

1 Measurement of global spin alignment of ϕ and K^* vector
2 mesons at RHIC

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4 **Abstract**

5 In non-zero impact parameter heavy-ion collisions, a large initial orbital angular momentum
6 (OAM) can be present. Such a large OAM can induce a non-vanishing polarization for
7 hadrons with non-zero spin. The global spin alignment of vector mesons is quantified by
8 the 00^{th} element of the spin density matrix (ρ_{00}) with respect to the quantization axis, i.e.
9 normal to the reaction plane. It can offer information on the spin-orbital interactions of
10 the QCD medium.

11 In this talk, we will present the transverse momentum (p_T) and collision centrality
12 dependence of ρ_{00} for ϕ and K^* vector mesons using RHIC Beam Energy Scan (BES)
13 Au+Au collisions at $\sqrt{s_{NN}} = 11.5 - 200$ GeV, and isobar collisions (Ru+Ru and Zr+Zr)
14 at $\sqrt{s_{NN}} = 200$ GeV. At RHIC BES energies, the ρ_{00} of ϕ meson is unexpectedly large,
15 while that of K^{*0} is largely consistent with non-polarization baseline. The magnitude of
16 ϕ meson ρ_{00} can not be explained by conventional mechanisms but may be attributed to
17 the influence of a vector meson strong force field. The measurement of the global spin
18 alignment can potentially reveal information about the strong force field as well as the spin
19 dynamics of the QCD medium. Moreover, the ρ_{00} measurements in Au+Au and isobar
20 species can provide information on the system size dependence of ρ_{00} .