π^0 reconstruction via conversion method in Au+Au at 1.23AGeV with HADES*

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Lepton pairs emerging from decays of virtual photons are one of the most promising probes of dense hadronic matter. Comprehensive information on meson production is thereby mandatory to benchmark and constrain contributions from freeze out. In this context the neutral pion and eta mesons are of particular interest as they contribute largely to the dilepton spectrum via their Dalitz decays $\pi^0/\eta \rightarrow \gamma e^+e^-$. HADES [1] in April/May 2012 measured the collision system Au+Au at the highest achievable beam energies (presently at SIS18), E_{kin} = 1.23 GeV/u. Since HADES has no photon detector yet, the measurement of the photonic decays of the π^0 is only possible via external

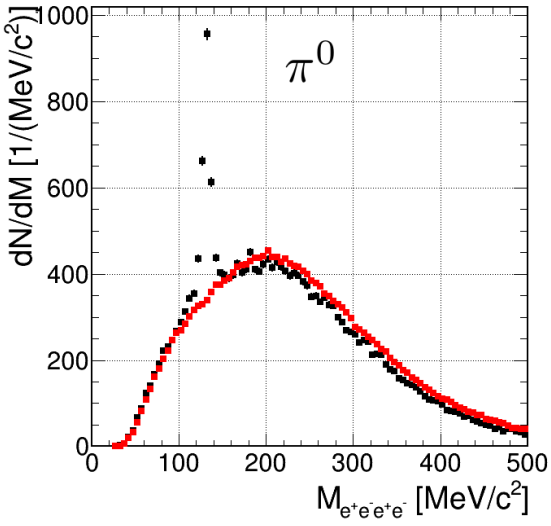

Figure 1: 4 lepton invariant mass spectrum after the topological cuts, together with event mixing.

conversion of photons in detector material. Average conversion probabilities of π^0 decay photons obtained from simulations is on the order of 0,36% (taking into account the Au target, the target holder, the δ-electron shield, the beam pipe and the RICH radiator gas). To study π^0 reconstruction leptons have been identified using the correlation between the velocity (β) and the momentum. Such identified leptons have been joined into opposite sign e^+e^- pairs and further combined into $e^+e^-e^+e^-$ multiplets. In the next step of the analysis, topological selection criteria on opening angle between the leptons in a given pair were used to identify conversion pairs (α_1 <2.5°) and Dalitz pairs (α_1 <7.5°) at the same time (for details see [2,3]). The angle between the two photons is restricted to be in the kinematically possible region $\Theta_{\gamma\gamma}$ 10-50. Fig. 1 shows a preliminary invariant mass spectrum of $e^+e^-e^+e^-$ multiplets. A clear signal peak is visible at the nominal mass position of the π^0 (135 MeV). The mass spectrum is shown together with a background obtained via event mixing. Simulations show that the main background in the 4 lepton invariant mass spectrum originates from uncorrelated photons and virtual photons. After subtraction of the background and fitting the remaining spectrum with a Gaussian peak the extracted count rate is in the order of 8000 signal counts. This allows for a phase space depended analysis. In Fig. 2 the extracted and efficiency corrected yields as a function of transversal mass M_t and rapidity Y are shown. Due to missing acceptance for low momentum leptons (P <50 MeV/c) the spectra only shows the high $p_\perp$ yield of the π^0. This can be fitted with a single slope fit and a mean slope parameter can be extracted.

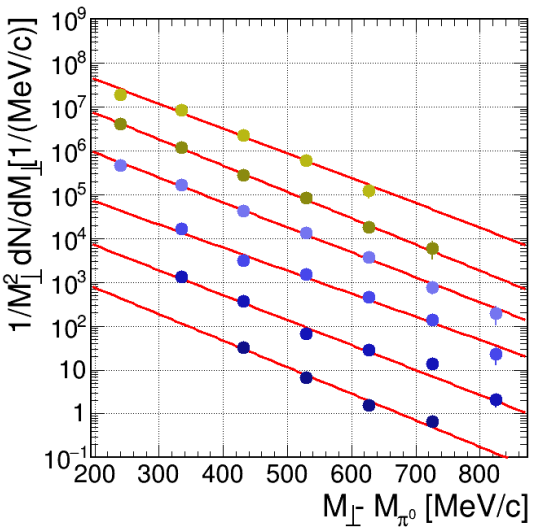

Figure 2: Efficiency corrected transversal mass yields as a function of rapidity (Rapidity: 0.2,0.4,0.6,0.8,1.0,1.2,1.4)

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