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Non-perturbative renormalization in QCD+QED and its applications to weak decays

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We present a new strategy to extend the usual non-perturbative renormalization procedure, performed on the lattice in the $\overline{\text{RI}}'$ -MOM scheme, in order to include electromagnetic corrections at first order in perturbation theory. We show the first numerical estimates for the QED corrections to the renormalization constants of quark bilinears and four-fermion operators (two quarks and two leptons). Since the non-perturbative renormalization is an important step in the numerical calculation of hadronic decay rates, we discuss the application of this strategy to light-meson leptonic decays. The numerical results are obtained using gauge ensembles produced by the European Twisted Mass Collaboration with $N_f = 4$ dynamical quarks.

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