Direct γ-hadron and π^0-hadron correlations in Pb-Pb collisions at $\sqrt{s_{NN}}$= 5.02 TeV with ALICE

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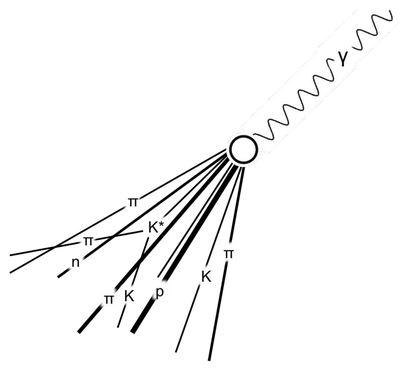
for the ALICE Collaboration

The Physics Case

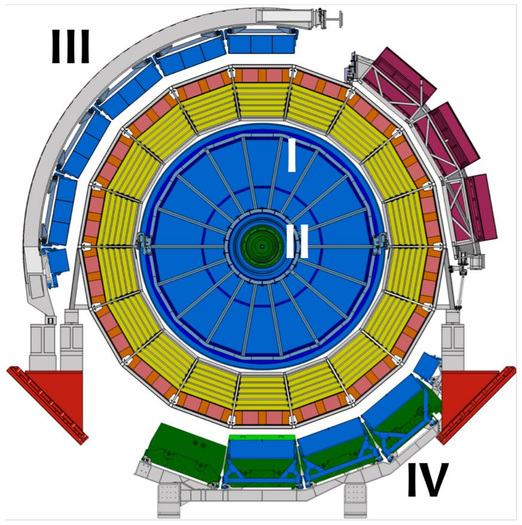


In specific scattering processes direct photons (γ) are produced back-to-back with a parton. If these hard scattering events occur inside of a heavy-ion collision, they can be utilized to probe the properties of the created medium. While the parton fragments and interacts with the medium, the photon leaves the QCD medium unaffected. Thus, correlating the γ with the fragmented hadrons in an event can yield information about the properties of the medium.

The ALICE Electromagnetic Calorimeter

ALICE is a multipurpose detector located at the Large Hadron Collider at CERN. For the correlation of γs and π^0s with hadrons three parts of the spectrometer are of importance. The inner tracking system (ITS) and time projection chamber (TPC) for track reconstruction, and the electromagnetic calorimeter (EMCal) for neutral cluster reconstruction.

cross section through ALICE



I TPC
II ITS
III EMCal
IV DCal

Understanding the main source of background

The dominant source of background in this analysis is the contribution of decay photons to the measured inclusive photon yield. Most of the decay photons originate from π^0 mesons. Thus, in order to extract any physics information from an inclusive γ-hadron correlation measurement, π^0-hadron correlations need to be studied first. To this end, π^0 mesons were reconstructed by their two photon decay with help of the EMCal. Figure 3 shows di-photon invariant mass spectra with a visible π^0 peak. The π^0s were selected by a 2σ mass cut around the peak center. These π^0 candidates are a combination of real signal and combinatorial γ-pairs and were correlated with hadrons.

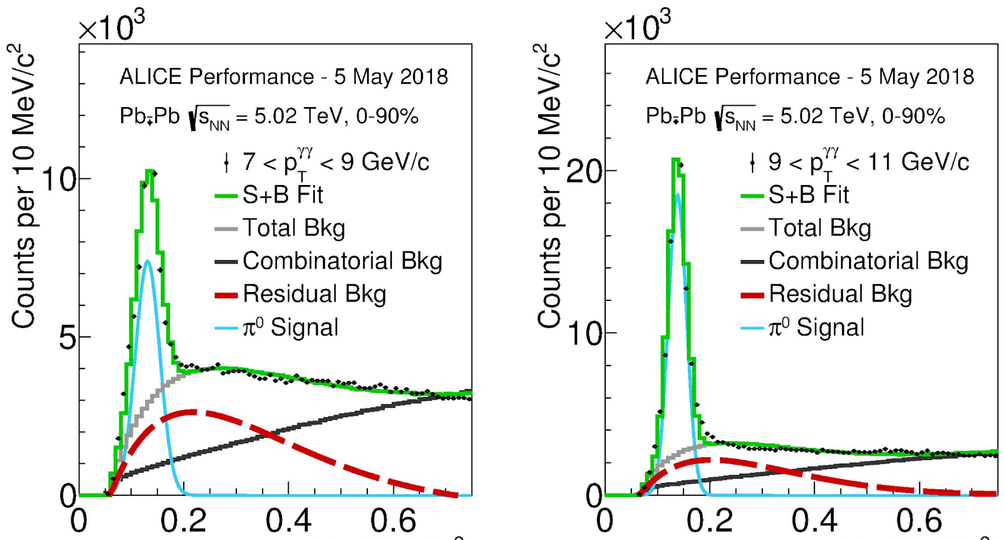


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Figure 2

π^0-hadron correlations as a first step to γ-hadron correlations

The correlation function (CF) of π^0-candidates and hadrons was built of their distance in $\Delta\eta$ and $\Delta\varphi$ and was reconstructed by the ratio of same- and mixed-event correlations. Figures 3 and 4 show the projection of the CF where the near and away side peaks of di-jets are visible. The CF is displayed in several z_T bins which is the fraction of π^0-candidate p_T carried by the hadron. In $\Delta\eta$ regions around 1 the CF is dominated by the underlying event (UE). These regions can be used to extract the shape of the UE in order to subtract it from the CF. After the background in Fig. 4 is subtracted the pure jet-like contribution to the CF remains and can be evaluated.

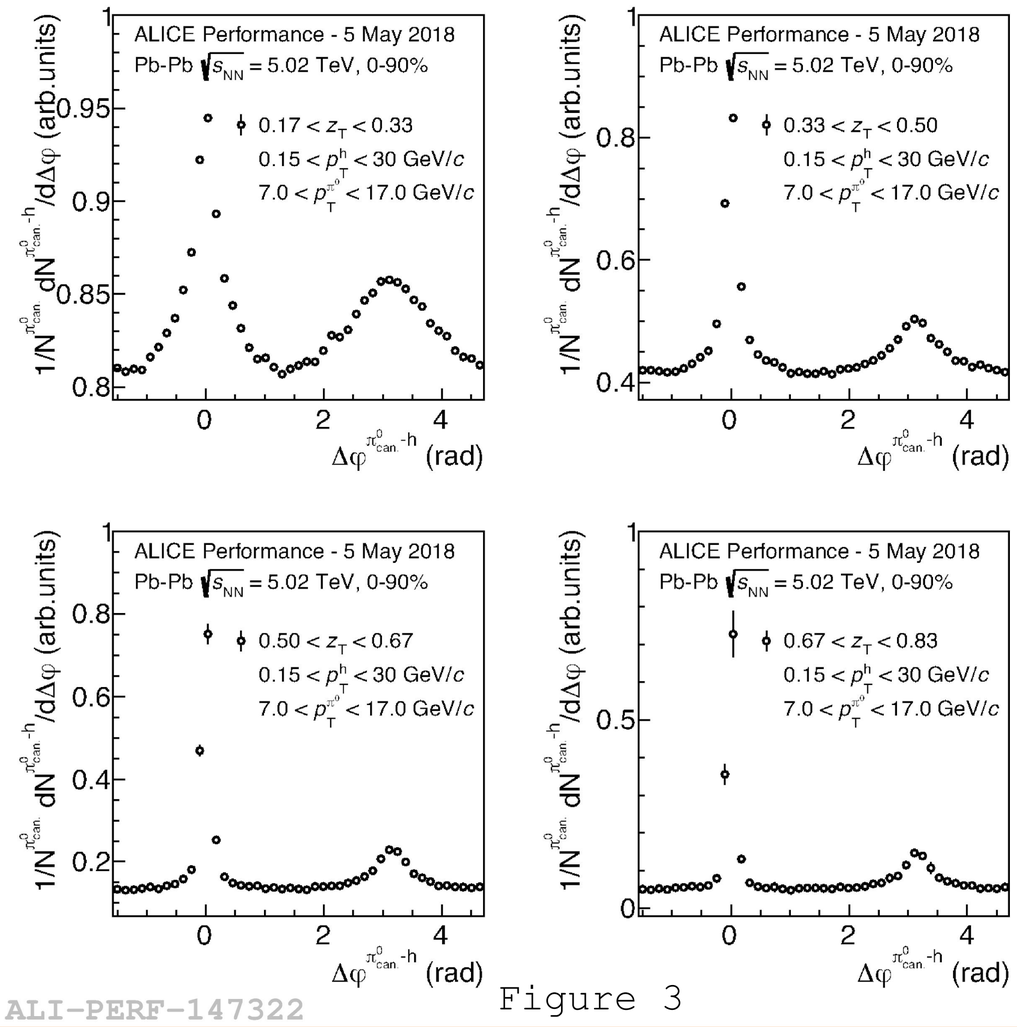

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Figure 3

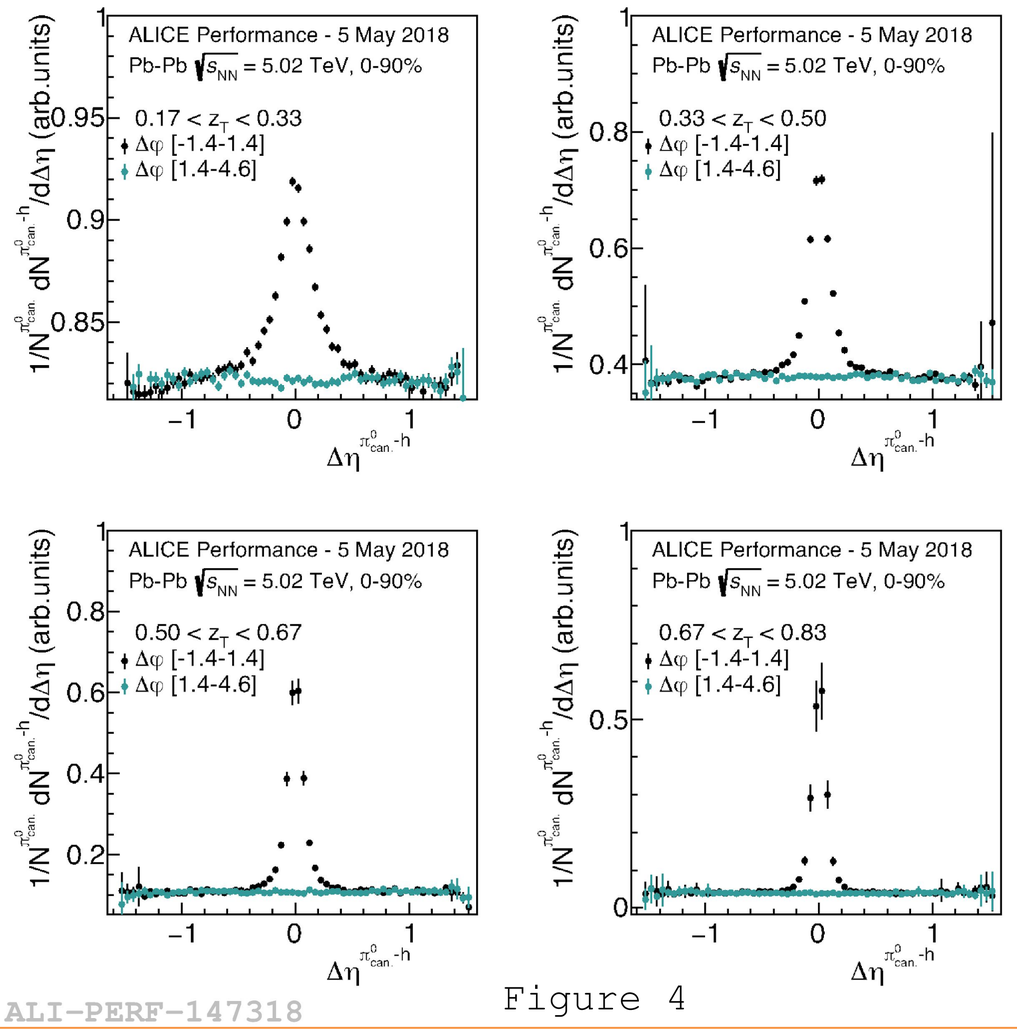

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Figure 4