B_s meson excited states from the lattice

Presenter: Jonna Koponen
A. M. Green, J. Koponen, C. McNeile, C. Michael, G. Thompson (for UKQCD Collaboration)

Abstract: The energies of different angular momentum states of a heavy-light meson were measured on a lattice in Phys. Rev. D 58, 34506 (1998). We have now continued this study using several different lattices, quenched and unquenched, that have different physical lattice sizes, clover coefficients, hopping parameters and quark–gluon couplings. The heavy quark is taken to be infinitely heavy, whereas the light quark mass is approximately that of the strange quark. By interpolating in the heavy and light quark masses we can thus compare the lattice results with the B_s meson. Most interesting is the lowest P-wave B_s state, since it is possible that it lies below the BK threshold and hence is very narrow. Unfortunately, there are no experimental results on P-wave B_s mesons available at present.

In addition to the energy spectrum, we measured earlier also vector (charge) and scalar (matter) radial distributions of the light quark in the S-wave states of a heavy-light meson on a lattice [Phys. Rev. D 65, 014512 (2002) and Eur. Phys. J. C 28, 79 (2003)]. Now we have extended the study of radial distributions to P-wave states. The aim is to understand these distributions in terms of a simple one-body Dirac equation.