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Photon emission at hadronization from quark-gluon plasma

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We investigate photon emission at the hadronization stage of high-energy heavy-ion collisions. According to coalescence/recombination models for hadronization from a quark-gluon plasma (QGP), quarks and antiquarks closely locating in the phase space are assumed to suddenly form a hadron. Transition from free quark/antiquark states to hadrons (bound states of quarks or antiquarks) is, however, an energy violating process, and should be accompanied by emission of other particles to compensate the energy difference between the initial and final states.We consider the case where the additional particle is a photon, which is an analog of the "radiative recombination," a well-known process in plasma physics. The radiative recombination, such as $e^- + p^+ \longrightarrow \mathrm{H}^0 + \gamma$, occurs when an electromagnetic plasma goes back to an atomic gas. When a QGP hadronizes, we expect similar processes, such as $q+\bar{q} \rightarrow \pi^0 + \gamma$, to take place. As a simplest and phenomenological realization of the radiative recombination for hadronization, we modify the recombination model so that the energy is conserved by the introduction of photon emission. Our "radiative hadronization" picture which is realized by this simple model has the following properties: (i) it brings about enhancement of the photon yield, (ii) radiated photons flow similarly as hadrons, and (iii) the p_T distribution of emitted photons mimics thermal distribution whose effective temperature is given by blue-shifted quark's temperature. We also present numerical results combined with a hydrodynamic model on the pT spectrum and elliptic flow parameter of the photon at RHIC and LHC energies.

Collaboration (if applicable)

Track

Electroweak Probes

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