

Studies of P-wave and S-wave quarkonium production with the CMS detector

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Precise measurement of S-wave quarkonium cross-sections and polarizations performed at LHC helped clarifying the experimental scenario in the field of quarkonium production. From the theoretical point of view, the most promising framework to explain such phenomena has been, for almost 20 years, NRQCD. However, the interpretation of the latest results in this framework is not straight-forward, and might require the revision of some of the assumptions that were so far made. The scientific community has come to realize that a thorough understanding must encompass a broader view, and that the study of P-wave states plays a fundamental role. The CMS collaboration has provided some of the most precise P-wave charmonium and bottomonium measurements to date. In this contribution, such results will be presented and discussed. The studies of heavy quarkonium prompt-production and polarization at the LHC are becoming crucial to solve the puzzle of hadron formation. A dedicated dimuon trigger strategy combined with the energy and luminosity provided by the LHC allowed the CMS experiment to collect large samples of quarkonium states decaying in the dimuon channel. This contribution presents the most recent CMS quarkonium production results including rapidity-integrated production cross sections extended up to $\sim 120\text{GeV}$ for J/Ψ and $\sim 100\text{GeV}$ for $\psi(2S)$ and $Y(nS)$ with $n=1,2,3$.

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