

# Measurements of $\phi$ production in Au+Au collisions at $\sqrt{s_{NN}} = 19.6, 14.6$ and $7.7$ GeV

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$\phi$  has relatively small hadronic interaction cross sections and it can be used to study the properties of nuclear medium at the early stage. The recombination model indicates that the  $\Omega/\phi$  ratio will be enhanced at low and medium transverse momentum ( $p_T$ ), where thermal strange quarks dominate the production of  $\Omega$  and  $\phi$  in the QGP. Therefore, the multi-strange baryon-to-meson ratio  $\Omega(sss)/\phi(s\bar{s})$  is proposed to be a sensitive probe for studying the onset of deconfinement. Because the STAR Beam Energy Scan Phase II (BES II) program has 10 times larger data size than BES I and explore the QCD phase diagram in a region which may cover the potential critical point, it offers us a great opportunity to investigate collision energy and system size dependence of  $\phi$  production in heavy-ion collisions.

In this report, we present new measurements on  $p_T$  spectra, centrality dependence of  $\phi$  production yields ( $dN/dy$ ), resonance to non-resonance yield ratio ( $\phi/K^-$ ), nuclear modification factor ( $R_{CP}$ ), the rapidity spectra and  $\Omega(sss)/\phi(s\bar{s})$  ratio in Au+Au collisions at  $\sqrt{s_{NN}} = 7.7, 14.6$  and  $19.6$  GeV. Physics implications of these measurements will be discussed.

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