

## Surprising similarities between the high transverse momentum spectra in pp and Pb-Pb collisions

### Abstract

We study the particle production at high transverse momentum ( $p_T < 8$  GeV/c) in both pp and Pb-Pb collisions at the LHC energies. The  $p_T$  distributions of charged particles in pp collisions are known to obey the so-called  $x_T$ -scaling which is a feature of pQCD hard processes. Therefore, the characterisation of the spectra is done using a power-law function and the resulting power-law exponent ( $n$ ) is studied as a function of  $x_T$  for minimum-bias pp collisions at different  $\sqrt{s}$ . The function form of  $n$  as a function of  $x_T$  exhibit an universal behavior. PYTHIA 8.212 reproduces the scaling properties and therefore, it is used to study the multiplicity dependent particle production. Going from low to high multiplicities, the power-law exponent decreases. A similar behavior is also observed in heavy-ion collisions when one studies the centrality (multiplicity) dependent particle production. The values of the exponents in pp and Pb-Pb collisions are rather similar. These results suggest that the nature of high  $p_T$  particles in small and large systems could have the same origin. And therefore, for a correct interpretation of heavy-ion results in terms of the nuclear modification factor this similarity should be understood.

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