# Expansion of system

$$P = \sum_i \frac{g_i}{6\pi^2} \int_0^\infty \frac{dk\, k^4}{\sqrt{k^2+\hat{m}_i^2}} \left[ \exp\left(\frac{1}{T}\sqrt{k^2+\hat{m}_i^2}\right) \mp 1 \right]^{-1} \qquad i = g, u, \bar{u}, d, \bar{d}, s, \bar{s}$$

$$\varepsilon = \sum_i \frac{g_i}{2\pi^2} \int_0^\infty \frac{dk\, k^2}{\sqrt{k^2+\hat{m}_i^2}} \left[ \exp\left(\frac{1}{T}\sqrt{k^2+\hat{m}_i^2}\right) \mp 1 \right]^{-1} \left( k^2 + \hat{m}_i^2 - \hat{m}_i T \frac{d\hat{m}_i}{dT} \right)$$

$$s(T) = s(T_0)(T_0/T)$$

$$c_s^2 = (dP/dT)/(d\varepsilon/dT)$$

$$V = 2\pi R^2 \tau \sinh\eta^* \rightarrow E_{tot} = 2AE_{beam} = \pi R^2 \tau \int_{-\eta^*}^{\eta^*} d\eta \left[ \varepsilon \cosh^2\eta + P \sinh^2\eta \right]$$

parton gas longer lived than minijet gas