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Measurement of the weak mixing phase ϕ_s through time-dependent CP violation in $B_s^0 \rightarrow J/\psi \phi$ decay in ATLAS

In this work, we present a measurement of the $B_s^0 \rightarrow J/\psi \phi$ time-dependent CP asymmetry parameters using the combined Run-1 dataset. $B_s^0 \rightarrow J/\psi \phi$ decay channel is sensitive to the new physics contributions, and already small deviations in a measurement of ϕ_s would be hints for the existence of the new particles. A four-dimensional unbinned maximum likelihood fit, which also includes information of the B_s^0 production flavour, is used to extract the parameters from the corresponding measured decay time and angular distributions of the $B_s^0 \rightarrow J/\psi(\mu^+\mu^-)\phi(K^+K^-)$ decay. Apart from CP-violating mixing phase ϕ_s , several parameters describing the B_s^0 meson system are measured. These include the B_s^0 lifetime $1/\Gamma_s$, the decay width difference $\Delta\Gamma_s$ between the heavy and the light mass eigenstates, and the transversity amplitudes $|A_0(0)|$ and $|A_{||}(0)|$. The results are compatible with Standard Model predictions. Within the given uncertainties, the ATLAS results are consistent with the measurements from other LHC experiments. The significance of the deviation from the Standard Model prediction will be clarified once more data has been accumulated following the LHC upgrade and the statistical precision of the measurements improved.

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