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Calculation of B_K with Wilson fermion using gradient flow

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B_K is a parameter which is related with the Kaon mixing and is one of the targets of Lattice QCD.
Naive calculation of B_K with the Wilson fermion is difficult because the chiral symmetry is explicitly broken.
In this study we shall present on our calculation of B_K with the Wilson fermion by applying the gradient flow method both to the gauge and quark fields.
Our study is based on a fact that the chiral symmetry is restored if we apply the gradient flow to the Wilson fermion and take the continuum limit without bothering the UV divergence.
This property is already observed for practical numerical simulation in Phys. Rev. D 95, 054502 (2017), where the chiral Ward-Takahashi relation is effectively restored for the topological susceptibility.
In our study we expect the same good property even for the four fermi operators used for B_K.

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