



Measurement of the azimuthal anisotropy of neutral pions in PbPb collisions at $\sqrt{s_{NN}} = 2.76$ TeV

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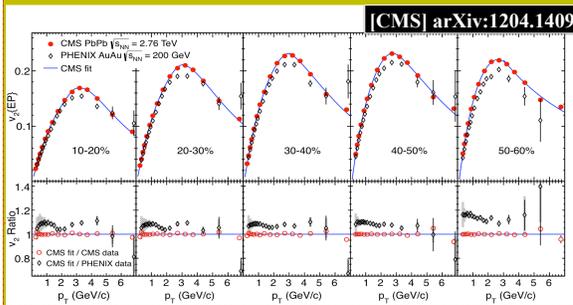


ABSTRACT

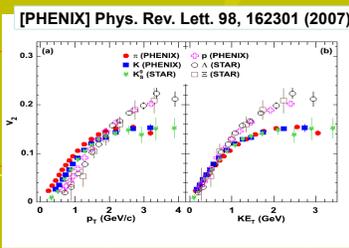
First measurements of the azimuthal anisotropy of neutral pions produced in PbPb collisions at a center-of-mass energy of $\sqrt{s_{NN}} = 2.76$ TeV are presented. The amplitudes of the second Fourier component (v_2) of the π^0 azimuthal distributions are extracted using an event-plane technique. The values of v_2 are studied as a function of the neutral pion transverse momentum (p_T) for different classes of collision centrality in the kinematic range $1.6 < p_T < 8.0$ GeV/c, within the pseudorapidity interval, $|\eta| < 0.8$. The CMS measurements of $v_2(p_T)$ are similar to previously reported π^0 azimuthal anisotropy results from $\sqrt{s_{NN}} = 200$ GeV AuAu collisions at RHIC, despite a factor of 14 increase in the center-of-mass energy. In the momentum range $2.5 < p_T < 5.0$ GeV/c, the neutral pion anisotropies are found to be smaller than those observed by CMS for inclusive charged particles.

Motivation

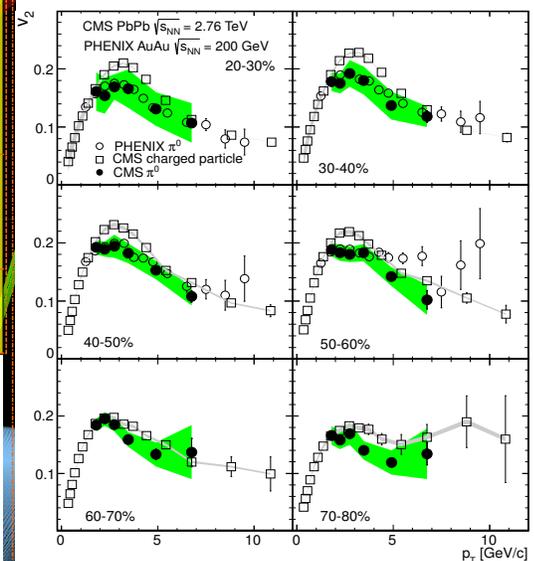
Charged particle v_2 of similar magnitude at RHIC and LHC



Does the baryon/meson difference observed at RHIC persist at the LHC?



Results



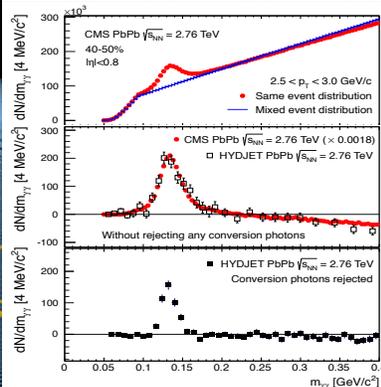
Analysis details

- π^0 measured through a two-particle decay channel ($\pi^0 \rightarrow \gamma\gamma$) in barrel ECAL
- 18 Supermodules contain 1700 Lead Tungstate (PbWO_4) crystals
- $\Delta\Phi = 360^\circ$, $|\eta| < 1.479$,
- $\Delta\eta \times \Delta\Phi = 0.0174 \times 0.0174$
- γ -clusters selected based on shower shape cut called S4/S9 ratio
- S4/S9 = highest 2x2 energy/3x3 energy



- Cartoon of array of 3×3 PbWO_4 crystals containing $\sim 93\%$ γ -energy

- 2x2 matrix showing the four most energetic crystals
- Can be any four continuous combinations
- Cluster with S4/S9 > 0.87 is accepted as a γ -cluster



Top panel:

- π^0 invariant mass distribution
- Combinatoric background from mixed events

Middle panel:

- Background subtracted invariant mass distribution
- Open squares: HYDJET simulation results
- Over-subtraction arise from converted photons

Bottom panel:

- Mass distribution from HYDJET after suppressing converted photons

Conclusions

- Presented measurement of elliptic azimuthal anisotropy of neutral pions in PbPb collisions at 2.76 TeV
- Results agree with PHENIX π^0 v_2 despite a factor of ~ 14 increase in the center of mass energy
- Comparison of π^0 v_2 with inclusive charged particle v_2 shows a systematic decrease, which may be attributed to baryon contribution which increases the overall v_2 for charged particles

