$\boxed{x(g) \text{ with Heavy Falvours}}$
$\boxed{\text{in } ep \text{ and } \gamma p \text{ collisions at THERA}}$

THERA meeting 19.10.2000

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O U T L I N E :

Conclusions from previous meeting(s)

$d\sigma/dx(g)$ **for BGF in NLO QCD**

Can we measure low $x(g)$ **HF production at THERA ?**

from Aprili

First Conclusions

- THERA will provide HQ measurements at high Q^2 and high $P_\perp$ values. Proper place to varify ressumed NLO calculations.
- THERA is more competetive with HERA in beauty sector.
- x_g range till 10^{-5} is kinematically available but hardly measurable. 10^{-4} is more realistic.
- Rear tracking (in addition to central, of course,) is crucial for charm studies.
- Rear μ-detector (in addition to central, of course,) is crucial for beauty studies.
- THERA is great machine for resolved processes and photon structure (g, c, b) measurements.

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$\theta^{trk} > 0.4^\circ$

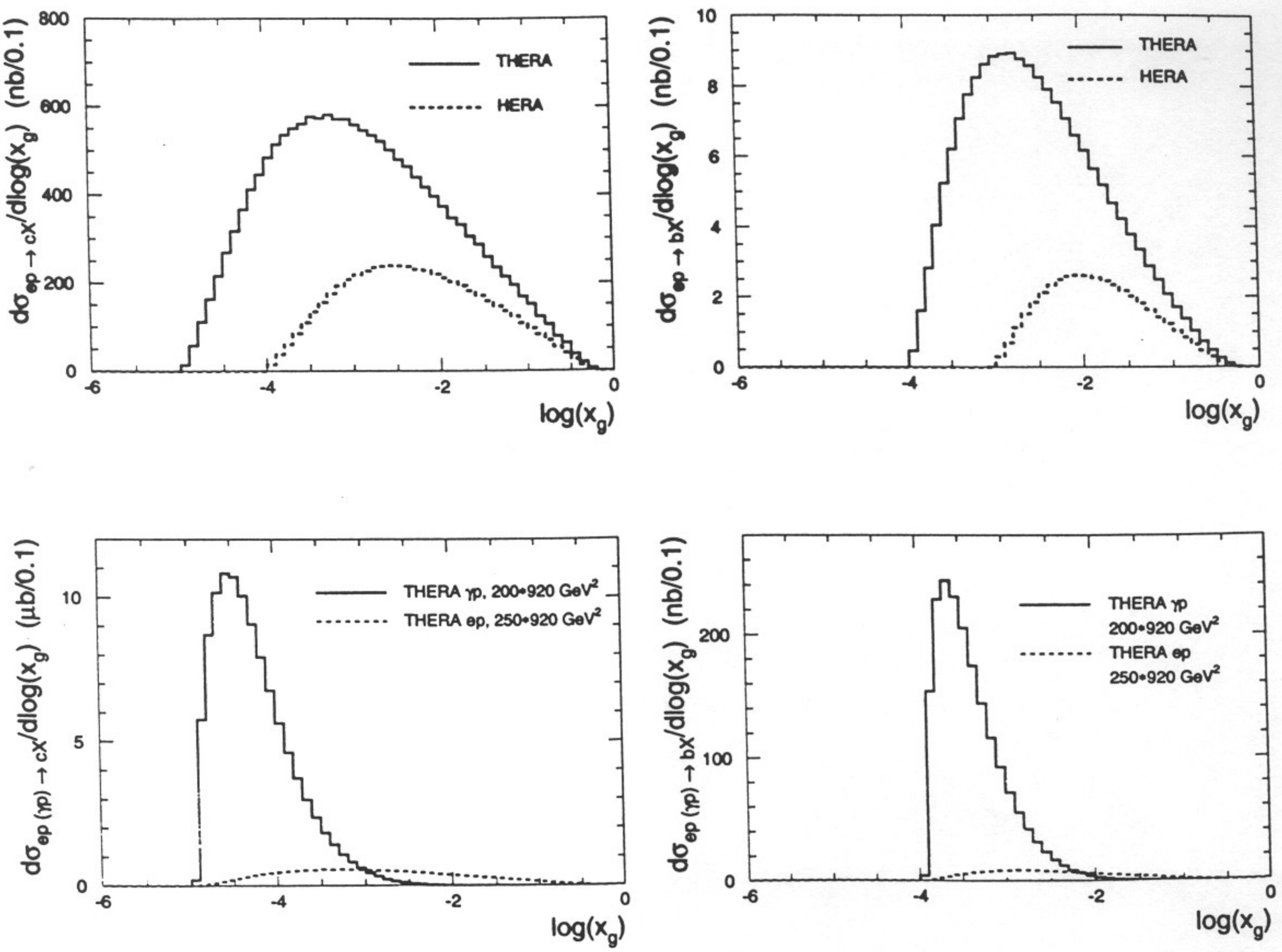
$P_\perp \sim 1$ GeV

$x(g)$ at **HERA and THERA** ep **and** γp

NLO QCD (FMNR), $\gamma g \to c\bar{c}(b\bar{b})$

proton s.f. GRV 98, $\mu_r = \mu_f = m_\perp, m_c = 1.5, m_b = 4.75$

	charm $[\mu b]$	**beauty** $[nb]$
HERA ep, $Q^2 < 1\,\mathbf{GeV}^2$	**0.56**	**4.2**
THERA ep $Q^2 < 100\,\mathbf{GeV}^2$	**1.62**	**18.0**
THERA γp	**107.6**	**188.7**



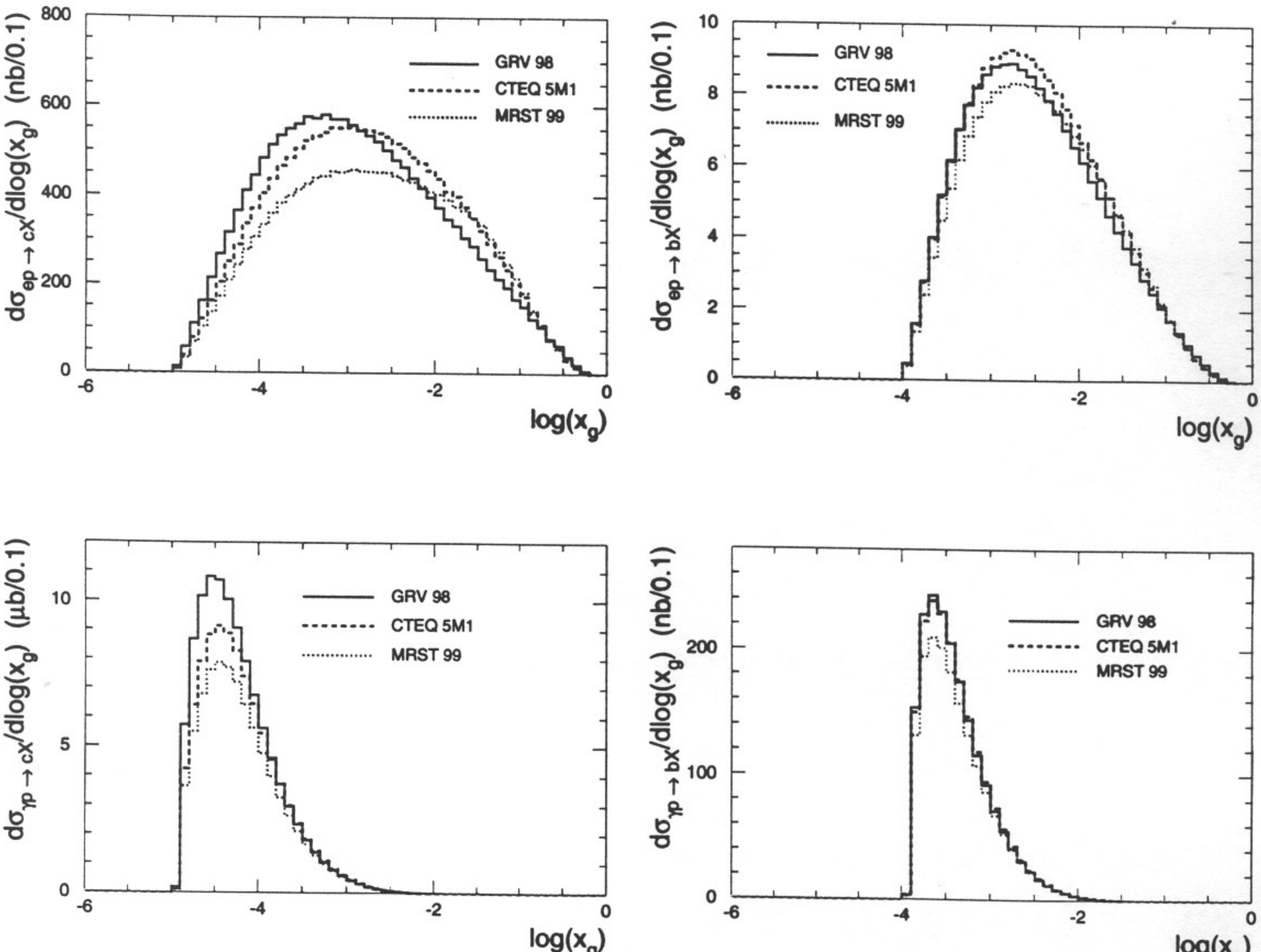
$10^{-5} < x_g < 10^{-3}$: THERA region

$x(g)$ at THERA ep and γ with different SF

NLO QCD (FMNR), $\gamma g \to c\bar{c}(b\bar{b})$

proton s.f. GRV 98, CTEQ 5M1, MRST 99,

$\mu_r = \mu_f = m_\perp, m_c = 1.5, m_b = 4.75$

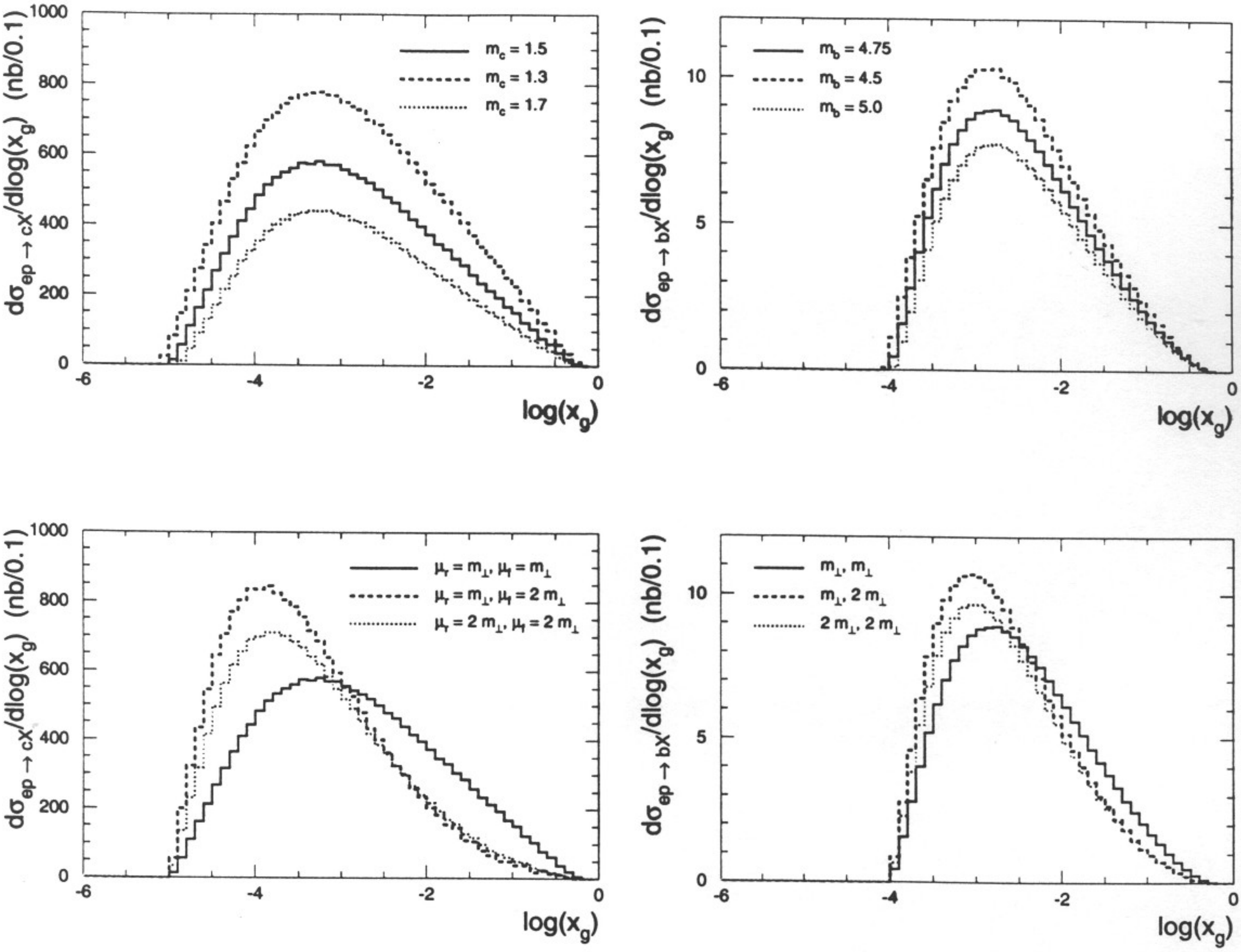


~30%　　　　10÷20%

Different masses and scales

NLO QCD (FMNR), $\gamma g \to c\bar{c}(b\bar{b})$

proton s.f. GRV 98



m_c is better known already now

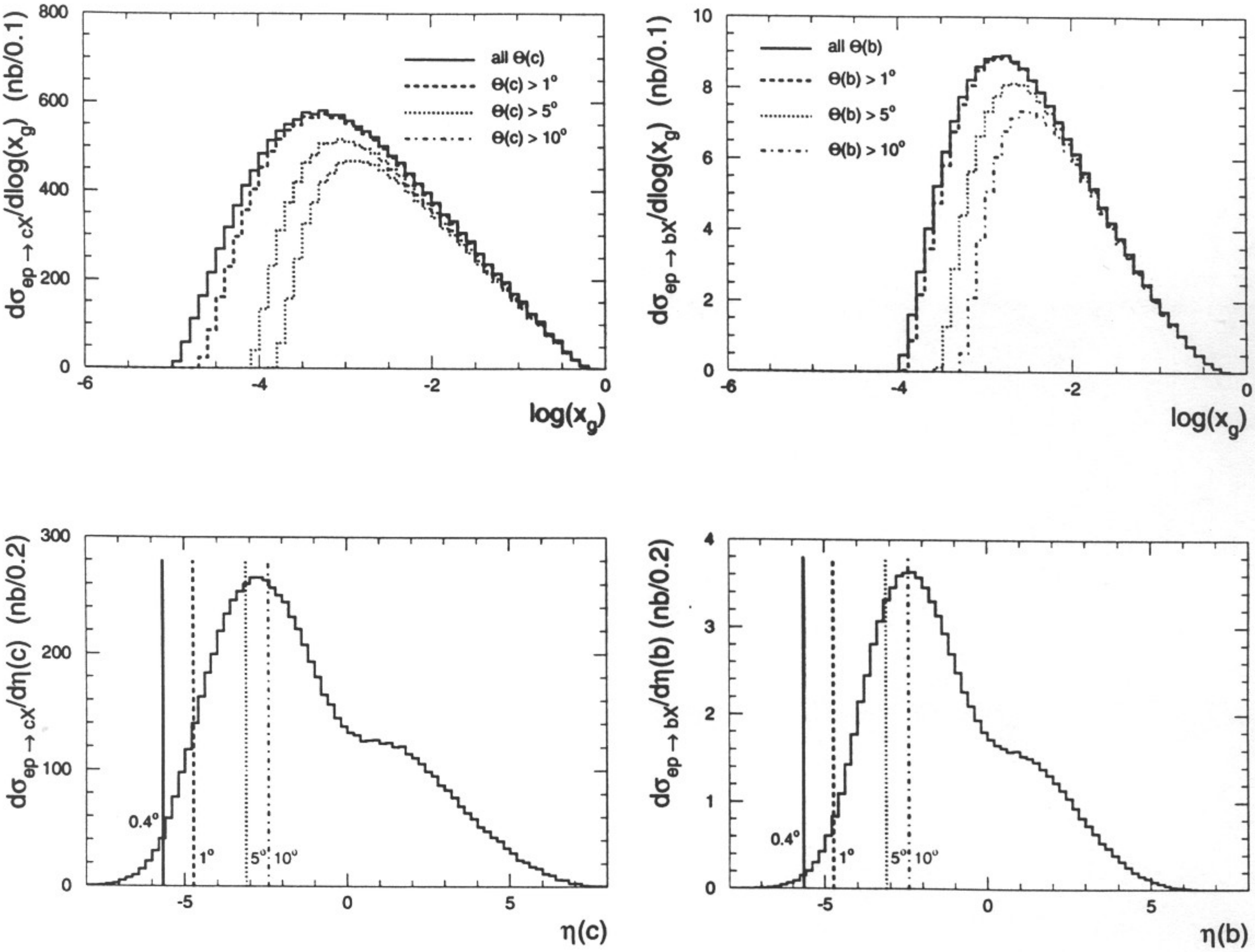
scale? => NNLO => N^3LO

major theoretical progress is needed!

$x(g)$ and $\eta(c, b)$; ep collisions

NLO QCD (FMNR), $\gamma g \rightarrow c\bar{c}(b\bar{b})$

proton s.f. GRV 98, $\mu_r = \mu_f = m_\perp, m_c = 1.5, m_b = 4.75$

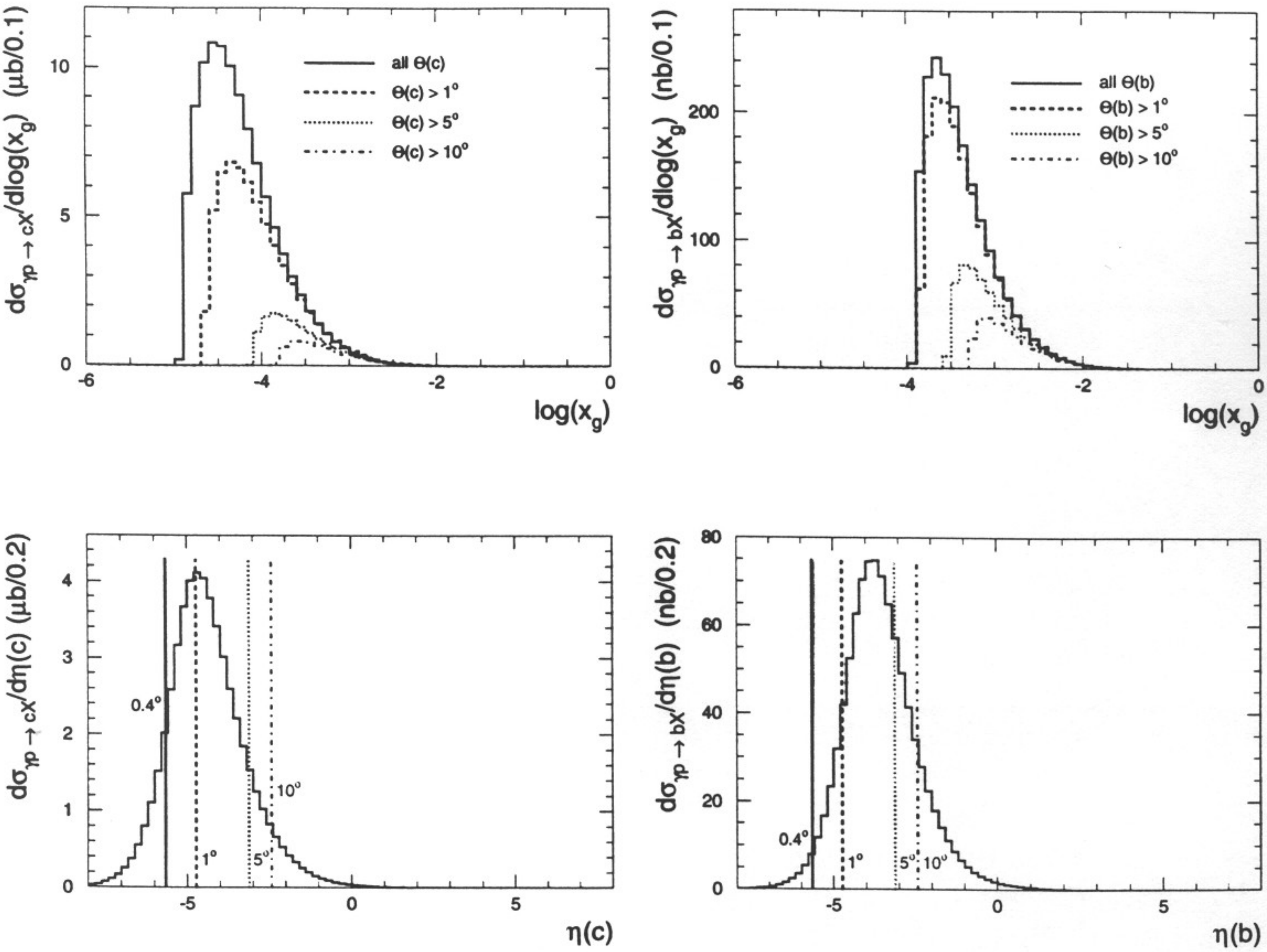


$\Theta(c) < 5^\circ$ is the region of major interest!

$x(g)$ and $\eta(c,b)$; γp collisions

NLO QCD (FMNR), $\gamma g \to c\bar{c}(b\bar{b})$

proton s.f. GRV 98, $\mu_r = \mu_f = m_\perp, m_c = 1.5, m_b = 4.75$

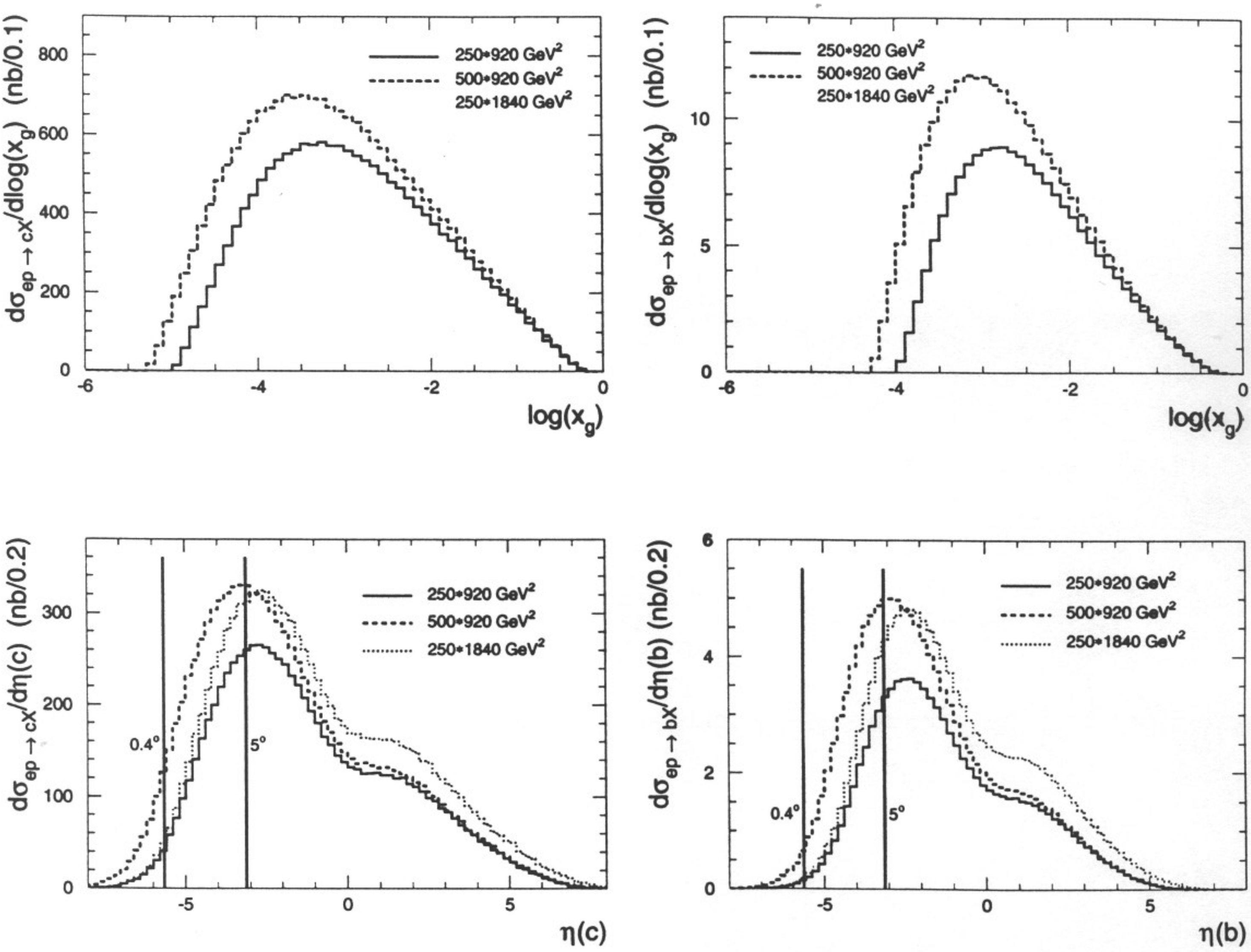


Backward region is even more important for γp option.

$x(g)$ and $\eta(c,b)$; extended ep options

NLO QCD (FMNR), $\gamma g \to c\bar{c}(b\bar{b})$

proton s.f. GRV 98, $\mu_r = \mu_f = m_\perp, m_c = 1.5, m_b = 4.75$

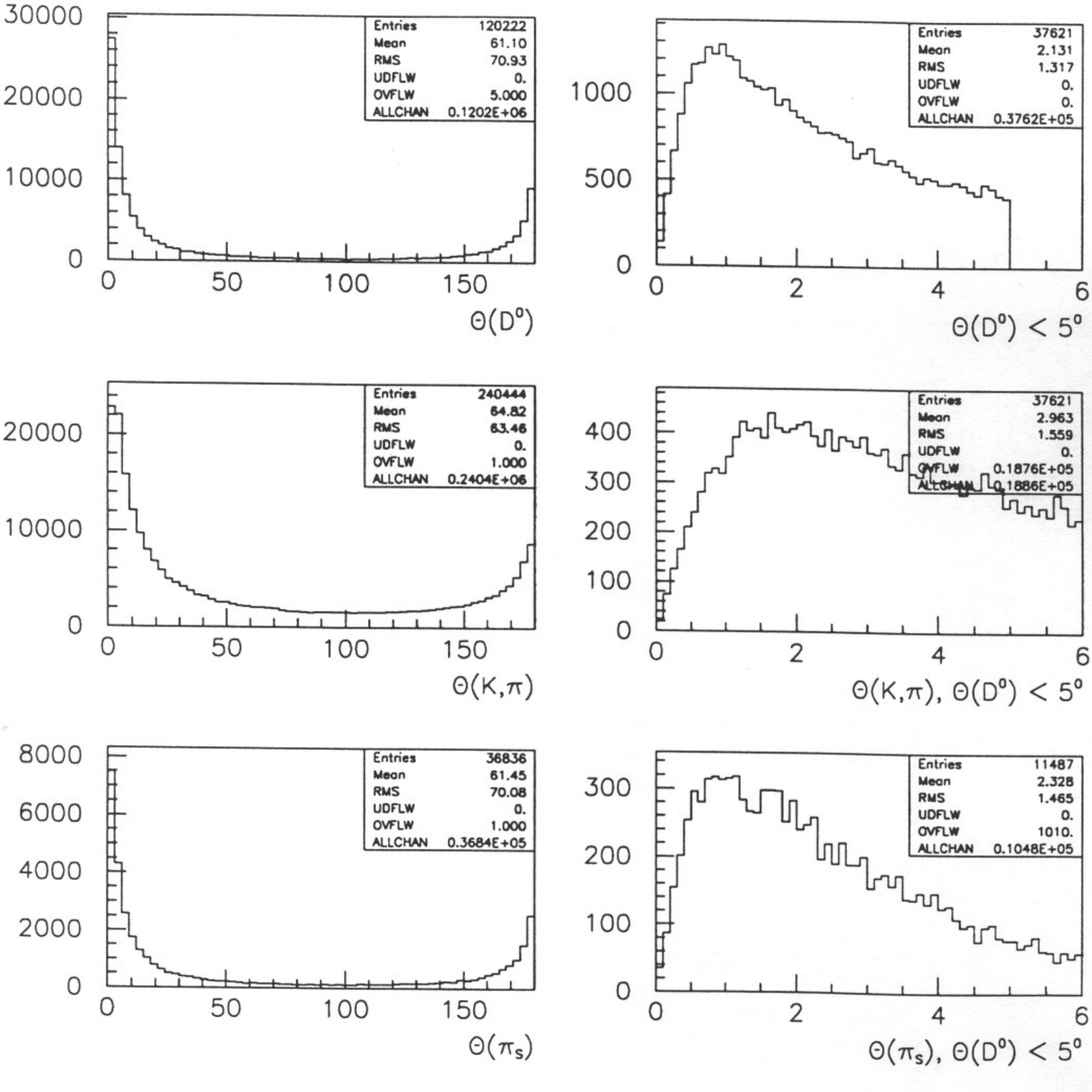


Is 920 GeV real limit for HERA at THERA time?

$\gamma g \to c\bar{c}$, $D^0 \to K^- \pi^+$ + c.c.

$D^{*+} \to D^0 \pi_s^+$ + c.c.

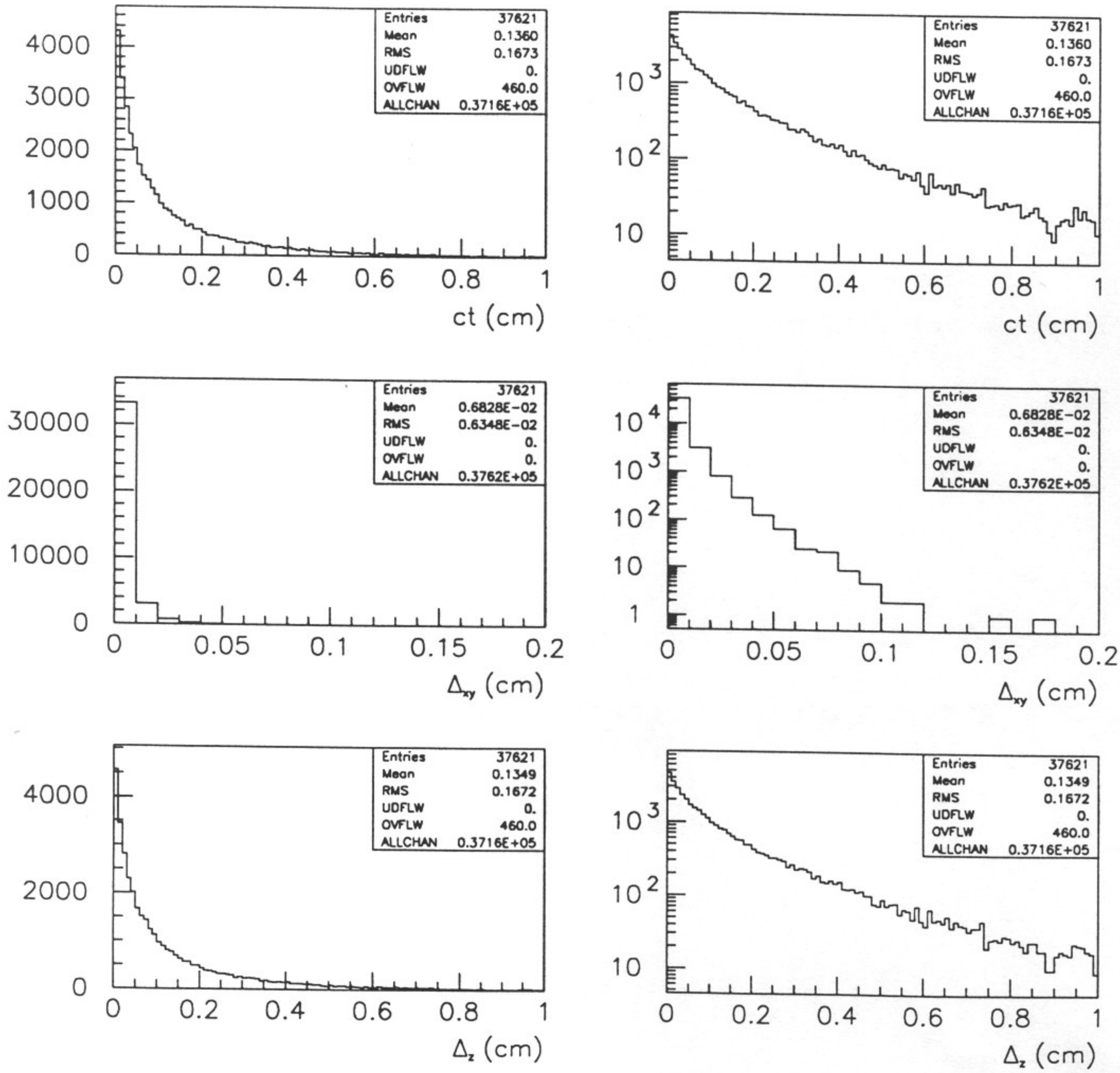
Herwig 5.9, $\Theta(D^0)$, $\Theta(K,\pi)$, $\Theta(\pi_s)$



"$\theta^{trk} > 0.4^\circ$" will accept charm events!

Secondary verticies from D^0 decays !

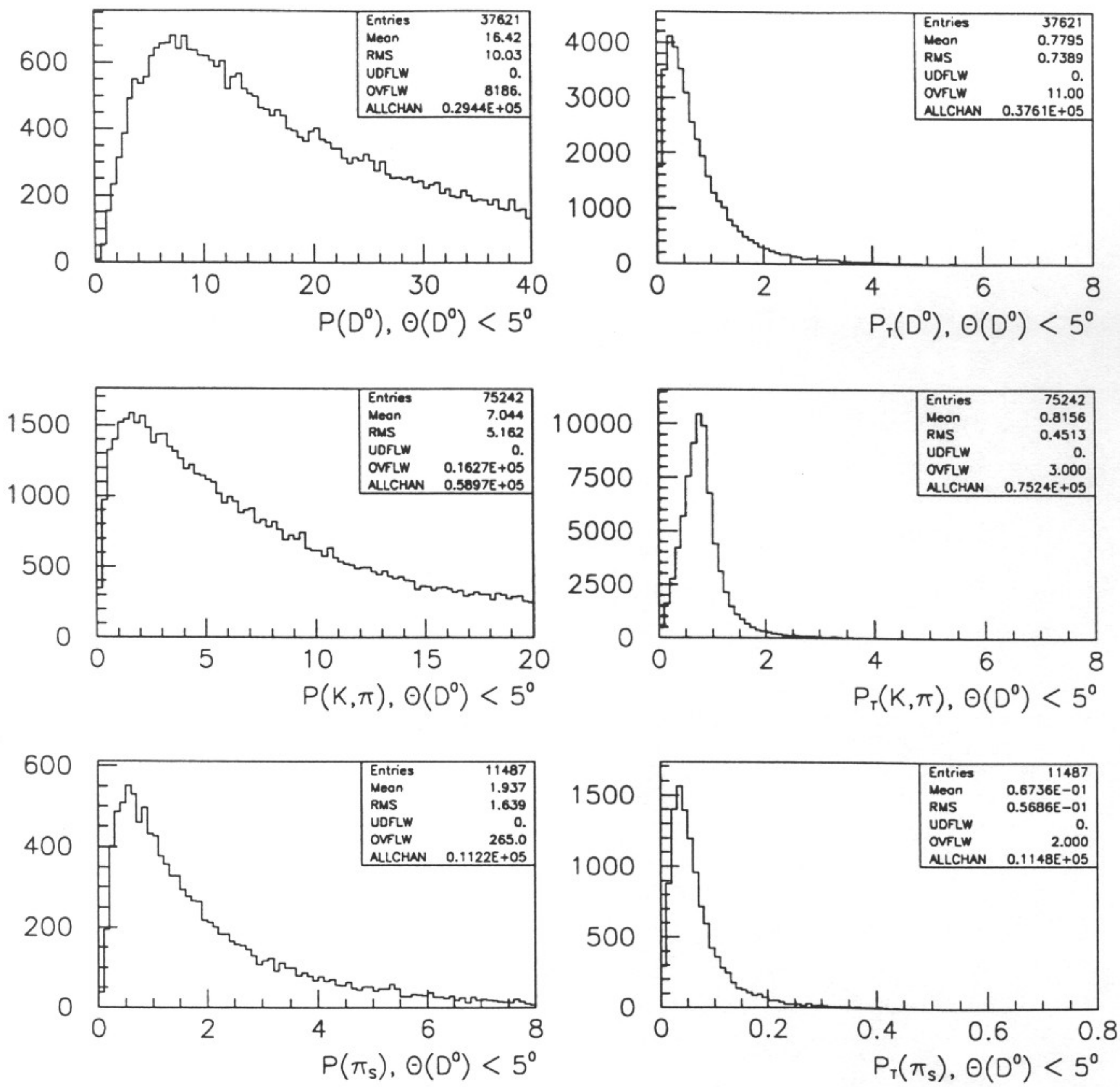
Herwig 5.9, $\Theta(D^0) < 5^\circ$



No, at small x_g secondary verticies from D decays will not help.

Track parameters.

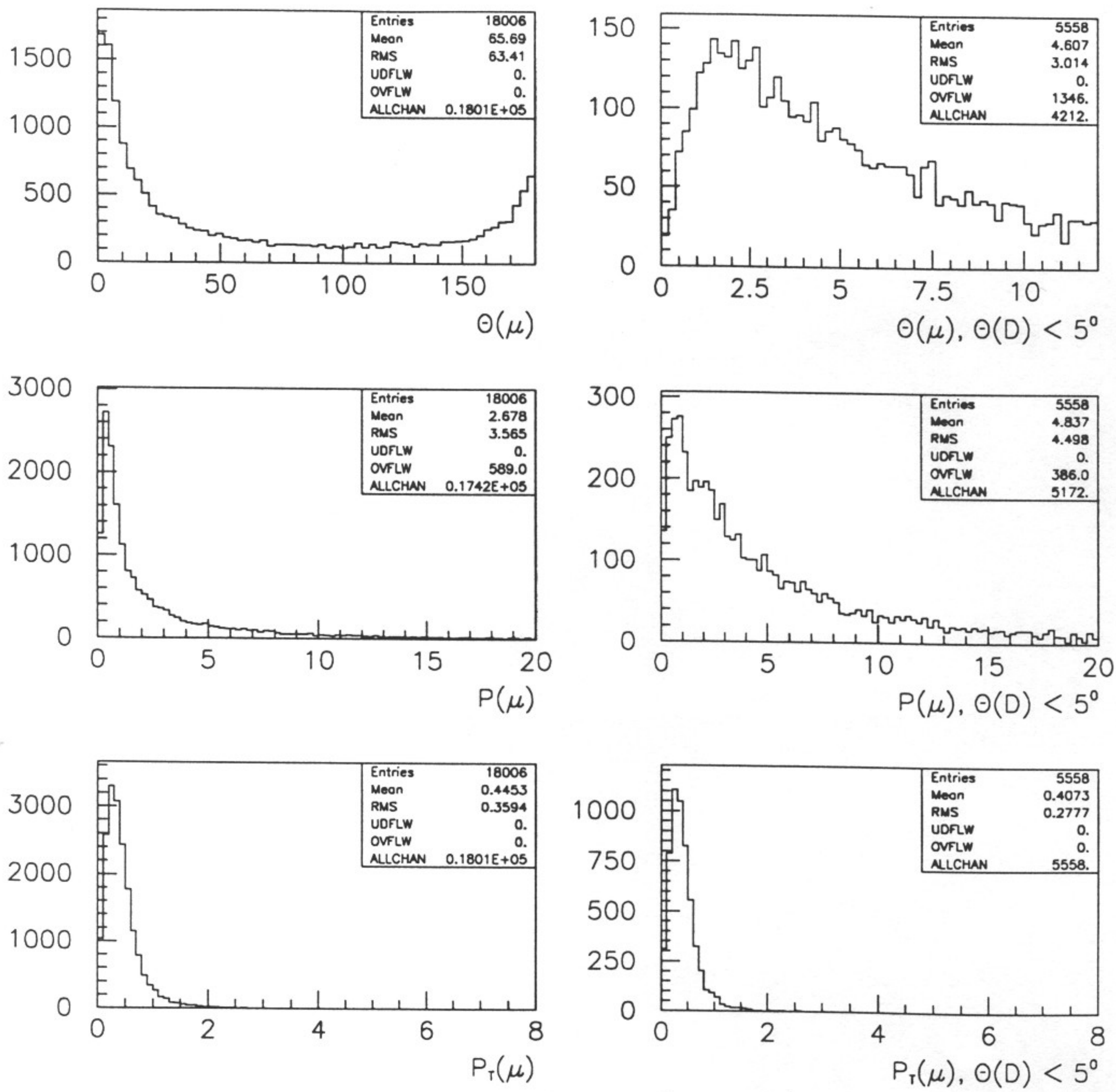
Herwig 5.9, $P, P_T(D^0)$, $P, P_T(K,\pi)$, $P, P_T(\pi_s)$



K and π from D^0 are, probably, measuvable. And π_s looks not too promissing.

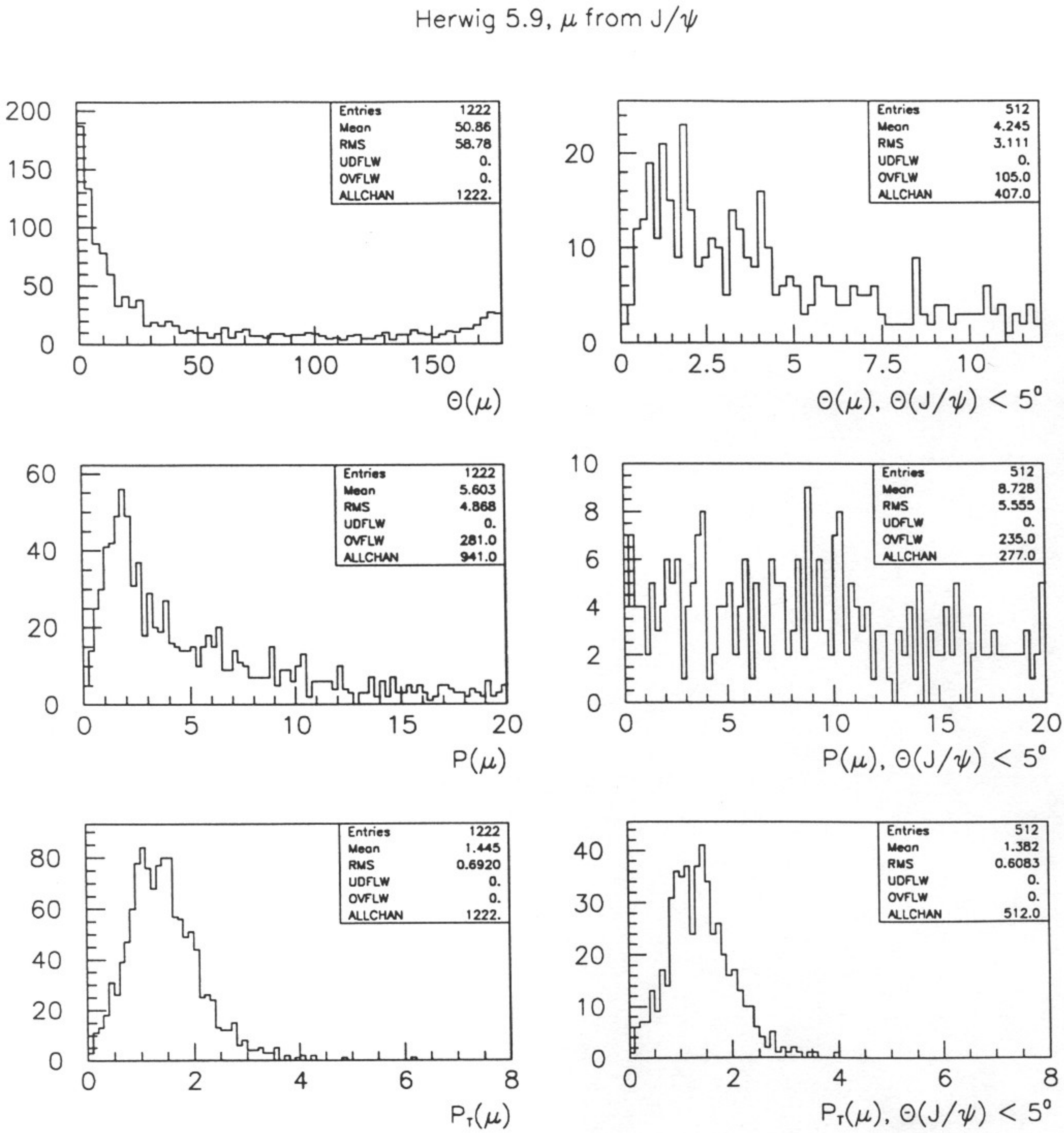
$\mu^{\pm}$ from charm s/l decays

Herwig 5.9, μ from D^0, D^+, D_s and Λ_c decays



Some substantial fraction of s/l muons can be measured!

$\mu^\pm$ from J/ψ decays



J/ψ is reconstructable!

Conclusions

1. γp option provides one order, at least, larger x-sections at small x_g values

2. Theoretical uncertainties are rather large (scales). Major theoretical progress (N^2LO, N^3LO, ressumations, ...) are needed

3. Backward region (Θ(c,b) < 5°) is the most crusial for low x_g measurements

4. "Θ^{trk} > 0.5°" accepts tracks from D^0, $D^{*+/-}$, s/l $\mu^{+/-}$, $\mu^{+/-}$ from J/ψ

5. track resolution will be, probably, too poor in backward direction for $\pi_s^{+/-}$

6. s/l $\mu^{+/-}$ look more promissing

7. J/ψ will be reconstructable (if we will be able to identify and measure muons, of course).