# Measurement of dielectron production in $\sqrt{s_{NN}} = 5.02$ TeV p-Pb collisions by using the ALICE detector

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Heavy quark (charm and bottom quarks) measurements in heavy ion collisions provide key information on the properties of the deconfined matter, the quark gluon plasma (QGP). Since heavy quarks are produced via gluon fusion, gluon splitting, and flavor excitation, cold nuclear matter effects (CNM) cannot be negligible[1)]. In $p$-Pb collisions at the Large Hadron Collider (LHC), correlations between electrons from heavy flavor decays and charged hadrons in $p$-Pb collisions show the correlations in rapidity space, which may be due to the gluon saturation or collective expansion of the system[2)]. In the electron-positron pair (dielectron) mass spectrum, dielectrons from semi-leptonic decays of heavy quarks are dominant at $m_{ee} > 1$ GeV/$c^2$ and can be affected by CNM effects. The Transition Radiation Detector (TRD) in ALICE provides online electron trigger[3)]. ALICE recorded 1.4 nb$^{-1}$ with the TRD trigger in p-Pb collisions in 2012-2013, which is 20 times larger statistics than the minimum bias data (0.067nb$^{-1}$).

In the ALICE detector, charged tracks are reconstructed by the Inner Tracking System (ITS) and the Time Projection Chamber (TPC)[4)]. Electrons are identified by $dE/dx$ in the TPC and hadrons are rejected by a time-of-flight (ToF) detector. To extract the raw dielectron spectrum, the background is estimated using the same event like-sign pairs corrected by the relative acceptance difference between unlike-sign and like-sign pairs, which is evaluated using an event-mixing technique[5)]. Pair acceptance and detection efficiency are evaluated with the fast Monte Carlo simulation. First, the single electron efficiency is obtained from the full Monte Carlo calculation using the DPMJET event generator and GEANT3 simulations. Pair efficiency is extracted by the product of the single electron efficiency. Dielectrons from light meson decays ($\pi^0, \eta, \rho, \omega, \eta^{'}, \phi$) are generated from EXODUS according to the measured charged pion spectrum in $p$-Pb collisions and $m_T$ scaling. For heavy quarks contribution, dielectrons are generated using PYTHIA with the parametrization tuned for the NLO calculation[6)]. Figure 1 shows the pair efficiency as a function of invariant mass, where circles and boxes correspond to the pair reconstruction efficiency and TRD trigger efficiency for pairs, respectively. The single electron trigger efficiency is calculated as the number of triggered electrons divided by the number of minimum bias electron samples. TRD trigger efficiency for pairs is extracted according to Eq 1 .

$$\epsilon_{trig}^{pair}(m_{ee}, p_T^{ee}) = 1-[1-\epsilon_{trig}^{single}(p_{T_1})][1-\epsilon_{trig}^{single}(p_{T_2})] \quad (1)$$

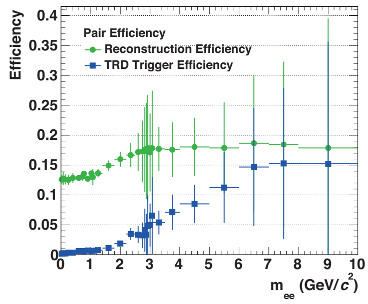


Fig. 1. $p_T$ integrated pair efficiency as a function of invariant mass. Circles and boxes correspond to the pair reconstruction efficiency and TRD trigger efficiency for pairs, respectively.

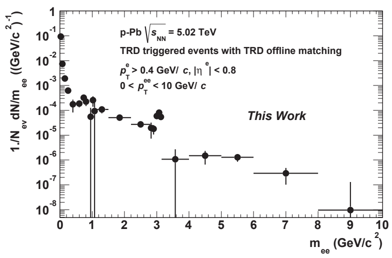


Fig. 2. Corrected dielectron yield per inelastic $p$-Pb collision as a function of invariant mass.

Figure 2 shows the inclusive invariant yield of dielectrons as a function of invariant mass. The next step is to take into account the azimuthal angle and rapidity dependence of the single electron efficiency in the pair and trigger efficiency calculations. After the invariant yield is extracted, $c\bar{c}$ and $b\bar{b}$ cross-sections will be extracted and compared with the theoretical models to understand the dielectron production in $p$-Pb collisions.

References
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