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Hadronic contribution to the running of the electromagnetic coupling constant

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The electromagnetic coupling constant, α , is one of the fundamental parameters of the Standard Model (SM). Its value at the Z boson mass, $\alpha(M_Z)$, is of particular interest as it enters electroweak precision tests. When running α from low energies up to the Z mass, five orders of magnitude in precision are lost. This makes it one of the least well determined parameters of the SM at that scale. The largest source of error comes from non-perturbative hadronic effects in the low energy region.

These non-perturbative effects can be determined from ab initio calculations on the lattice. We present preliminary lattice results for the leading order hadronic contribution to this running at different values of Q^2 , the four-momentum transfer squared. These are obtained using simulations with 2+1+1 flavors of staggered fermions at physical values of the quark masses.

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