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Heavy-light mesons in Minkowski space

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We present a study of the heavy-light pseudoscalar and vector meson masses, using a covariant formalism based on the Covariant Spectator Theory (CST). Derived directly in Minkowski space, our approach approximates the Bethe-Salpeter equation, effectively taking into account the contributions of both ladder and crossed ladder diagrams in the kernel.

Our goal was to provide—without already performing a comprehensive fit—an initial test whether our approach was able to describe the experimental data in a reasonable fashion. Our results show that such a description is indeed possible. Not only do we obtain a surprisingly good match in the heavy sector of the spectrum, but also the masses of mesons containing light and strange (anti-) quarks are very well described.

This is an encouraging first step towards a comprehensive study of mesons in this approach. Further steps will involve a fit of our model parameters to a wider range of data, but will also have to include a more general—and more complicated—version of our bound-state equation. That equation is more appropriate for the description of mesons consisting of light quarks, and we expect that its solutions will be closer to the experimental masses than the ones calculated with the approximation used in this work. This is of particular importance for a good description of the pion, which has already been studied successfully within CST, however only with a simpler phenomenological kernel.

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