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Coalescence production of charmonium states in heavy ion collisions

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We study charmonium states, J/ψ , $\psi(2S)$, and $\chi_{c1}(1P)$ mesons in heavy ion collisions by focusing on their production from charm and anti-charm quarks in a quark-gluon plasma by coalescence. Starting from the investigation on the difference in their internal structures, or different wave functions of charmonium states we calculate the yield and transverse momentum distributions of charmonium states produced in heavy ion collisions. We show that the wave function distribution plays a significant role, especially, in the production of charmonium states, leading to the transverse momentum distribution of the $\psi(2S)$ meson as large as that of the J/ψ meson. We also discuss the anisotropic flow, or elliptic and triangular flow of charmonium states using the transverse momentum distribution of charmonium states. We find that the internal structure differences as well as feed-down contributions of charmonium states are averaged out for elliptic and triangular flow, resulting in similar elliptic and triangular flow for all charmonium states. Based on our evaluation of elliptic and triangular flow of charmonium states we also discuss the quark number scaling of elliptic and triangular flow for charmonium states in heavy ion collisions.

Category

Theory

Collaboration (if applicable)

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