

A PYTHIA-8 underlying event tune from RHIC to the LHC

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Abstract

General purpose Monte Carlo event generators are a vital component of the feedback loop between experimental measurement, where they are used to model detector effects and correct for them, and theory, where comparisons to data can inform further improvements in the models. However, most tuning exercises are performed on LHC or Tevatron data, with the most recent RHIC tune being the single-parameter modification of the PYTHIA-6 Perugia 2012 tune that is typically used in STAR. In this talk, we show a new underlying event tune – the “Detroit” tune – of PYTHIA-8 suitable for pp collisions at RHIC and LHC energies, and compare to a variety of measurements at mid-rapidity at RHIC, as well as the LHC and the Tevatron. We find, in general, that the Detroit tune offers an improvement on the default PYTHIA-8 Monash tune at RHIC energies, and outperforms Monash at large transverse momenta at LHC energies. At forward rapidities, neither tune is adequate to describe pion cross sections from BRAHMS and STAR. This leads to future opportunities to develop a refined parameter set that can describe both regions simultaneously, in order to be applicable to STAR data with the forward upgrade installed as of 2022, and eventually the Electron-Ion Collider.