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Meson spectroscopy in a study of the Bethe-Salpeter equation

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We calculate the spectrum of light mesons, charmonium and bottomonium, for total momenta $J=0..3$ in the Dyson-Schwinger/Bethe-Salpeter approach to QCD, using the rainbow-ladder approximation in combination with an effective interaction.

We find two new states in the $n\bar{n}$ and $s\bar{s}$ channels for $J=3-$, with masses 1528(184) MeV and 1752(94) MeV respectively, that compare well with the experimental values of 1688 MeV and 1854 MeV. The underlying reasons for agreement in some states, and discrepancy in others, are discussed and quantified. The impact of the shape of the effective interaction on the fine splitting of excited states in the charmonium spectra is discussed in detail.

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