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Standard-model prediction for direct CP violation in $K \rightarrow \pi \pi$ decays

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We discuss our recent publication [arXiv:1505.07863] of the first lattice QCD calculation of the complex kaon decay amplitude A_0 with physical kinematics, using a single $32^3 \times 64$ domain wall ensemble with G-parity spatial boundary conditions. We obtain approximate agreement with the experimental value for $\text{Re}(A_0)$, which serves as a test of our method. Our prediction of $\text{Im}(A_0)$ can be used to compute the direct CP violating ratio $\text{Re}(\epsilon'/\epsilon)$, which we find to be ~ 2 sigma lower than the experimental value. This result provides a new test of the Standard Model theory of CP violation, one which can be made more accurate with increasing computer capability.

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