

Spin-momentum correlation in hot and dense QCD matter

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The transport phenomena involving spin are instrumental in investigating quantum effects in many-body systems. In heavy-ion collisions, the recent measurement of spin polarization and spin alignment opens a new avenue to explore the properties of hot and dense QCD matter. Based on linear response theory and quantum kinetic equation, we have systematically studied spin-momentum correlation induced by hydrodynamic gradients [1]. In addition to the widely studied thermal vorticity effects, we identify an undiscovered contribution from the fluid shear [2]. This shear-induced polarization (SIP) can be viewed as the fluid analog of strain-induced polarization observed in elastic and nematic materials. The possible signature of SIP at RHIC and LHC will be elaborated. Finally, we shall briefly discuss how to employ Spin Hall effect to explore the properties of QCD matter with high baryon density [3,4].

[1] Shuai Y.F. Liu and Yi Yin, JHEP 07 (2021) 188, arXiv: 2103.09200.

[1] Baochi Fu, Shuai Y.F. Liu, Longgang Pang, Huichao Song and Yi Yin, Phys.Rev.Lett. 127 (2021) 14, 142301, arXiv: 2103.10403.

[3] Shuai Y.F. Liu and Yi Yin, Phys.Rev.D 104 (2021) 5, 054043, arXiv: 2006.12421

[4] Baochi Fu, Shuai Y.F. Liu, Longgang Pang, Huichao Song and Yi Yin, arXiv: 2103.10403

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