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Direct photon production and correlations in Pb–Pb collisions with ALICE

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Measurements of direct photons provide valuable information on the properties of the quark-gluon plasma (QGP) because they are colour-neutral and created during all phases of the collision. Sources of photons include initial hard scatterings, Bremsstrahlung and the fragmentation process, jet-medium interactions, and radiation from the medium.

Direct thermal photons, produced by the plasma, are sensitive to the collective flow at photon production time. Their exponential spectral shape gives access experimentally to an effective medium temperature. Furthermore, Bose-Einstein correlations can be used to study the space-time evolution of the medium created in heavy-ion collisions with Hanbury Brown and Twiss interferometry. The correlation function is sensitive to the source size and the direct photon fraction.

Direct prompt photons produced in hadronic collisions through annihilation and Compton processes have minimal event activity from the hard process, allowing the isolation method to suppress background photons from parton fragmentation and neutral meson electromagnetic decays.

Isolated photon measurements in pp and p–Pb collisions can constrain NLO pQCD predictions. Hadrons correlated with isolated photons are a promising channel to study the energy loss in heavy-ion collisions and to constrain the Q^2 of the initial hard scattering, obtaining information on the amount of energy lost by the parton recoiling off the photon.

The ALICE experiment reconstructs photons from conversion photons using its excellent tracking capabilities and directly in calorimeters. Combining these methods, ALICE can measure direct photons at mid-rapidity with transverse momentum from 0.4 GeV/ c , where direct thermal photons should dominate until few GeV, then direct prompt photons take over and can be measured until about 100 GeV/ c .

This talk presents ALICE measurements of direct-photon distributions using statistical (decay-photon subtraction, thermal photons) and isolation (prompt photons) methods in different collision systems and energies and their correlations.

Category

Experiment

Collaboration (if applicable)

ALICE

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