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Determination of the CKM angle γ and the D meson mixing and CP-violating parameters in a Bayesian framework

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In the last few years, $D^0 - \overline{D^0}$ mixing has become a true benchmark for the Standard Model thanks to the precision reached by modern experiments. Charm mixing may reveal signals of heavy New Physics since it happens through Flavour Changing Neutral Currents, which are absent at the tree level and GIM-suppressed at the loop level in the Standard Model.
The most promising observables in this regard are the two phases ϕ_f^M and ϕ_f^Γ controlling CP violation in the neutral D meson system.
Therefore, we performed a simultaneous combination of beauty and charm measurements to determine the $D^0 - \overline{D^0}$ mixing and CP-violating parameters, together with the angle γ of the Unitary Triangle.
At the current level of experimental precision, the final state dependence of ϕ_f^M and ϕ_f^Γ can be safely neglected, employing the so-called *approximate universality*, allowing them to be approximated by the phases ϕ_2^M and ϕ_2^Γ.
The latter are defined with respect to the direction of the dominant U-spin ($\Delta U = 2$) contribution to the dispersive and absorptive parts of the antimeson-meson transition amplitude.

The sensitivity to ϕ_2^M and ϕ_2^Γ is provided by combinations of D^0 meson time-dependent decay rates. However, these observables rely on several unknown hadronic parameters.
Thus, we considered also measurements concerning the beauty sector, such as the so-called Gronau-London-Wyler, Atwood-Dunietz-Soni and Giri-Grossman-Soffer-Zupan observables obtained from B meson decay chains (i.e. $B \to [X]_D h$, with X, h hadrons), as well as time-dependent decay rates of processes like $B_q^0 \to \overline{B_q^0} \to D_q h$, with $q = d, s$.

This improved the precision of the fit, while allowing us to determine the CKM angle γ.
We fit the parameters in a Bayesian framework, generalizing the 2021 LHCb combination.

Consent

I consent to recording/broadcasting my presentation.

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