi K_S^0$, the U -spin-related decay $B_s^0 \rightarrow J/\psi K_S^0$ offers a tool to control the penguin effects. As the required measurements are not yet available, data for decays with similar dynamics and the $SU(3)$ flavour symmetry are used to constrain the size of the expected penguin corrections. Predictions of the CP asymmetries of $B_s^0 \rightarrow J/\psi K_S^0$ and are given and a scenario is presented to fully exploit the physics potential of this decay, emphasising also the determination of hadronic parameters and their comparison with theory. In the case of the benchmark mode $B_s^0 \rightarrow J/\psi \phi$ used to determine the B_s^0 - $\bar{B}_s^0$ mixing phase ϕ_s the penguin effects can be controlled through $B_d^0 \rightarrow J/\psi \rho^0$ and $B_s^0 \rightarrow J/\psi K^*$ decays. The LHCb collaboration has recently presented pioneering results on this topic. I will discuss their implications and present a roadmap for controlling the penguin effects.

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