
Comparing Results from Pythia6 and Pythia8 with data from HERA

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0.1 INTRODUCTION

This document contains plots from comparison between lepton-hadron collision events in Pythia6 and Pythia8 with experimental data from HERA. (Paper - <http://dx.doi.org/10.17182/hepdata.45101>, Energy flow and charged particle spectrum in deep inelastic scattering at HERA, Table 1). This is part of the work done in Google Summer of Code Project on Pythia8. The details of this project can be found at <https://vikasnt.github.io/pythia8/>.

0.2 PLOTS

- Electron-Proton Collision but with different way to run event, Code ISUB=10
ISUB=10 is 2-2 process $f + f' \rightarrow f + f'$ (f and f' are quark and lepton pair). This process exists in both Pythia8 and Pythia6. We have 3 cases to consider : Pythia8 process, Pythia6 process, and Pythia6 process but running using Plugin made for Pythia8. Comparison is stored in Histogram 1, and the result looks within reasonable limits.

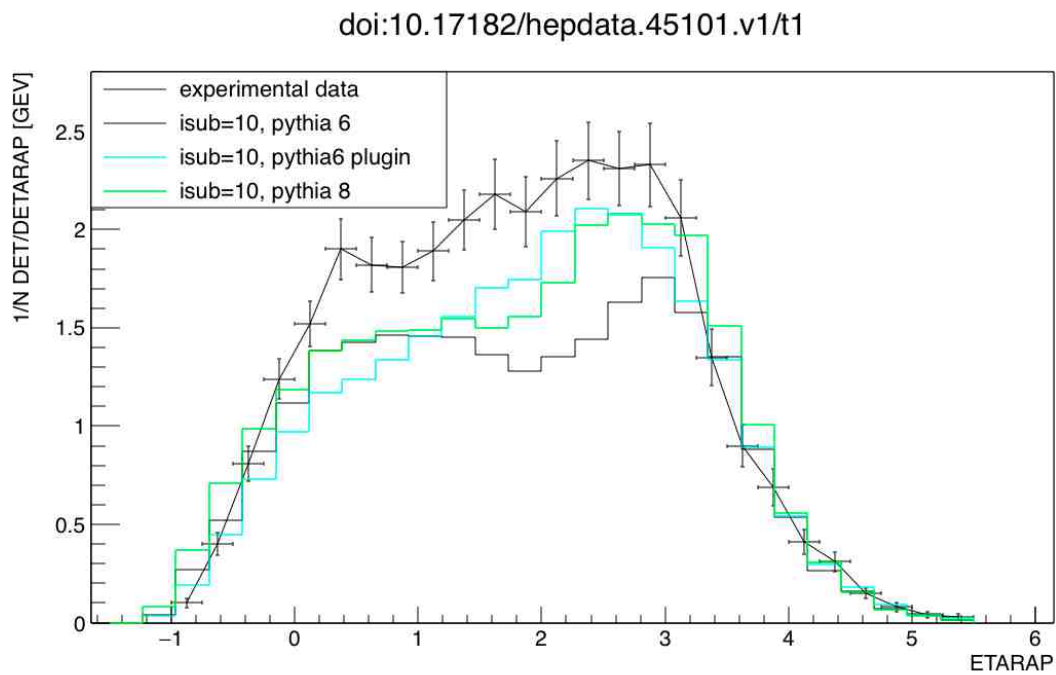


Figure 1: Histogram 1

- Electron-Proton Collision using both implementation of Pythia6.

Code ISUB=10, and MSEL=2 with gamma/lepton as input beam.

MSEL=2 with gamma/lepton is the new way of modeling lepton-hadron collision in which photon inside lepton beam interact with the quark. It is classified in 4 categories based on how photon interacts: VMD, anomalous, direct*hadron and DIS. In Histogram 2, we compare these 2 implementations using only Pythia6 with experimental data. There seems to be unreasonable difference at a few points. But this is actually coming from statistics issue. Msel=2 run seems to be highly inefficient for this particular set of cuts. Needs further work for conclusion.

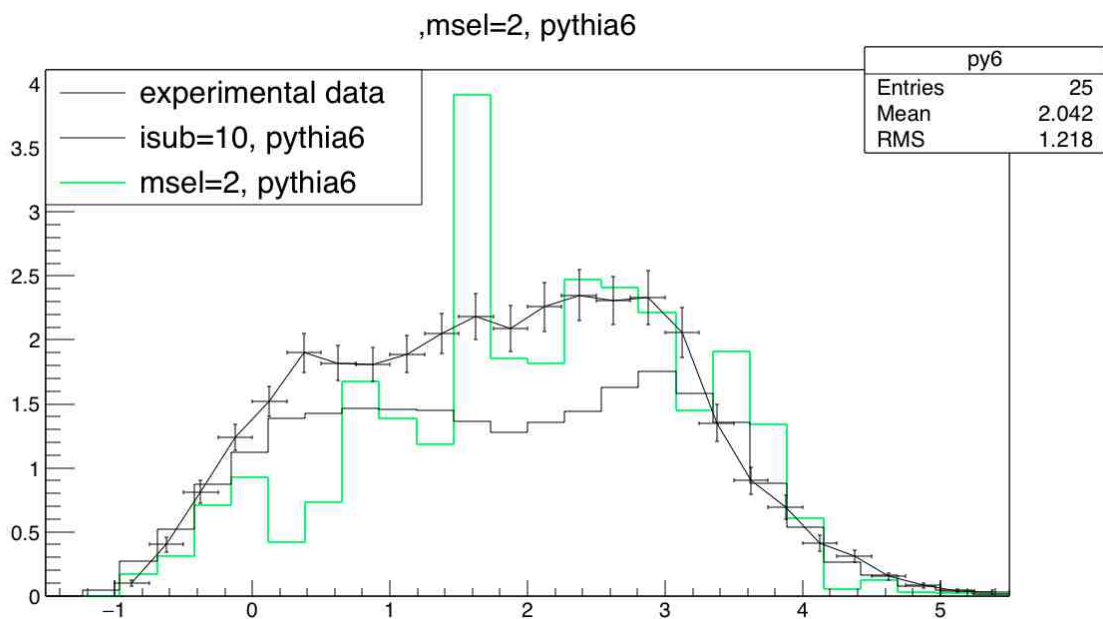


Figure 2: Histogram 2

- Msel=2 lepton/gamma machinery sub-process breakdown.

As stated earlier, this can be divided into four classes. Of these four, only two appreciably contribute to events for chosen set of cuts in this study : DIS (Histogram 3) and direct*hadron (Histogram 4).

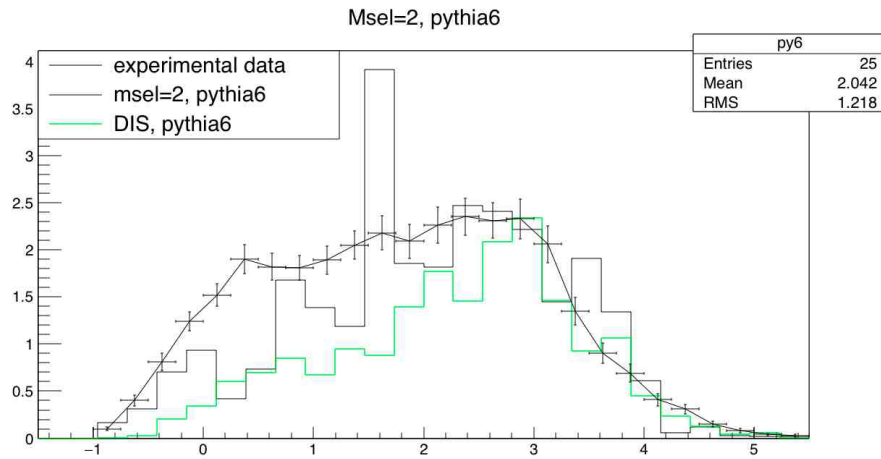


Figure 3: Histogram 3

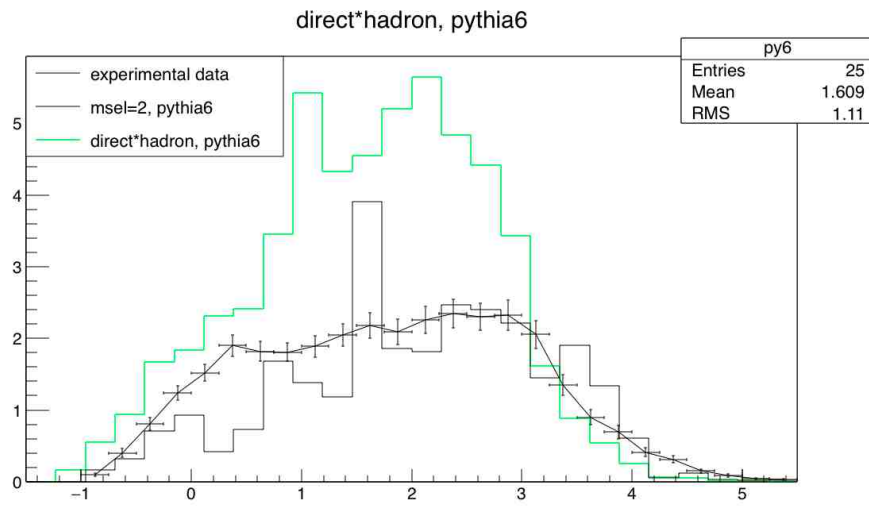


Figure 4: Histogram 4