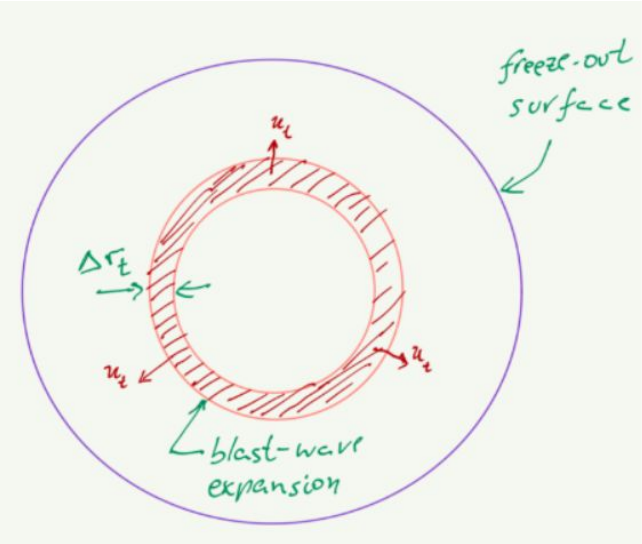
Nuclear Modification Factor in High Energy Collisions

Fator de Modificação Nuclear

$$R_{AA}(p_T) = \frac{1}{N_{part}(\epsilon)} \frac{d\sigma^{AA}/dp_T}{d\sigma^{pp}/dp_T}$$



Modelo Blast-Wave

$$N = \int_\Sigma d\Sigma_\mu j^\mu \quad \rightarrow \quad E\frac{d^3N}{dp^3} = \int_\Sigma d\Sigma_\mu p^\mu f^{AA}(p)$$

$$E\frac{d^3\sigma(p)}{dp^3} = N g\, \pi\, r_T^2\, \tau\, \Delta\eta\, m_t\, \cosh y\, \exp_q\left[-\frac{(p^\mu \cdot u_\mu - \mu)}{T}\right]$$

Distribuição para colisões próton-próton

$$\frac{1}{N}\frac{d\sigma}{dp_T} = f(p_T) \qquad f(p_T) = \frac{gV\Delta y}{8\pi^2} p_T m_T \cosh y \left[1 + (q-1)\frac{m_t \cosh y - \mu}{T}\right]^{\frac{-q}{q-1}} \qquad q = 1.14$$

Equação plastino-plastino - Dinâmica dos pártons no QGP

$$\frac{\partial f}{\partial t} - \gamma \frac{\partial f}{\partial p_i} - D \frac{\partial}{\partial p_i}\left(\frac{\partial f^{2-q}}{\partial p_j}\right) = 0$$

No referencial do fluido

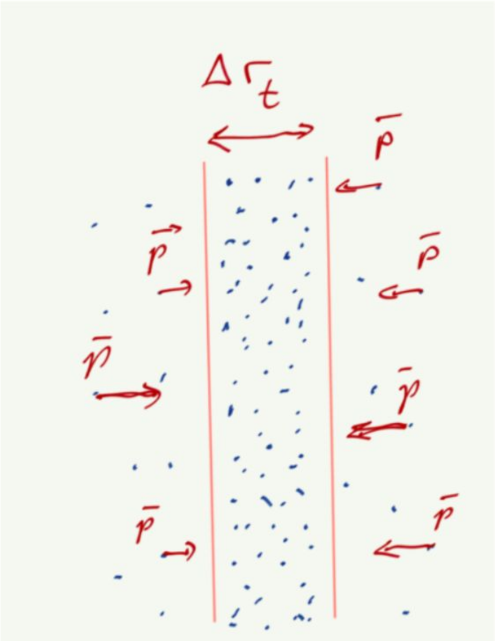
$$p_T^F = L_u(p_T) \qquad L_u(p) = \gamma_f\,(p - uE)$$

Efeito do arrasto nos momentos

$$p_T^F = p_0^F \exp(-\gamma\tau) \qquad \gamma(p_T) = \gamma_o \exp_q\left[(m_T^F - a)/T\right]$$

Solução calculada em p_0

$$f\left(p_T^F\right) = f\left(p_0^F \exp(-\gamma\tau)\right)$$



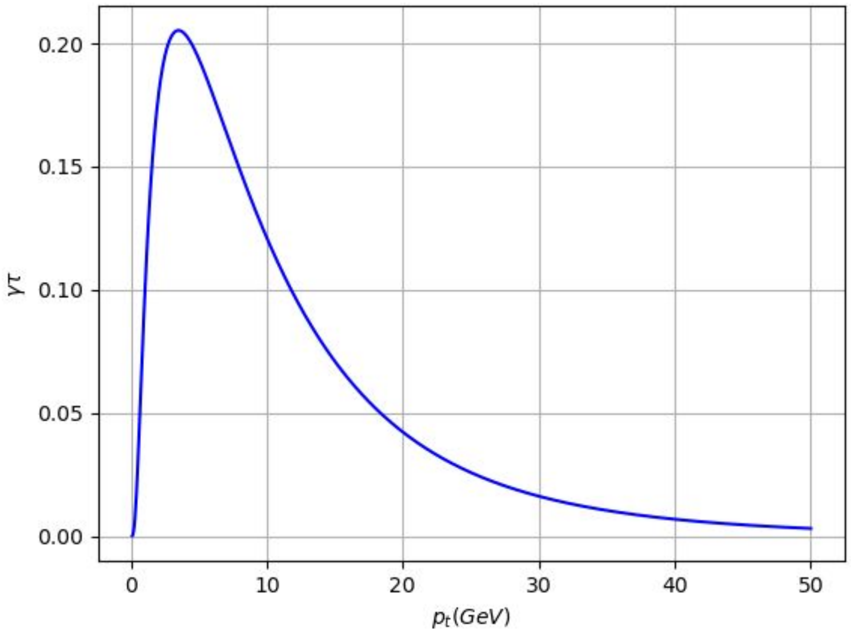
$$R_{AA}(p_T) = \frac{1}{N_{part}(\epsilon)} \frac{d\sigma^{AA}/dp_T}{d\sigma^{pp}/dp_T}$$

R_{AA} é calculado para um mesmo valor de p_T nas distribuições de colisões pp e AA

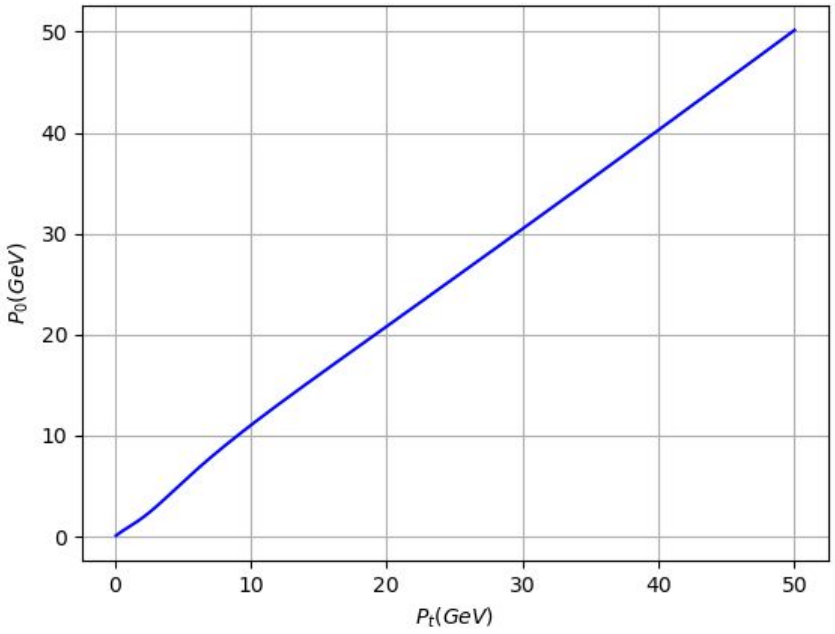
Distribuições calculadas em p_T no referencial do lab

$$f^{BW}(p_T) = f\left(L_{-u}\left[L_u[p_T]\exp(\gamma\tau)\right]\right) \qquad p_o = L_{-u}\left[L_u[p_T]\exp(\gamma\tau)\right]$$

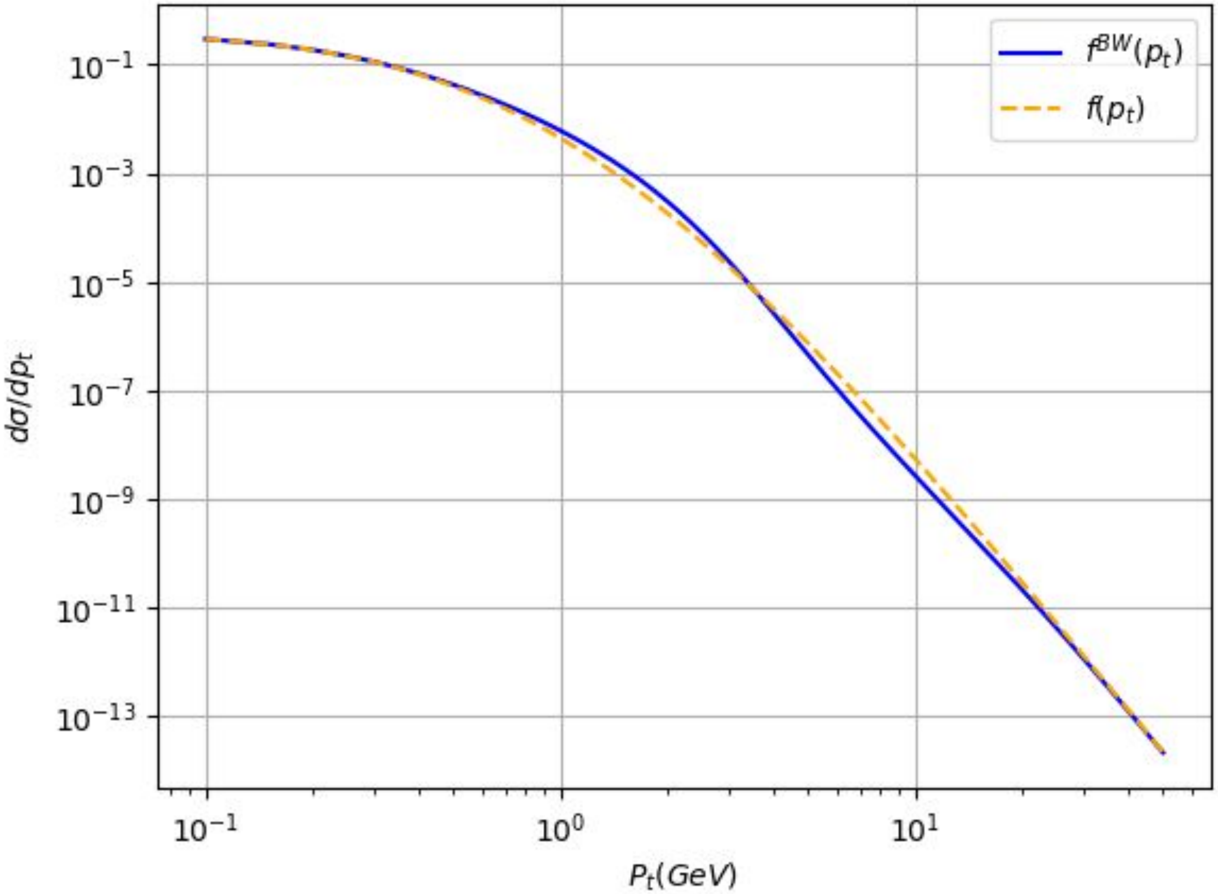
$$f(p_T) = \frac{gV\Delta y}{8\pi^2}\, p_T m_T \cosh y \left[1 + (q-1)\frac{m_t \cosh y - \mu}{T}\right]^{\frac{-q}{q-1}}$$



0.20
0.15
0.10
0.05
0.00
$\gamma\tau$
0
10
20
30
40
50
$p_t(GeV)$



50
40
30
20
10
0
$P_0(GeV)$
0
10
20
30
40
50
$P_t(GeV)$



$f^{BW}(p_t)$
$f(p_t)$
10^{-1}
10^{-3}
10^{-5}
10^{-7}
10^{-9}
10^{-11}
10^{-13}
$d\sigma/dp_t$
10^{-1}
10^{0}
10^{1}
$P_t(GeV)$

Incluindo a dispersão

$$g_q(p_T, p_M) = A\left(1 + (q-1)\frac{(p_T - p_M)^2}{2\sigma(p_T)^2}\right)^{\frac{-1}{q-1}}$$

Uma q-Gaussiana com média p_j tem uma probabilidade de gerar um momento observado p_i

$$f^{AA}(p_i) = A\sum_j g_q\left(L_u(p_i), L_u(p_j)\right) f\left(L_{-u}\left[L_u[p_j]\exp(\gamma\tau)\right]\right)$$

$$j = i - \delta, \ldots, i + \delta \qquad \delta = 20$$

$$A = 1/\sum_j g_q\left(L_u(p_i), L_u(p_j)\right)$$

$$R_{AA} = [N_{AA}(1-\epsilon)]^{-D} \frac{V_{AA}}{V_{pp}} \frac{f^{AA}_{\Delta p_l}(p_T)}{f_{\Delta p_l}(p_T)}$$