

論文内容の要旨

論文題目: J/ψ Production in High Energy Heavy Ion
Collisions at RHIC
(RHICでの高エネルギー重イオン衝突における J/ψ 生成)

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High-energy heavy-ion collision is the only tool in the world to realize the phase transition from ordinary nuclear matter to a deconfined quarks and gluons, called Quark-Gluon-Plasma (QGP). Suppression of J/ψ production has been considered as one of the most promising signatures to probe the deconfinement and to study the properties of deconfined medium. J/ψ yield has been measured by the PHENIX experiment, which is one of the major experiments at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL), in $p + p$, $d + \text{Au}$ and $\text{Au} + \text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV.

The measurement of J/ψ yield in $\text{Au} + \text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV has been performed at mid-rapidity region ($|\eta| \leq 0.5$).

Invariant yield of J/ψ and integrated yield of J/ψ were extracted as a function of p_T and the collision centralities. Nuclear modification factor of J/ψ was extracted in order to study the modifications of J/ψ production in A+A collisions.

It is observed that the yield of J/ψ is strongly suppressed by a factor of ~ 4 in central $\text{Au} + \text{Au}$ collisions relative to that in $p + p$ collisions. Suppression of J/ψ does not have strong p_T dependence and $\langle p_T^2 \rangle$ as a function of centrality shows little centrality dependence. The survival probability of J/ψ in the medium at RHIC energy is quite similar compared at SPS energies from peripheral to mid-central collisions, which is interpreted by the dissociation of only χ_c and ψ' . In central collisions, survival probability reaches ~ 0.4 , which indicates that the direct produced J/ψ may be dissolved. This is the first experimental results, which suggest the dissociation of directly produced J/ψ . The suppression pattern as a function of the number of participants gives the estimation of the dissociation temperature of J/ψ , χ_c and ψ' and they were extracted to be $(2.175 \pm 0.075)T_c$ for J/ψ and $(1.5 \pm 0.4)T_c$ for χ_c and ψ' , which are in good agreement with the predictions from lattice QCD calculations and potential model analyses.