CHIRAL SYMMETRY RESTORATION AND DECONFINEMENT FOR MANY QUAKR FLAVOR QCD

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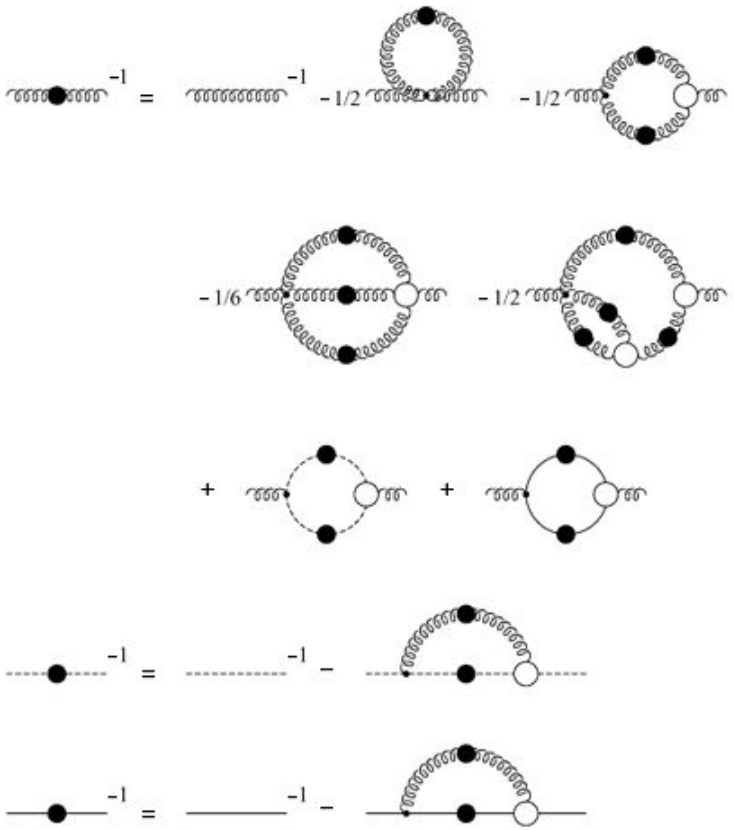
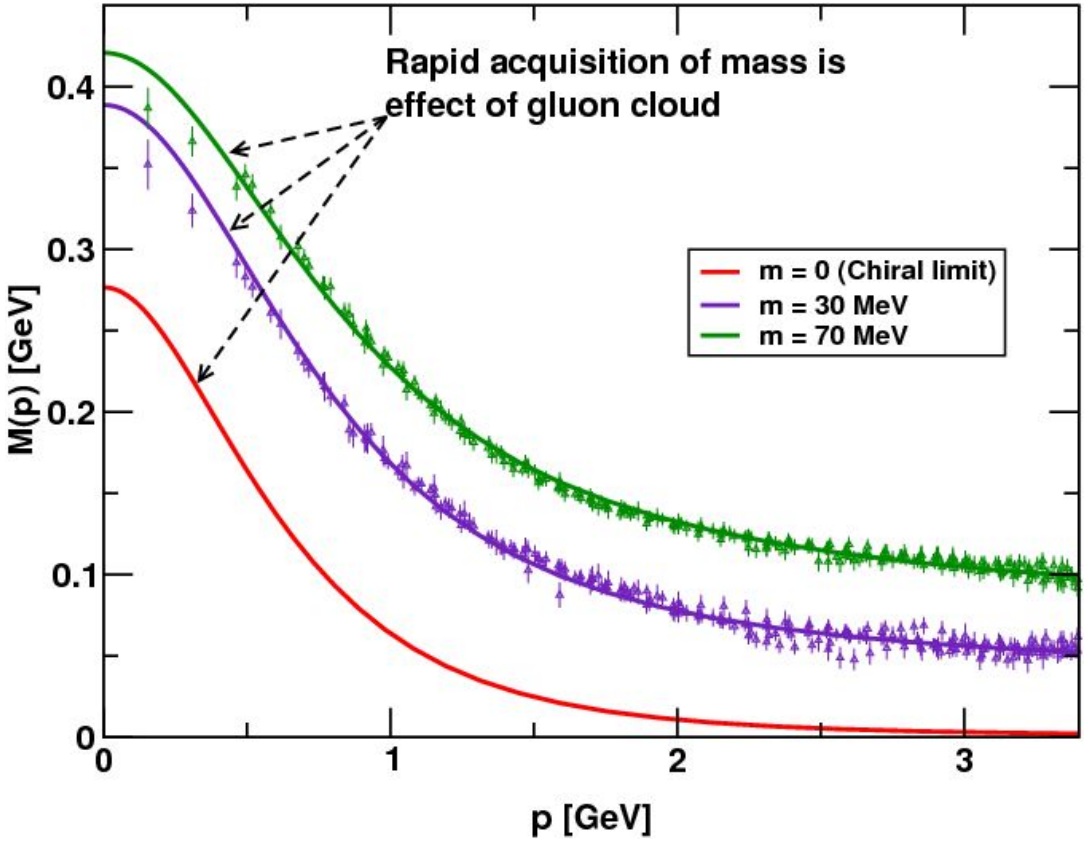
Schwinger-Dyson equations

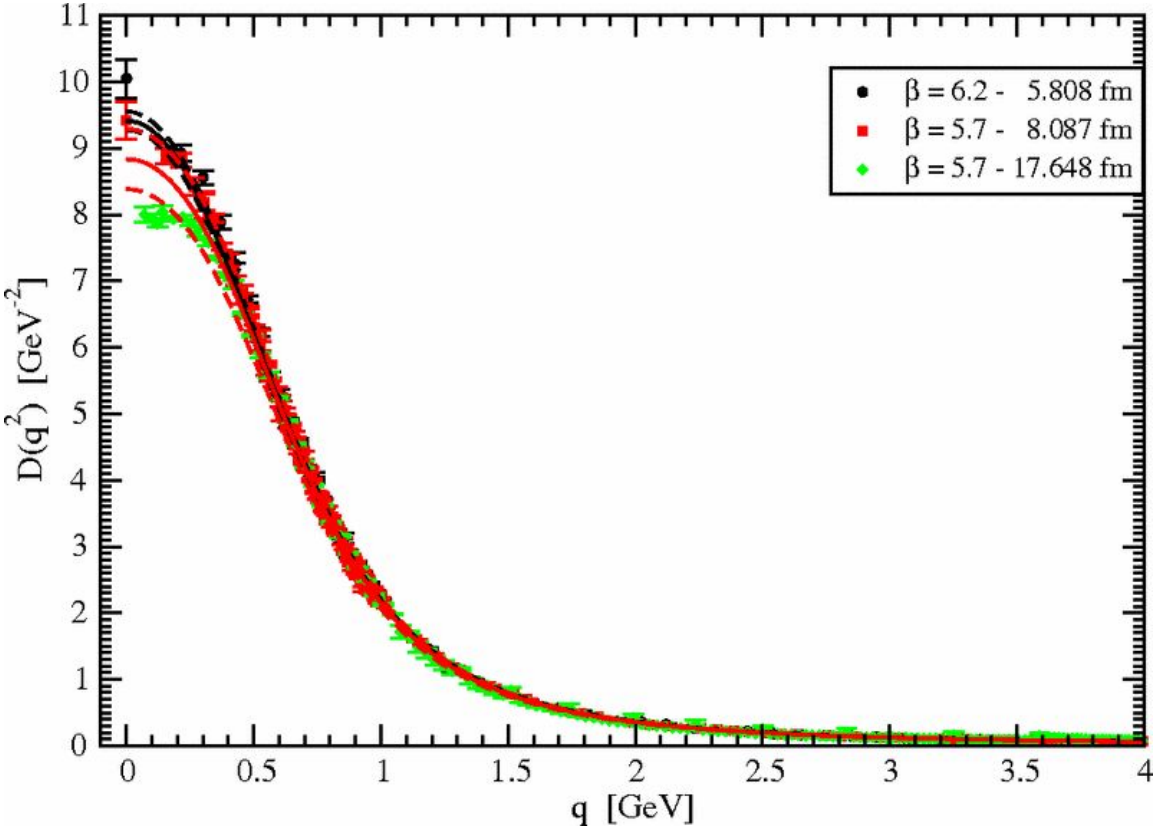
- Non perturbative, first principles approach to QCD
- Require truncation
- Competitive against Lattice QCD, effective field theories and other approaches



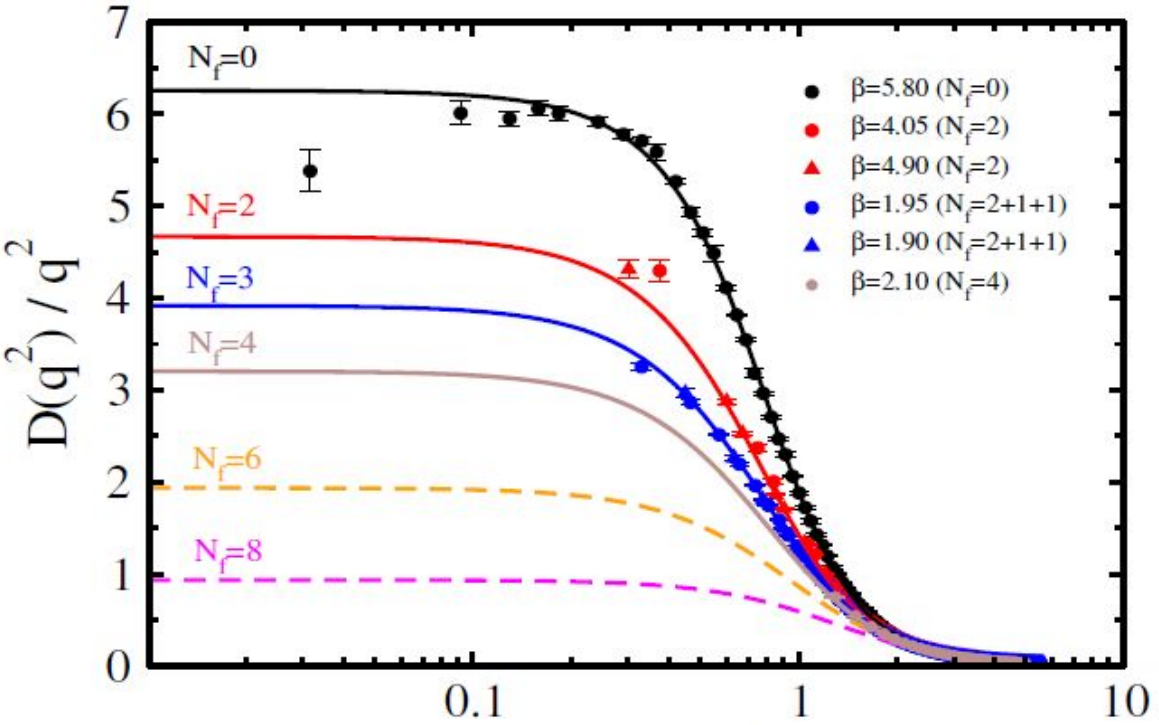
Fermion Propagator



Gluon Propagator



Gluon Propagator



$$D(q^2) = \frac{z(\mu^2)\ q^2(q^2+M^2)}{q^4 + q^2\left(M^2 - 13g^2\langle A^2\rangle/24\right) + M^2 m_0^2}$$

Chiral Symmetry Breaking/Restoration

$$S^{-1}(p) = \mathcal{Z}_2(i\gamma \cdot p + m) + \Sigma(p)$$

$$\Sigma(p) = \mathcal{Z}_1 \int \frac{d^4q}{(2\pi)^4} g^2 \Delta_{\mu\nu}(p-q) \frac{\lambda^a}{2} \gamma_\mu S(q) \Gamma^a_\nu(q,p)$$

$$S^{-1}(p) = \frac{i\gamma \cdot p + M(p^2)}{Z(p^2, \mu^2)}$$

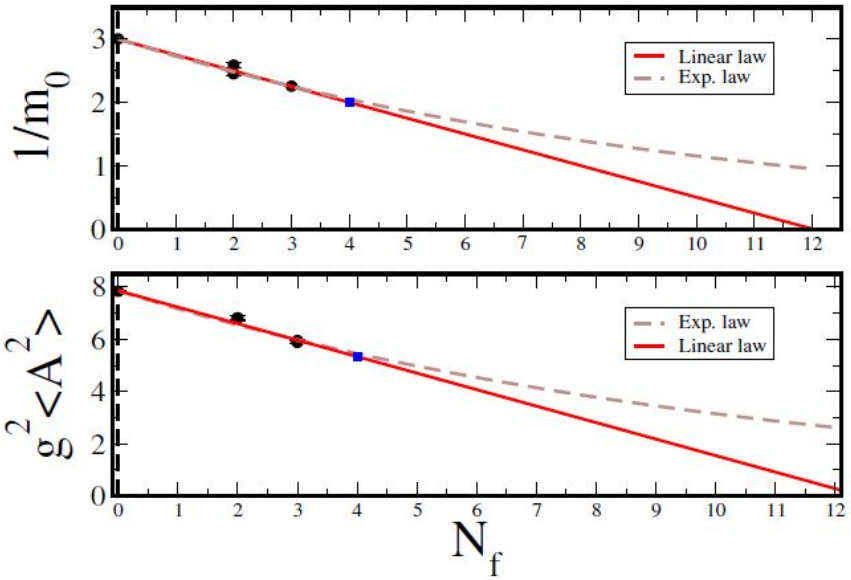
Chiral Symmetry Breaking/Restoration

$$\mathcal{Z}_1 g^2 \Delta_{\mu\nu}(p-q)\Gamma_\nu(p,q) \rightarrow g^2_{\rm eff}(q^2)\ \Delta^N_{\mu\nu}(p-q)\frac{\lambda^a}{2}\gamma_\nu$$

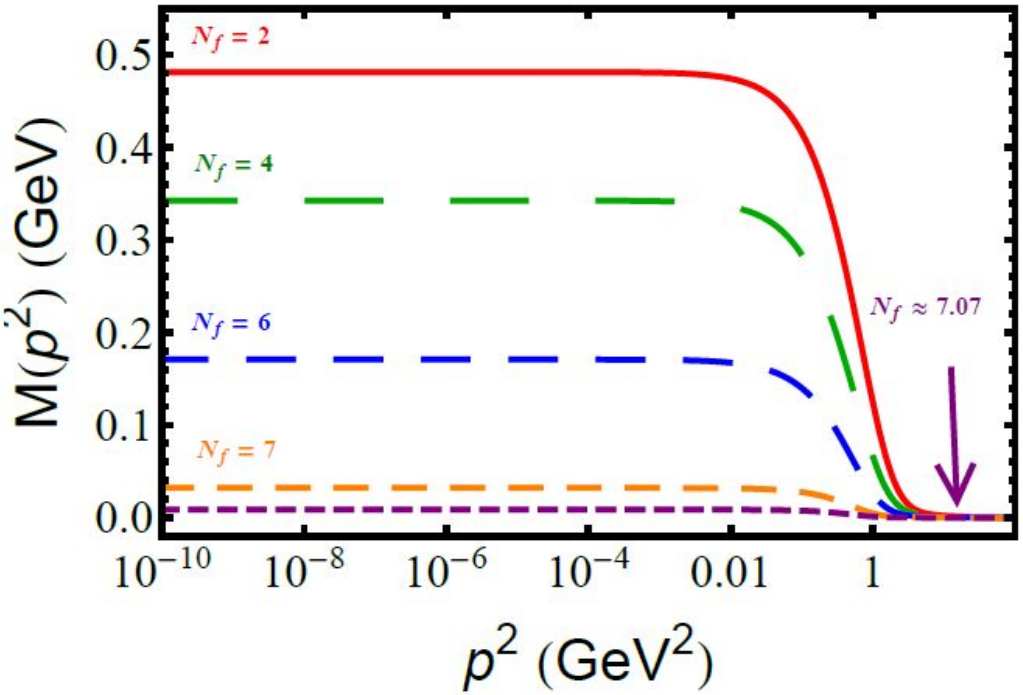
$$\Delta^N_{\mu\nu}(q) \ = \ \frac{D(q^2)}{q^2}\ \left[\delta_{\mu\nu} - \frac{q_\mu q_\nu}{q^2}\right]$$

Chiral Symmetry Breaking/Restoration

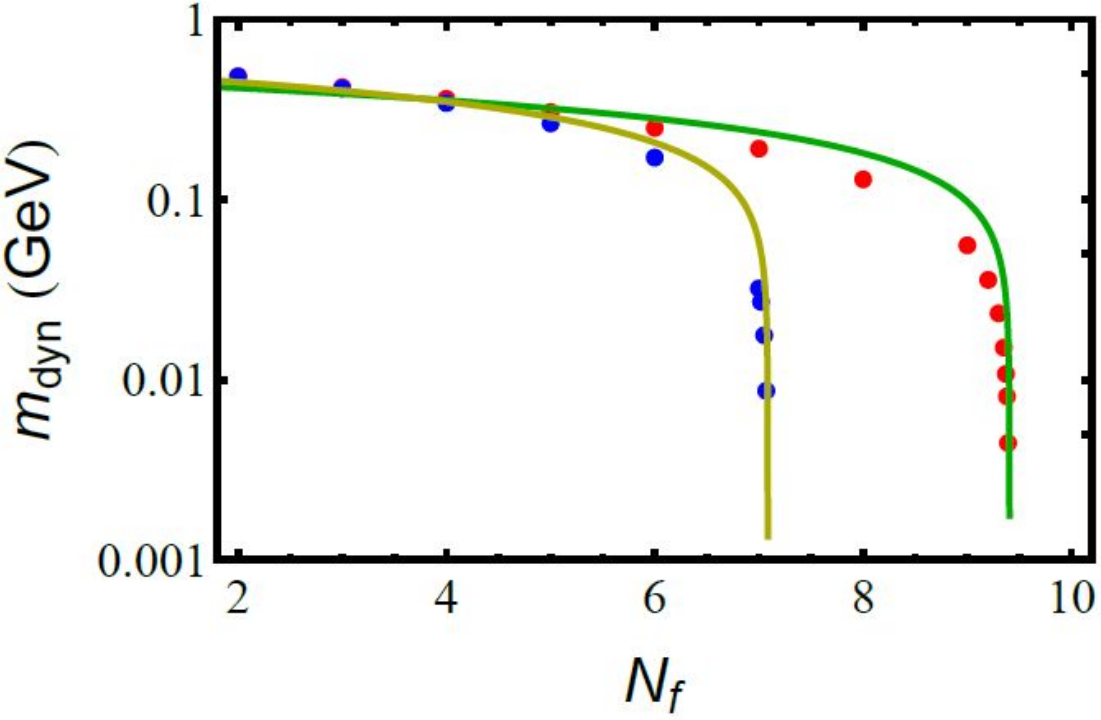
$$D(q^2) = \frac{z(\mu^2)\ q^2(q^2+M^2)}{q^4 + q^2\left(M^2 - 13g^2\langle A^2\rangle/24\right) + M^2 m_0^2}$$



Chiral Symmetry Breaking/Restoration



Chiral Symmetry Breaking/Restoration



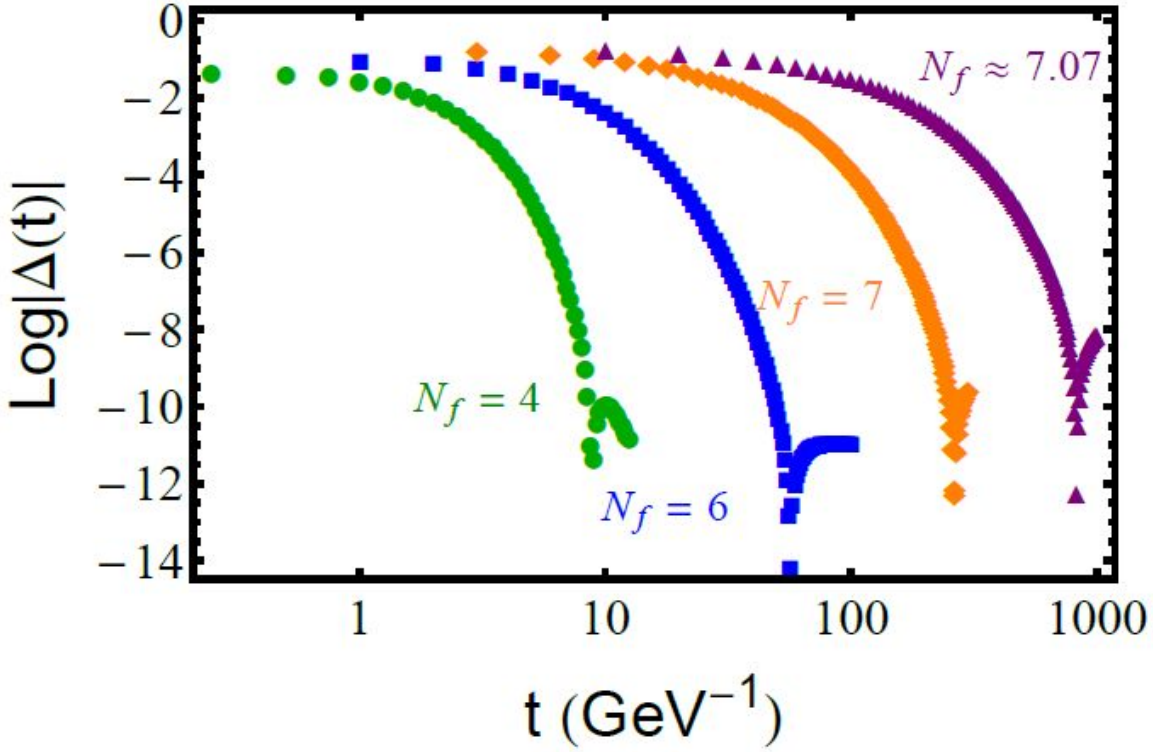
Confinement/Deconfinement

$$\Delta(t) = \int d^3x \int \frac{d^4p}{(2\pi)^4} \, \mathrm{e}^{i(p_4 t + \mathbf{p}\cdot\mathbf{x})} \sigma_s(p^2)$$

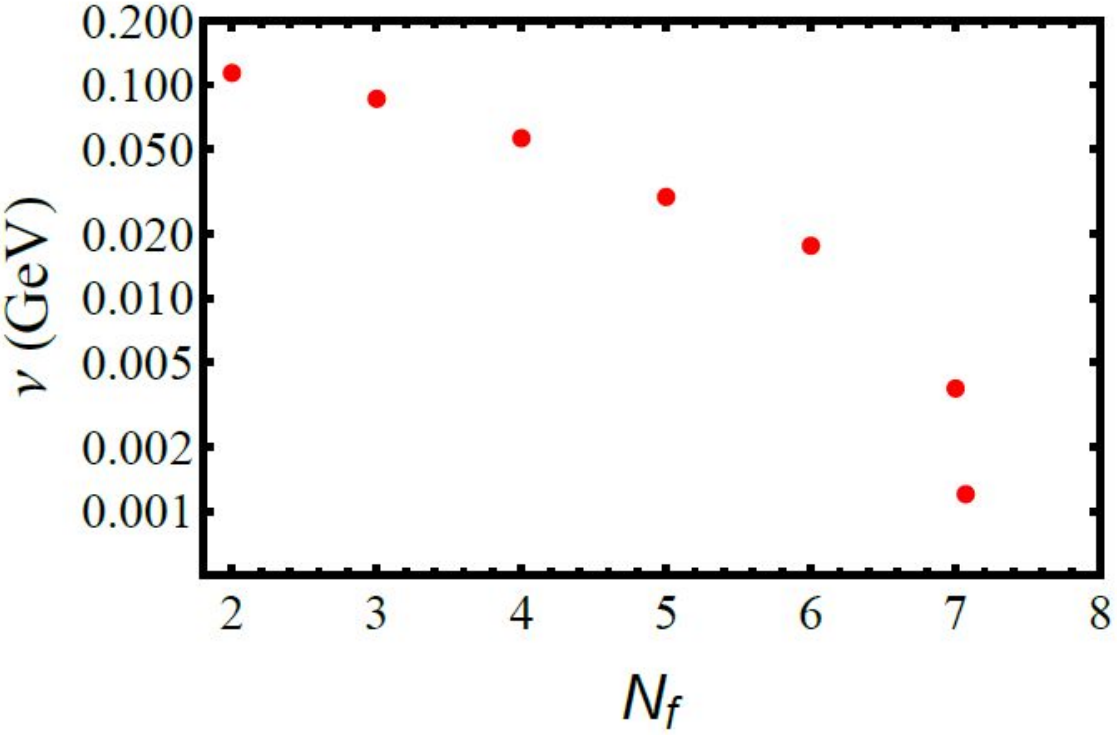
$$\Delta(t) \sim \mathrm{e}^{-mt}$$ Stable Partcle

$$\Delta(t) \sim \mathrm{e}^{-at}\cos(bt+\delta)$$ Unstable Particle

Confinement/Deconfinement



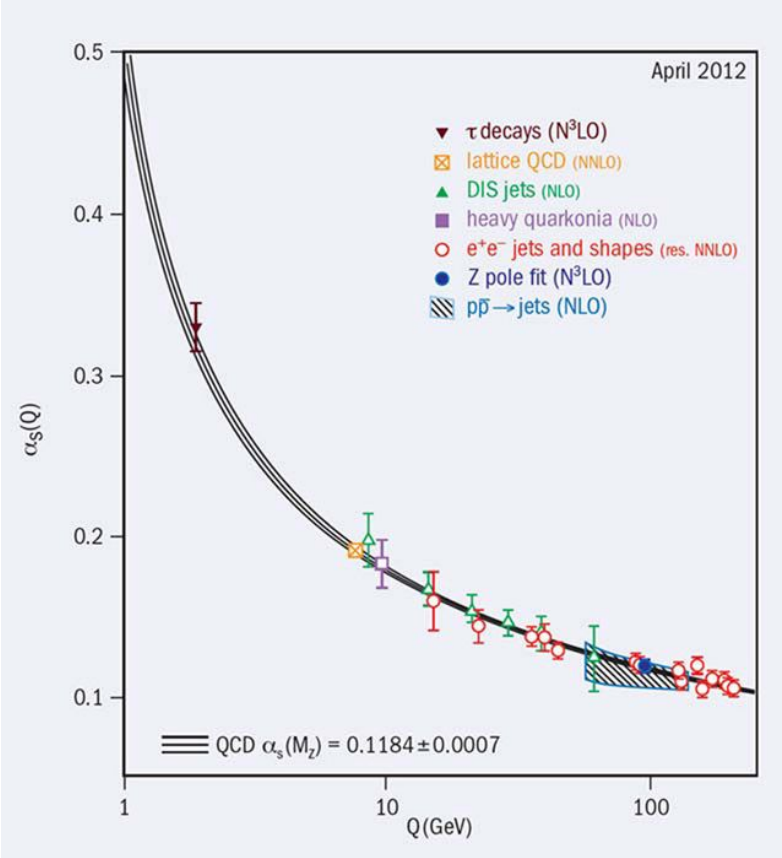
Confinement/Deconfinement



Final Remarks

$$N_f^{c1} = 16.5$$

$$N_f^{c2} \approx 8.2 \pm 1.2$$



GRACIAS