Heavy mesons in the SD/BS approach

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Talk at XX Baldin ISHEPP

October 4, 2010

Schwinger – Dyson equation

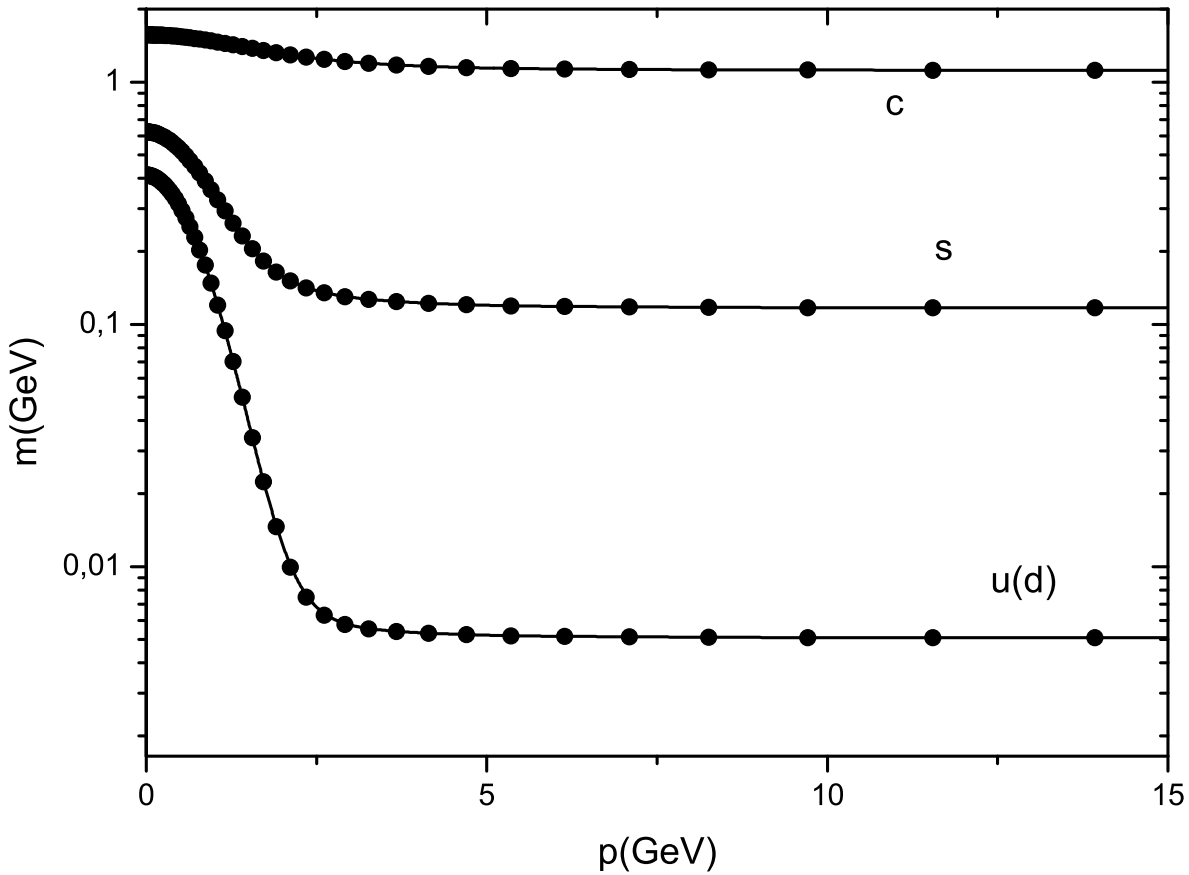
$$S_q^{-1}(p) = i\gamma \cdot p + \tilde{m} + \frac{4}{3}\int \frac{d^4 l}{(2\pi)^4}\left[g^2 D(p-l)\right]_{\mu\nu}\gamma_\mu S_q(l)\gamma_\nu$$

Rainbow-ladder approximation

$$g^2(k^2)D_{\mu\nu}(k^2) = \left(\frac{4\pi^2 Dk^2}{\omega^2}e^{-k^2/\omega^2} + \frac{8\pi^2\gamma_m F(k^2)}{ln[\tau + (1+\frac{k^2}{\Lambda_{QCD}^2})]}\right)\left(\delta_{\mu\nu} - \frac{k_\mu k_\nu}{k^2}\right)$$

$$S_q^{-1}(p) = i\gamma \cdot pA(p) + B(p)$$

Solutions of the SD equation



Bethe–Salpeter equation

$$\Gamma(P,p) = (-\frac{4}{3}) \int \frac{d^4k}{(2\pi)^4} \gamma_\mu S(k_+) \Gamma(P,k) S(k_-) \gamma_\nu (g^2 D(p-k))_{\mu\nu}$$

$$\Gamma(p_4, \mathbf{p}) \;\; = \;\; \sum_\alpha g_\alpha(p_4, |\mathbf{p}|)\, \mathcal{T}_\alpha(\mathbf{p})$$

$$\mathcal{T}_1(\mathbf{p}) = \frac{\gamma_5}{\sqrt{16\pi}}, \quad \mathcal{T}_2(\mathbf{p}) = \frac{\gamma_0\gamma_5}{\sqrt{16\pi}},$$

$$\mathcal{T}_3(\mathbf{p}) = \frac{1}{\sqrt{16\pi}} \frac{(\mathbf{p}\boldsymbol{\gamma})}{|\mathbf{p}|} \gamma_0\gamma_5, \quad \mathcal{T}_4(\mathbf{p}) = \frac{1}{\sqrt{16\pi}} \frac{(\mathbf{p}\boldsymbol{\gamma})}{|\mathbf{p}|} \gamma_5$$

$$g_i(p4, |\mathbf{p}|) = \sum_j g_i^j(p) X_{j,0(1)}(\chi_p)$$

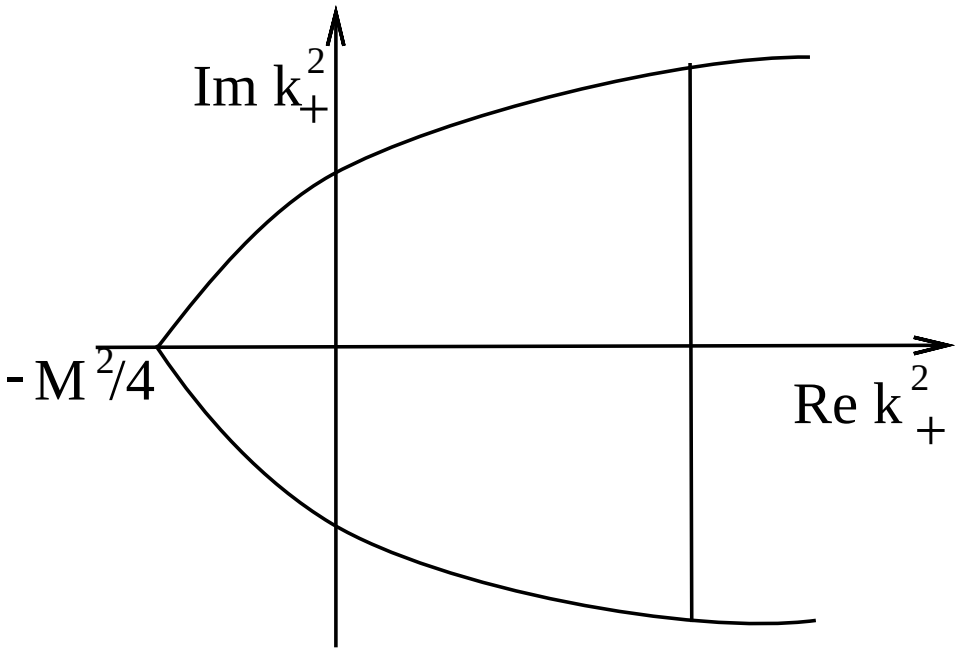
Solving of the BS equation

$$g_i^k(p) = \int_0^\infty \frac{dkk^3}{4\pi^2} \sum A_{ij}^{km}(p,k) g_j^m(k)$$

$$g = K \cdot g$$

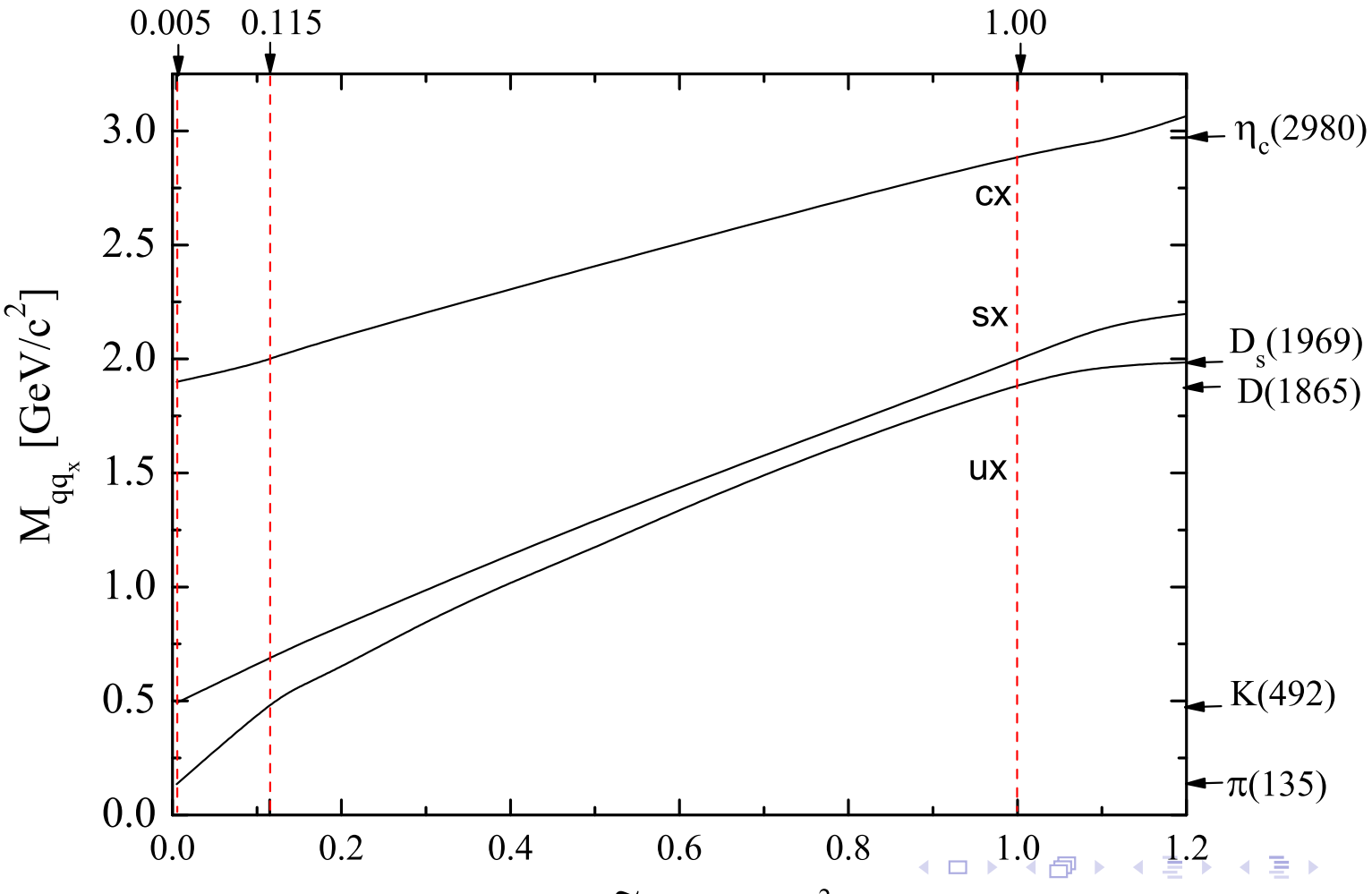
$$\det(K - 1) = 0$$

Calculation of functions A and B at complex momenta



$$2\pi i A(z_1) = \oint dz \frac{A(z)}{z - z_1}$$

Results for pseudoscalar mesons



Excited states

$\bar{u}u$ 1080 MeV
$\bar{u}c$ 2530 MeV