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Bottomonium vector resonances and threshold effects

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The bottomonium spectrum is a perfect testing ground for the QCD confining potential and unitarisation effects. First of all, the bottom quark is about three times heavier than the charm quark, so that $b\bar{b}$ systems probe much more the short-range region of that potential. Secondly, the much smaller colour-hyperfine interaction in the B meson makes the $B\bar{B}$ threshold lie significantly higher relative to the $\Upsilon(1S)$ state than the $D\bar{D}$ threshold with respect to the J/ψ.

Another complicating circumstance is that none of the experimentally observed vector $b\bar{b}$ mesons have been positively identified as $^3D_1$ states, contrary to the situation in charmonium. This makes definite conclusions about level splittings very problematic. Finally, there are compelling indications that the $\Upsilon(10580)$ is not the $\Upsilon(4S)$ state, as is generally assumed.

In this talk I shall review an empirical modelling of vector $b\bar{b}$ resonances above the open-bottom threshold, including the $\Upsilon(10580)$, based on the Resonance-Spectrum-Expansion production formalism. Furthermore, an analysis of other experimental bottomonium data will be presented, showing strong indications of the two lowest and so far unlisted $^3D_1$ states below the $B\bar{B}$ threshold.

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