ϕ meson production in Au + Au collisions at $\sqrt{s_{\rm NN}} = 3\,\text{GeV}$ from STAR

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The ϕ meson is the lightest bound state of strange and anti-strange quarks($s\bar{s}$). It has a relatively small hadronic interaction cross section, therefore the ϕ meson is considered to be a sensitive probe of the early dynamics in the heavy-ion collision. The ratio of ϕ meson yield to other strange hadrons is often used to understand the strangeness production mechanism. Recent measurements by HADES and FOPI on subthreshold ϕ meson production show a larger ϕ/K^- ratio compared to the results at higher energies[1, 2]. The larger ϕ/K^- ratio cannot be described by thermal model calculations with Grand Canonical Ensemble (GCE) for strangeness.

In this presentation, we report the first measurements of ϕ meson production by STAR in Au+Au collisions at $\sqrt{s_{\rm NN}} = 3$ GeV, just above the NN threshold energy ($pp \to pp\phi$). The data were taken in 2018 by the STAR experiment with the fixed target configuration. ϕ mesons are measured through their hadronic decay channel, $\phi \to K^- + K^+$. After being corrected for the detector acceptance, tracking efficiencies, and decay branching ratio, invariant yields of ϕ mesons as well as ϕ/K^- ratio are presented in several centrality intervals. The results are compared to thermal model predictions based on GCE and Canonical Ensemble as well as transport model calculations.

References

[1] J. .Adamczewski-Musch *et al.* (HADES Collaboration), Phys. Let. **B 778**, (2018) 403-407.

[2] P. Gasik *et al.* (FOPI Collaboration), Eur. Phys. J. **A 52**, (2016) 177.