

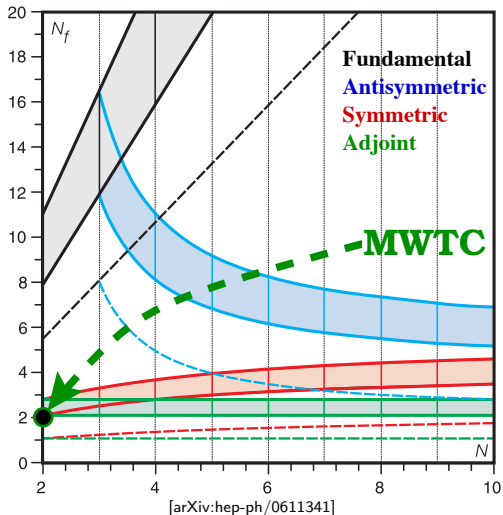
Lattice field theory beyond QCD

Liam Keegan

November 2013

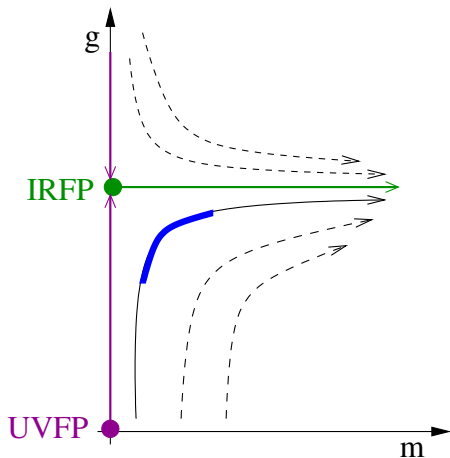
CERN Theory Group Retreat, Les Houches.

Introduction



- ▶ Perturbative phase diagram of $SU(N)$ gauge theories with N_f fermions
- ▶ Shaded region shows conformal window
- ▶ Can be very different to QCD

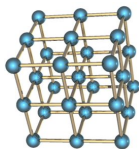
RG flows in mass-deformed CFT



- ▶ Flow from UV to IR
- ▶ Finite mass drives us away from FP in the IR
- ▶ Interested in intermediate blue region
- ▶ $\frac{1}{L} \ll m \ll \text{blue} \ll \frac{1}{a}$

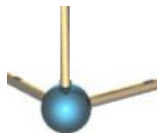
Large N Twisted Volume Reduction

Lattice field theory:



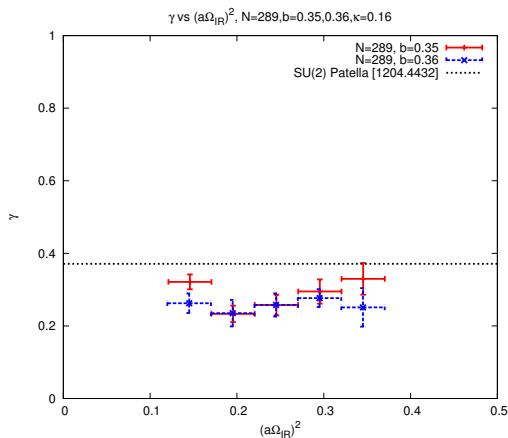
- ▶ \hat{L}^4 points, lattice spacing a
- ▶ Physical volume $L^4 = (\hat{L}a)^4$
- ▶ UV cut-off: $1/a$
- ▶ IR cut-off: $1/L$

Twisted reduction: $\hat{L} \rightarrow \sqrt{N}$



- ▶ Single site lattice, lattice spacing a
- ▶ Physical volume $L^4 = (\sqrt{N}a)^4$
- ▶ UV cut-off: $1/a$
- ▶ IR cut-off: $1/\sqrt{N}$

Mass Anomalous Dimension at IRFP γ_*



- ▶ SU(N) + 2 adjoint Dirac fermions
- ▶ γ_* determined from fit to the Dirac mode number
- ▶ data points: SU(N) with N=289 (single site)
- ▶ dotted line: SU(2) (32^4 lattice) [Patella 1204.4432]

[Margarita García Pérez, Antonio González-Arroyo, Masanori Okawa]