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Pre-equilibrium photons from the early stages of heavy-ion collisions

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We use QCD kinetic theory to compute photon production in the chemically equilibrating Quark-Gluon Plasma created in the early stages of high-energy heavy-ion collisions. We do a detailed comparison of pre-equilibrium photon rates to the thermal photon production. We show that the photon spectrum radiated from a hydrodynamic attractor evolution satisfies a simple scaling form in terms of the specific shear viscosity and entropy density. We confirm the analytical predictions with numerical kinetic theory simulations. We use the extracted scaling function to compute the pre-equilibrium photon contribution in central PbPb collisions. We demonstrate that our matching procedure allows for a smooth switching from pre-equilibrium kinetic to thermal hydrodynamic photon production. Finally, our publicly available implementation can be straightforwardly added to existing heavy ion models.

Ref.: Garcia-Montero, Mazeliauskas, Plaschke, Schlichting, 2308.09747

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