



Contribution ID: 136

Type: **bullet talk (poster)**

Polarization in heavy-ion collisions via local initial energy deposition

Wednesday 13 January 2021 19:45 (1h 30m)

In the recent past the STAR collaboration reported the measurement of Λ hyperon in non-central AuAu collisions. The origin of this polarization was successfully modeled as the vorticity present in the QGP fluid due to the non-zero angular momentum in non-central collisions. Other phenomena may generate vorticity in a fluid. A fast parton crossing the QGP transfers momentum and energy to it and will introduce a gradient in velocity, which will lead to vorticity generation. In our work, we model such energy-momentum deposition as a spot of high energy and high velocity a few cells wide. We embed it in a smooth initial condition based on central PbPb collisions at $\sqrt{s_{NN}} = 2.76$ TeV and evolve it using (3+1)D hydrodynamic using MUSIC. We show that our initial condition generates a vortex ring in the hydrodynamic evolution, with noticeable effects on the spin polarization of Λ hyperons. We present a study showing the dependence of this effect with shear viscosity and parameters of the energy-momentum deposition.

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Session Classification: Poster

Track Classification: The initial stages of heavy-ion collisions