Contribution ID: **488** Type: **Poster**

Energy loss of leading jets - from LEP to the LHC

Wednesday, 6 April 2022 18:06 (4 minutes)

Different than for inclusive jets, leading jet cross sections constitute normalized probability distributions for the leading jet to carry a longitudinal momentum fraction relative to the initial fragmenting parton. The formation and evolution of leading jets can be described by jet functions that satisfy non-linear DGLAP-type evolution equations. We present a parton shower algorithm that allows for the systematic calculation of leading-jet cross sections where logarithms of the jet radius and threshold logarithms are resummed to next-to-leading logarithmic (NLL) accuracy. By calculating the mean of the leading jet distribution, we are able to quantify the average out-of-jet radiation, the so-called jet energy loss. When an additional reference scale is measured, we are able to determine the energy loss of leading jets at the cross section level which is identical to parton energy loss at leading-logarithmic accuracy. We present comparisons to the first direct measurements of vacuum and medium-induced energy loss at LEP and the LHC in proton-proton and heavy-ion collisions.

[1] Neill, Ringer, Sato: JHEP 07 (2021) 041, arXiv 2103.16573

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Session Classification: Poster Session 1 T04_2

Track Classification: Jets, high-pT hadrons, and medium response