

## Probing the partonic degrees of freedom in high multiplicity p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV

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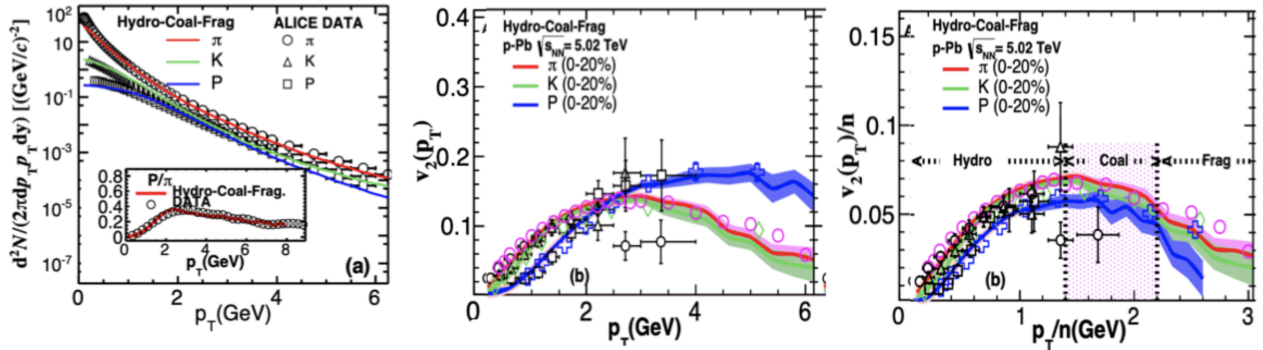
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We have carried out the first quantitative and timely study [1] of the number of constituent quark (NCQ) scaling of elliptic flow  $v_2$  of pions, kaons and protons at intermediate  $p_T$  in high multiplicity p-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV via the coalescence of soft thermal partons from the VISH2+1 hydrodynamics [2] and hard partons from the energy loss LBT model [3]. As shown in Fig. 1, adding low  $p_T$  hadrons from the hydrodynamically expanding fluid and high  $p_T$  hadrons from jet fragmentation to these intermediate  $p_T$  hadrons from quark coalescence, our Hydro-Coal-Frag hybrid model can simultaneously describe the  $p_T$  spectra (left window) and differential elliptic flow  $v_2(p_T)$  (middle window) of identified hadrons over the  $p_T$  range from 0 to 6 GeV. We have also demonstrated that the inclusion of the quark coalescence contribution to the production of hadrons is essential in reproducing the measured  $v_2(p_T)$  of these identified hadrons and their observed approximate NCQ scaling at intermediate  $p_T$  (right widow). Results from the present study thus provides a strong indication for the existence of the partonic degrees of freedom and the possible formation of the QGP in high multiplicity p-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV.



**Fig. 1.** Transverse momentum  $p_T$  spectra (left window), elliptic flow  $v_2$  (middle window) and NCQ scaled elliptic flow (right window) of pions, kaons and protons in 0-20% p-Pb at  $\sqrt{s_{NN}} = 5.02$  TeV. ALICE data on  $p_T$  spectra are from Ref.[4], and ALICE, CMS, and ATLAS data on elliptic flow are from Refs.[5], [6], and [7], respectively.

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