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New beta-function and the QCD running coupling at the Z-boson pole mass

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With scale changes set by the gradient flow time, a new beta function emerges from infinite volume extrapolations, matching 3-loop predictions from Harlander and Neumann at weak coupling. Non-perturbative lattice methods are used to get the beta-function in the infrared region at strong coupling. The method was tested in multi-flavor QCD with ten and twelve flavors and compared in contrast with the respective step beta-functions where scale changes are set by the physical volume. We are investigating the new beta function for alternate lattice determination of the QCD running coupling at the scale of the Z-boson pole mass.

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