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The re-discovery of the decays for the CP violation measurements

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$\sin 2\phi_1$ $(\sin 2\beta)$ is measured using the CP-eigenstates induced by the $b \to c$ tree diagram and it is the most precise variable among the CKM angles.
We have presented the result of the measurement using the $B^0 \to J/\psi K^0_S$ decay collected from the early Belle II data. On the other hand, it can be measured also using the decays induced by $b \to s$ penguin diagram. In that case, contribution of the new physics is expected so that effective $\sin 2\phi_1 \equiv \sin 2\phi_1^{\rm eff}$ is measured. In relation to those measurements, we present the re-discoveries of the $B^0 \to J/\psi K^0_L$ and $B^0 \to \eta' K^0_S$ decays using the data set obtained by the Belle II in 2019 and 2020. Former one is a good indicator to check the difference of CP eigenvalue between $B^0 \to J/\psi K^0_S$. Latter one is one of the modes used for $\sin 2\phi_1^{\rm eff}$ measurement and its branching fraction is relatively large.

Summary

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