MILOU: A DVCS generator

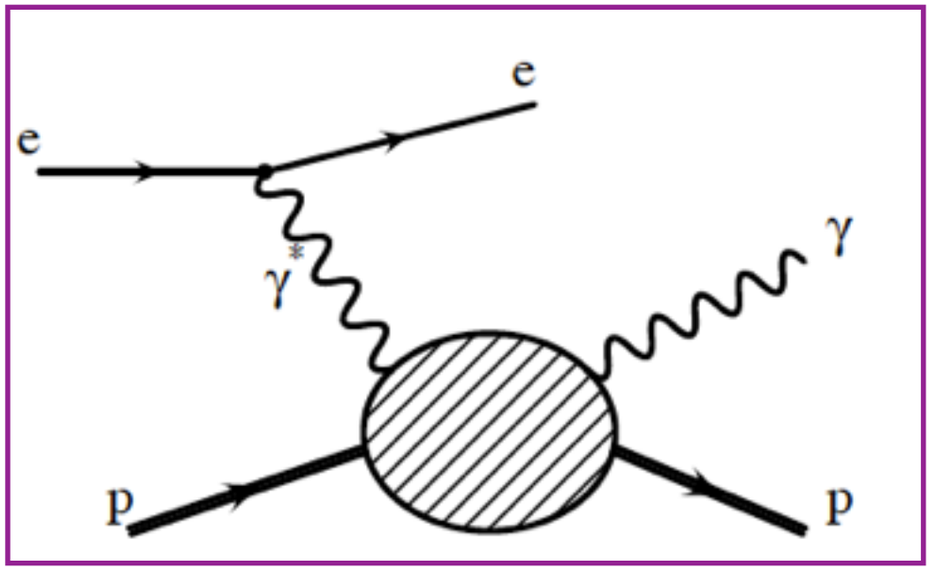
With some comparisons with

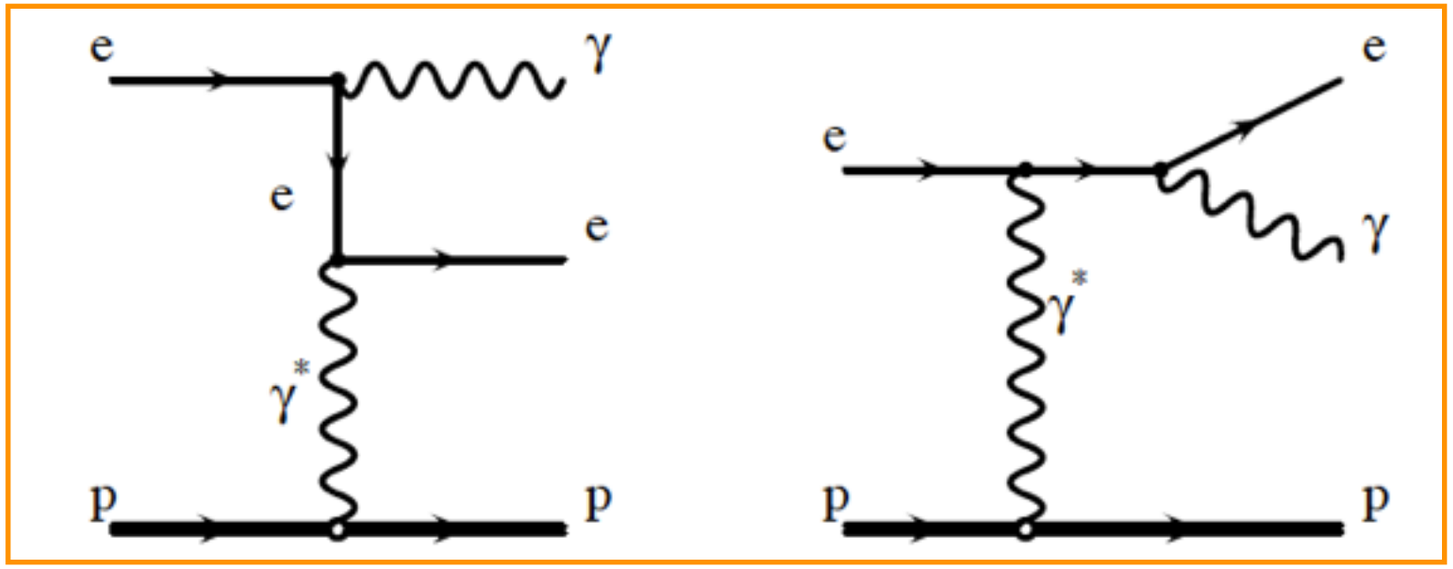
PYTHIA exclusive ρ^0 production

EIC Task Force meeting, 6th May 2010

MILOU

A Monte Carlo generator for Deeply Virtual Compton Scattering (DVCS), the Bethe-Heitler process (BH) and their interference.





$$\sigma \sim |T_{DVCS} + T_{BH}|^2$$

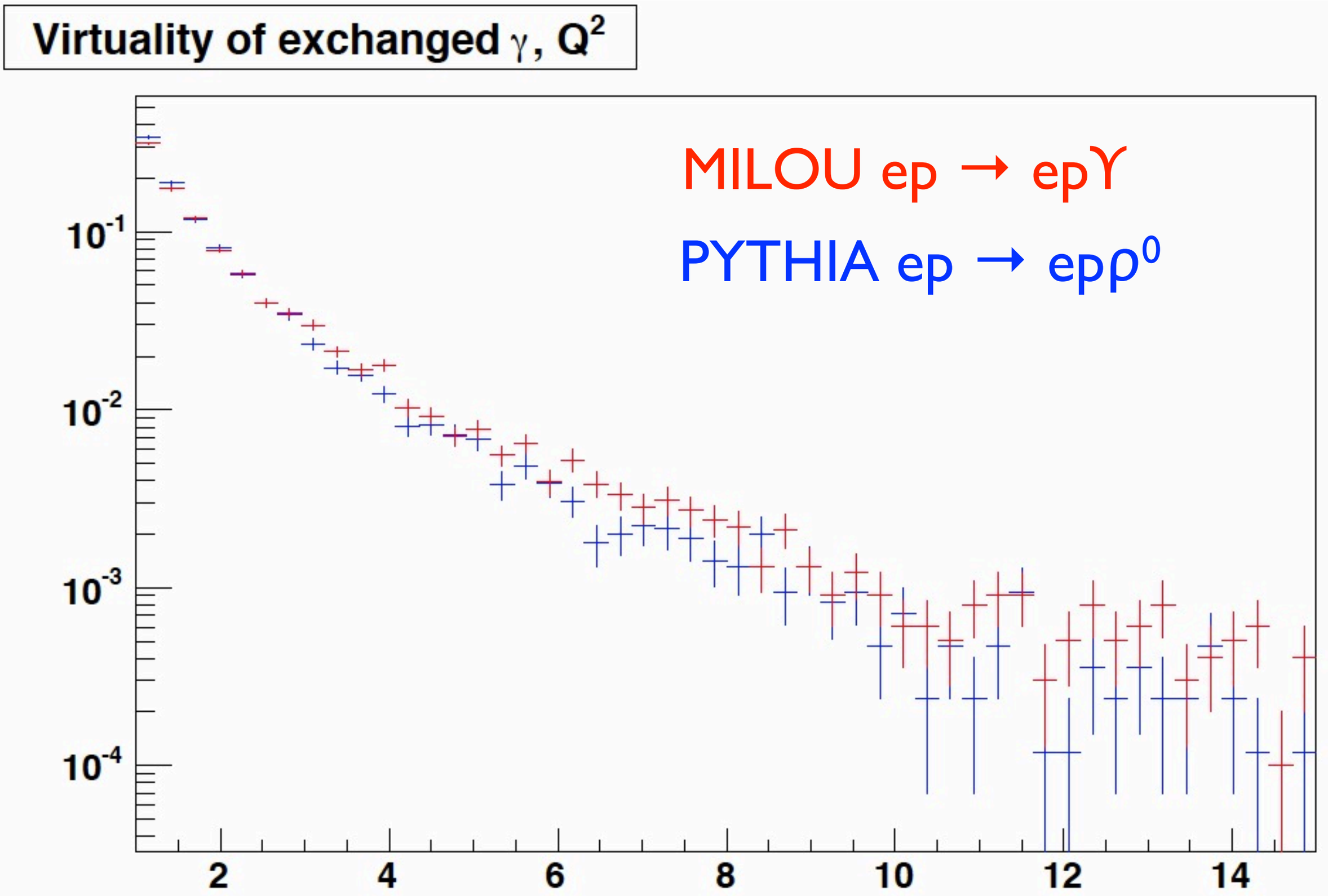
$$= |T_{DVCS}|^2 + |T_{BH}|^2 + T_{DVCS}T_{BH}^* + T_{DVCS}^*T_{BH}$$

Overview

- Generalised Parton Distributions (GPDs) → Compton form factors → σ_{DVCS} and $\sigma_{Interference}$ → probability distributions → events.
- Options for proton dissociation and QED radiative corrections.
- Lepton and proton polarisation.
- E. Perez, L. Schoeffel and L. Favart, arXiv: hep-ph/0411389v1
- https://wiki.bnl.gov/eic/index.php/MILOU

MILOU options

- DVCS only (no BH or interference)
- $E_{electron}$ = 4 GeV, E_{proton} = 100 GeV
- $10^{-4} < x_B < 0.7$
- $1 < Q^2 < 40$ GeV^2
- $-1 < t < 0$ GeV^2, slope B = 7 GeV^{-2}
- No radiative corrections, proton dissociation


Virtuality of exchanged γ, Q²
MILOU ep → epϒ
PYTHIA ep → epρ⁰
10⁻¹
10⁻²
10⁻³
10⁻⁴
2
4
6
8
10
12
14

t

χ^2 / ndf 24.35 / 39
Constant -1.672 ± 0.014
Slope 9.399 ± 0.093

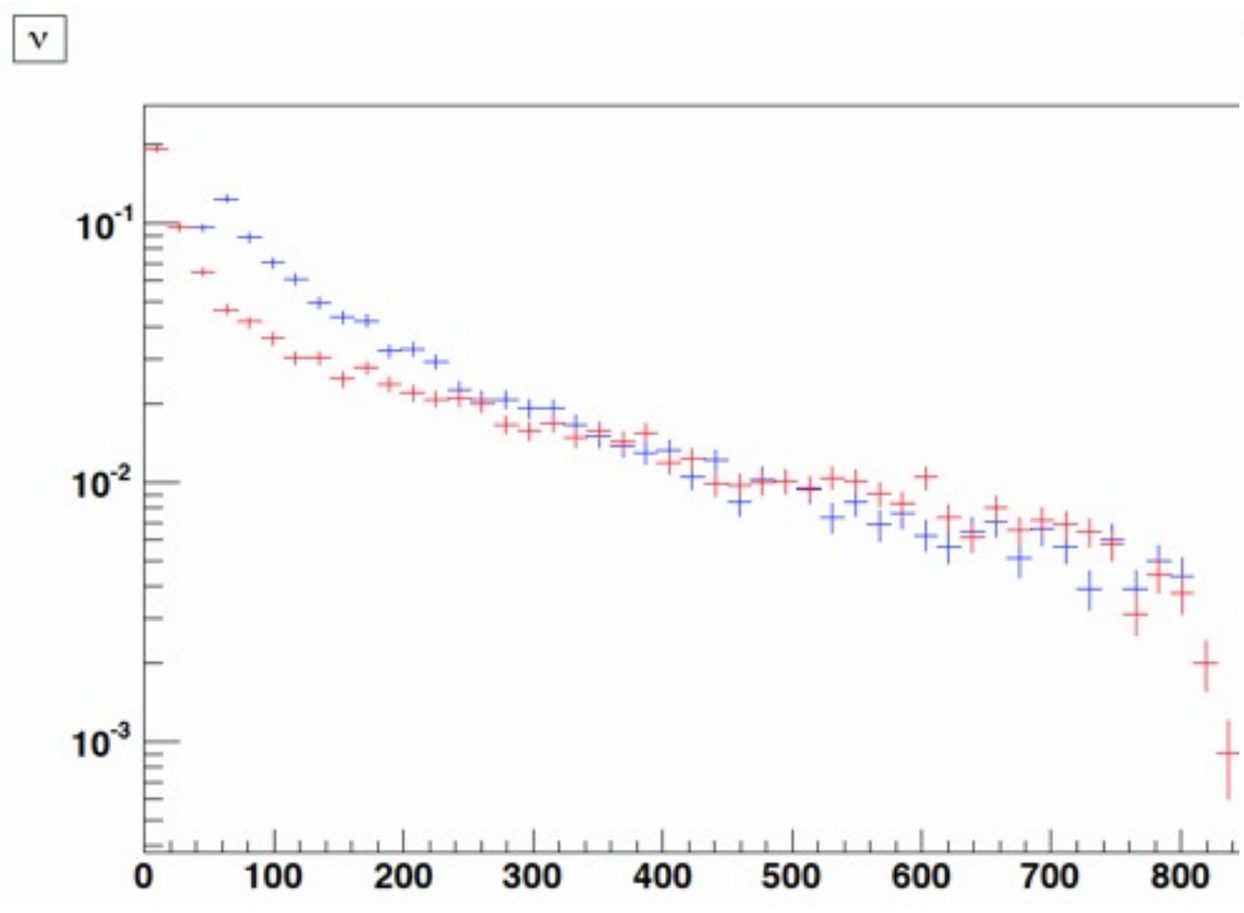
DVCS with B = 7 GeV^{-2}

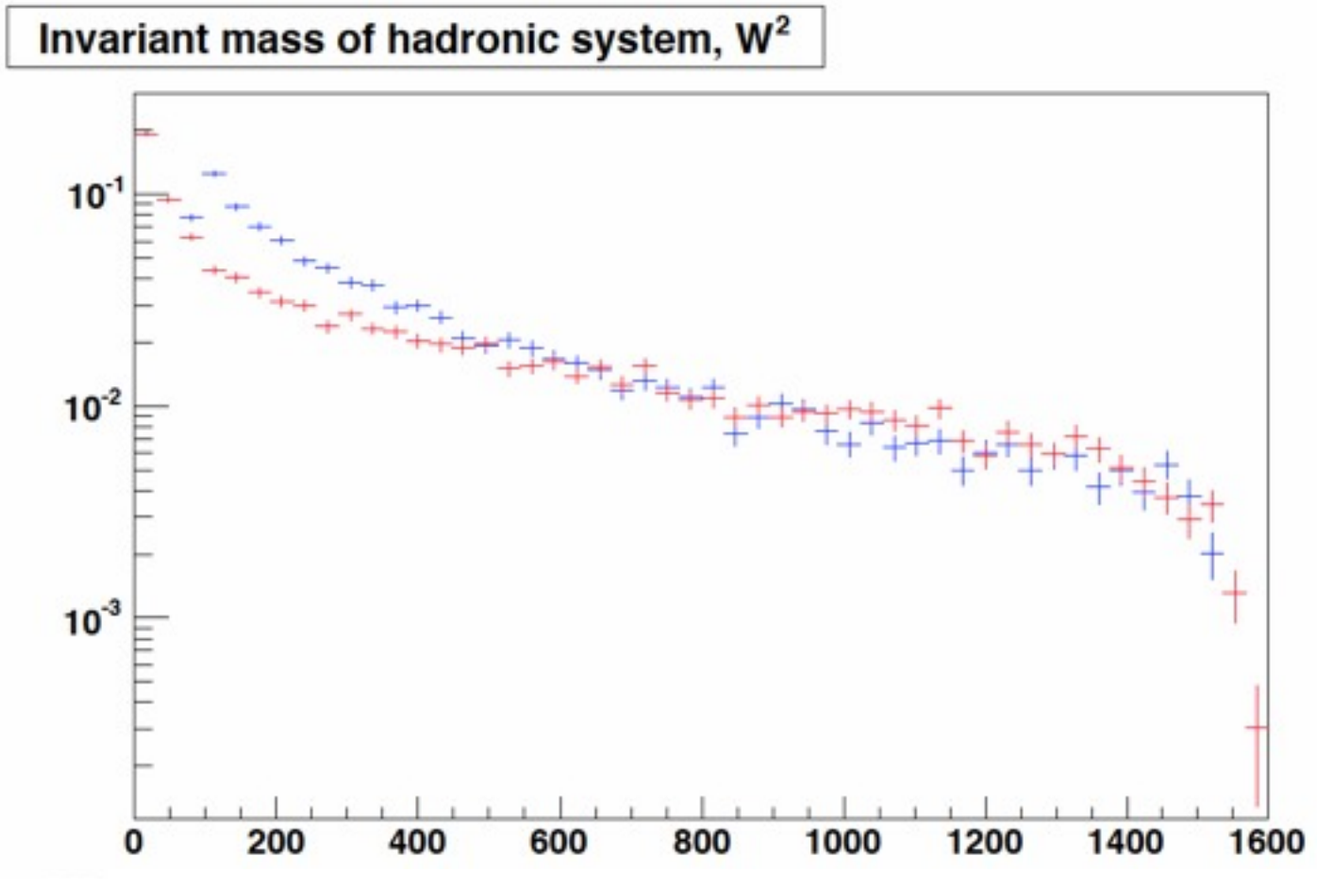
PYTHIA exclusive rho production

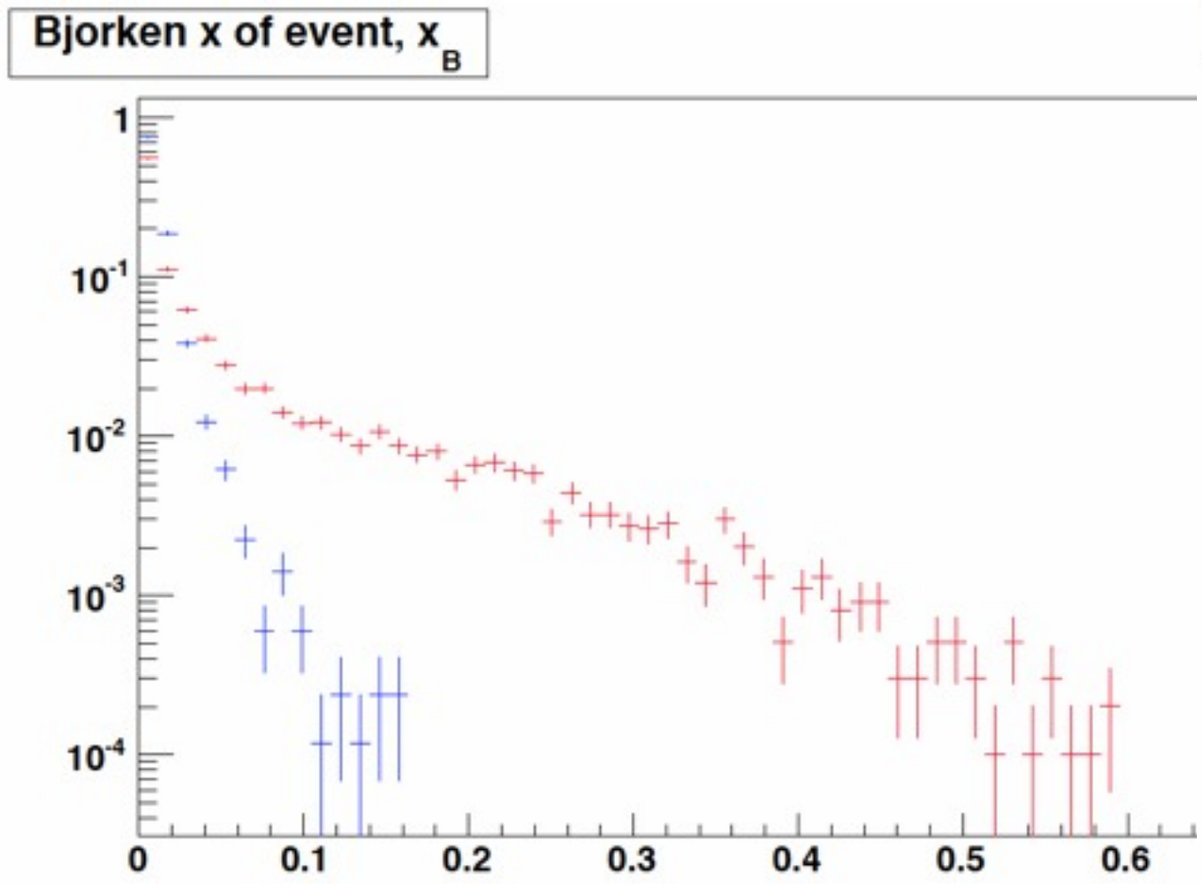
10^{-1}
10^{-2}
10^{-3}
10^{-4}

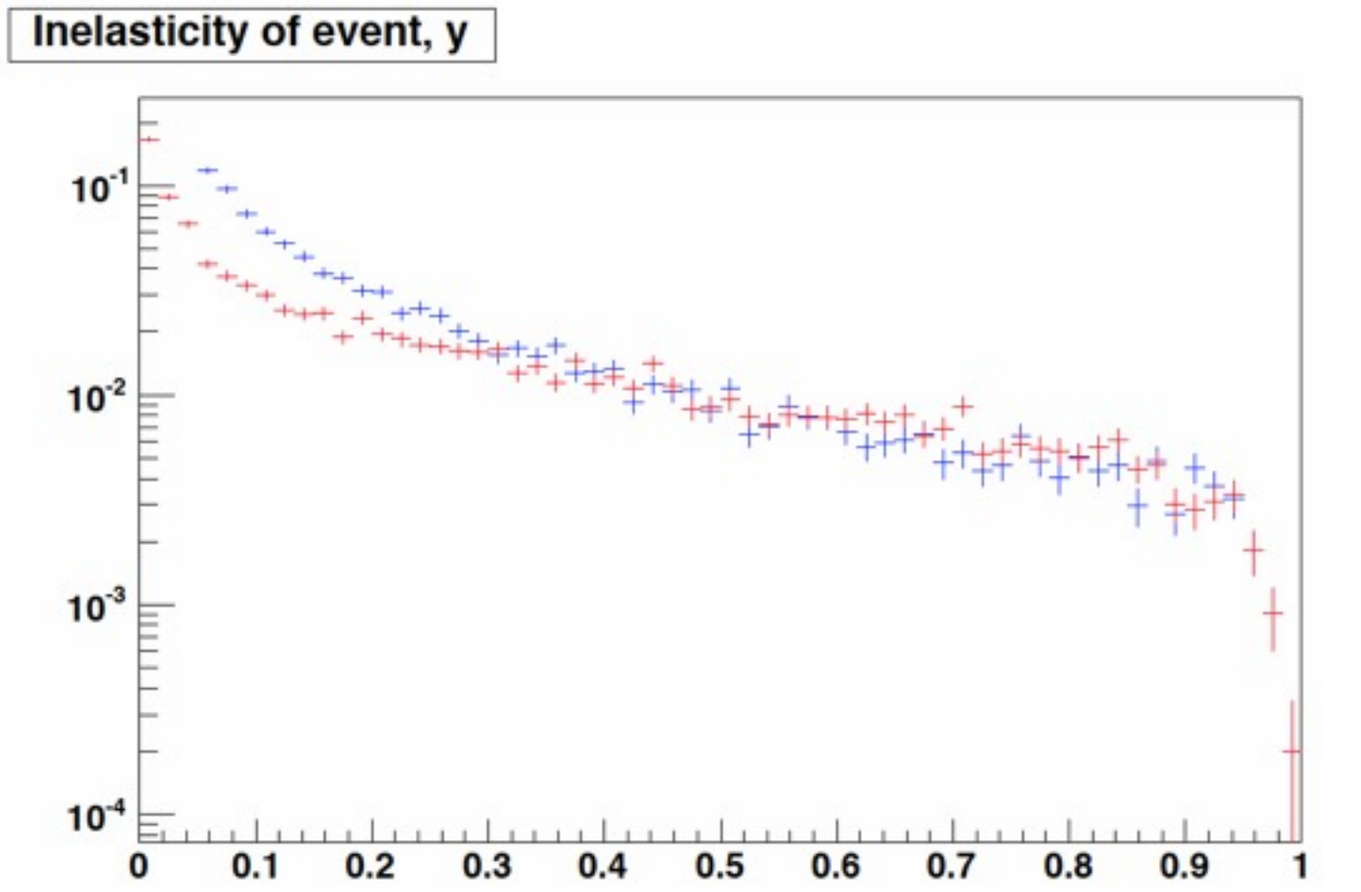
-2 -1.8 -1.6 -1.4 -1.2 -1 -0.8 -0.6 -0.4 -0.2 0

t (GeV^2)

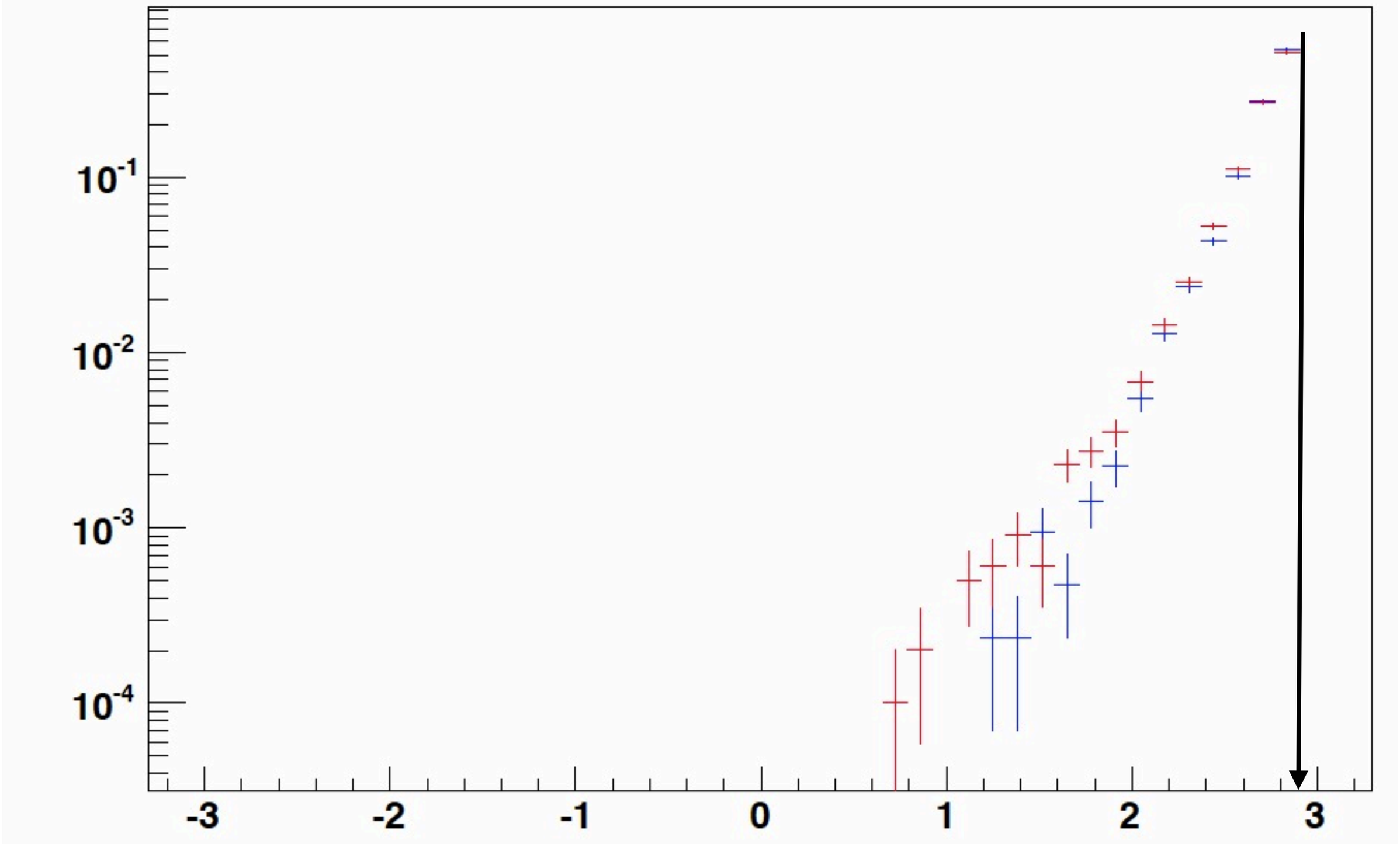

ν


Invariant mass of hadronic system, W²
10⁻¹
10⁻²
10⁻³
0
200
400
600
800
1000
1200
1400
1600


Bjorken x of event, x_B
1
10⁻¹
10⁻²
10⁻³
10⁻⁴
0
0.1
0.2
0.3
0.4
0.5
0.6


Inelasticity of event, y
10⁻¹
10⁻²
10⁻³
10⁻⁴
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

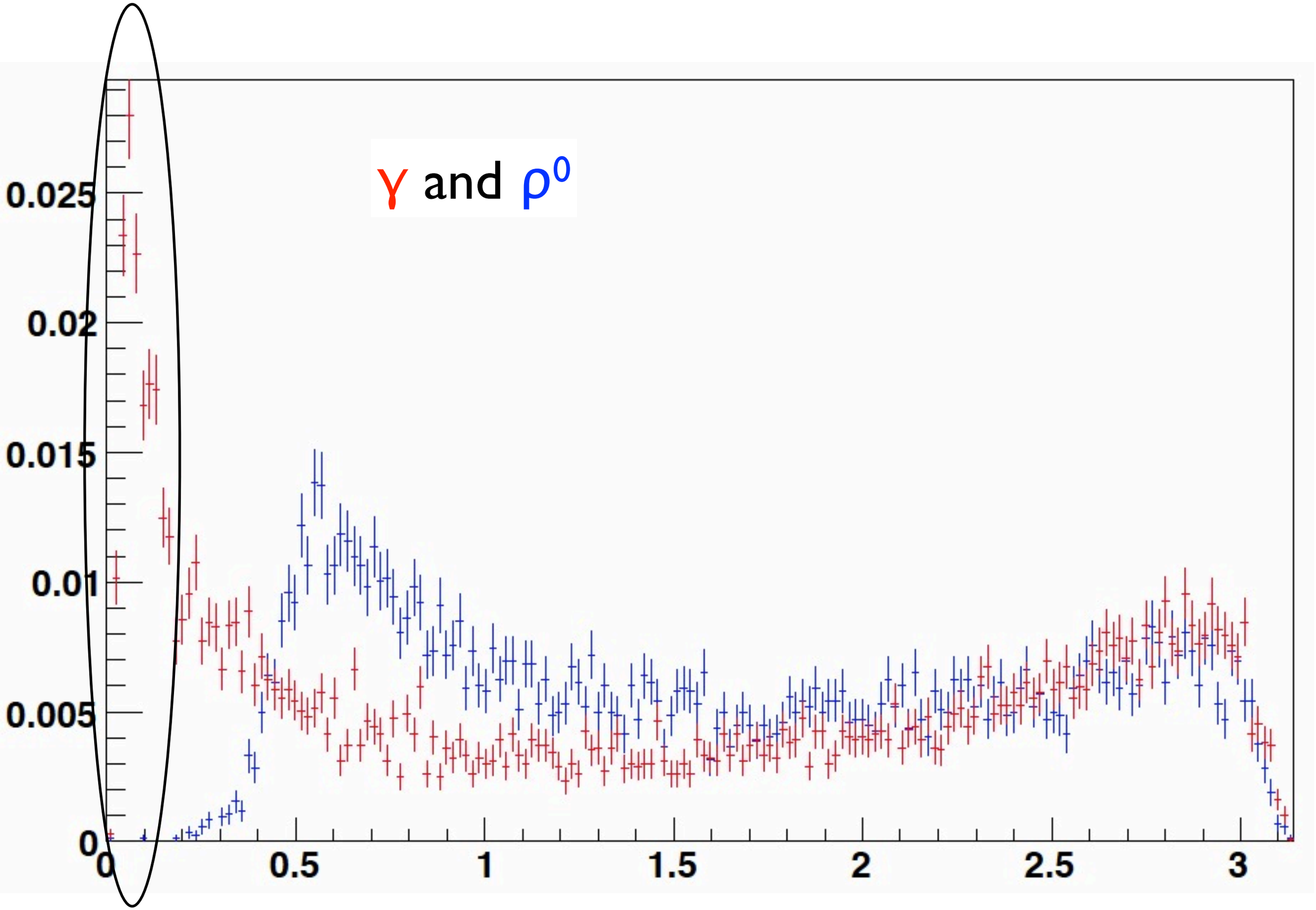
θ of scattered lepton in lab frame, θ_l

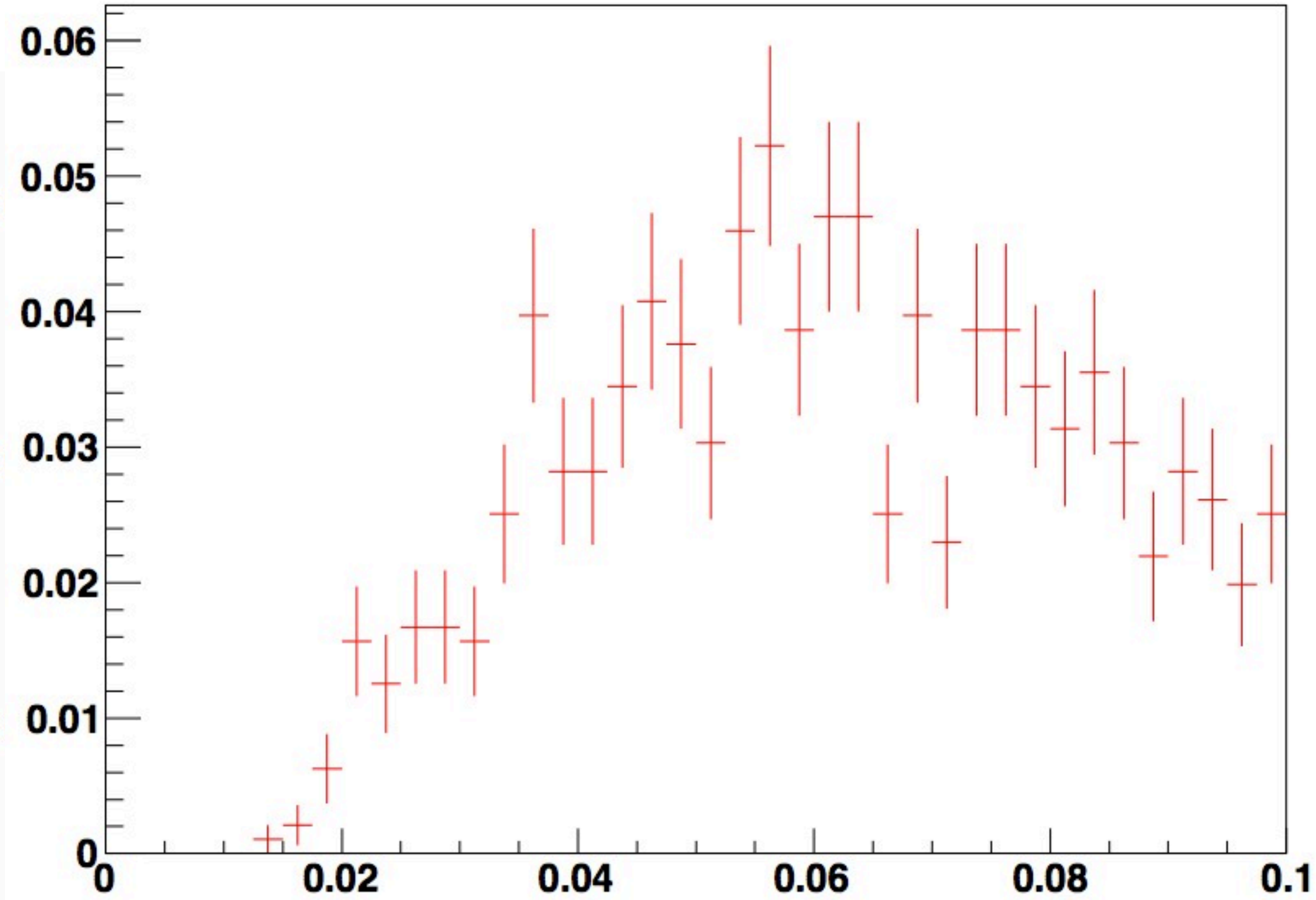


γ and ρ^0

0.025
0.02
0.015
0.01
0.005
0

0
0.5
1
1.5
2
2.5
3

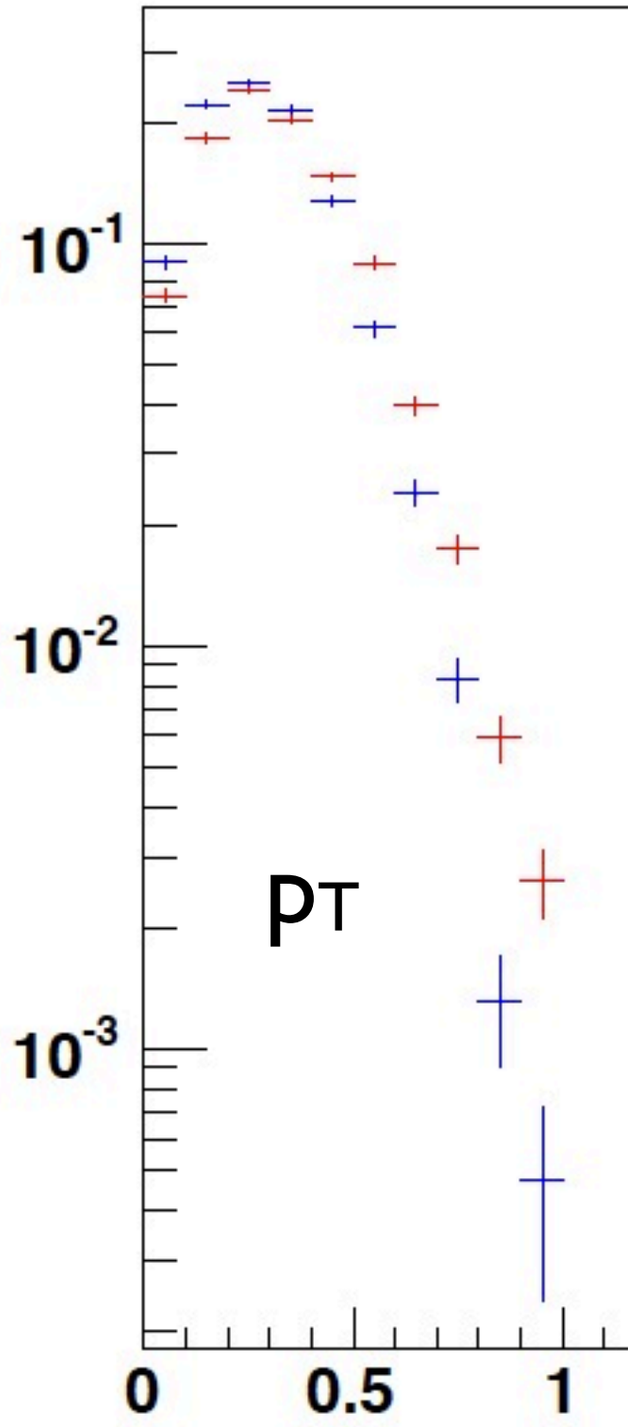

γ and ρ0
0.025
0.02
0.015
0.01
0.005
0
0
0.5
1
1.5
2
2.5
3

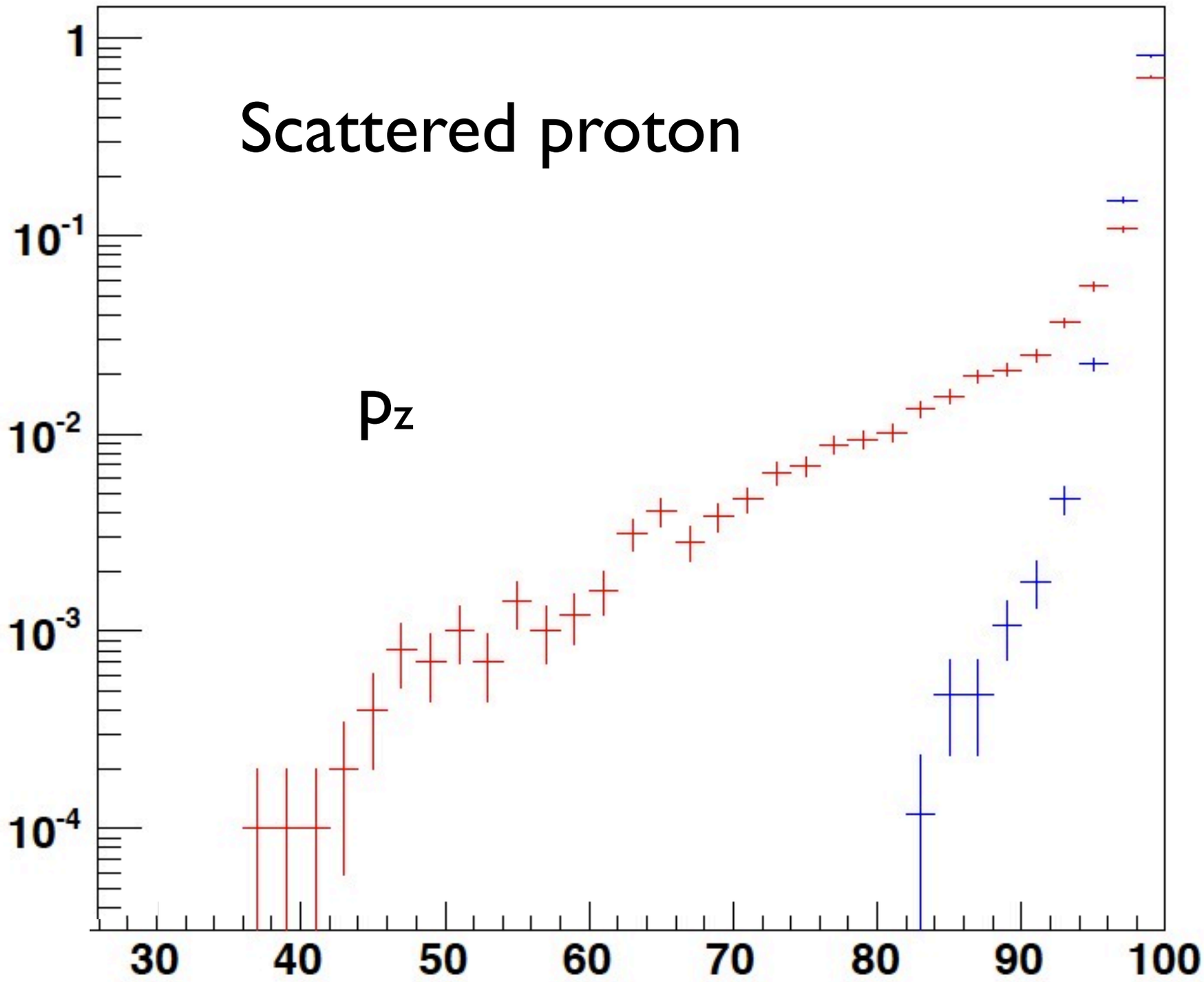

0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.02
0.04
0.06
0.08
0.1

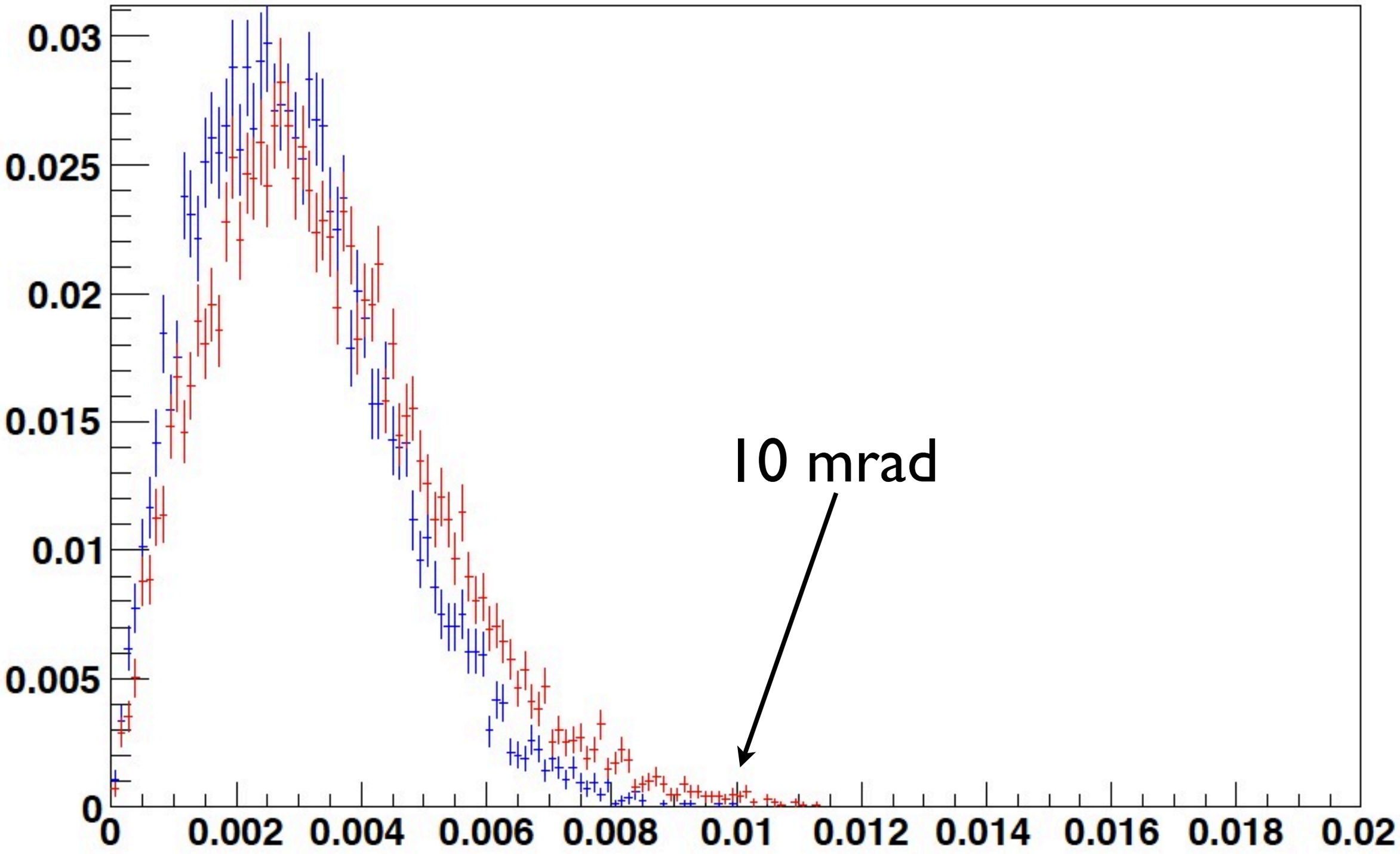
Scattered proton

pz

pT






0.03
0.025
0.02
0.015
0.01
0.005
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
0.018
0.02
10 mrad

Current work

- Interference term + Bethe-Heitler → asymmetries.
- Different beam energies.