

Análise dos jatos produzidos com o gerador PYTHIA em colisões pp em $\sqrt{s} = 7$ TeV

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Resumo

Análise dos jatos gerados pelo PYTHIA82 através de simulações de colisões pp em $\sqrt{s} = 7$ TeV. Num primeiro momento é realizada uma comparação da simulação do PYTHIA82 com os dados experimentais publicados pelas colaborações ATLAS e CMS. A comparação é feita através das análises disponíveis no programa RIVET.

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1 PYTHIA82

- **Parâmetros Iniciais do PYTHIA:**

- Energia no centro de massa (centro de momento) : $\sqrt{s} = 7$ TeV.
- 10^4 colisões pp.
- HardQCD.
- $p_{T\min} = 80$ GeV.
- Arquivo de saída: **pythia.hepmc** (.hepmc (High Energy Physics Monte Carlo) é um formato padrão para armazenagem de eventos)

- Subprocessos referentes as colisões pp:

$$gg \rightarrow gg, gg \rightarrow q\bar{q}, qg \rightarrow qg, q\bar{q}' \rightarrow q\bar{q}', q\bar{q} \rightarrow gg, q\bar{q} \rightarrow q'\bar{q}', gg \rightarrow c\bar{c}, gg \rightarrow b\bar{b}.$$

$$q = u, d, s.$$

2 Seção de Choque Inclusiva de Jatos

Double-differential cross section:

$$\frac{d^2\sigma}{dp_T dy} = \frac{1}{\mathcal{E}\mathcal{L}_{\text{int}}} \frac{N_{\text{jet}}}{\Delta p_T \Delta y}. \quad (1)$$

Differential form of the tranverse momentum:

$$\frac{d\sigma}{dp_T} = \frac{1}{\mathcal{E}\mathcal{L}_{\text{int}}} \frac{N}{\Delta p_T}. \quad (2)$$

Dijet differential cross section normalised by the inclusive dijet cross section, σ_{dijet} :

$$\frac{1}{\sigma_{\text{dijet}}} \frac{d\sigma_{\text{dijet}}}{d\Delta\phi_{\text{dijet}}} = \frac{1}{\mathcal{E}\mathcal{L}_{\text{int}}} \frac{N}{\Delta\phi}. \quad (3)$$

3 Measurement of the inclusive jet cross-section in pp collisions at $\sqrt{s} = 7$ TeV [ATLAS 2011 S9128077](#) [1]

Measurement of multi-jet cross sections

Authors:

Frank Siegert <frank.siegert@cern.ch>

Description:

Inclusive multi-jet production is studied using an integrated luminosity of 2.4 pb⁻¹. Results on multi-jet cross sections are presented differential in pT of the four leading jets, HT. Additionally three-to-two jet fractions are presented differential in different observables. Jets are anti- k_t with $R=0.4$ and $R=0.6$, $p_{\perp} > 80(60)$ GeV and $|\eta| < 2.8$.

Experiment: ATLAS(LHC)

Beams: p+ p+

Beam energies: (3500.0, 3500.0) GeV

Run details:

Pure QCD, inclusive enough for jet pT down to 60 GeV.

References:

arXiv:1107.2092 - <http://arxiv.org/abs/1107.2092>

A Figura 1 é resultado da análise do RIVET [ATLAS 2011 S9128077](#), com um gráfico da seção de choque (σ) total inclusive de jatos em função da multiplicidade de jatos (N_{jet}), produzidos nas colisões pp observados no detector ATLAS. A seção de choque inclusiva de jatos incluem todos os processos inelásticos e elásticos que resultam em jatos. Nesta análise é utilizado o algoritmo anti- k_t [2] para a reconstrução de jatos, com o parâmetro de resolução fixado a $R = 0.4$ é usado para definir um jato.

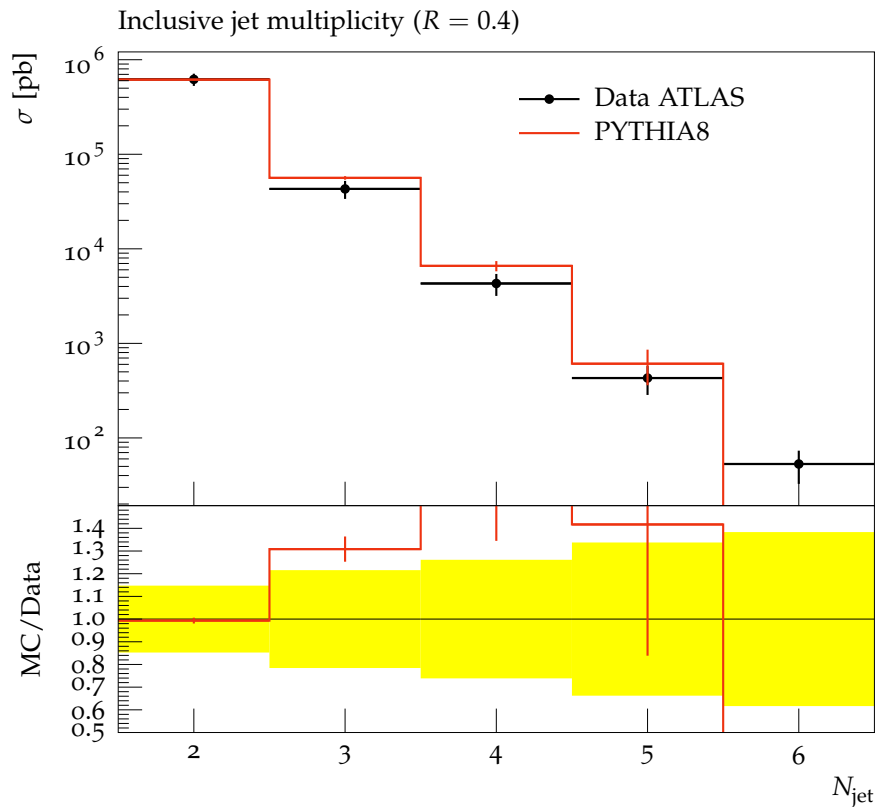


Figura 1: No gráfico, a seção de choque (σ) total inclusiva de jatos em função da multiplicidade de jatos, produzidos em colisões pp. Os dados experimentais medidos pelo detector ATLAS formam comparados com os dados gerados da simulação do PYTHIA8 para as condições iniciais descritas no tópico **Parâmetros Iniciais do PYTHIA**. Na parte inferior do gráfico a razão (MC/DATA) faz estimativa numérica entre dados do PYTHIA8 (MC) com dados experimentais (DATA). A (MC/DATA) mostra uma significativa concordância entre teoria e dados experimentais para a formação de dois jatos.

4 Measurement of the inclusive jet cross-section at 7 TeV ATLAS 2014 I1325553 [3]

ATLAS_2014_I1325553

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Year of publication: 2014

Authors:

Vojtech Pleskot <vojtech.pleskot@cern.ch>

Description:

Measurement of the inclusive jet cross-section in proton--proton collisions at a centre-of-mass energy of 7 TeV using a data set corresponding to an integrated luminosity of 4.5/fb collected with the ATLAS detector at the Large Hadron Collider in 2011. Jets are identified using the anti- k_t algorithm with radius parameter

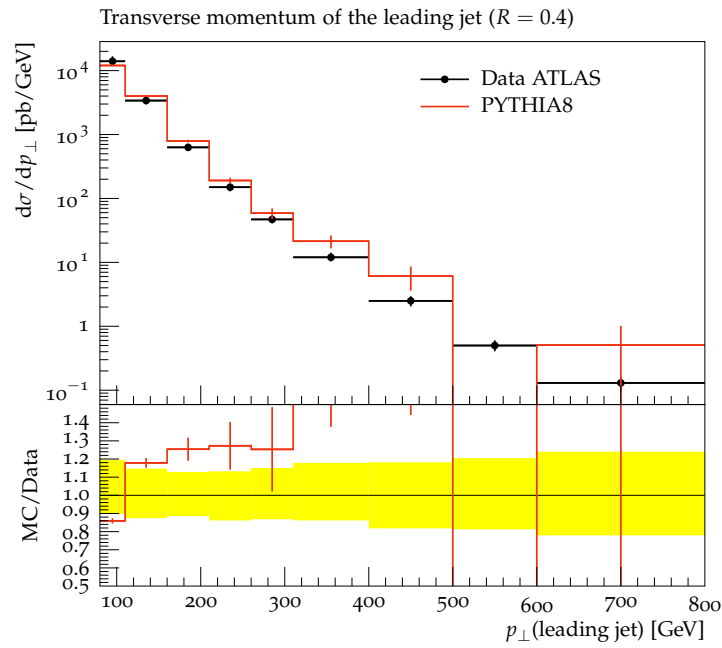


Figura 2: .

values of 0.4 and 0.6. The double-differential cross-sections are presented as a function of the jet transverse momentum and the jet rapidity, covering jet transverse momenta from 100 GeV to 2 TeV.

Experiment: ATLAS(LHC)

Beams: p+ p+

Beam energies: (3500.0, 3500.0) GeV

Run details:

p p \rightarrow jet + X. $\sqrt{s} = 7$ TeV.

References:

arXiv:1410.8857 [hep-ex] - <http://arxiv.org/abs/1410.8857>

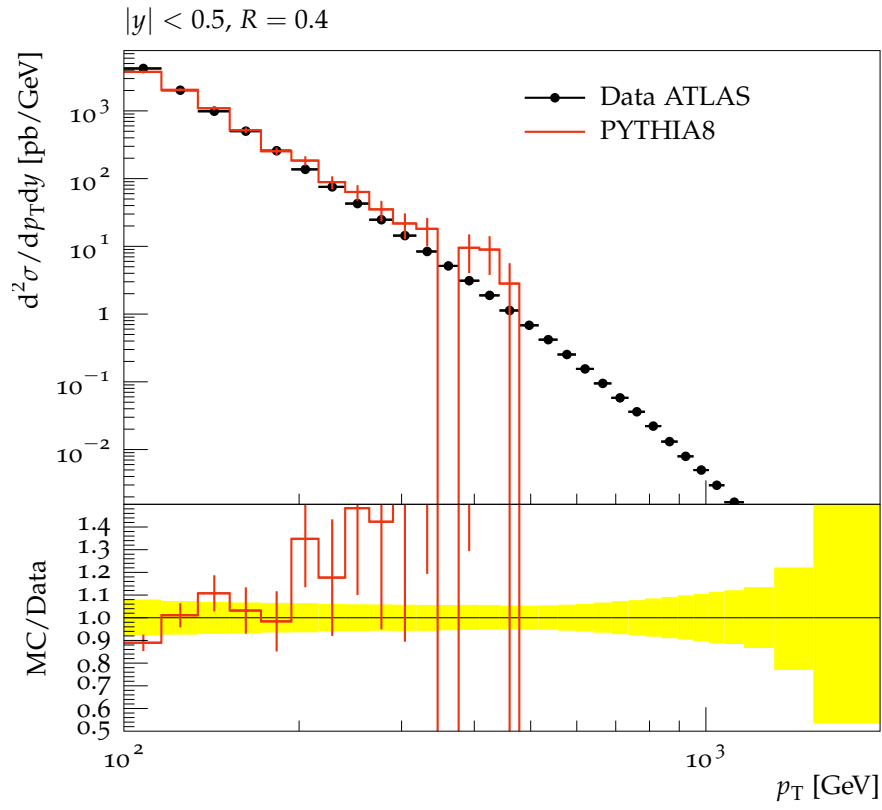


Figura 3: .

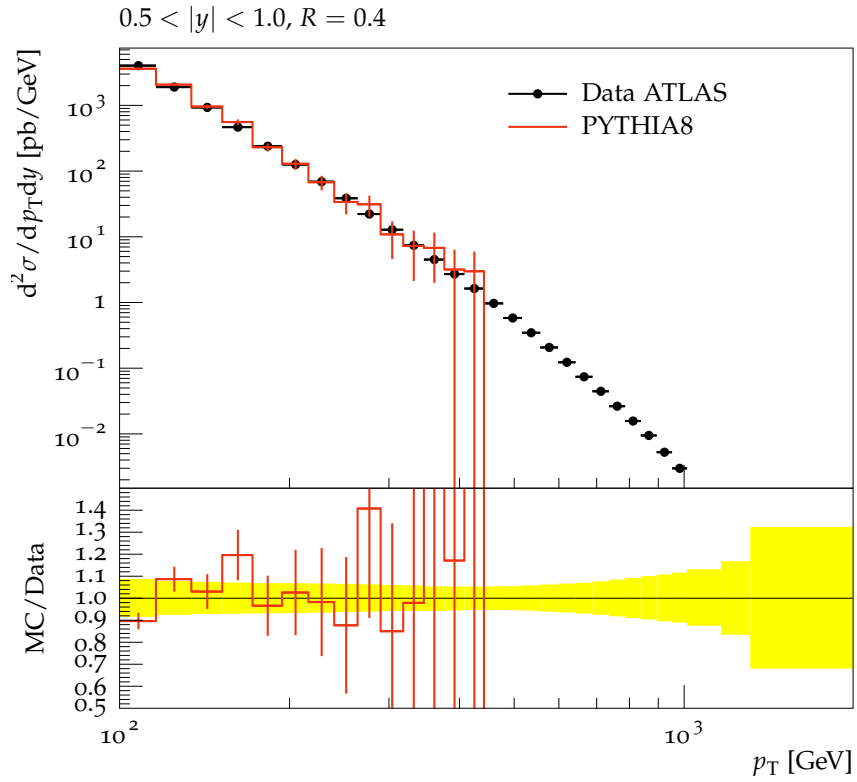


Figura 4: .

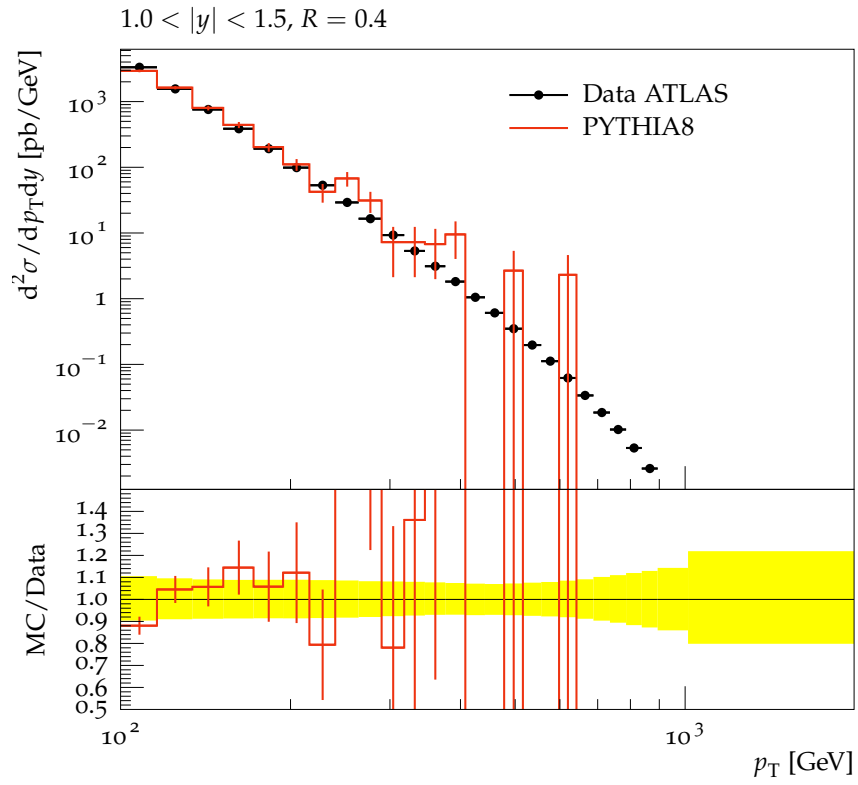


Figura 5: .

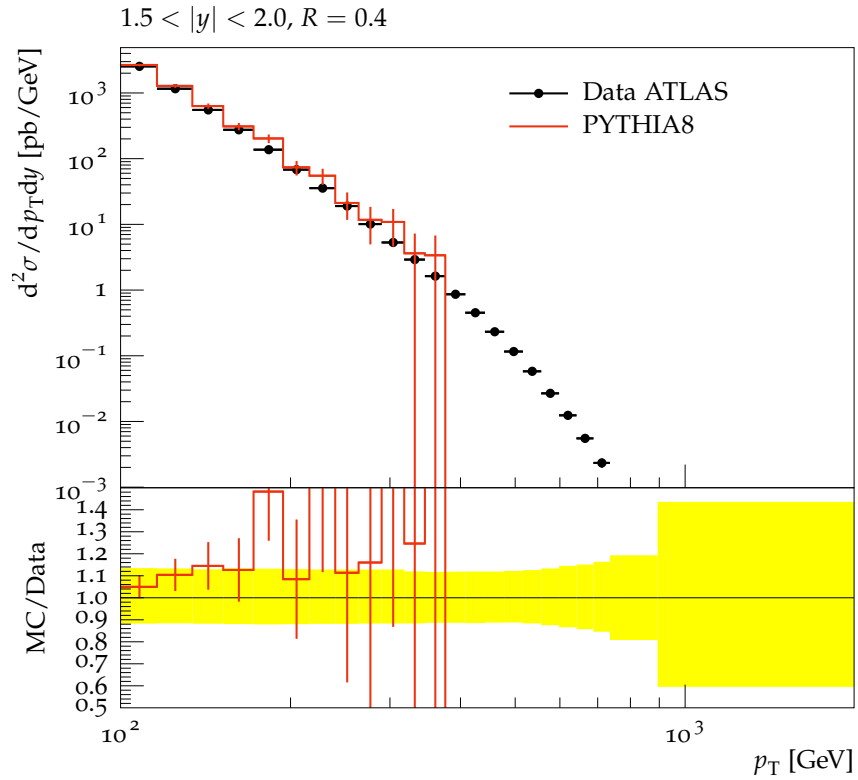


Figura 6: .

5 Dijet azimuthal decorrelations in pp collisions at $\sqrt{s} = 7$ TeV **CMS 2011 S8950903** [4]

CMS_2011_S8950903

Authors:

Tomo Umer <tomo.umer@cern.ch>

Description:

Measurements of dijet azimuthal decorrelations in pp collisions at $\sqrt{s} = 7$ TeV using the CMS detector at the CERN LHC are presented. The analysis is based on an inclusive dijet event sample corresponding to an integrated luminosity of 2.9/pb. Jets are anti- k_t with $R = 0.5$, $p_{\perp} > 80$ (30) GeV and $|\eta| < 1.1$.

Experiment: CMS(LHC)

Beams: p+ p+

Beam energies: (3500.0, 3500.0) GeV

Run details:

Inclusive QCD at $\sqrt{s} = 7$ TeV, \hat{p}_T (or equivalent) greater than 20 GeV

References:

Phys. Rev. Lett. 106 (2011) 122003

arXiv:1101.5029 [hep-ex] - <http://arxiv.org/abs/1101.5029>

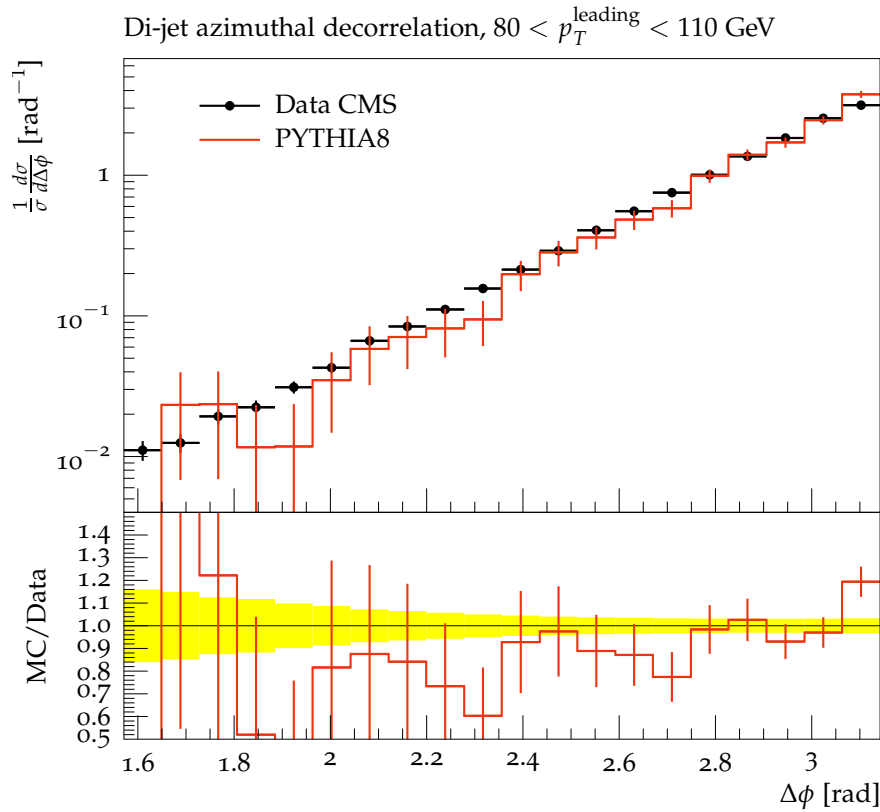


Figura 7: .

Referências

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- [2] Matteo Cacciari, Gavin P. Salam e Gregory Soyez. “The Anti-k(t) jet clustering algorithm”. Em: *JHEP* 04 (2008), p. 063. DOI: [10.1088/1126-6708/2008/04/063](https://doi.org/10.1088/1126-6708/2008/04/063). arXiv: [0802.1189](https://arxiv.org/abs/0802.1189) [hep-ph].
- [3] Georges Aad et al. “Measurement of the inclusive jet cross-section in proton-proton collisions at $\sqrt{s} = 7$ TeV using 4.5 fb¹ of data with the ATLAS detector”. Em: *JHEP* 02 (2015). [Erratum: *JHEP*09,141(2015)], p. 153. DOI: [10.1007/JHEP02\(2015\)153](https://doi.org/10.1007/JHEP02(2015)153), [10.1007/JHEP09\(2015\)141](https://doi.org/10.1007/JHEP09(2015)141). arXiv: [1410.8857](https://arxiv.org/abs/1410.8857) [hep-ex].
- [4] Vardan Khachatryan et al. “Dijet Azimuthal Decorrelations in pp Collisions at $\sqrt{s} = 7$ TeV”. Em: *Phys. Rev. Lett.* 106 (2011), p. 122003. DOI: [10.1103/PhysRevLett.106.122003](https://doi.org/10.1103/PhysRevLett.106.122003). arXiv: [1101.5029](https://arxiv.org/abs/1101.5029) [hep-ex].