The Spectra of Yang-Mills Gauge Theories with novel, non QCD-like dynamics

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Motivation

- Why non QCD-like?

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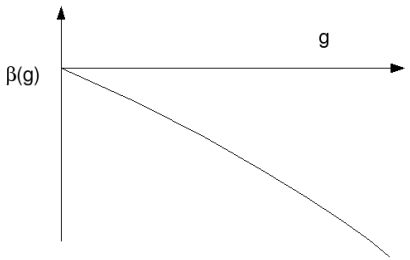
- For QCD

$$\beta_1 = 0 \quad N_f \sim 8$$
$$\beta_0 = 0 \quad N_f \sim 16$$

Beta function



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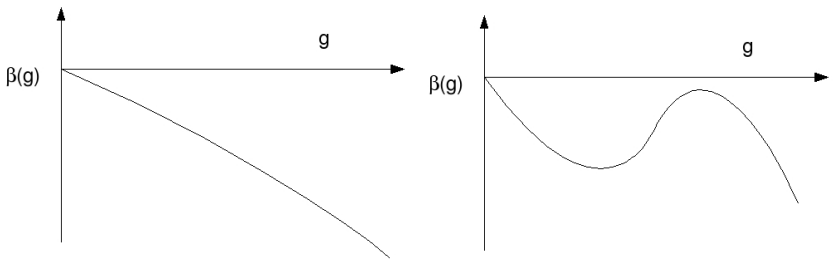

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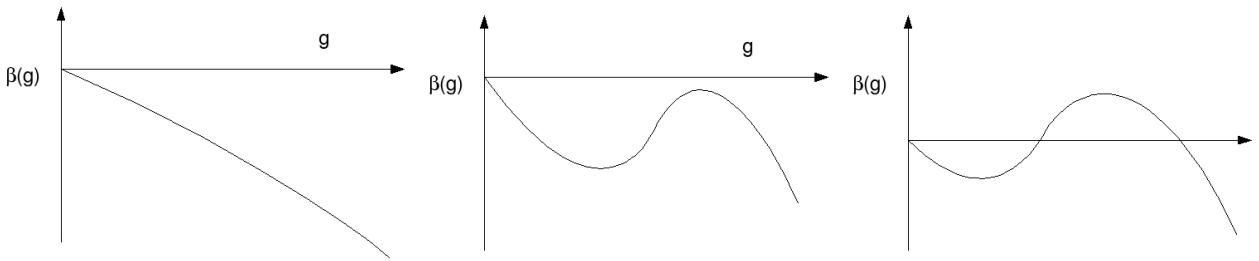

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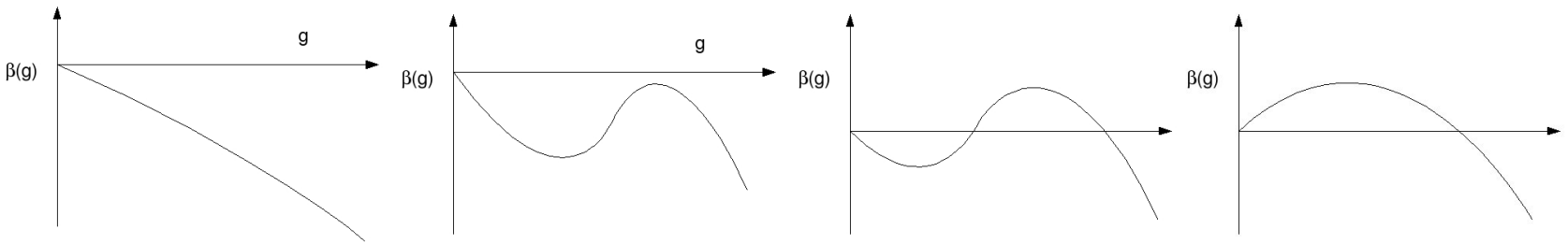

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  - does not admit a particle interpretation

Unparticles [Geo07]

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- Analyses matrix elements of $\mathcal{BZ}$ operators
- Concludes that "unparticle stuff with scale dimension $d_{\mathcal{U}}$ looks like a non-integral number $d_{\mathcal{U}}$ of invisible particles"

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- 2 massless fermions forming minimal technicor sector
- $N_f - 2$ electroweak singlet fermions , charged under $\mathcal{BZ}$ with explicit mass terms

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- Proximity to IR fixed point ensures condensate has large anomalous dimension
- Fermion masses are enhanced, as in Walking Technicolor
- Argued in [San08] that CT is equivalent to *Partially Gauged Technicolor* [DST06], but needs new mass scale for EWSB

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- Chirally symmetric phase has $m_{\pi,\rho,\ldots} \longrightarrow 0$ as $m_q \longrightarrow 0$
- Chirally broken phase has $m_\pi \sim \sqrt{m_q}$, $m_{\rho,\ldots} \nrightarrow 0$ as $m_q \longrightarrow 0$

Outline

[CS07]

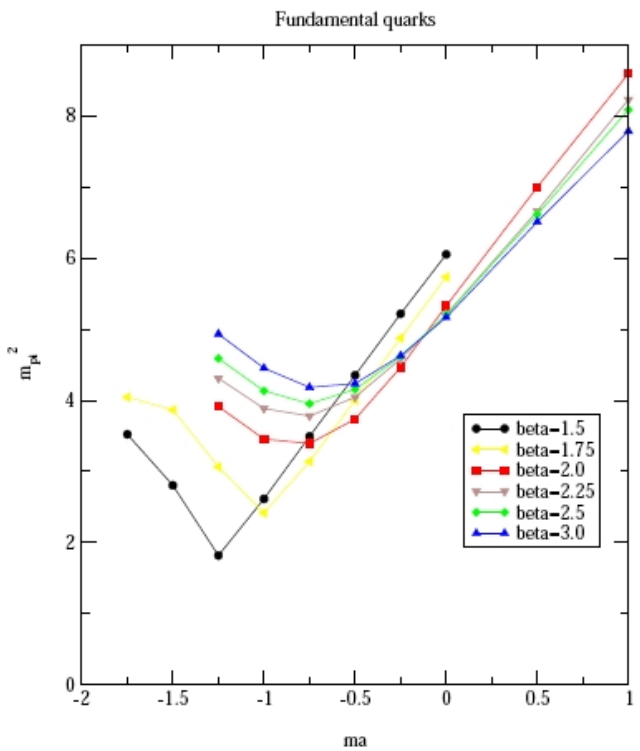
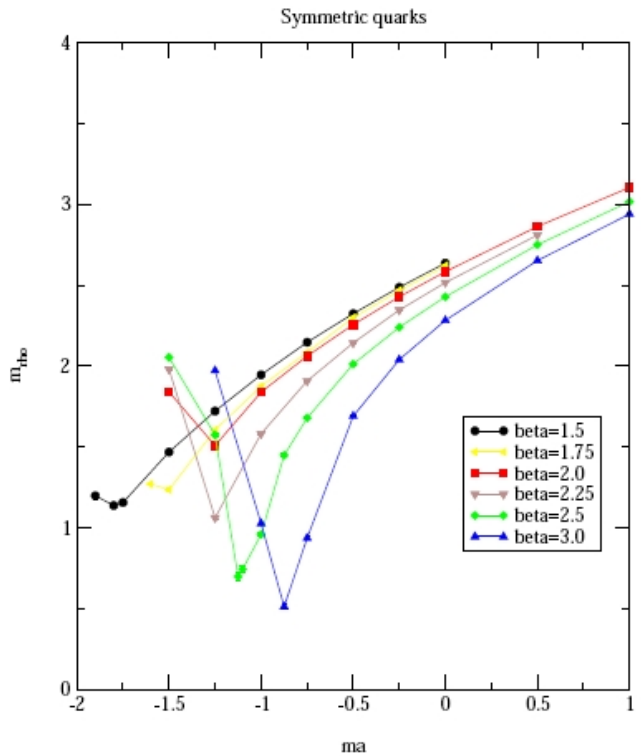


Figure: Fundamental quarks



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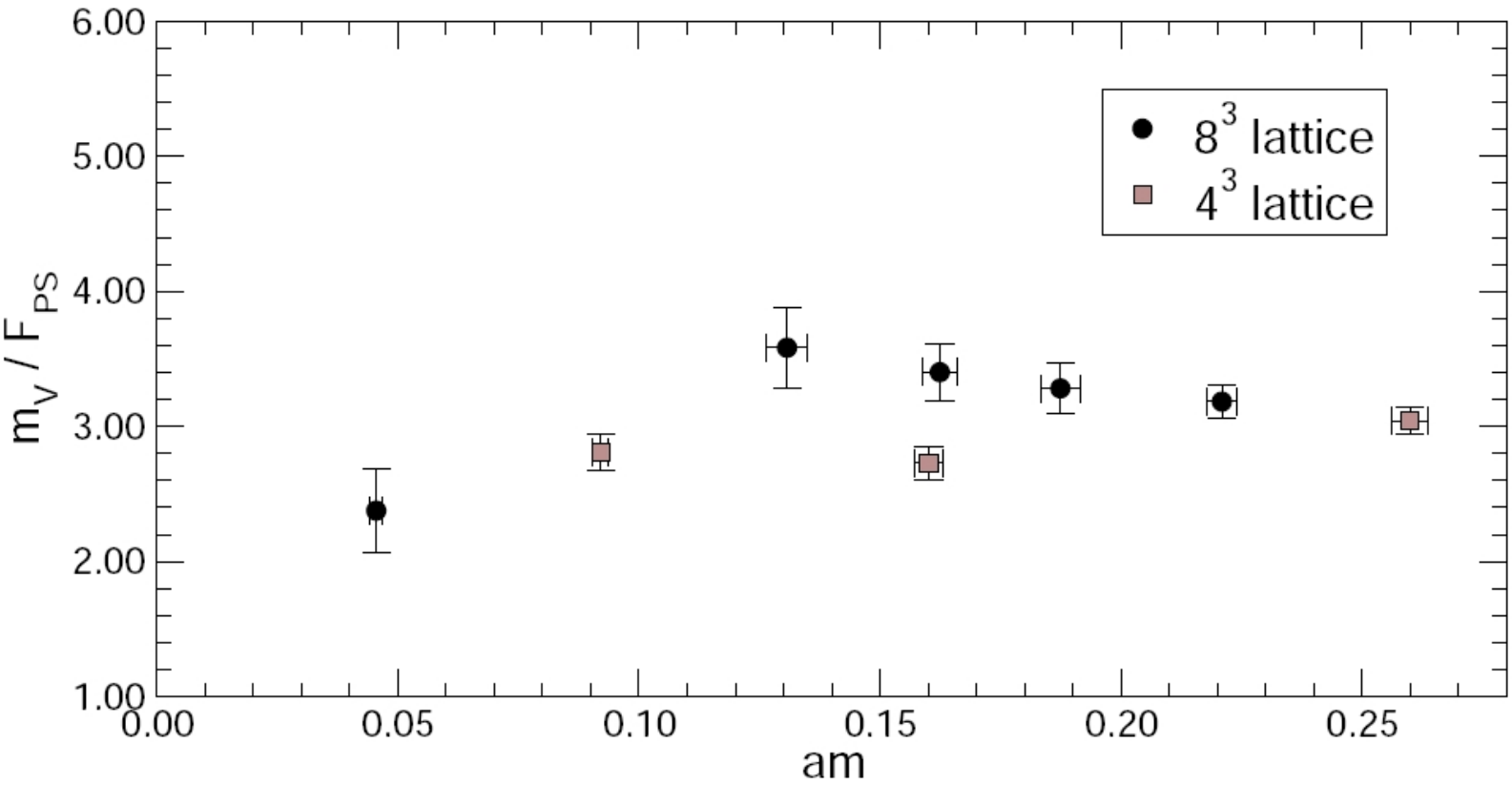
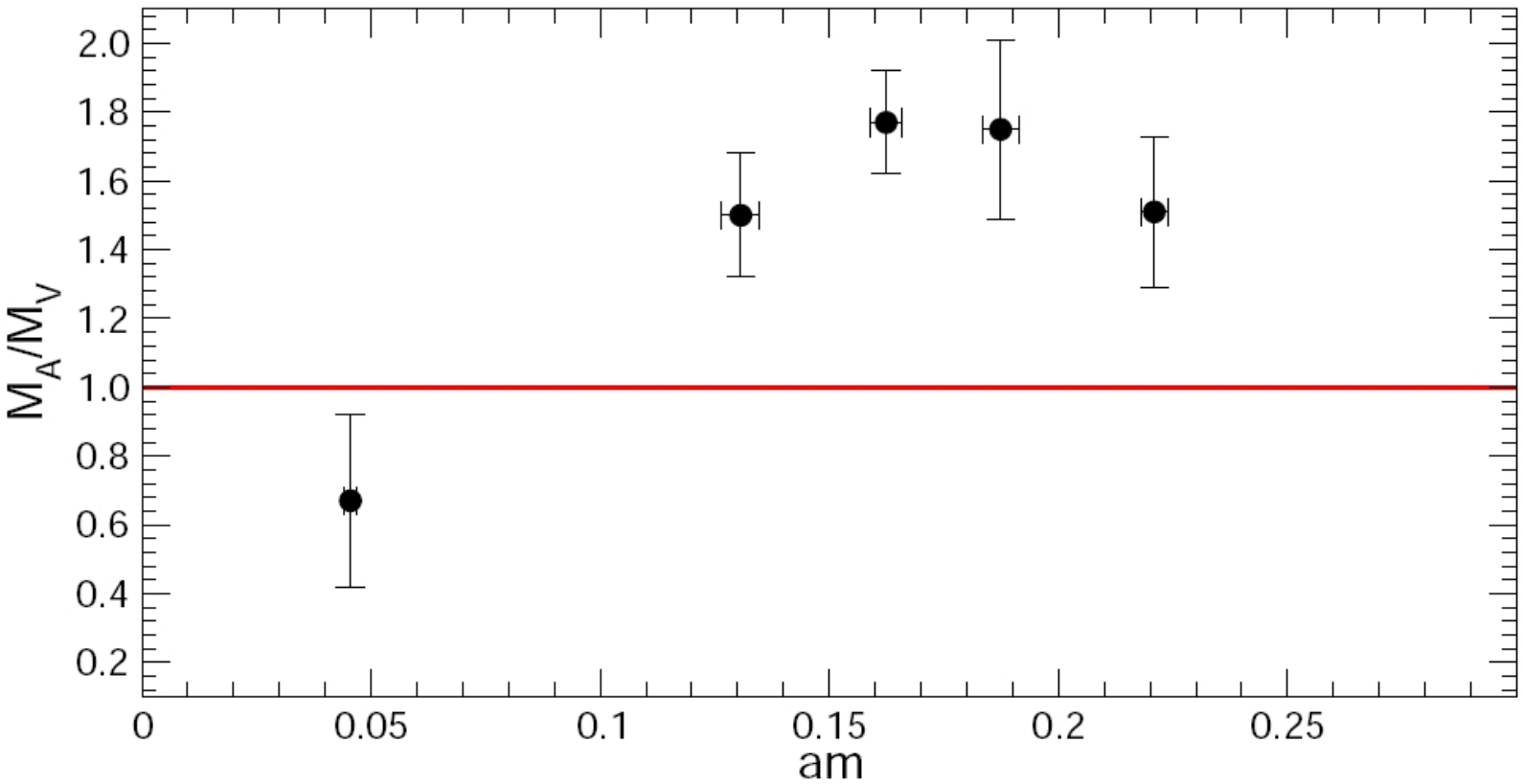
[DDPP08]


6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.05
0.10
0.15
0.20
0.25
am
m_V / F_{PS}
8^3 lattice
4^3 lattice

[DDPP08]



[HRRT09]

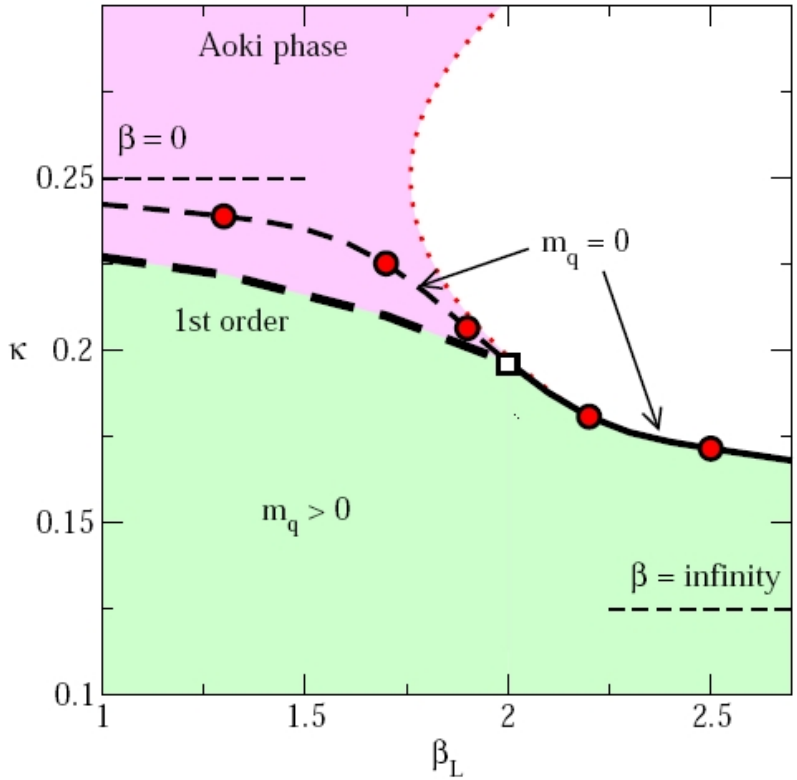
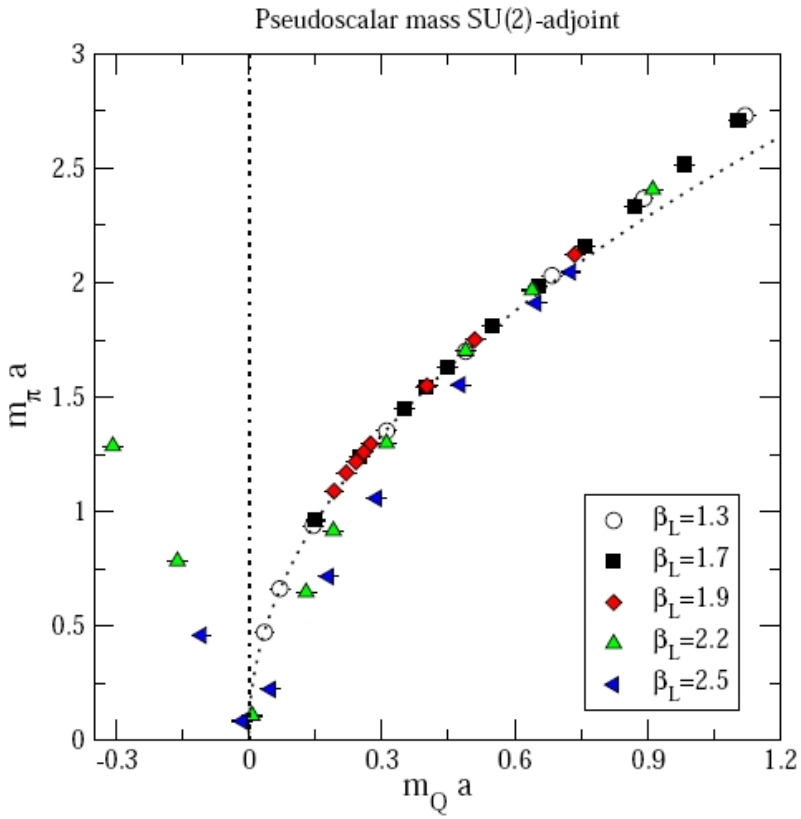


Figure: Phase diagram of $SU(2)$ adjoint theory

[HRRT09]



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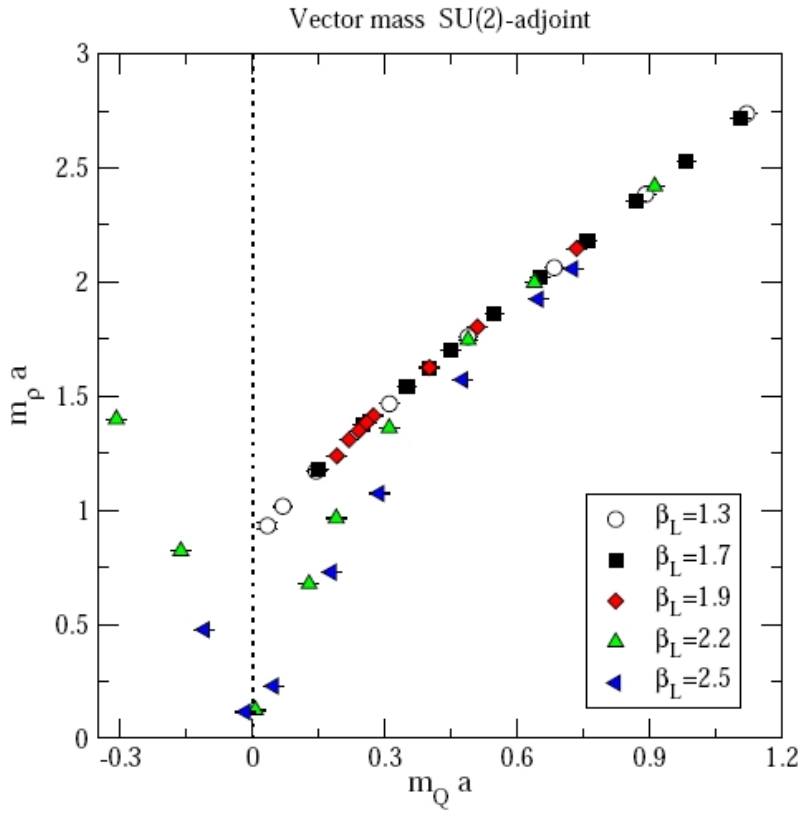

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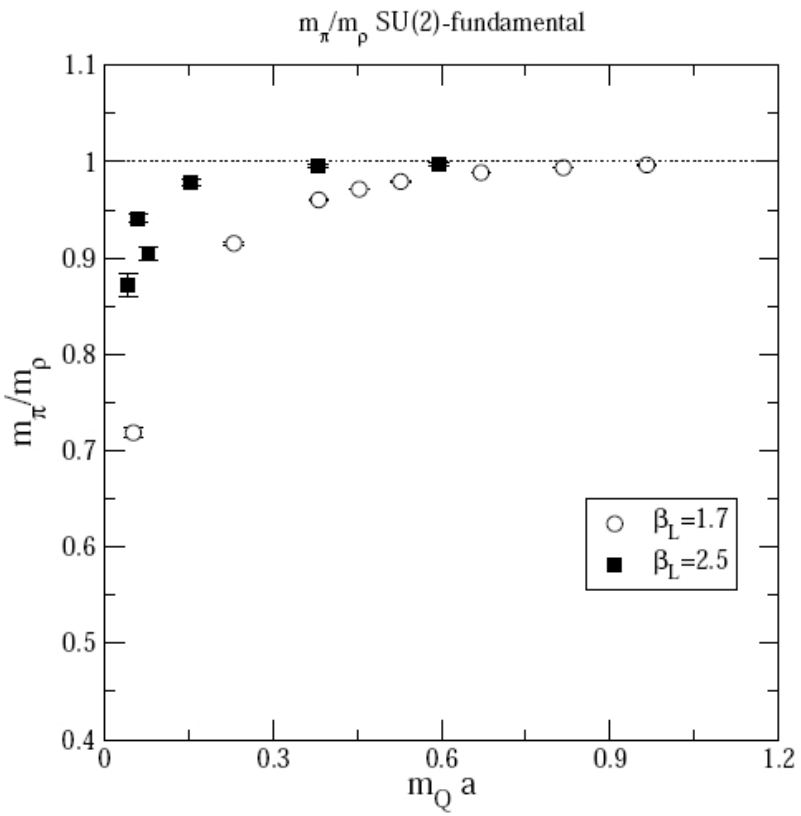

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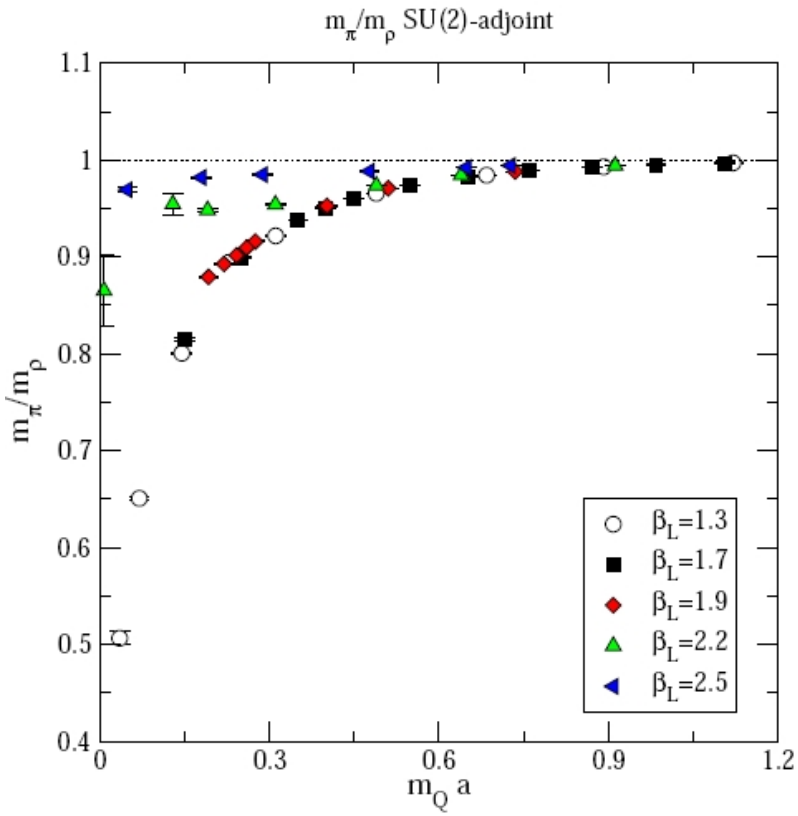

Figure: Adjoint


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