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## Detailed study of the production of $\Upsilon$ mesons in PbPb collisions with CMS

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One of the fundamental aspects of the formation and interaction of heavy quark bound states in the quark-gluon plasma is the amount of their suppression, expected to be stronger for quarkonia with smaller binding energies. Indeed, past results show a significant suppression of  $\Upsilon(1S)$  mesons in heavy ion collisions, with  $\Upsilon(2S)$  mesons being even more suppressed. However, for the  $\Upsilon(3S)$  meson, only upper limits have been reported so far. At the same time, features like polarization of quarkonia or feed-down contributions from excited states remain to be assessed. In this talk, we report the observation of the  $\Upsilon(3S)$  meson and a detailed study of the production of  $\Upsilon$  mesons in lead-lead collisions recorded by CMS. For the first time, the nuclear modification factor has been extended to the strongly suppressed  $\Upsilon(3S)$  state. The results are compared with model calculations describing the dynamics of quarkonia in a hot environment, whereas future prospects are shown too.

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