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Photons production in heavy ion collisions as a signal of deconfinement phase

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The study of the hadron matter properties under extreme conditions of baryons high density, energy and strong electromagnetic fields in heavy ion collisions is one of the most important problems of modern high-energy physics. One of the possible ways to study the properties of quark-gluon plasma is the so-called electromagnetic probes - photons and leptons. Since these particles freely leave the plasma volume practically without interacting with hadron matter, they can carry direct information about the processes in the plasma. The report is devoted to the mechanism of photon production during the conversion of gluons into photons gg → γ in the framework of the mean-field approach to the QCD vacuum. According to the domain model of QCD vacuum, the confinement phase is dominated by Abelian (anti-)self-dual fields, while the deconfinement phase is characterized by a strong chromomagnetic field. In the confinement phase, the conversion probability of two gluons into a photon vanishes due to the random nature of the statistical ensemble of confining vacuum fields. In contrast, a strong magnetic field with preferred direction is generated by relativistic heavy ion collisions and plays the role of a catalyst for the deconfinement phase transition which is accompanied by the appearance of a chromomagnetic field with the same preferred direction as the magnetic field. As a consequence, the conditions of Furry's theorem are not satisfied, the conversion probability of two gluons into a photon is nonzero, and their distribution has a strong angular anisotropy. Thus, the photon distribution anisotropy can act as one of the important signals of the hadronic matter phase transition to the deconfinement phase.

• Sergei Nedelko, Aleksei Nikolskii, arXiv: 2208.00842 (2022).
• V.V. Goloviznin, A.V. Nikolskii, A.M. Snigirev and G.M. Zinovjev, Eur. Phys. J. A. 55, 142 (2019), arXiv: 1804.00559.
• S.N. Nedelko, V.E. Voronin, Eur. Phys. J. A. 51, 45 (2015), arXiv: 1403.0415.

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