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## Effective quarks and gluons in heavy-flavor QCD

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Hadrons composed of heavy quarks are the simplest ones to study in QCD. They provide an affordable theoretical laboratory for investigating the dynamics of gluons, mainly because quarks move slowly with respect to each other as the sources of gluons and in the analysis of heavy meson states one can safely take advantage of asymptotic freedom and expand renormalized interactions in powers of the coupling constant [1]. The effective quarks and gluons are introduced using the renormalization group procedure for effective particles (RGPEP), whose details are addressed in the abstract submitted by Maria Gomez-Rocha to HADRON2017 [2]. We use the RGPEP to derive the leading-order renormalized light-front QCD Hamiltonian and to formulate its eigenvalue problem for mesons in terms of the Fock components with smallest possible number of effective particles, which resembles the constituent quark model. However, the dynamics of quarks originates in the gluons in higher Fock sectors. In the second-order calculation we describe here, only the Fock sector with one gluon in addition to quarks matters. However, in order to approximately account for the non-abelian and non-perturbative effects due to higher sectors, we introduce a mass ansatz for the gluon. As a result, we obtain the Coulomb force plus a harmonic oscillator force between heavy quarks in the quark-antiquark Fock sector. In this first approximation, the harmonic oscillator potential does not depend on the assumed gluon mass or on the generator of the RGPEP [3].

[1] M. Gómez-Rocha, S. D. Głazek, Phys. Rev. D 92, 065005

[2] María Gómez-Rocha's abstract submitted to HADRON2017.

[3] S.D. Głazek, M. Gómez-Rocha, J. More, K. Serafin. arXiv:1705.07629

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