Contribution ID: **637** Type: **Parallel**

KNO scaling in quark and gluon jets at the LHC

The Koba-Nielsen-Olesen (KNO) scaling of hadron multiplicity distributions, empirically confirmed to hold approximately in e^+e^- collisions and Deep Inelastic Scattering, has been observed to be violated in hadron-hadron collisions. In this work, we show that the universality of KNO scaling can be extended to hadron-hadron collisions when restricted to QCD jets. We present a comprehensive study of KNO scaling in QCD jets produced in proton-proton collisions at the LHC. Using perturbative QCD calculations in the double logarithmic approximation and PYTHIA simulations, we find that KNO scaling approximately holds for both quark and gluon jets across a broad jet p_T range, from 0.1 TeV to 2.5 TeV, at both the parton and hadron levels. Especially, we highlight characteristic differences between the KNO scaling functions of quark and gluon jets, with the quark-jet scaling function lying above that of gluon jets at both low and high multiplicities. This distinction is essential for interpreting inclusive jet data at the LHC. Furthermore, we propose direct experimental tests of KNO scaling in QCD jets at the LHC through quark-gluon discrimination using jet substructure techniques, as demonstrated by applying energy correlation functions to PYTHIA-generated data.

Secondary track

Authors: WU, Bin (IGFAE, Universidade de Santiago de Compostela); SALGADO, Carlos (Universidade de Santiago de Compostela); Prof. MA, Guo-Liang (Fudan University); Dr CHEN, Lin (Instituto Galego de Física de Altas Enerxías (IGFAE) - Universidade de Santiago de Compostela (USC)); DUAN, Xiang-Pan (Fudan University and IGFAE, Universidade de Santiago de Compostela)

Presenter: DUAN, Xiang-Pan (Fudan University and IGFAE, Universidade de Santiago de Compostela)

Session Classification: T05

Track Classification: T05 - QCD and Hadronic Physics