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The fate of quarkonia in heavy-ion collisions at LHC energies: a unified description of the sequential suppression patterns

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Measurements made at the LHC have shown that the production of the J/psi, psi(2S), Upsilon(1S) and Upsilon(2S) quarkonia is suppressed in Pb–Pb collisions, with respect to the extrapolation of the pp production yields. The psi(2S) and Upsilon(2S) states are more strongly suppressed than the ground states and the level of the suppression changes with the centrality of the collision.

We show that the measured patterns can be reproduced by a simple model, where all quarkonia are treated in a unified way, starting from the recent realisation that, in pp collisions, the probability of quarkonium formation has a universal dependence on the binding-energy of the bound state. The hot-medium suppression effect is parametrized by a penalty factor in the binding energy, identical for all (S- and P-wave) charmonium and bottomonium states, including those that indirectly contribute to the measured results through feed-down decays. This single parameter, computed through a global fit of all available suppression patterns, fully determines the hierarchy of nuclear effects, for all states and centrality bins.

The resulting faithful description of the data provides convincing evidence in favour of the conjecture of sequential quarkonium suppression induced by QGP formation.

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