# Is the meson spectrum limited?

P. González

Departamento de Física Teórica, Universidad de Valencia (UV) and IFIC (UV-CSIC), Valencia, Spain

We study the applicability of a static potential to the description of the meson spectra. Masses of the high excited light-quark mesons (formed by quarks $u$ and $d$) and heavy quarkonia (charmonium and bottomonium), for which they are sufficient data for a trustable analysis [1], can be reproduced by means of an effective static potential that becomes asymptotically coulombic [2]. In the light-quark meson case this provides an explanation to the observed hydrogen-like spectral pattern observed from data [3]. This coulombic behavior might be effectively parametrizing string breaking effects [4] due to the combination, for sufficiently large quark-antiquark distance, of sea pairs, popping out of the vacuum, with the quark and antiquark to form a two-meson state. Otherwise said the long-distance limit of confinement could be coulombic. Comparison with other proposed potential forms of string breaking [5] is carried out.

As a consequence of the coulombic long-distance behaviour the meson spectra have upper energy limits. In particular for light-quark mesons, with only quarks $u$ and $d$, the estimated limiting value is 2.823 GeV whereas for charmonium and bottomonium these limits are 5.025 GeV and 11.720 GeV respectively, all of them perfectly compatible with known data. Beyond these limits one meson states cannot exist since they would necessarily fragment into two or more mesons.

[1] D. V. Bugg, Phys. Rep. **397**, 257 (2004); C. Amsler *et al.* [Particle Data Group], Phys. Lett. B **667**, 1 (2008).

[2] El Houssine Mezoir and P. González, Phys. Rev. Lett. **101**, 232001 (2008); P. González, Phys. Rev. D **80**, 054010 (2009).

[3] S. S. Afonin, Mod. Phys. Lett. A **22**, 1359 (2007); Int. J. Mod. Phys. A **23**, 4205 (2008); arXiv:hep-ph/0707.1291.

[4] G. S. Bali, Phys. Rep. **343**, 1 (2001); G. S. Bali *et al.*, Phys. Rev. D **71**, 114513 (2005).

[5] K. D. Born *et al.* Phys. Rev. D **40**, 1653 (1989); A. M. Badalian, B. L. G. Bakker and Yu. A. Simonov, Phys. Rev. D **66**, 034026 (2002).

E-mail: pedro.gonzalez@uv.es