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Probing the QCD phase diagram with the measurements of ϕ-meson production and elliptic flow in the heavy-ion collision at STAR.

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The main goal of the Beam Energy Scan (BES) program at
Relativistic Heavy Ion Collider (RHIC) is to study
the QCD phase diagram by varying the colliding beam energy. Due to the small hadronic interaction cross-section, the yield and elliptic flow of the ϕ meson are primarily controlled by the partonic interaction in the relativistic heavy-ion collisions[1,2]. Therefore, the ϕ meson can be considered as a good probe for the phase boundary study in the BES program at RHIC. At top RHIC energy ($\sqrt{s_{NN}}$ = 200 GeV) in Au + Au collisions, the ϕ meson has played an important role to establish that matter formed in such collisions is partonic. The number-of-constituent-quark scaling of the elliptic flow of the ϕ meson[3], enhancement in the yield of the ϕ meson in Au + Au collisions relative to $p + p$ collisions[4], and the ratio of yield of the Ω baryon to the yield of the ϕ meson as a function of p_T[3] have been the key measurements.
We will present transverse momentum dependence of yield and elliptic
flow of the ϕ meson in Au + Au collisions at $\sqrt{s_{NN}}$ = 7.7 - 200 GeV data collected in the years 2010 and 2011 by
the STAR experiment. We will discuss the number-of-constituent-quark scaling of ϕ-meson v_2, nuclear modification factor R_{CP} and ratio of yield of the Ω baryon to the yield of the ϕ meson as a function of p_T. The implications of these results on the quark-hadron phase transition will be also discussed.

References:

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