

# SIGNATURES OF ABSORPTION MECHANISMS FOR $J/\psi$ AND $\psi'$ PRODUCTION IN HIGH-ENERGY HEAVY-ION COLLISIONS<sup>1</sup>

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$J/\psi$  and  $\psi'$  produced in high-energy heavy-ion collisions are absorbed by their collisions with nucleons and produced soft particles, leading to two distinct absorption mechanisms. The signature of absorption by produced soft particles, as revealed by  $\psi'$  production data, consists of a gap and a change of the slope in going from the  $pA$  line to the nucleus–nucleus line when we make a semi-log plot of the survival probability as a function of the path length. Using this signature, we find from the  $J/\psi$  production data in  $pA$ , O–Cu, O–U, and S–U collisions that the degree of  $J/\psi$  absorption by produced soft particles is small and cannot account for the  $J/\psi$  data in Pb–Pb collisions. The anomalous suppression of  $J/\psi$  production in Pb–Pb collisions can be explained as due to the occurrence of a new phase of strong  $J/\psi$  absorption, which sets in when the local energy density exceeds about 3.4 GeV/fm<sup>3</sup>. To probe the chemical content of the new phase, we propose to study the abundance of open-charm mesons and charm hyperons which depends sensitively on the quark chemical potential.

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<sup>1</sup>Abstract of published paper: *Nucl. Phys. A* **630**, 487c (1998) (Proceedings of 6th International Conference on Nucleus–Nucleus Collisions, Gatlinburg, TN, June 2–6, 1997).