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Viscous corrections to photon production channels in QGP

Saturday 24 September 2016 10:40 (20 minutes)

Photons radiated in heavy-ion collisions are a penetrating probe, and as such can play an important role in the determination of the quark-gluon plasma (QGP) transport coefficients. In the first part of the talk we will present a calculation of the bulk viscous correction to photon production through two-to-two scattering, complementing a previous study involving the shear viscosity [1]. The presence of the bulk viscosity of QCD is now understood to be demanded by heavy-ion data [2]. In this work, phase-space integrals describing the bulk viscous correction are evaluated explicitly in order to avoid the forward scattering approximation which is shown to be poor for photons at lower energies. Furthermore, thermal masses are included in momentum distribution functions. We will present hydrodynamical simulations of AA collisions focusing on the effect of this calculation on photonic observables. In the second part, we will highlight the work done to calculate the viscous correction to other leading-order photon production mechanisms, such as bremsstrahlung, inelastic pair annihilation and the Landau-Pomeranchuk-Migdal effect. These had previously been shown to be as important as two-to-two scattering for QGP in equilibrium [3], while a viscous correction was still lacking. The equilibrium derivation used the Kubo-Martin-Schwinger (KMS) condition in a power counting scheme. Using more general arguments, we will show that in the viscous case only ladder diagrams with soft gluon rungs contribute at leading order to the photon self energy. Relevant phenomenological implications will be discussed.

[1] C. Shen et. al., Phys. Rev. C 91 no. 1, 014908 (2015).

[2] S. Ryu et. al., Phys. Rev. Lett. 115 no. 13, 132301 (2015).

[3] P. Arnold et. al., JHEP 2001 no. 12, 009 (2001).

Summary

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