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Electromagnetic radiation in pp and Pb–Pb collisions with dielectrons in ALICE

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Electromagnetic probes such as photons and dielectrons (e^+e^- pairs) are a unique tool to study the space-time evolution of the hot and dense matter created in ultra-relativistic heavy-ion collisions. They are produced at all stages of the collision with negligible final-state interactions. At intermediate dielectron invariant mass ($m_{ee} > 1$ GeV/c^2), thermal radiation from the quark-gluon plasma carries information about the early temperature of the medium. At LHC energies, it is however dominated by a large background from correlated heavy-flavour hadron decays. At smaller m_{ee}, thermal radiation from the hot hadronic phase contributes to the dielectron spectrum via decays of ρ mesons, whose spectral function is sensitive to chiral-symmetry restoration. Finally, at vanishing m_{ee}, the real direct photon fraction can be extracted from the dielectron data. In pp collisions, such measurement in minimum bias events serves as a baseline and a fundamental test for perturbative QCD calculations, while studies in high charged-particle multiplicity events allow one to search for thermal radiation in small colliding systems. The latter show surprising phenomena similar to those observed in heavy-ion collisions.
In this talk, final ALICE results, using the full data sample collected during the LHC Run 2, will be presented. They include measurements of the dielectron and direct-photon production in central Pb–Pb at the centre-of-mass energy per nucleon pairs, $\sqrt{s_{NN}}$, of 5.02 TeV, as well as of direct photons in minimum bias and high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV. Finally, first results with the Run 3 pp data at $\sqrt{s} = 13.6$ TeV, using the upgraded ALICE detector to disentangle the different dielectron sources, will be reported.

Category

Experiment

Collaboration (if applicable)

ALICE

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