Análise de Eventos C-jatos Observados pela CBJ

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Resumo

Através das medidas de energia e posição podemos calcular as variáveis cinemática do evento.

Sumário

Cinemática

$$\gamma = \frac{1}{\sqrt{1 - |\vec{\beta}|^2}}, \qquad \beta = |\vec{\beta}| \equiv \frac{|\vec{v}|}{c}.$$

$$\beta_x = \frac{\sum_i^N p_x}{E}, \quad \beta_y = \frac{\sum_i^N p_y}{E}, \quad \beta_z = \frac{\sum_i^N p_z}{E}, \qquad E = \sum_i^N E_i.$$

$$\beta^2 = \beta_x^2 + \beta_y^2 + \beta_z^2,$$

$$\sum_i^N \vec{p_i}^{\,\mathbf{CM}} = 0, \qquad \beta_{\mathbf{CM}} = \frac{|\vec{p}|}{E}.$$

$$\sqrt{s} = \sqrt{2 m_p E}, \quad \gamma = \frac{E + m_p}{\sqrt{s}}$$

1   Evento 1517

```
pₓ= -0.002050 GeV  p_y= 0.436974 GeV  p_z = 5799.999984 GeV  E = 5800 GeV
pₓ= 0.211400 GeV   p_y= 0.152594 GeV  p_z = 7299.999995 GeV  E = 7300 GeV
pₓ= 0.220063 GeV   p_y= 0.050864 GeV  p_z = 5299.999995 GeV  E = 5300 GeV
pₓ= -0.184532 GeV  p_y= -0.308225 GeV p_z = 799.999919 GeV   E =  800 GeV
pₓ= -0.097354 GeV  p_y= -0.280053 GeV p_z = 579.999924 GeV   E =  580 GeV
pₓ= -0.076283 GeV  p_y= -0.055449 GeV p_z = 199.999978 GeV   E =  200 GeV
pₓ= 0.043756 GeV   p_y= 0.051485 GeV  p_z = 599.999996 GeV   E =  600 GeV
pₓ= -0.021867 GeV  p_y= -0.002731 GeV p_z = 259.999999 GeV   E =  260 GeV
pₓ= -0.093133 GeV  p_y= -0.045459 GeV p_z = 129.999959 GeV   E =  130 GeV
```

Parâmetro da velocidade ($\beta_{\mathbf{CM}}$) do Centro de Massa (Centro de Momento)(CM) em relação ao referencial do Laboratório (LAB).

```
# Evento 1517
βₓ = 0.0000000000  β_y = 0.0000000000  β_z = 0.9999999880

 E_total = 20.970 TeV  β = 0.9999999880  γ = 6467.6671916480

# Benchmark: pp collision pythia

E_LAB = 100 TeV → √s = 433.20 GeV  γ = 230.8424  β = 0.9999906.

#  BenchMark: pp collision LHC

E_LAB = 2.6·10⁴ TeV → √s = 7 TeV  γ = 3730.2  β = 0.999999928.
```

2   Evento 1547

```
pₓ= -0.049838 GeV  p_y = -0.115162 GeV p_z = 11999.9999 GeV E = 12000 GeV
pₓ= -0.132588 GeV  p_y = -0.165776 GeV p_z = 41099.9999 GeV E = 41100 GeV
pₓ= -0.034289 GeV  p_y = 0.246870 GeV  p_z = 24999.9999 GeV E = 25000 GeV
pₓ= 0.052967 GeV   p_y = -0.004729 GeV p_z = 6000 GeV       E =  6000 GeV
pₓ= 0.112474 GeV   p_y = -0.022833 GeV p_z = 2499.9999 GeV  E =  2500 GeV
pₓ= 0.027207 GeV   p_y = -0.023132 GeV p_z = 849.9999 GeV   E =    85 GeV
pₓ= 0.015077 GeV   p_y = 0.027654 GeV  p_z = 499.9999 GeV   E =   500 GeV
pₓ= 0.014613 GeV   p_y = 0.050835 GeV  p_z = 499.9999 GeV   E =   500 GeV
pₓ= -0.005623 GeV  p_y = 0.006272 GeV  p_z = 4100 GeV       E =  4100 GeV
```

Evento 1547
β_x = 0.0000000000 β_y = 0.0000000000 β_z = 0.99999999989341

 E_{total} = 92.55 TeV β = 0.99999999989341 γ = 68488.4884

Benchmark: pp collision pythia

E_{LAB} = 100 TeV $\rightarrow$ $\sqrt{s}$ = 433.20 GeV γ = 230.8424 $\beta = 0.9999906$.

BenchMark: pp collision LHC

E_{LAB} = $2.6 \cdot 10^4$ TeV $\rightarrow$ $\sqrt{s}$ = 7 TeV γ = 3730.2 $\beta = 0.999999928$.