

Poster: Measurement of directed and elliptic flow of ϕ meson in $\sqrt{s_{NN}} = 3.0, 4.5$ GeV Au+Au collisions at the STAR detector

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Abstract

The ϕ vector mesons have much smaller hadronic cross section which makes them less influenced at late-stage interactions than other hadrons [1–4]. Thus their anisotropies like the elliptic flow should be small if the system is always in a hadronic phase. This, in turn, makes ϕ meson v_2 especially sensitive to the energy where quark-gluon plasma turns off. Measurements from STAR at 7.7 and 11.5 GeV have seen ϕ v_2 at highest transverse momentum close to zero [5] and ϕ directed flow, v_1 , is consistent with zero [6] with conclusions limited by statistics. On the other hand, the closeness of ϕ mass to the nucleon and its s \bar{s} constituent quarks makes them suitable to test the deviation of net-nucleon and net-meson v_1 at energies below 7.7 GeV where could be a breakdown of the assumption that s and \bar{s} quarks have the same flow [6]. Measurements of directed and elliptic flow of ϕ vector meson at 3.0 and 4.5 GeV Au+Au collisions at STAR will be presented and compared with RHIC Beam Energy Scan results from 7.7–39 GeV. Measurements will have better precision with increased particle acceptance and 100 more statistics at 3.0 GeV compared to 4.5 GeV from the STAR fixed-target run. Physics implication related to the search for quark-gluon plasma turn-off will also be discussed.

References

- [1] Y. Cheng, F. Liu, Z. Liu, K. Schweda, and N. Xu. Transverse expansion in $^{197}\text{Au}+^{197}\text{Au}$ collisions at rhic. *Phys. Rev. C*, 68:034910, Sep 2003.
- [2] Asher Shor. φ -meson production as a probe of the quark-gluon plasma. *Phys. Rev. Lett.*, 54:1122–1125, Mar 1985.
- [3] Sibirtsev, A., Hammer, H. -W., Meißner, U. -G., and Thomas, A. W. on photoproduction from nuclei. *Eur. Phys. J. A*, 29(2):209–220, 2006.
- [4] H. van Hecke, H. Sorge, and N. Xu. Evidence of early multistrange hadron freeze-out in high energy nuclear collisions. *Phys. Rev. Lett.*, 81:5764–5767, Dec 1998.
- [5] L. Adamczyk and et al. Elliptic flow of identified hadrons in Au + Au collisions at $\sqrt{s_{NN}} = 7.7 - 62.4$ GeV. *Phys. Rev. C*, 88:014902, Jul 2013.
- [6] L. Adamczyk and et al. Beam-energy dependence of directed flow of Λ , $\bar{\Lambda}$, K^\pm , K_s^0 , and ϕ in Au + Au collisions. *Phys. Rev. Lett.*, 120:062301, Feb 2018.