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Dielectron production studies in nuclear collisions with the ALICE experiment

The aim of this project is to study the production of dielectrons with the ALICE experiment at the LHC.

The production of low-mass dielectrons is one of the most promising tools for the understanding of the chiral symmetry restoration and of the thermodynamical properties of the Quark-Gluon plasma (QGP), created in ultra-relativistic heavy-ion collisions. Since such pairs do not interact strongly and are emitted during all stages of the collisions, they provide information about the full time evolution and dynamics of the medium created.

There are several sources of dielectrons. Most of them are not produced directly in the QGP but e.g. from decays of particles containing heavy (charm and beauty) quarks. So it is important to understand the origin of the observed dielectrons and measure the contributions connected to the QGP.

This measurement in Pb-Pb collisions is very challenging, due to the high background components. For this, we need to study dielectron production also in smaller systems, i.e. pp and p-Pb collisions, which are simpler environments where we expect the QGP not to be formed. Dielectron production in p-Pb collisions can be used to investigate initial state effects, due to the presence of cold nuclear matter in the collision.

We use Monte Carlo simulations to get the expected distributions of electrons from different sources, and the most up-to-date techniques for data analysis, in particular machine learning methods to separate efficiently background and signal components.

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