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Polarization in heavy-ion collisions via local initial energy deposition

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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.

Primary authors: M. SERENONE, Willian (Universidade Estadual de Campinas); BARBON, João; DOBRIGKEIT CHINELLATO, David (University of Campinas UNICAMP (BR)); LISA, Mike (Ohio State University (US)); SHEN, Chun (Wayne State University); TAKAHASHI, Jun (University of Campinas UNICAMP (BR)); TORRIERI, Giorgio (IFGW, Unicamp)

Presenter: M. SERENONE, Willian (Universidade Estadual de Campinas)

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