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Dilepton emission in heavy ion collisions and chemical equilibrium of QCD matter

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Dileptons are produced throughout the entire evolution history of the medium. Owing to their electromagnetic coupling to strongly interacting matter, dileptons traverse the QGP medium unaltered after their production and carry information about their space-time points of production. The emissivity is correlated with the quark abundance in the collision system as well. Therefore, dileptons provide a unique probe to study the pre-equilibrium phase of heavy ion collisions and to report on the chemical composition in the early stages.

In this talk, we will present the thermal dilepton production and dilepton anisotropic flow calculated using next-to-leading order (NLO) thermal QCD dilepton emission rate [1] in Pb+Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV collision energy, at the LHC. Multistage modelling consisting of IP-Glasma+Komet+MUSIC+URQMD [2] is used to simulate the dynamical evolution of heavy ion collisions. The relative contribution of the pre-equilibrium stage to dilepton observables is explored and discussed. In addition, the effect of chemical equilibrium of QCD matter is also presented and highlighted.

[1] Jessica Churchill, Lipei Du, Charles Gale, Greg Jackson, Sangyong Jeon, “Dilepton production at next-to-leading order and intermediate invariant-mass observables”, *Phys.Rev.C* 109 (2024) 4, 044915.

[2] Charles Gale, Jean-François Paquet, Björn Schenke, Chun Shen, “Multimessenger heavy-ion collision physics”, *Phys.Rev.C* 105 (2022) 1, 014909

Category

Theory

Collaboration

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