

Observation of new structure in the $J/\psi J/\psi$ mass spectrum in proton-proton collisions at $\sqrt{s} = 13$ TeV

A search is reported for near-threshold structures in the $J/\psi J/\psi$ invariant mass spectrum produced in proton-proton collisions at $\sqrt{s} = 13$ TeV from data collected by the CMS experiment, corresponding to an integrated luminosity of 135 fb^{-1} . A new structure is observed with a significance above 5 standard deviations at a mass of 6552 ± 10 (stat) ± 12 (syst) MeV. Another structure with even higher significance is found at a mass of 6927 ± 9 (stat) ± 4 (syst) MeV, which is consistent with the $X(6900)$ resonance reported by the LHCb experiment and confirmed by the ATLAS experiment. Evidence for another new structure, with a local significance of 4.1 standard deviations, is found at a mass of 7287^{+20}_{-18} (stat) ± 5 (syst) MeV. The masses and significances are obtained in a model without considering possible quantum mechanical interference between the resonances. Incorporating this interference provides a better description of the mass spectrum between the resonances and shifts the measured masses by up to 150 MeV.

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