DEPARTAMENTO DE FÍSICA NUCLEAR E ALTAS ENERGIAS

Trabalho Final

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Exercícios

Amostra de MC-Pythia8

- The files contain visible final state particles from minimum bias events at 14 TeV p-p collisions.

- All files have same content (~2000 minbias events)!

https://www.theguardian.com/science/blog/2010/mar/29/cern-collision-explained

Definição da Amostra

Name	Type	Description
`m_px`	`float`	x component of the particle momentum in GeV/c
`m_py`	`float`	y component of the particle momentum in GeV/c
`m_pz`	`float`	z component of the particle momentum in GeV/c
`m_xProd`	`float`	x coordinate of the production point in mm
`m_yProd`	`float`	y coordinate of the production point in mm
`m_zProd`	`float`	z coordinate of the production point in mm
`m_id`	`int`	particle's id number
`m_motherid1`	`int`	particle's first mother id number
`m_motherid2`	`int`	particle's second mother id number
`m_mother1`	`int`	particle's first mother barcode (track) number
`m_mother2`	`int`	particle's second mother barcode (track) number

Use all files **`pythia_minbias_2k*_14TeV.root`**

1. On the same canvas draw
   a) the pseudo-rapidity distribution of all charged tracks
   b) the transverse momentum distribution of all charged tracks
   c) the pseudo-rapidity distribution of all photons
   d) the energy distributions of all photons

2. On the same canvas draw
   a) the energy distribution of all charged pions
   b) the energy distribution of all neural pions
   c) the energy distribution of all photons originating from neutral pions
   d) the energy distribution of all photons not originating from neutral pions

3. Consider the decay: $\rho^0 \rightarrow \pi^+ \pi^-$. On the same canvas draw
   a) the momentum distribution of neutral rho mesons decaying two pions
   b) the invariant mass distribution of neutral rho mesons decaying two pions
   c) the transverse momentum distribution of charged pions originating from neutral rho mesons
   d) the opening angle distribution between charged pions originating from a neutral rho meson

4. Consider the decay: $Ks^0 \rightarrow \pi^+ \pi^-$. On the same canvas draw
   a) the energy distribution of neutral kaons decaying two charged pions
   b) the momentum distribution of charged pions originating from neutral kaons
   c) the distribution of the distance between production point (xProd, yProd, zProd) of Ks^0 and interaction point (0,0,0).
   d) the distribution of the lab-frame lifetime of Ks^0 particles

Referencias

- https://root.cern.ch/root/htmldoc/guides/users-guide/Trees.html
- https://root.cern.ch/root/htmldoc/guides/users-guide/ExampleAnalysis.html
- http://pdg.lbl.gov/2016/reviews/rpp2016-rev-monte-carlo-numbering.pdf