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Thermal radiation and direct photon production in Pb-Pb and pp collisions with dielectrons in ALICE

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Electromagnetic probes such as photons and dielectrons 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 by a variety of processes during all stages of the collision with negligible final-state interactions. At low dielectron invariant mass (m_{ee}), thermal radiation from the hot hadron gas contributes to the dielectron spectrum via decays of ρ mesons, whose spectral function is sensitive to chiral-symmetry restoration. At larger m_{ee}, thermal radiation from the QGP carries information about the early temperature of the medium. It is nevertheless dominated by a large background of correlated heavy-flavour hadron decays affected by energy loss and flow in the medium. Alternatively, the transverse momentum ($p_{\mathrm{T,ee}}$) of virtual direct photons, including thermal photons at low $p_{\mathrm{T,ee}}$, can be extracted from the dielectron data together with inclusive photon measurements. In proton-proton (pp) collisions, such measurement serves as a fundamental test for perturbative QCD calculations and as a baseline for the studies in heavy-ion collisions. Recently, pp collisions with high charged-particle multiplicities have been found to exhibit interesting phenomena showing surprising similarities with those in heavy-ion collisions. Low-mass dielectrons could provide additional information regarding the underlying physics processes in such collisions.

In this talk, the latest ALICE results on dielectron studies in Pb-Pb and pp collisions at the center-of-mass energies of $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV and 13 TeV will be presented using the large data sample collected during the LHC Run 2. The results will be compared to the expected dielectron yield from known hadronic sources and predictions for thermal radiation from the medium. The production of direct photons in the different colliding systems including high-multiplicity pp collisions will be discussed.

Present via

Online

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