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Free energy on the sphere for non-abelian gauge theories

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We compute the Sd partition function of the fixed point of non-abelian gauge theories in continuous d, using the ϵ-expansion around d = 4. We obtain the result up to NLO, i.e. including two-loop vacuum diagrams. Depending on the sign of the one-loop beta function, there is a fixed point with real gauge coupling in d > 4 or d < 4. In the first case, we extrapolate to d = 5 to test a recently proposed construction of the UV fixed point of 5d SU(2) Yang-Mills via a susy-breaking deformation of the E1 SCFT. In the second case, we extrapolate to d = 3 to test whether QCD3 with gauge group SU(nc) and nf fundamental matter fields flows to a CFT or to a symmetry-breaking case.

Autori principali: DE CESARE, Fabiana (Istituto Nazionale di Fisica Nucleare); DI PIETRO, Lorenzo (Istituto Nazionale di Fisica Nucleare); SERONE, Marco (TS)

Relatore: DE CESARE, Fabiana (Istituto Nazionale di Fisica Nucleare)

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