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Hartree-Fock all-heavy c, b multiquarks and constraints on new top-sector physics

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Abstract

We deploy the Hartree-Fock approximation for all-heavy quark hadrons, including quarkonium, baryons, tetraquarks, pentaquarks, dibaryons and up to the 12-body dibaryon-antidibaryon which completely fill the $1s$ orbital, in a unified manner, with the spinless LO Coulomb interaction and beyond. After treating the c and b quarks in various combinations, we delve a bit longer on t -quark bound states. We extend the negative result of Kuchiev, Flambaum and Shuryak on the 12-body topball to now include the NLO QCD potential. We find that none of the examined multitop states should have binding energy exceeding their width in the Standard Model. Additional new-physics interactions can then be constrained by experimental searches for these bound states, assuming they are not detected, at a level somewhat less stringent than standing HEFT bounds, but with different systematics.

