

String fragmentation and rapidity distributions in pp collisions.

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Motivation

- Obtain some simple approach for consideration of collectivity effects in pp collisions
- Describe pp collisions in the general frame based on a model with agreement with e+e- data
- Investigate the model

The model of classical string

- *String action as the simplest local, covariant and gauge invariant expression*

$$x = x(\tau, \sigma)$$

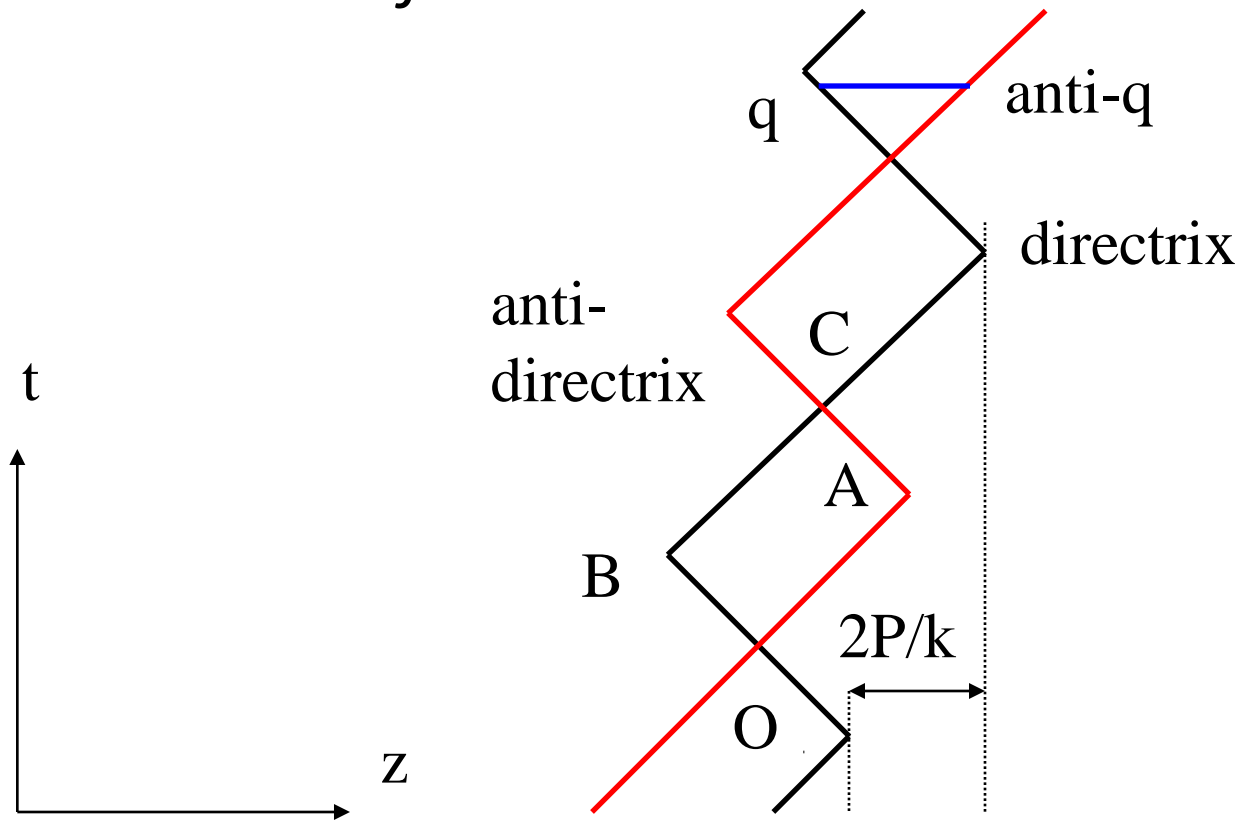
$$S = \int L d\tau d\sigma$$

$$L = -k \sqrt{-\det g} = -k \sqrt{(x' \dot{x})^2 - x'^2 \dot{x}^2}$$

$$S = -k \int d^2 A$$

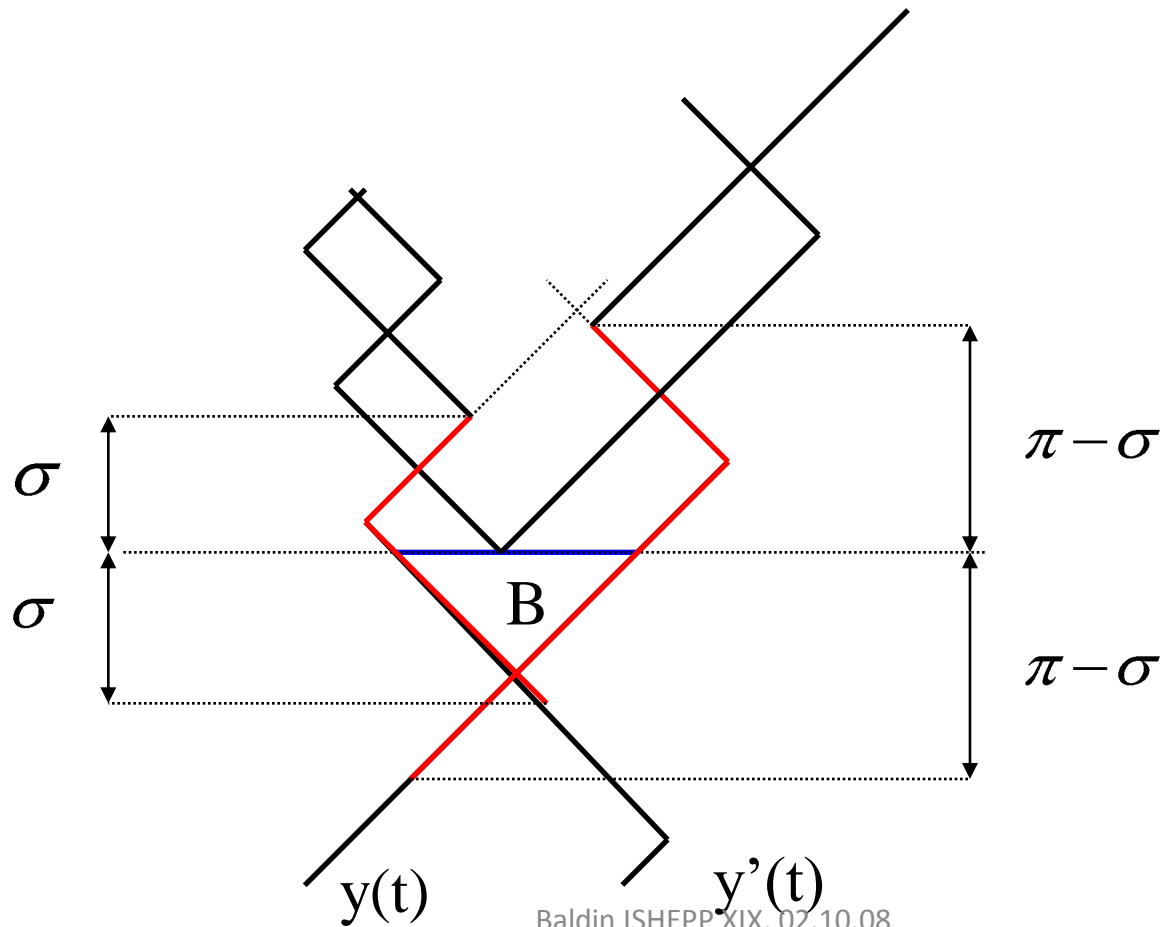
yo-yo string

- *Space-time picture of a yo-yo string with period $2P/k$*
- *Invariant of motion*

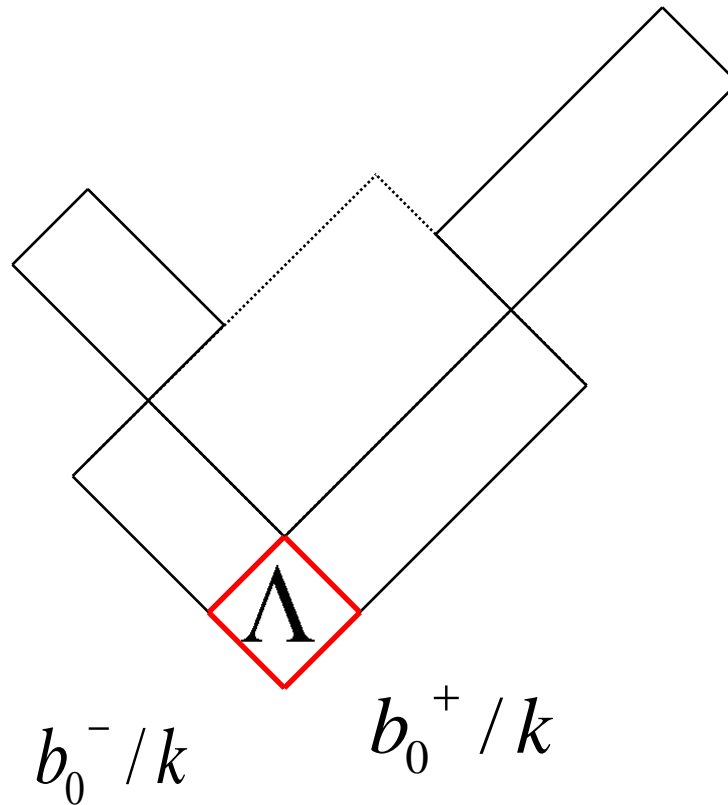


String fragmentation

- *Breaking law as symmetry requirements*



Description of fragmentation



$$\eta = \frac{1}{2} \ln \frac{b_0^+}{b_0^-}$$

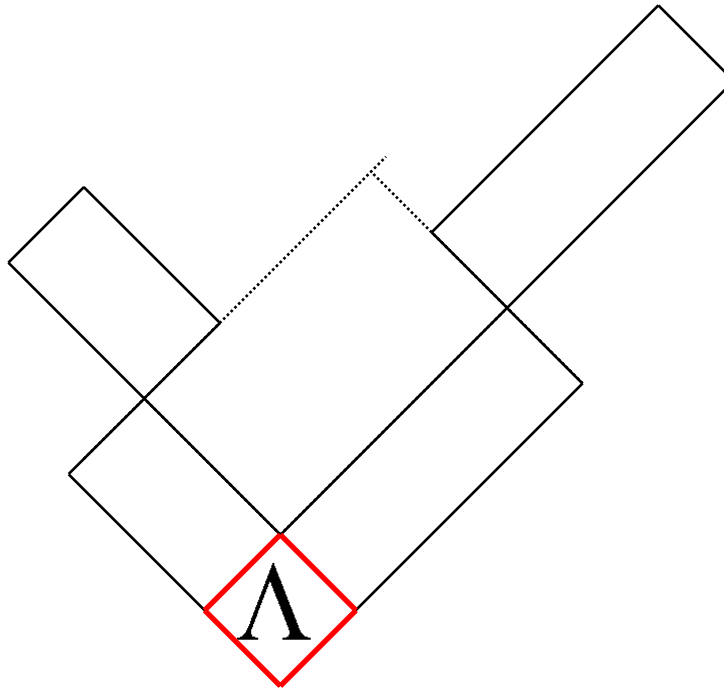
AMOR model

Artru-Mennessier model

(K.Werner “Strings, pomerons and the VENUS model...”)

$$dP(\tau, \sigma) \propto \sqrt{-\det g} d\tau d\sigma$$

AMOR model



AMOR model

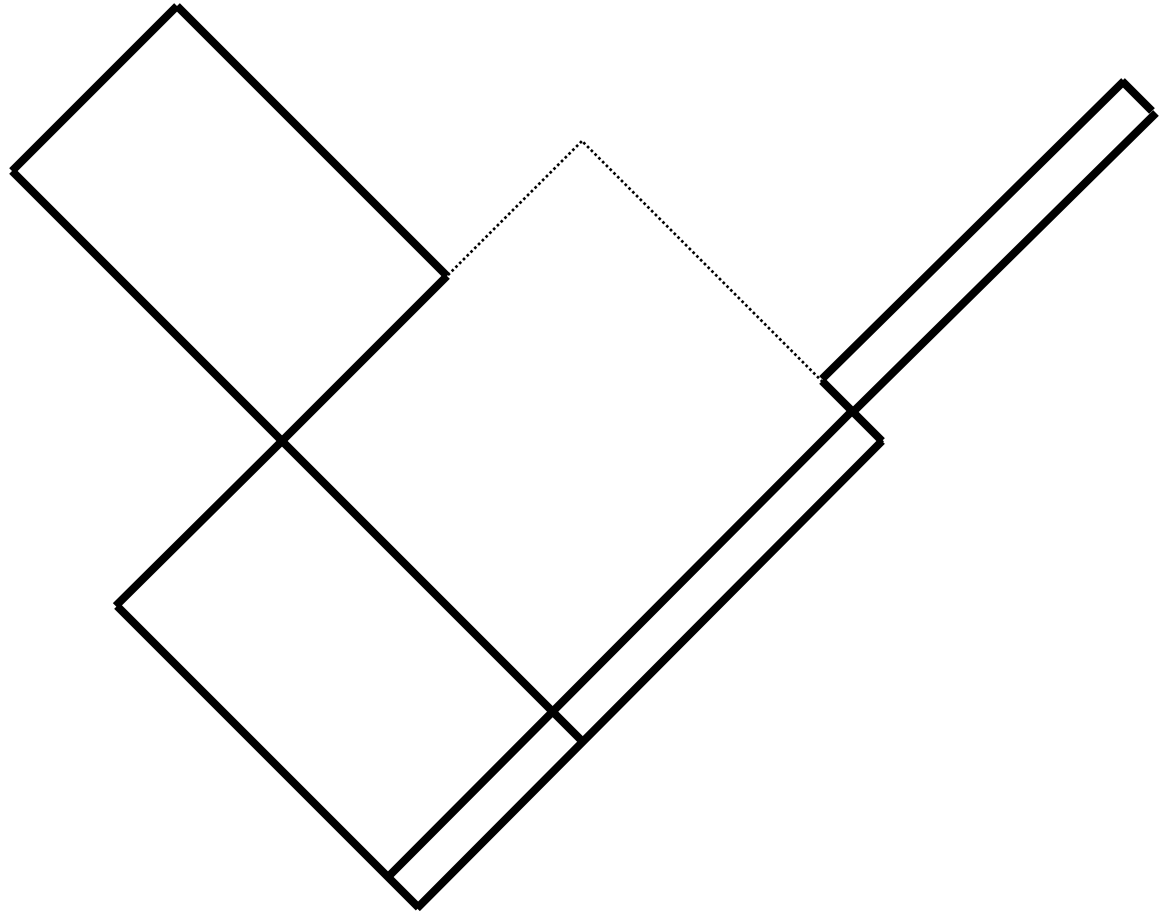
$$dP(\tau, \sigma) \propto \sqrt{-\det g} d\tau d\sigma$$

$$dP(\Lambda) = (1 - P(\Lambda))\alpha \cdot d^2\Lambda$$

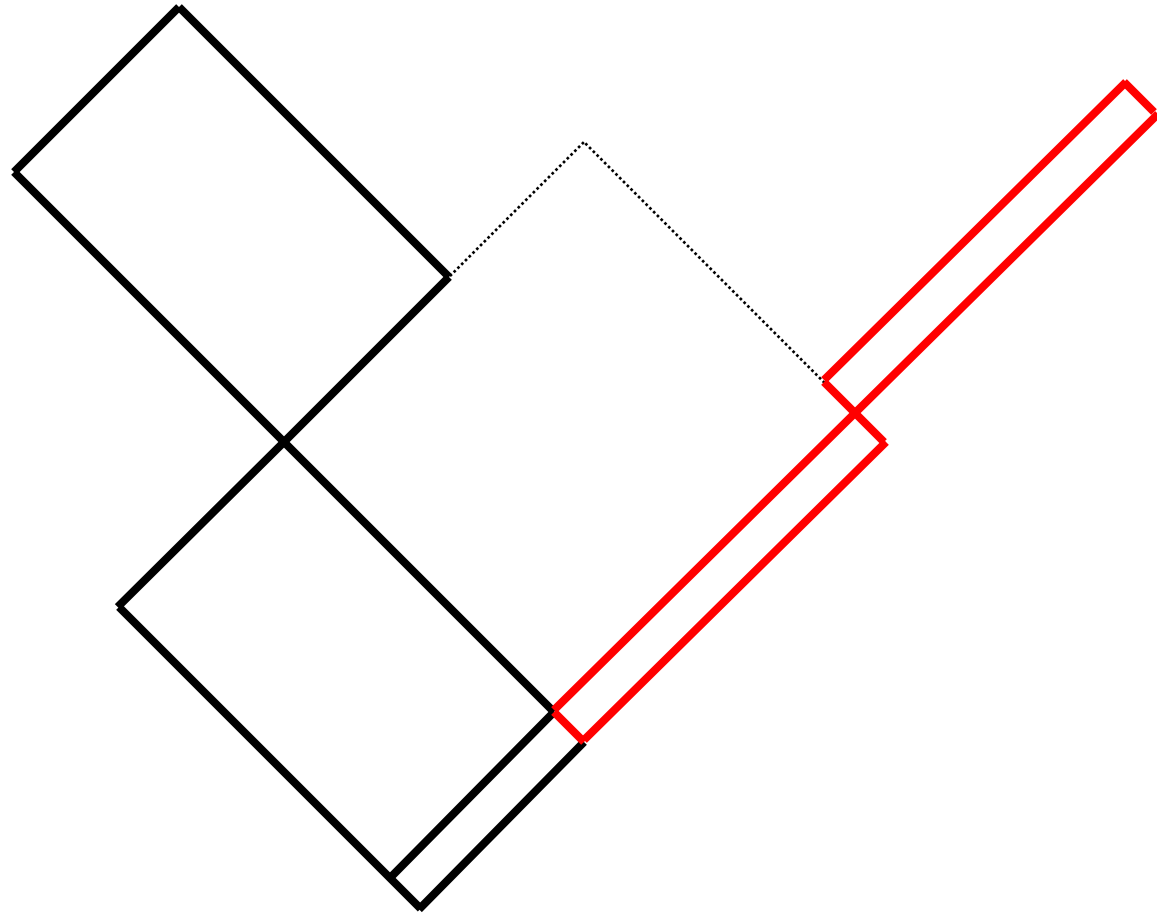
$$dP(\Lambda) = \alpha_0 e^{-\alpha_0 \Lambda} d\Lambda$$

$$\Lambda = -(1/\alpha_0) \ln r$$

AMOR model



AMOR model



AMOR model

$$dP(\Lambda) = \alpha_0 e^{-\alpha_0 \Lambda} d\Lambda$$

$$\Lambda = -(1/\alpha_0) \ln r$$

$$\mu_{\min} = \sqrt{m_{\min}^2 + p_t^2}$$

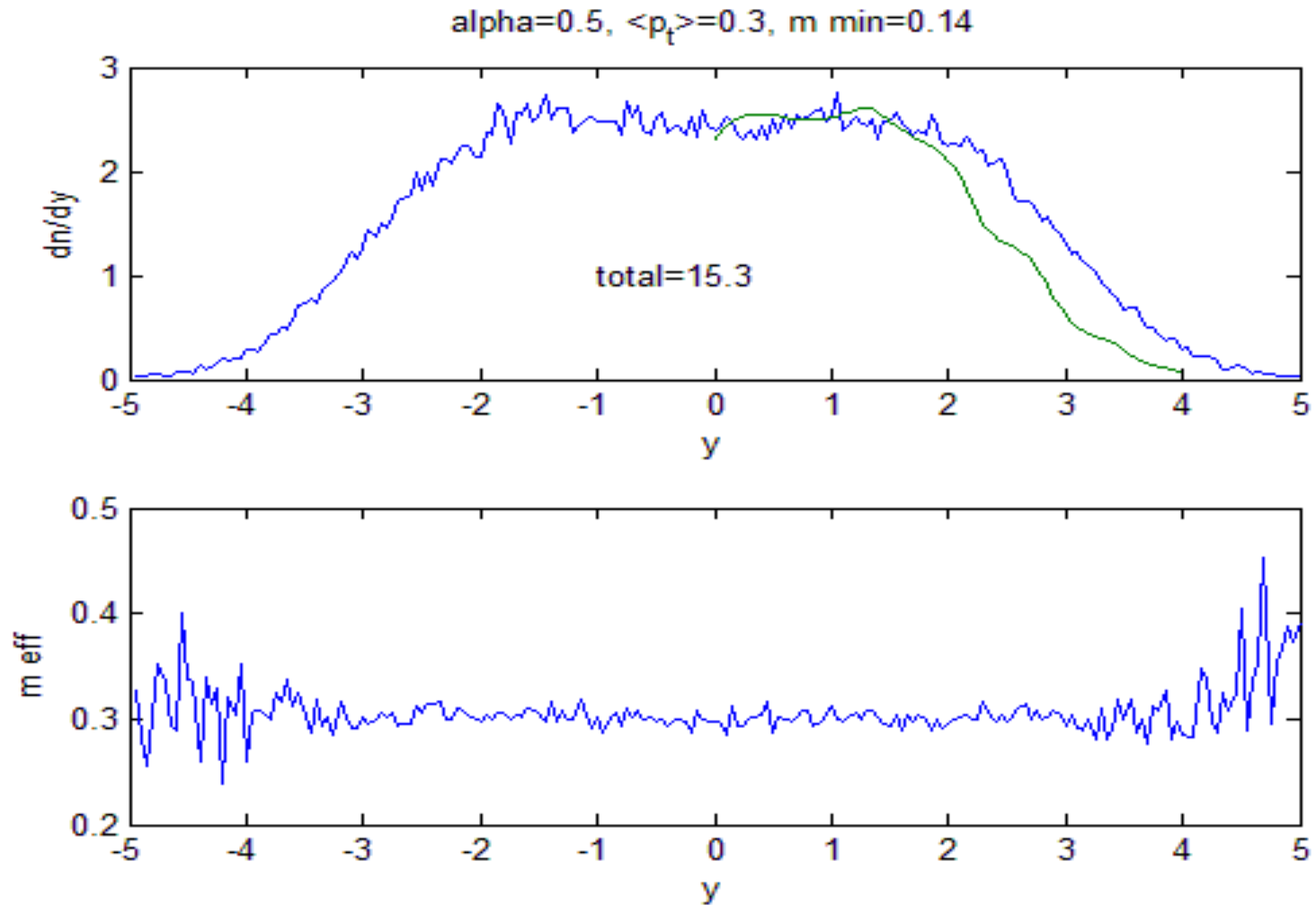
$$\eta_- < \eta < \eta_+$$

e+e- annihilation

- *M.Derrick et al.*

*Rapidity dependence of the charged particle
multiplicity distributions in e +e- annihilation
at 29 GeV*

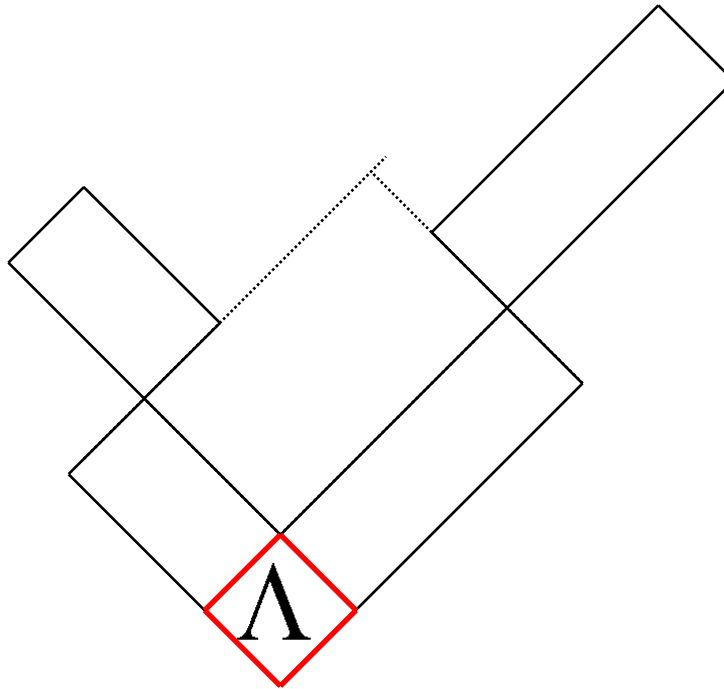
e^+e^- annihilation



Parameters dependence

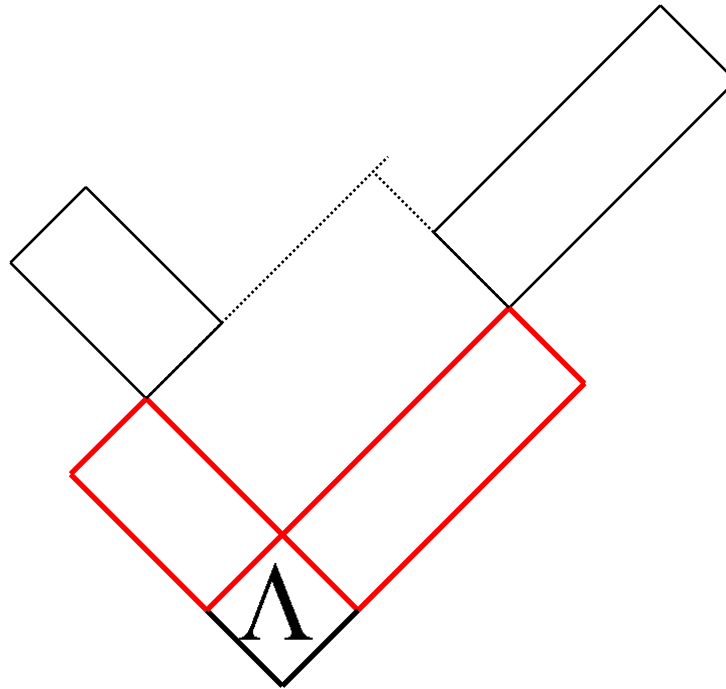
- Alpha dependence
- $\langle p_t \rangle$ dependence
- Dependence on the possibility of diquark-antidiquark production

Dependence on alpha

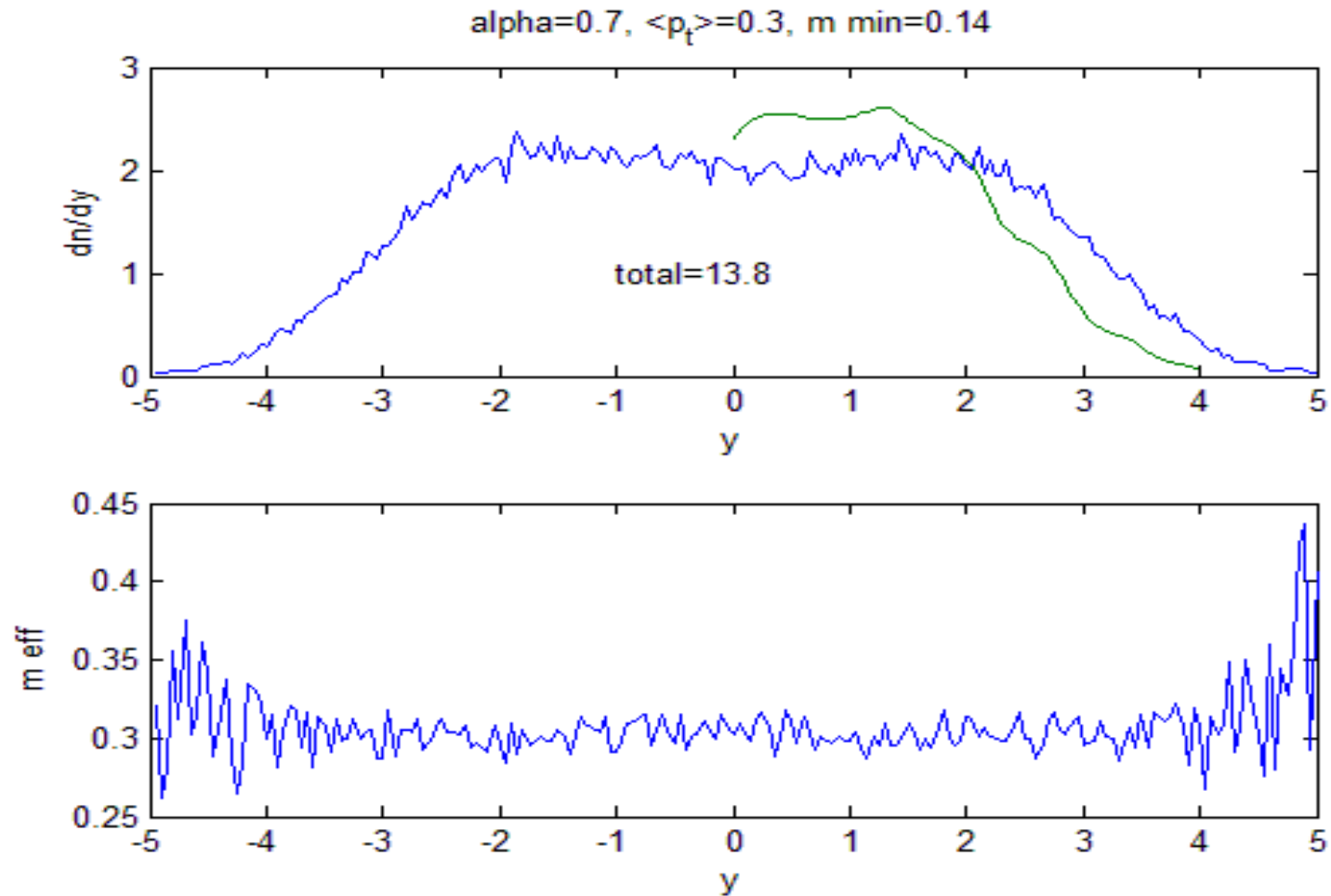


$$E(\Lambda) = \alpha_0$$

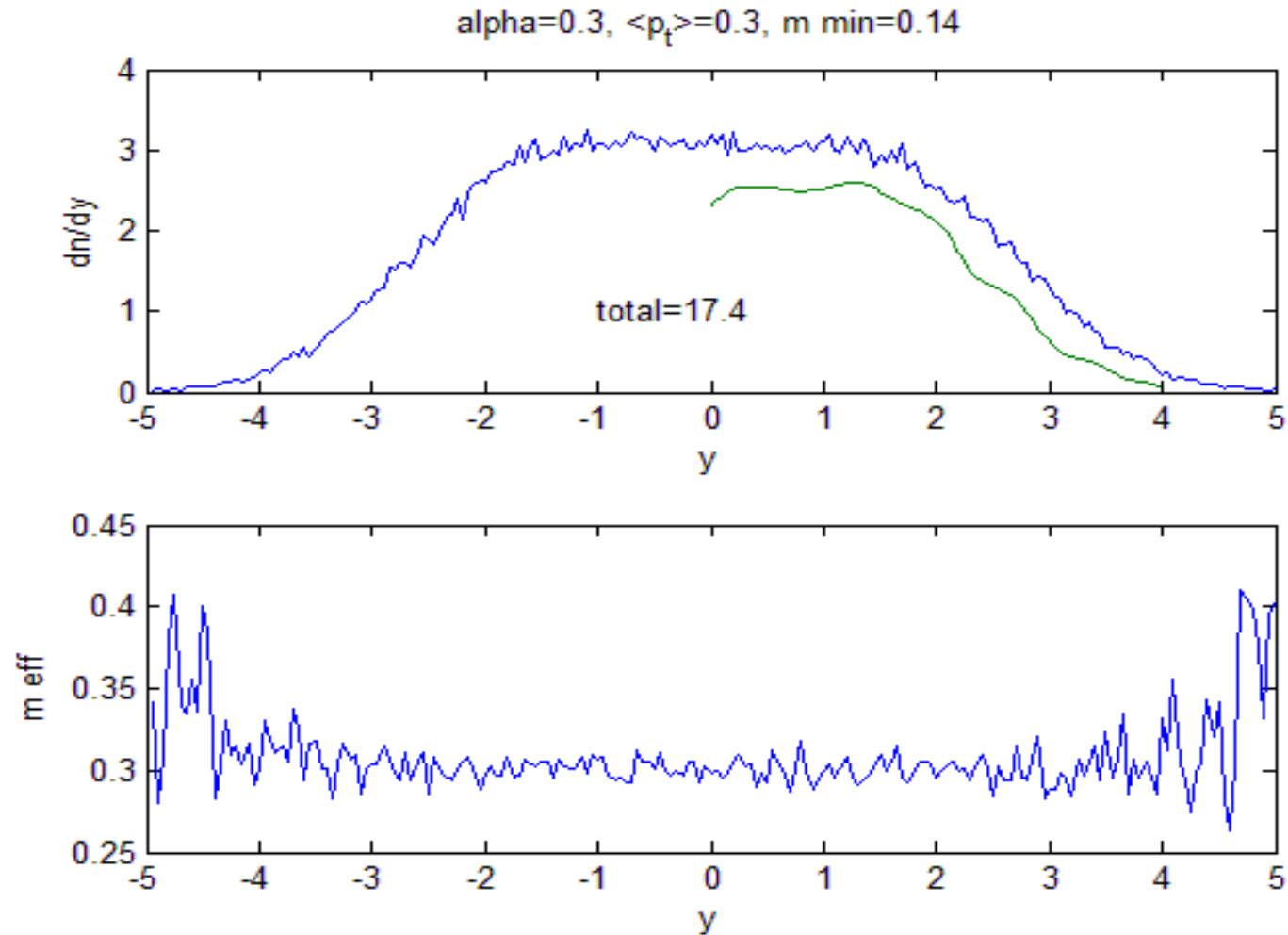
Dependence on alpha



Dependence on alpha



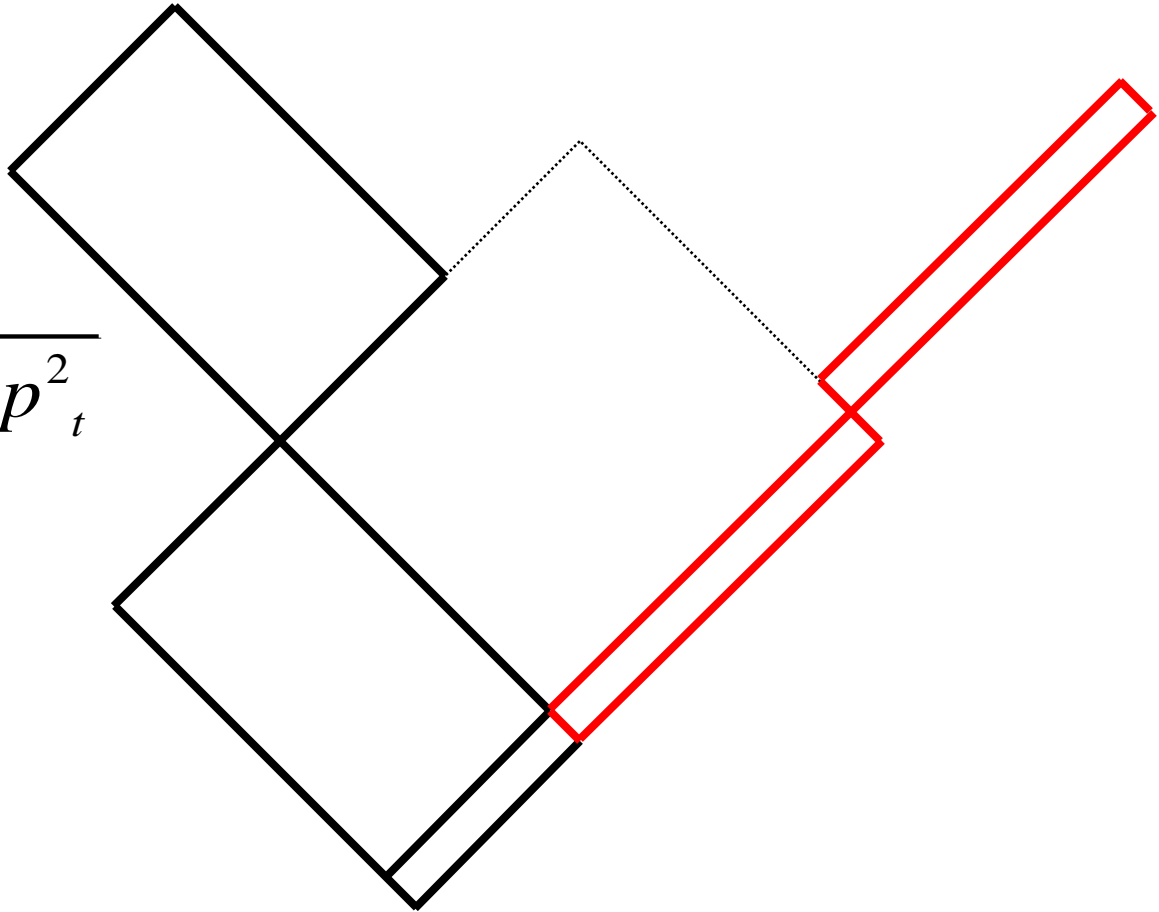
Dependence on alpha



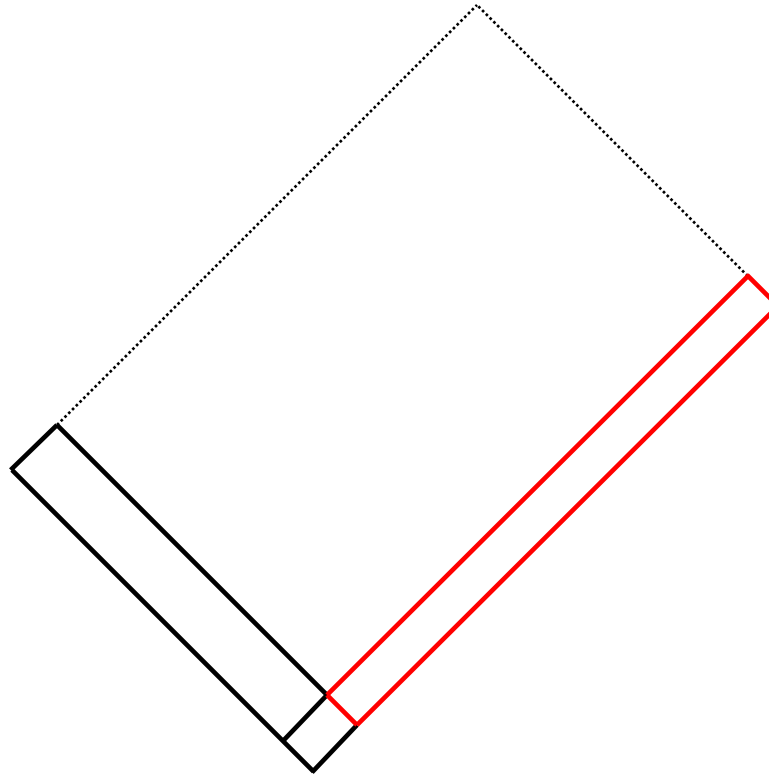
Dependence on $\langle p_t \rangle$

$$\mu_{\min} = \sqrt{m_{\min}^2 + p_t^2}$$

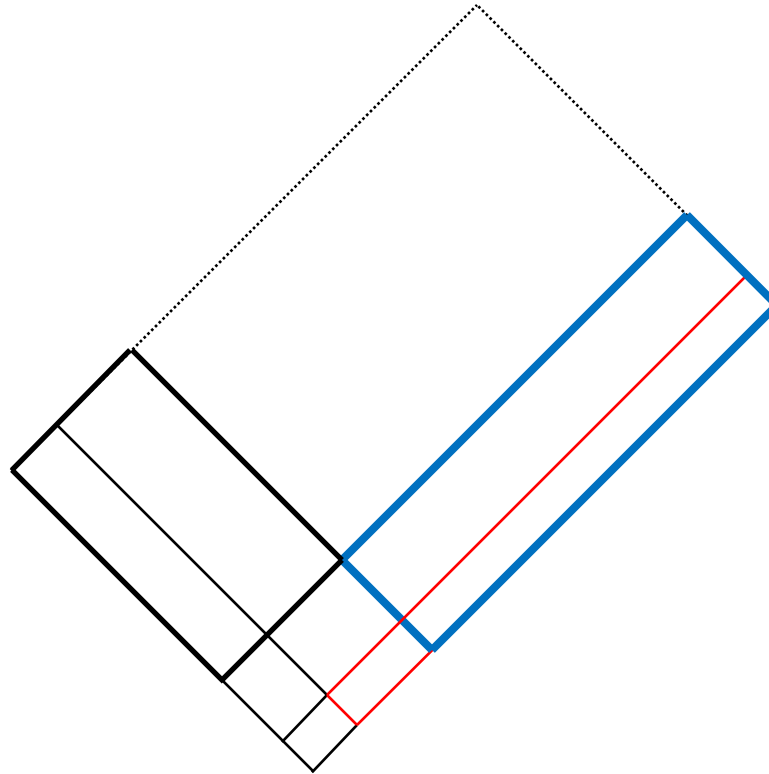
$$\eta_- < \eta < \eta_+$$



Single string with p-p_bar production

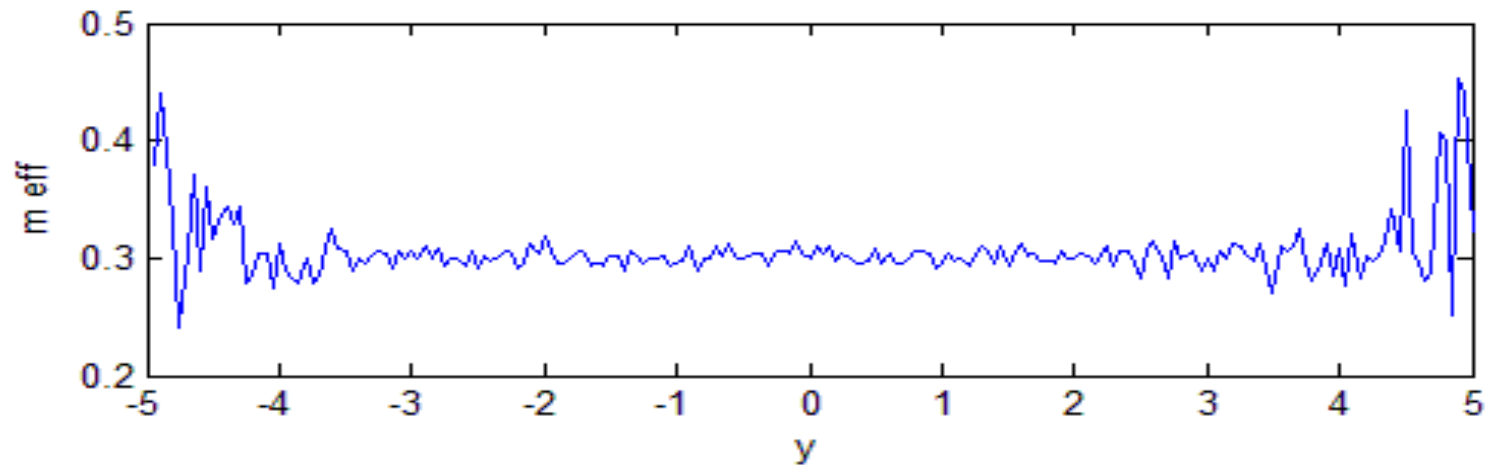
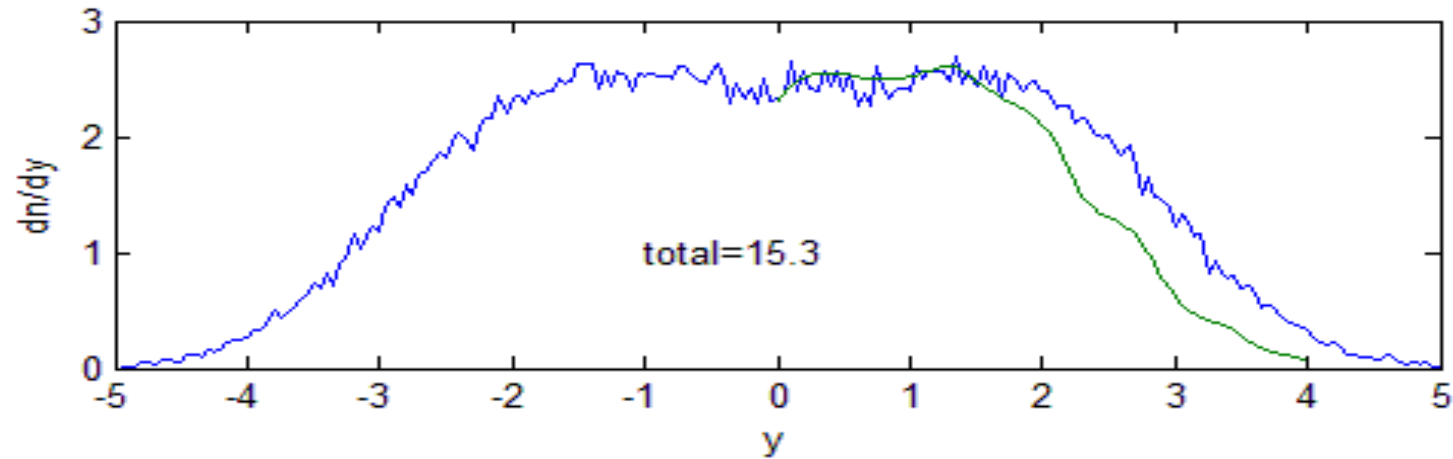


Single string with p-p_bar production



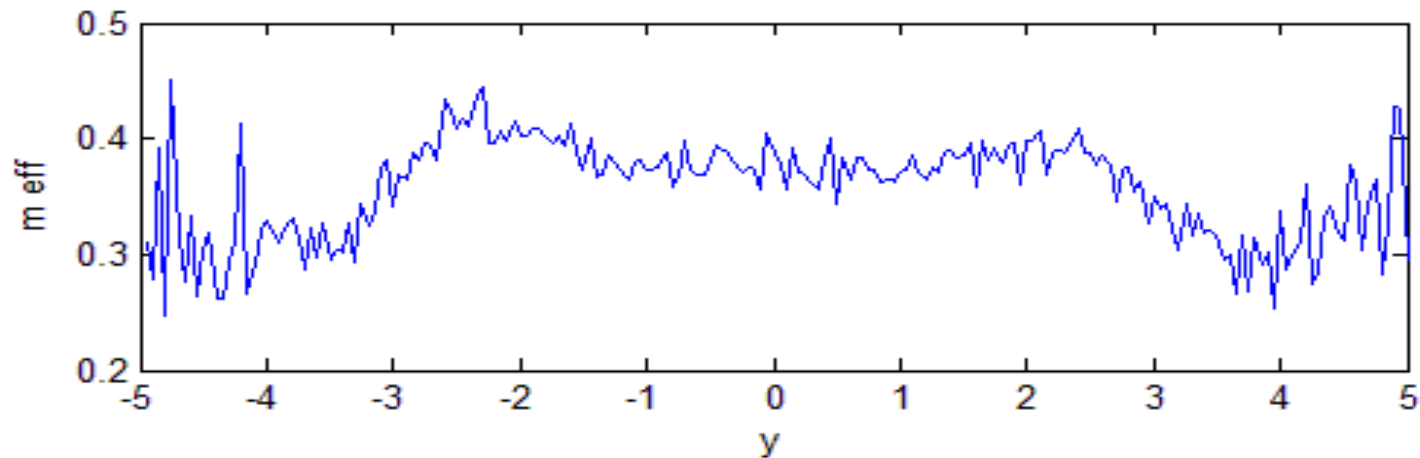
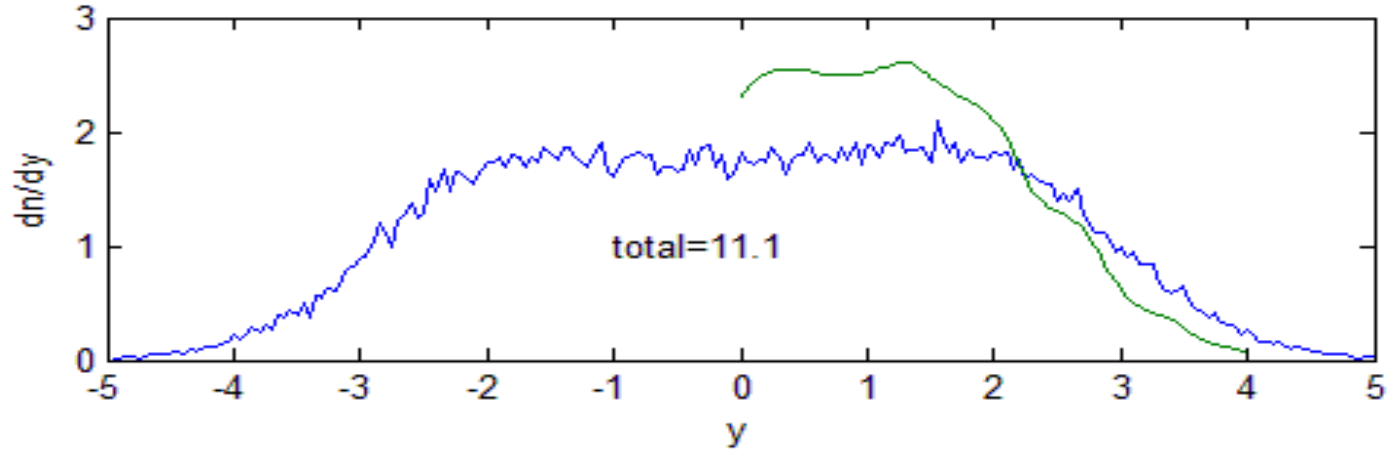
Single string with p-p_bar production

without p-p bar: $\alpha=0.5$, $\langle p_t \rangle=0.3$, $m \text{ min}=0.14$



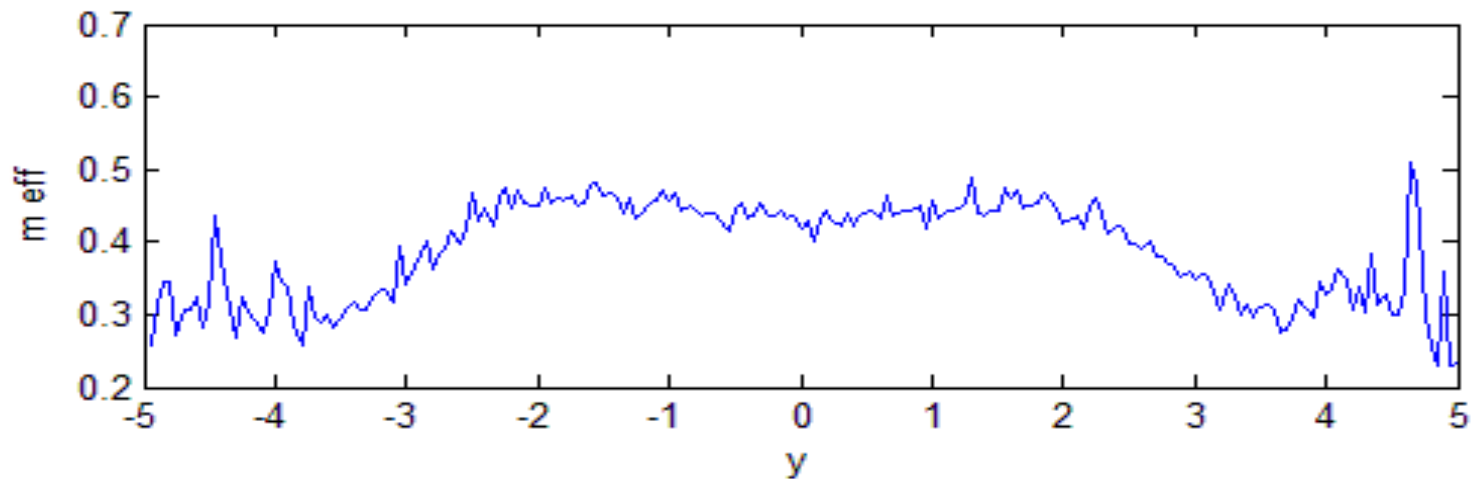
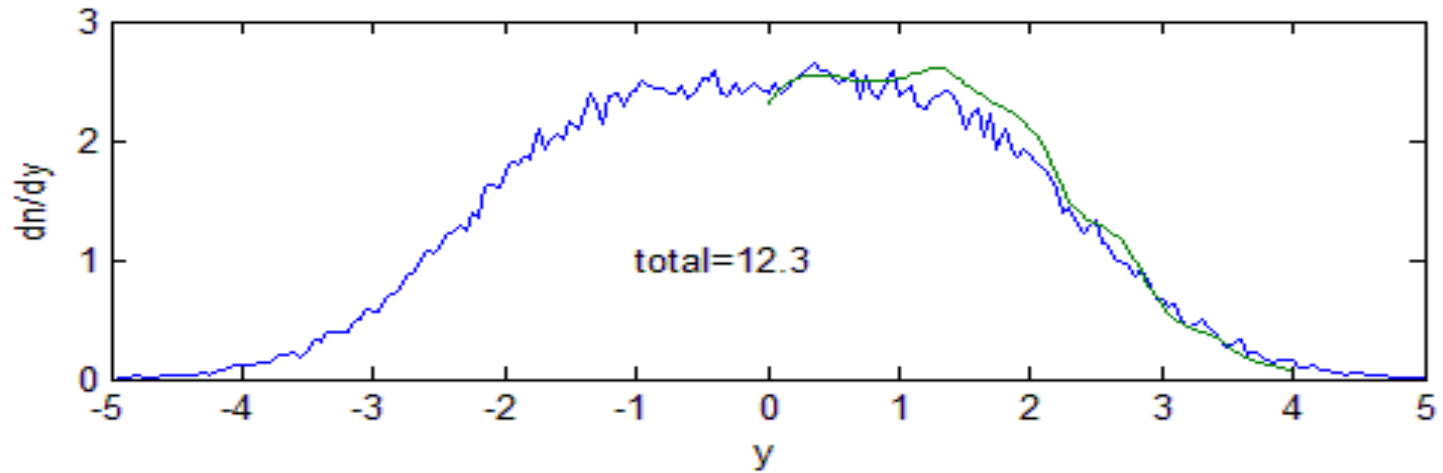
Single string with p-p_bar production

With p-p_bar: $\alpha=0.5$, $\langle p_t \rangle=0.3$, $m_{\min}=0.14$, $m_{\text{bar}}=0.94$, $p_{\text{diag}}=0.12$

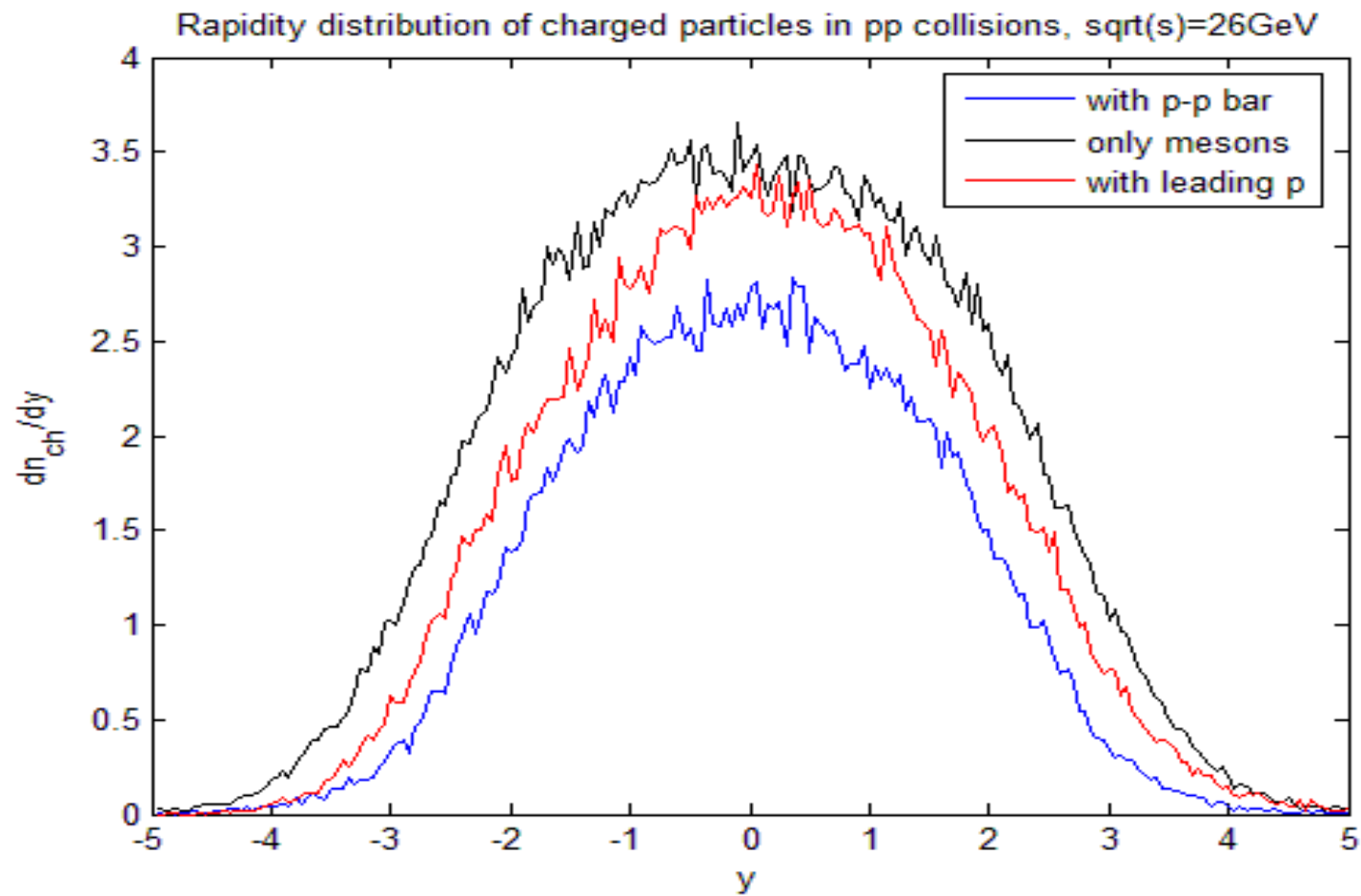


Result for single string

With p-p bar: $\alpha=0.15$, $\langle p_t \rangle=0.3$, $m_{\min}=0.14$, $m_{\text{bar}}=0.94$, $p_{\text{diag}}=0.20$



pp-collisions

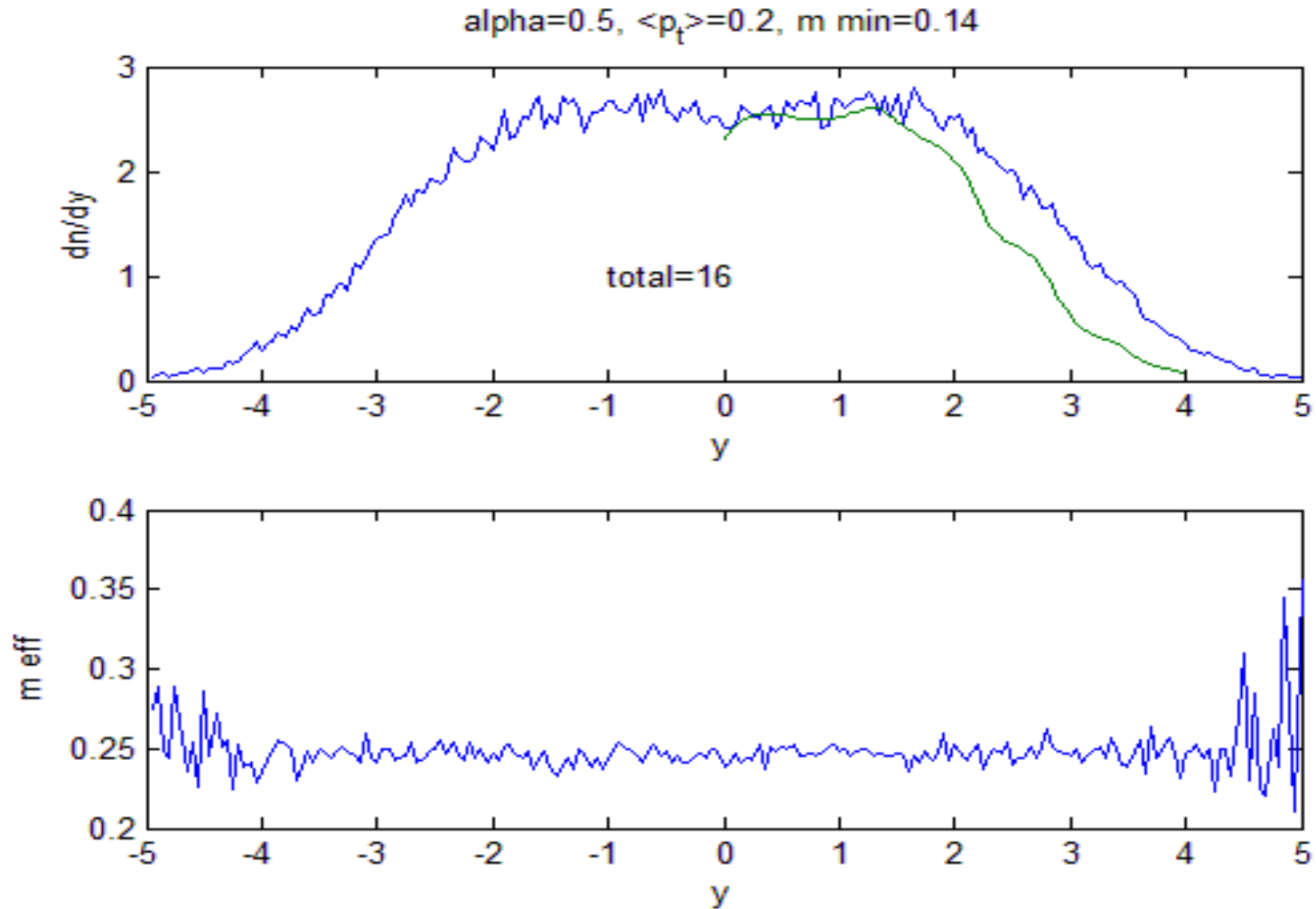


Conclusions

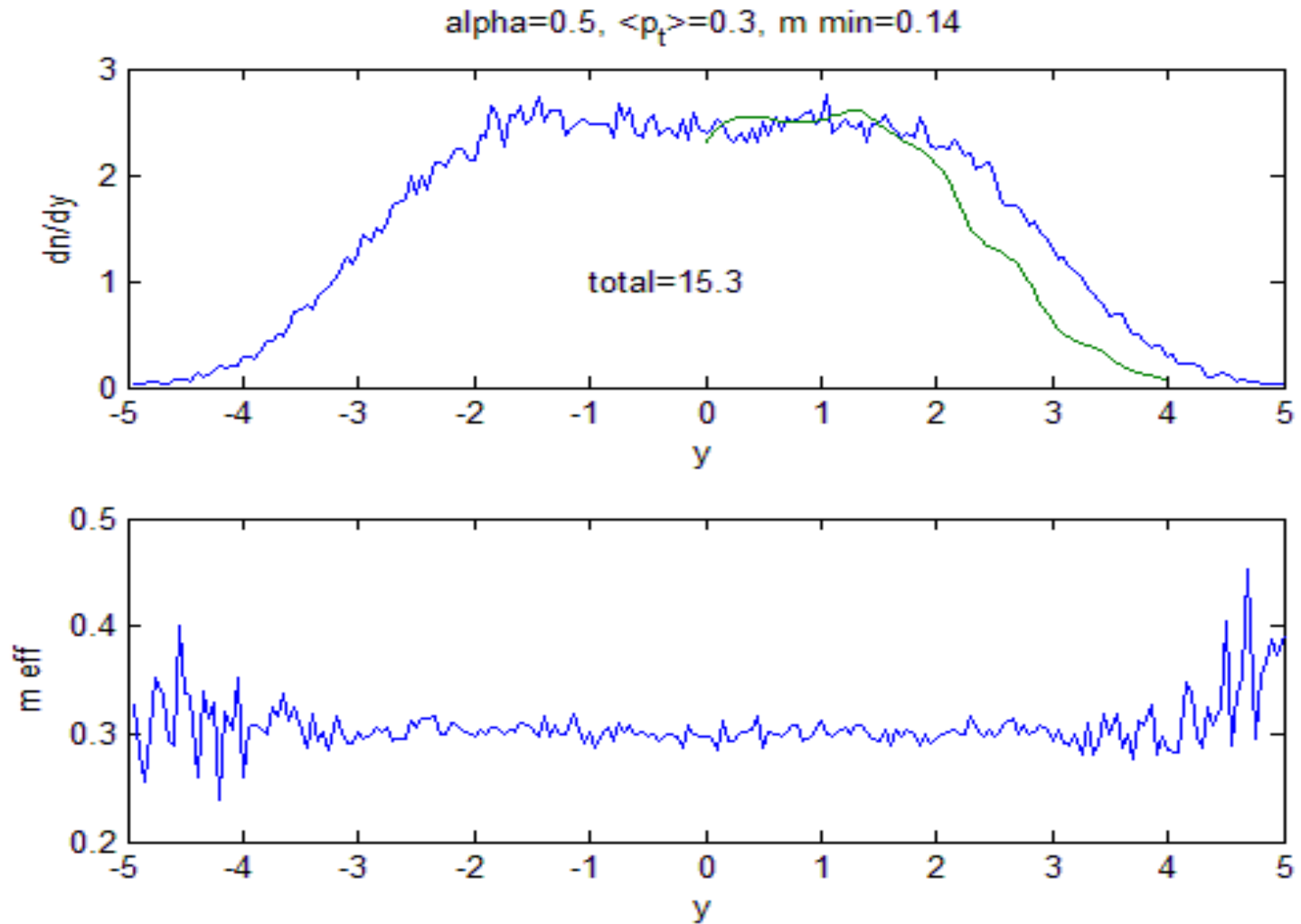
- Dependence of the AMOR model on the parameters was investigated
- Agreement with e^+e^- experimental data was obtained
- Simple way for consideration of collectivity effects in pp collisions in a form of string fusion

Thank you for attention

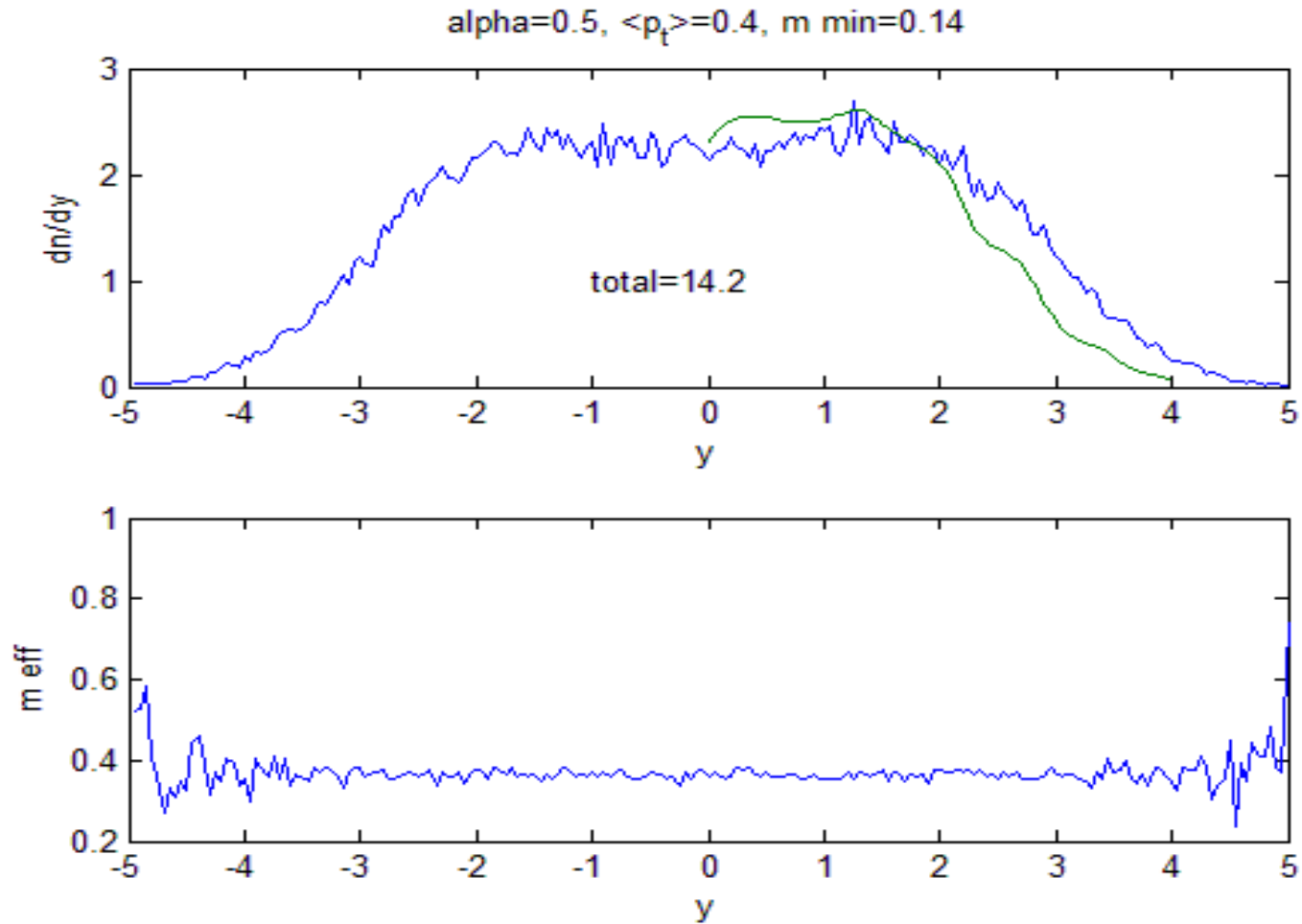
Dependence on $\langle p_t \rangle$



Dependence on $\langle p_t \rangle$



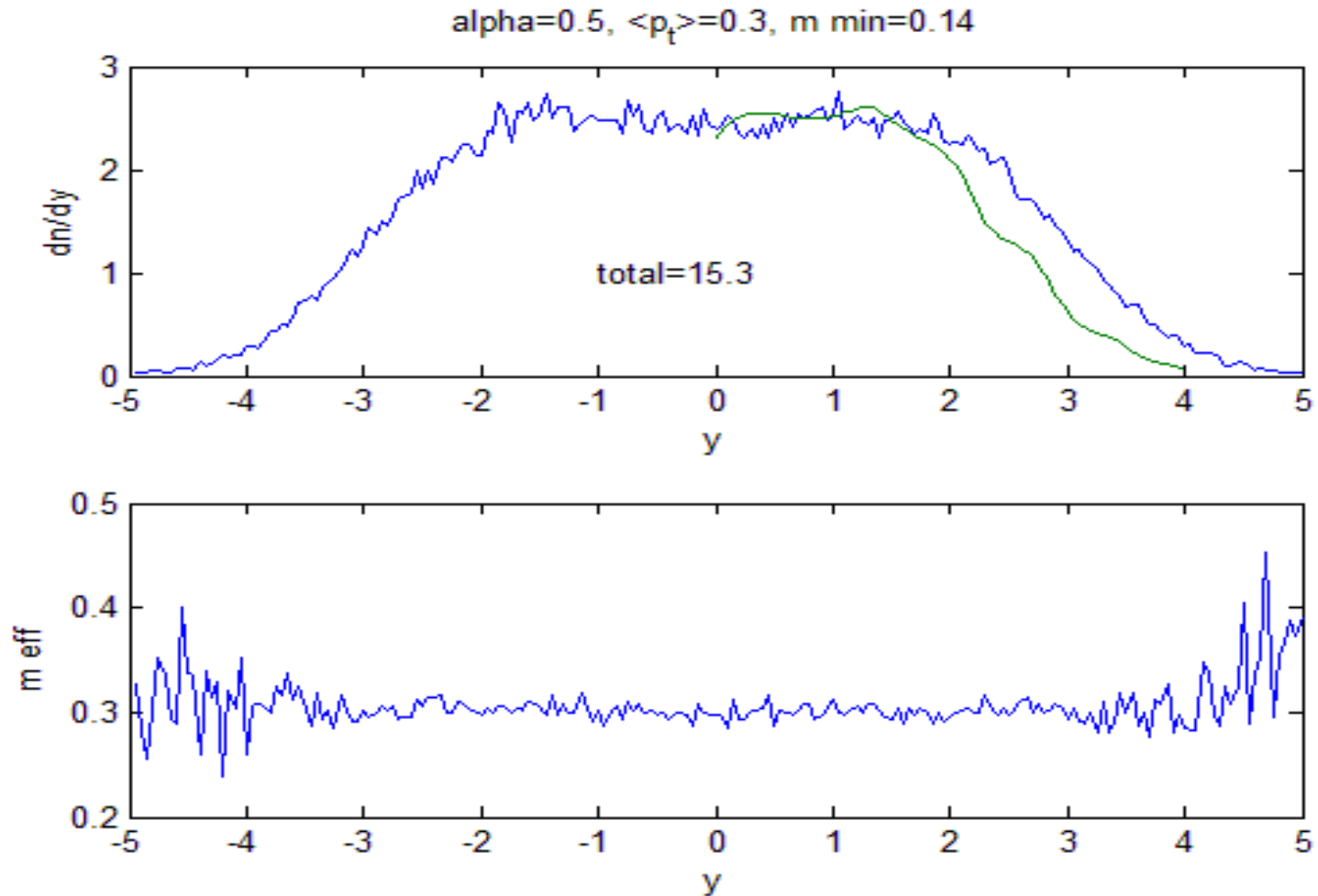
Dependence on $\langle p_t \rangle$



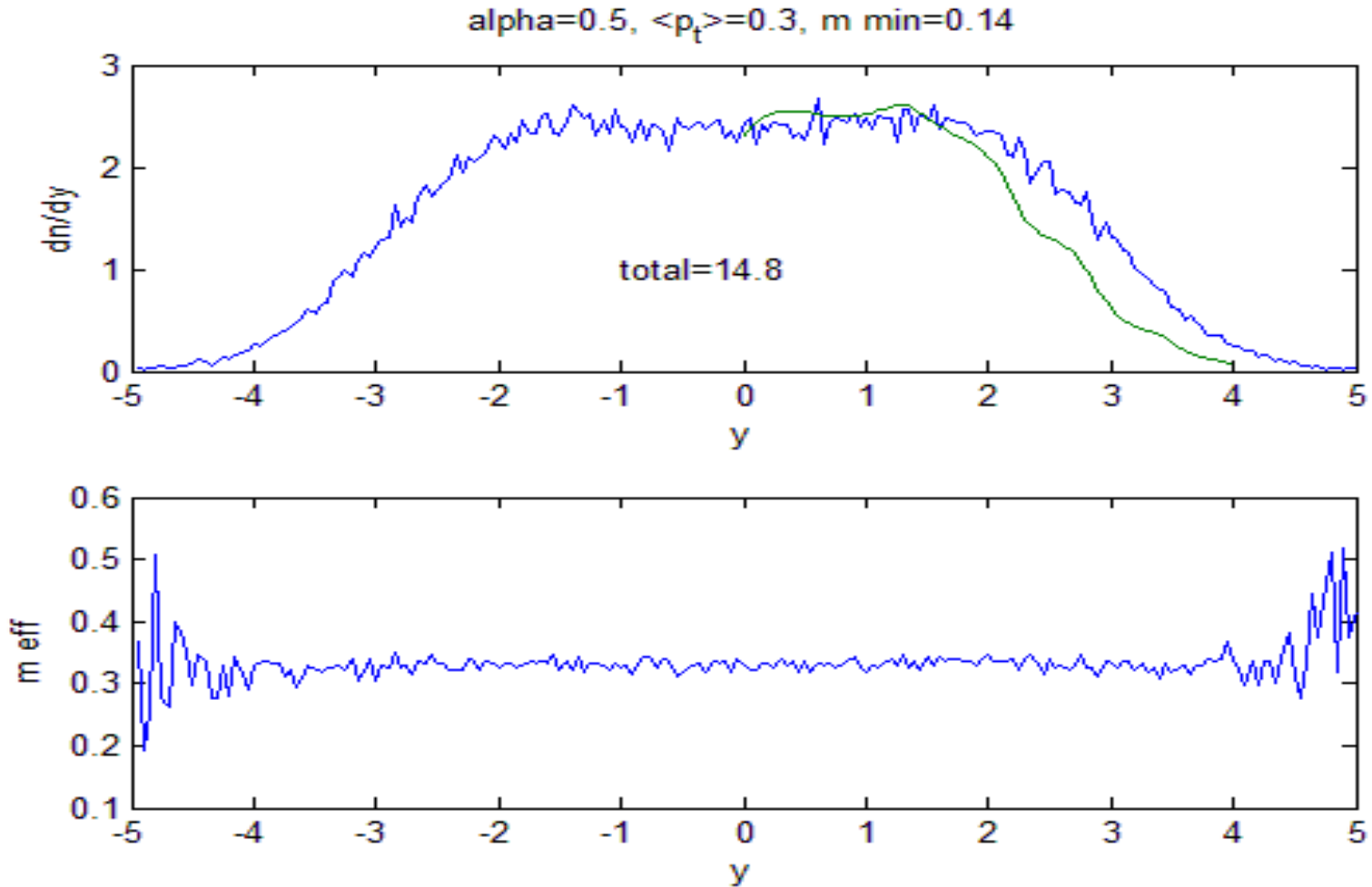
Fragmentation in low energies region

- m_c = the string cutoff mass
- $m_c = m_{\min} + r^* \Delta m$

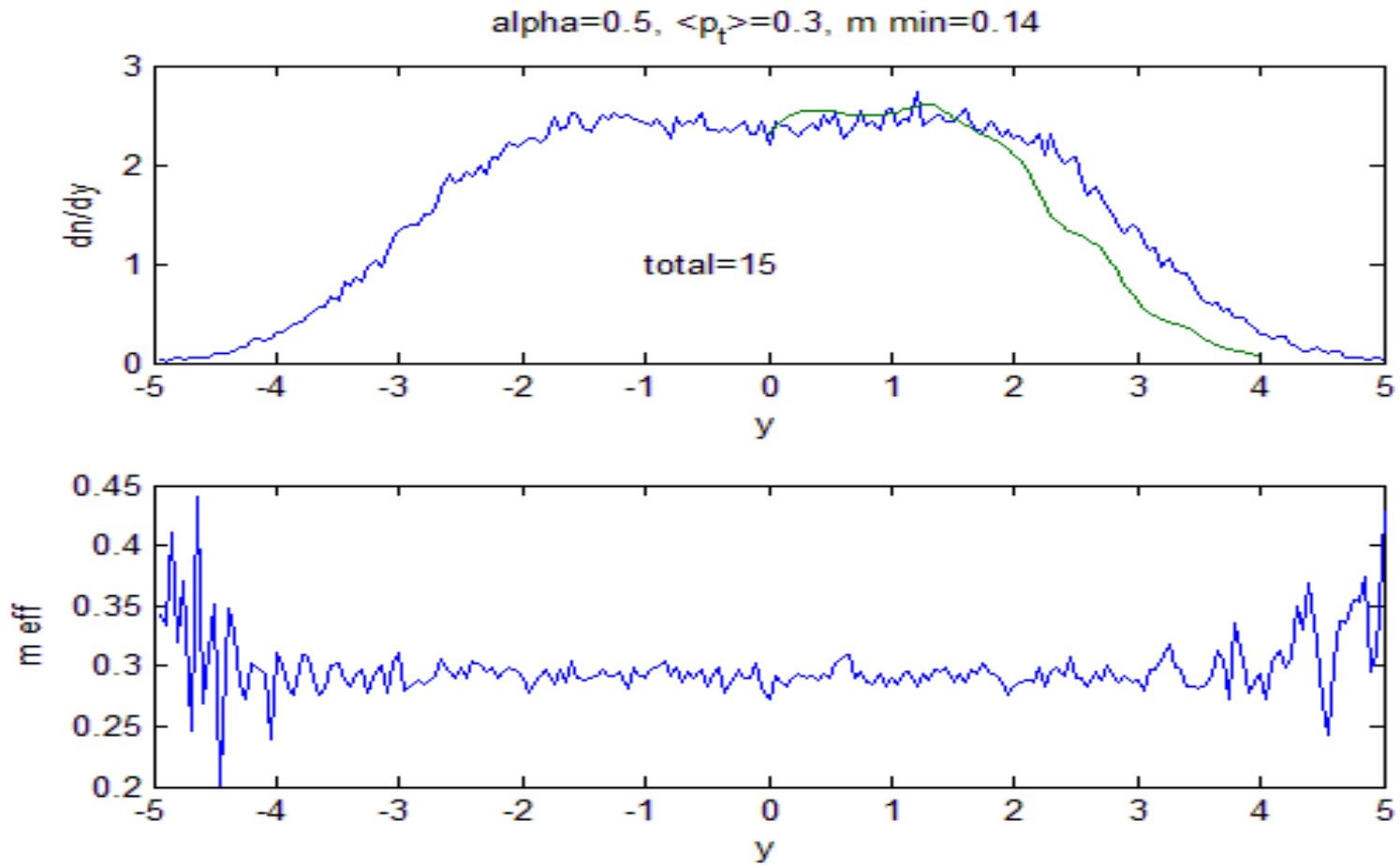
Dependence on Δm . $\Delta m=1\text{GeV}$



Dependence on Δm . $\Delta m = 0.5\text{GeV}$

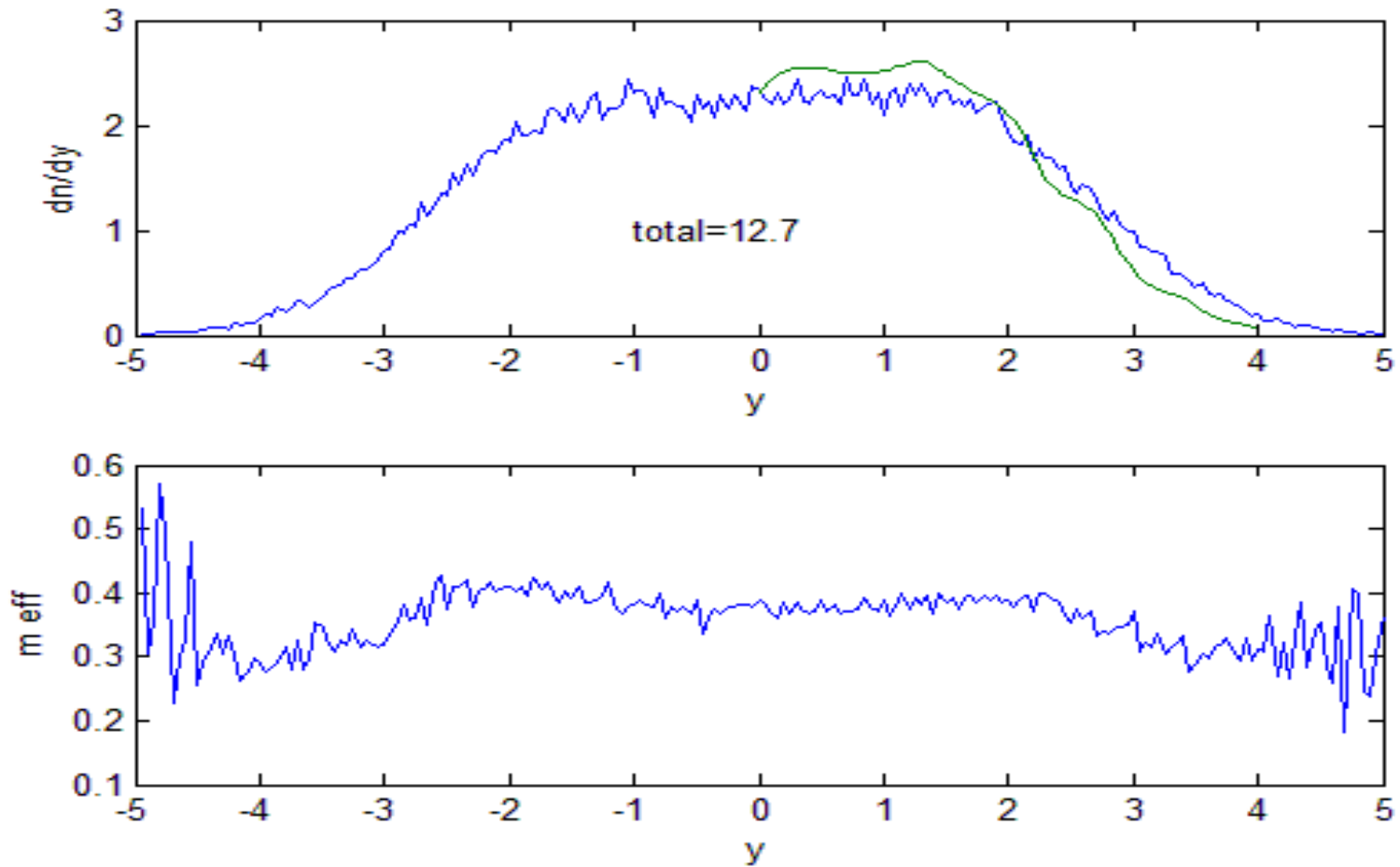


Dependence on Δm . $\Delta m=1.5\text{GeV}$



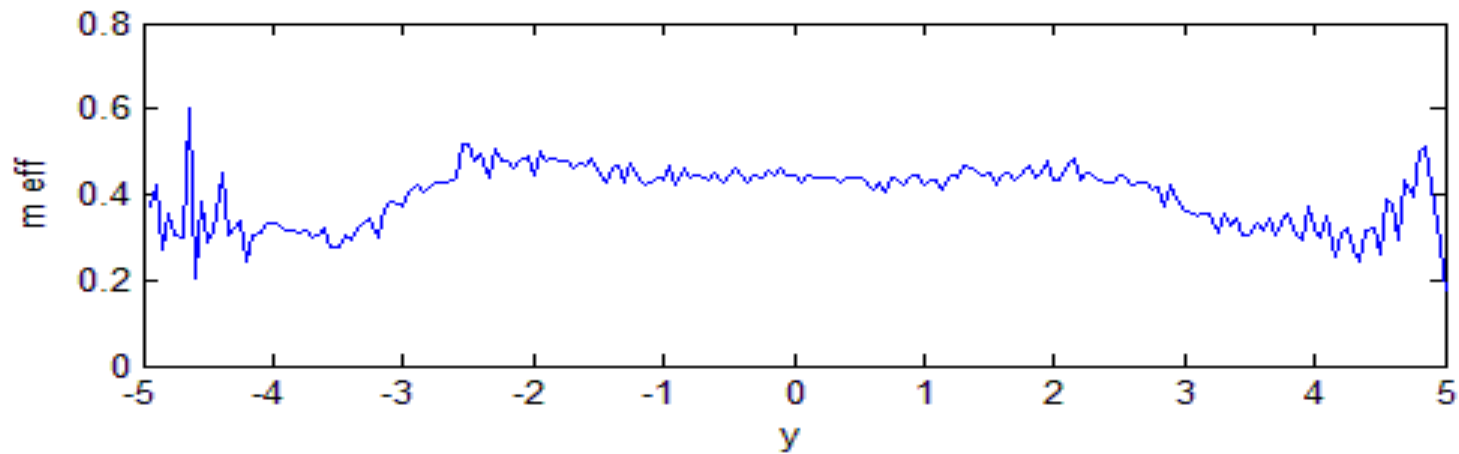
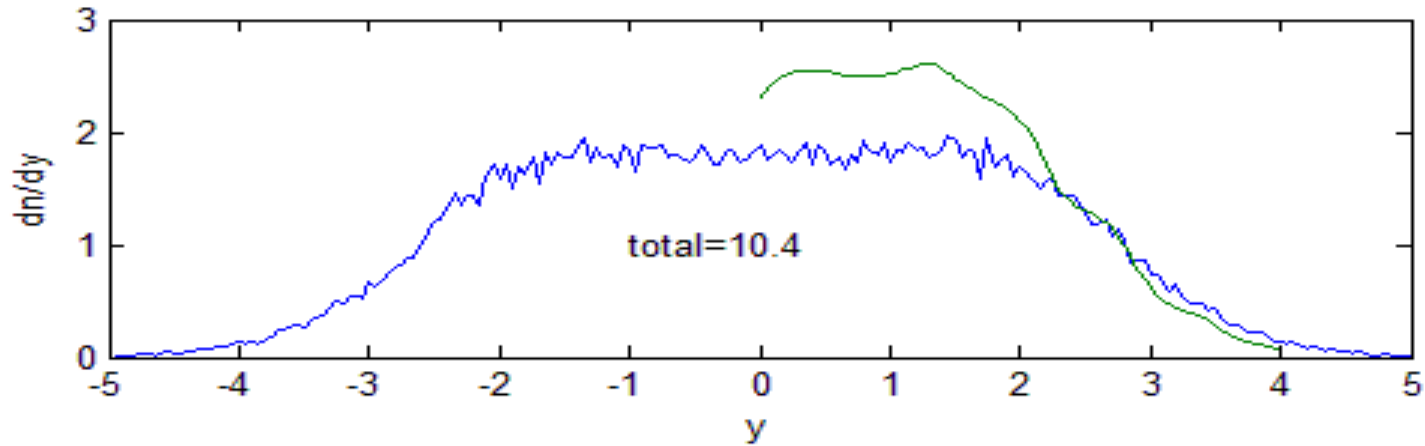
Dependence on p_{diq}

With $p\text{-}p$ bar: $\alpha=0.3$, $\langle p_t \rangle=0.3$, $m_{\text{min}}=0.14$, $m_{\text{bar}}=0.94$, $p_{\text{diq}}=0.12$

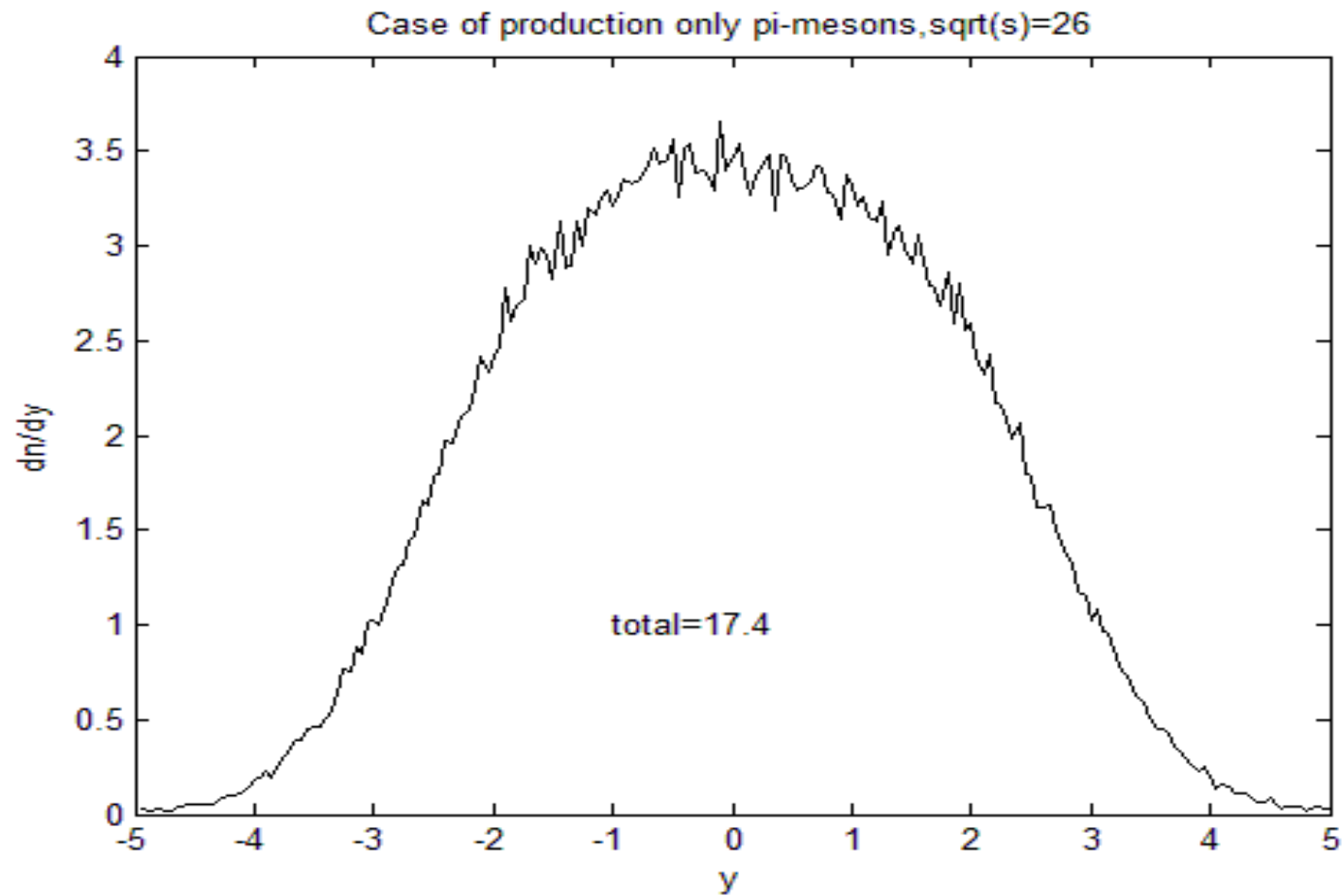


Dependence on p_{diq}

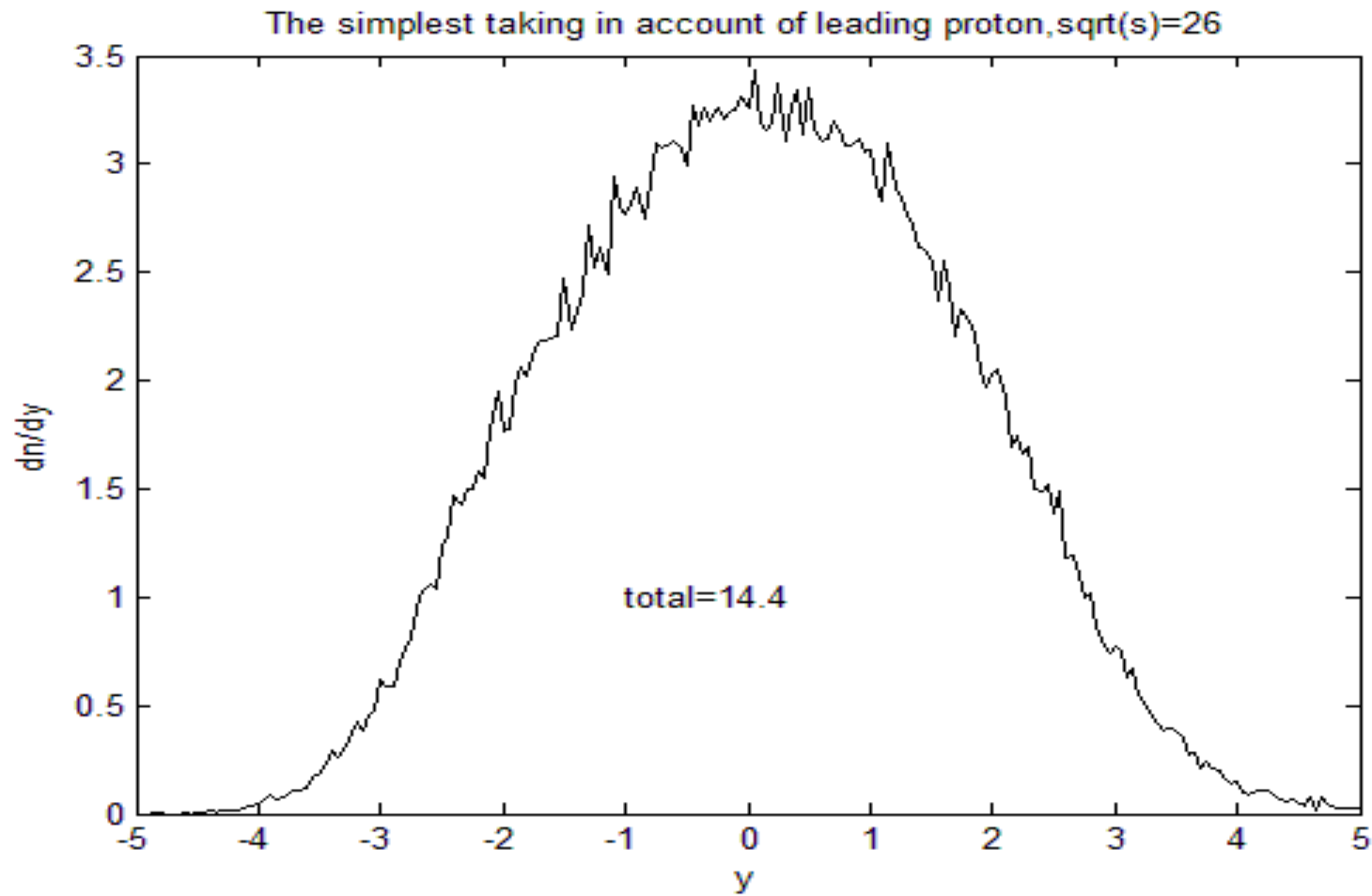
With $p\text{-}p$ bar: $\alpha=0.3$, $\langle p_t \rangle=0.3$, $m \text{ min}=0.14$, $m \text{ bar}=0.94$, $p \text{ diq}=0.20$



pp-collisions



pp-collisions



pp-collisions

