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C2: SU(2) gauge theory with $N_f = 24$ fermions at finite mass

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SU(2) gauge theory with $N_f = 24$ massless fundamental fermions is trivial: in the UV it has a Landau pole and in the IR it becomes free. At non-zero fermion mass the IR behaviour is expected to change: as the fermions decouple at sufficiently low energies, the theory reduces to pure gauge SU(2) and is therefore confining. We measure the evolution of the coupling constant with the gradient flow method. The decoupling of the fermions is observed clearly: the evolution of the coupling constant smoothly interpolates between the massless $N_f = 24$ behaviour and pure gauge behaviour as the energy scale μ changes from $\mu \gg m_q$ to $\mu \ll m_q$. We also measure the mass spectrum and string tension of the theory, and verify that they approach the expected free theory behaviour as $m_q \rightarrow 0$.

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