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A new cold atom experiment to study the hot quark-gluon plasma

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The hot quark-gluon plasma ($\sim 10^{12}$ K) and the cold atom systems ($\sim 10^{-6}$ K) exhibit amazingly similar phenomenon of azimuthal anisotropy [K.M.O'Hara et al., Science 298, 2179 (2002)]. This has been postulated as stemming out of a common underlying mechanism–both systems are strongly interacting and expand hydrodynamically–despite of the very different nature of their interactions. However, recent transport model studies suggest that the anisotropy in heavy-ion collisions may not be dominated by hydrodynamics, but the escape mechanism [L.He et al., arXiv:1502.05572 (2015)]. Moreover, quantum uncertainty principle may be relevant for the anisotropy of the quark-gluon plasma [D.Molnar et al., arXiv:1404.4119 (2014)]. In this talk I will illustrate why the hot quark-gluon plasma and the cold atom experiments performed to date are not similar as have been envisaged, and what it takes to truly use cold atoms to simulate the conditions of the quark-gluon plasma. I will outline a possible future cold atom experiment and discuss the technical challenges of such an experiment as well as the physics opportunities coming with it.

On behalf of collaboration:

NONE

Author: WANG, Fuqiang (Purdue University (US))

Presenter: WANG, Fuqiang (Purdue University (US))

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