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Overview of recent ALICE results

Taku Gunji on behalf of the ALICE Collaboration

Center for Nuclear Study, the University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan

Abstract

The ALICE experiment explores the properties of strongly interacting QCD matter at extremely high temperatures created in Pb-Pb collisions at LHC and provides further insight into small-system physics in (high-multiplicity) pp and p-Pb collisions. The ALICE collaboration presented 27 parallel talks, 50 posters, and 1 flash talk at Quark Matter 2015 and covered various topics including collective dynamics, correlations and fluctuations, heavy flavors, quarkonia, jets and high p_T hadrons, electromagnetic probes, small system physics, and the upgrade program. This paper highlights some of the selected results.

Keywords: Quark-gluon plasma, Heavy-ion collisions, Jet quenching, Collective flow, Heavy flavor, Direct photons, Quarkonia, ALICE

1. Introduction

ALICE (A Large Ion Collider Experiment) is one of the major experiments at the CERN-LHC (Large Hadron Collider). ALICE is dedicated to the study of heavy-ion physics. The details of the ALICE detectors and performances in Run1 are described in Ref [1, 2]. The central features of the ALICE detectors are efficient charged particle tracking down to very low $p_T \sim 0.15$ GeV/c, excellent particle identification (hadrons, electrons, muons, and photons) over a wide momentum range, and excellent vertexing for the measurements of V^0, cascades, heavy flavors, and conversion electrons from photons.

The ALICE collaboration has presented new and exciting results at Quark Matter 2015, which extend our knowledge on the dynamics of ultra-relativistic proton-proton and heavy-ion collisions. This paper is an overview of 27 parallel talks, 50 posters, and 1 flash talk delivered by the ALICE collaboration.

2. Highlights from Pb-Pb collisions

2.1. Collective Dynamics and Correlations

The first results on the p_T differential v_2, v_3, and v_4 for $\pi^{\pm}$, $K^{\pm}$, and $p + \bar{p}$ for top 0-1% and 20-30% centrality classes have been shown (upper panels of Fig. 1) [3]. These flow harmonics have been measured with the scalar product method with a pseudo-rapidity gap of $|\Delta\eta| \geq 0$ applied between the identified particles

[1] A list of members of the ALICE Collaboration and acknowledgements can be found at the end of this issue.

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and the reference charged particles. The contribution from non-flow effects is estimated using the HIJING event generator and corrected for. A clear mass ordering is seen in the low p_T region (for $p_T \leq 3$ GeV/c) for all v_n. The lower panels of Fig. 1 shows KE_T/n_q scaling for v_2 (left), v_3 (middle), and v_4 (right) for $\pi^{\pm}$, K$^{\pm}$, and $p + \bar{p}$ in 0-1% centrality. One can see that KE_T/n_q scaling works differently for different v_n and works best for v_3.

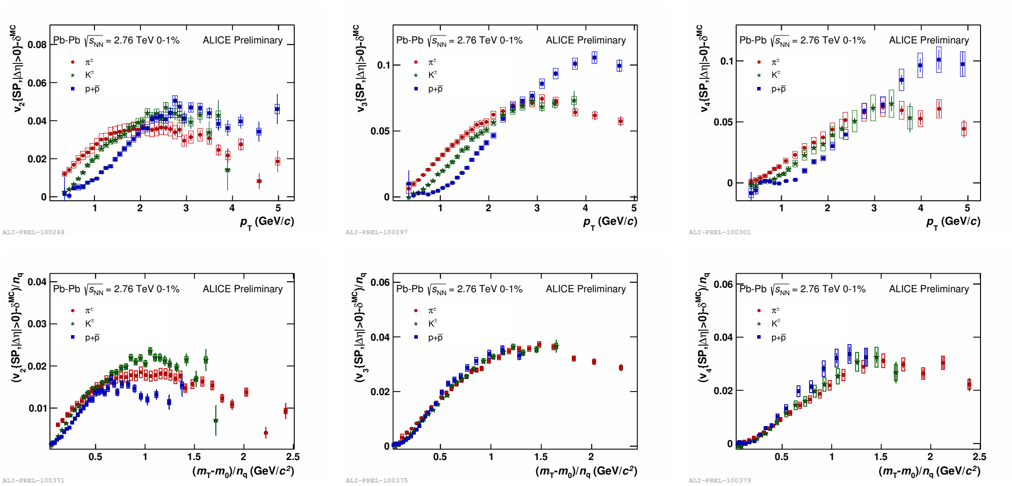

Fig. 1. (Color online) Upper: v_2 (left), v_3 (middle), and v_4 (right) for π, K, and protons in 0-1% centrality. Lower: KE_T/nq scaling for v_2 (left), v_3 (middle), and v_4 (right) for π, K, and protons in 0-1% centrality.

Left and right of Fig. 2 show deuteron (d+$\bar{\text{d}}$), proton (p+$\bar{p}$), K$^{\pm}$, and $\pi^{\pm}$ v_2 as a function of p_T in 10-20% and 30-40% centrality classes, respectively [4]. Solid lines are the results of the Blast-Wave model

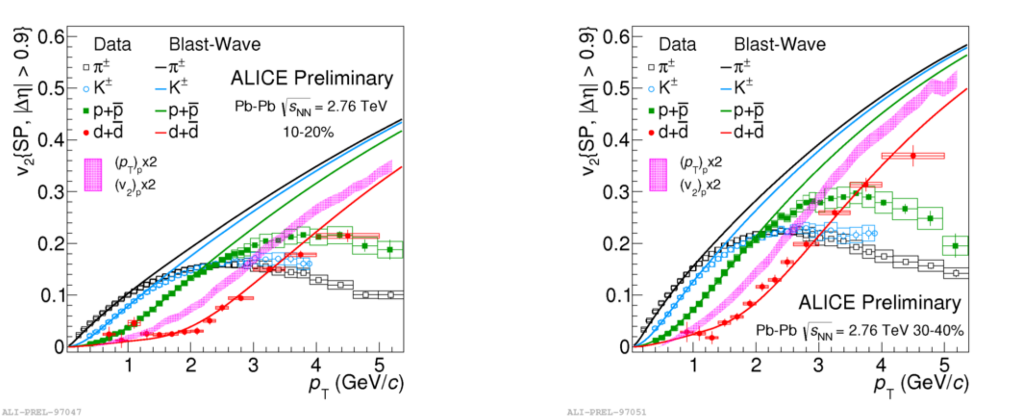

Fig. 2. (Color online) Deuteron v_2 as a function of p_T and v_2 expected from simple coalescence model for 10-20 % (left) and 30-40 % centrality (right).

fit to the measured $\pi^{\pm}$, K$^{\pm}$, and proton p_T spectra and v_2. The deuteron v_2 is then calculated using the resulting Blast-Wave model fit parameters. Hatched area shows the p_T differential v_2 estimated by a simple coalescence model, where v_2 of deuteron is calculated as $v_2(p_T)_{\text{deuteron}} = 2v_2(2p_{T_{\text{proton}}})_{\text{proton}}$. Deuteron v_2 is well-described by the Blast-Wave model and is overestimated by the simple coalescence model.