

# Precision measurements of $\alpha_s$ and its running at future colliders

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*THIS IS A PLACEHOLDER FOR A LETTER OF INTEREST*

The measurement of  $\alpha_s$  as a function of  $Q^2$  is an important goal for studies at future colliders. The value of  $\alpha_s(M_Z)$  is a key parameter of the standard model and impacts all QCD cross-sections and particle decays. Deviations between experimental measurements at  $e^+e^-$ ,  $\mu^+\mu^-$ ,  $ep$ , and  $pp$  colliders, results from lattice gauge calculations, and theoretical expectations, particularly

at high  $Q^2$ , could provide indications of new physical phenomena. There are many ways to access  $\alpha_s$  including measurements of jet cross sections, ratios of jet cross sections (e.g., 3-jet to 2-jet) or azimuthal decorrelations, event shape distributions,  $t\bar{t}$  production, electroweak production, and in the decay of particles such as the  $\tau$  lepton. Prior studies have indicated that a precision of 0.1% is possible.