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Hermansson-Truedsson: QED_r, an infrared-improved finite-volume prescription

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Precision calculations of flavour physics processes such as leptonic decays of pions and kaons allow for indirect searches of new physics. For instance, the Cabibbo-Kobayashi-Maskawa matrix elements V_{ud} and V_{us} accessible in these decays satisfy a unitarity relation within the Standard Model that can be probed with lattice QCD simulations. With a goal of (sub-)percent precision, isospin-breaking effects from quark-mass differences and electromagnetism have to be taken into account. The long-range nature of the electromagnetic force introduces systematic effects in the finite-volume lattice calculations, which have to be under good control for precision tests of the Standard Model. Motivated by recent results on weak decays of pions and kaons, we here present a finite-volume formulation of electromagnetism constructed to improve the associated systematic uncertainties in modern lattice simulations.

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