



Contribution ID: 85

Type: **not specified**

Lambda polarization as a probe of initial state

Wednesday 20 September 2017 18:00 (20 minutes)

In hydrodynamic approach to heavy ion collisions, hadrons with nonzero spin produced out of the fluid can acquire polarization via spin-vorticity thermodynamic coupling mechanism [1]. The hydrodynamical quantity steering the polarization is the thermal vorticity, that is minus the antisymmetric part of the gradient of four-temperature field $\beta^\mu = w^\mu/T$.

Based on this idea, it has been shown in the framework of cascade+viscous hydro model, UrQMD+vHLE [2] that in Au-Au collisions at RHIC Beam Energy Scan (BES) the mean polarization of Lambda hyperons grows with decreasing collision energy up to 1.5% at $\sqrt{s} = 7.7$ GeV RHIC Au-Au collisions. This goes in line with recent measurements of Lambda polarization by STAR experiment [3].

We show how the excitation function of the mean polarization is related to vorticity in the initial state and explore effects of initial state fluctuations on it. Finally, we propose a new polarization observable which can be probed in heavy ion collisions at LHC energies.

[1] F. Becattini, V. Chandra, L. Del Zanna, E. Grossi, *Ann. Phys.* 338 (2013) 32.

[2] I. Karpenko, F. Becattini, arXiv:1610.04717, to be published in EPJC.

[3] STAR collaboration, arXiv:1701.06657

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Session Classification: CGC / Vorticity