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The charged Z_c and Z_b structures in a constituent quark model approach

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The nature of the recently discovered Z_c and Z_b structures is intriguing. On the one hand, in the charm sector, the $Z_c(3900)^{\pm}$ and $Z_c(4020)^{\pm}$ were discovered in the $\pi J/\psi$ and $D^*\bar{D}^{(*)} + h.c.$ invariant mass spectra. Their nature is puzzling due to their charge, which forces its minimal quark content to be $c\bar{c}u\bar{d}$ ($c\bar{c}d\bar{u}$). Additionally, their strong coupling to channels such as $\pi J/\psi$ and the closeness of their mass to $D^*\bar{D}^{(*)}$-thresholds stimulates both a molecular interpretation or a coupled-channels threshold effect. On the other hand, in the bottom sector, the well-established $Z_b(10610)$ and $Z_b(10650)$ states couple to $B^{(*)}B^*$-channels and are heavy enough to assume that they should contain a constituent $b\bar{b}$-pair. Moreover, they are charged and hence they must also have another constituent light quark-antiquark pair, namely $u\bar{d}$ (Z_b^+). Their minimal structure would be then $b\bar{b}u\bar{d}$, which automatically qualifies them as an (exotic) bottomonium-like meson. Thus, in all cases, it is necessary to explore four-quark systems in order to understand their inner structure.

In this work we perform a coupled-channels calculation of the $I^G(J^{PC}) = 1^+(1^{+-})$ charm and bottom sectors in the framework of a constituent quark model [1,2] which satisfactorily describes a wide range of properties of (non-)conventional hadrons containing heavy quarks [3]. All the relevant channels are included for each sector: The $D^{(*)}\bar{D}^* + h.c.$, $\pi J/\psi$ and $\rho\eta_c$ channels for the Z_c [4] and $B^{(*)}B^*$ and $\Upsilon(nS)\pi$ ($n = 1, 2, 3$) channels for the Z_b analysis. Results will be discussed.

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