4.7 GeV Cu+Al beam+pipe event analysis

Brooke Haag
Hartnell College
University of California, Davis

Light flavor spectra meeting
October 29, 2009

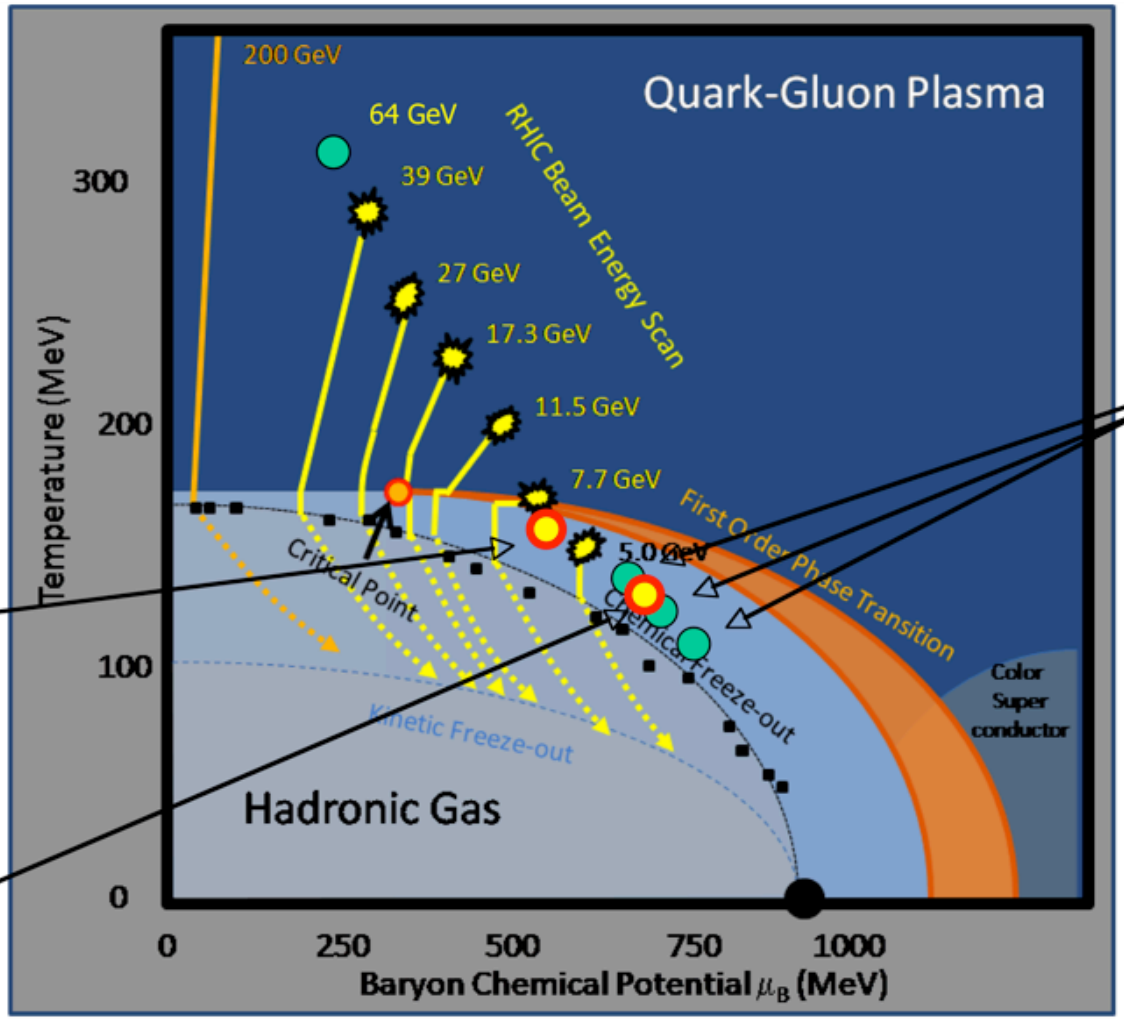
Summary of Low Energy Test Runs

Collision Energy (GeV)	Single Beam Energy	Single Beam P_z (GeV/C)	Fixed Target $\sqrt{s}$	Single Beam Rapidity	Center of Mass Rapidity
22.4 Cu+Cu	11.2	11.16	4.66 Cu+Al	3.18	1.59
19.6 Au+Au	9.8	9.76	4.47 Au+Al	3.04	1.52
9.2 Au+Au	4.6	4.50	3.21 Au+Al	2.28	1.14

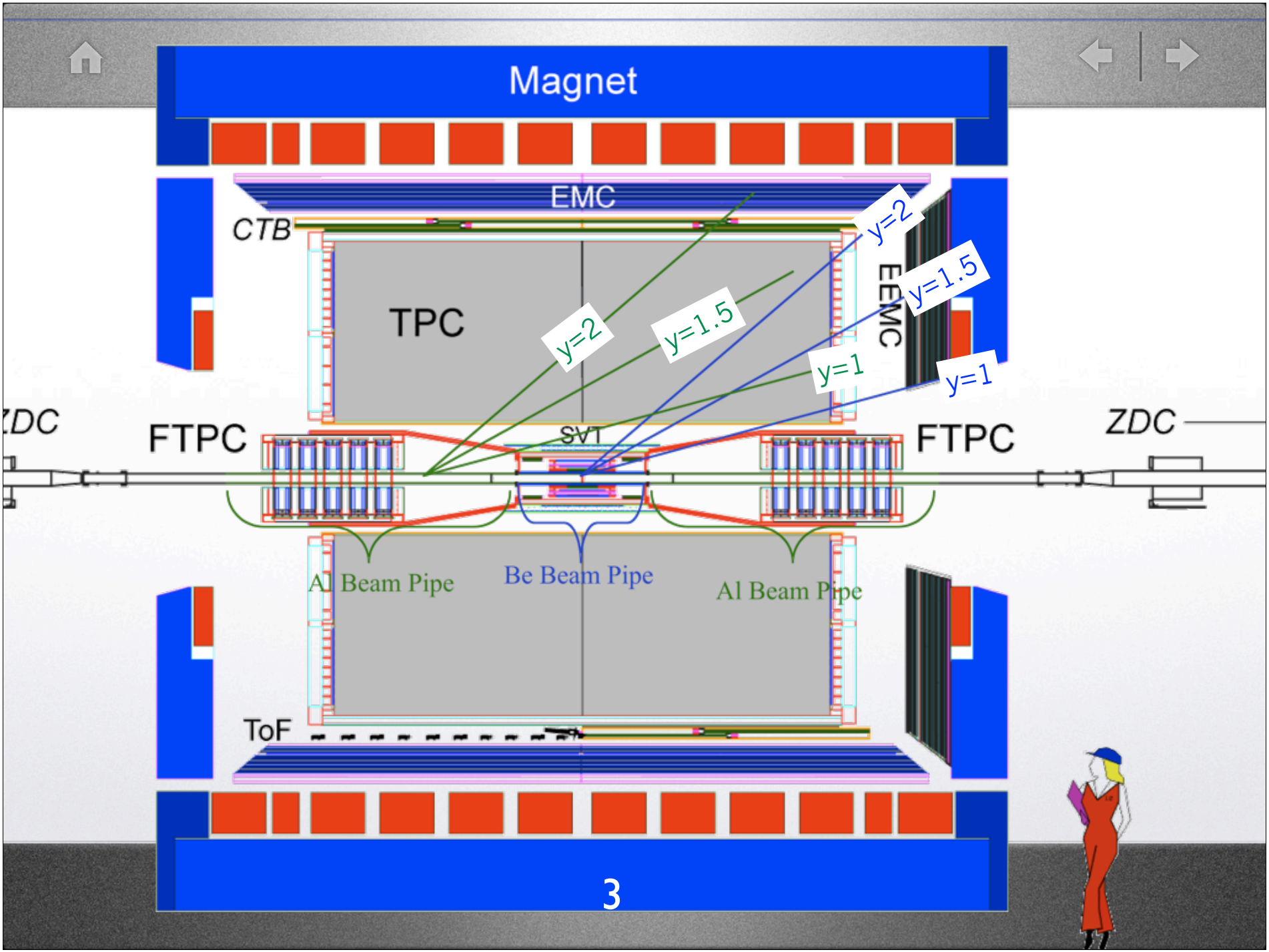
Proposed Beam Energy Scan

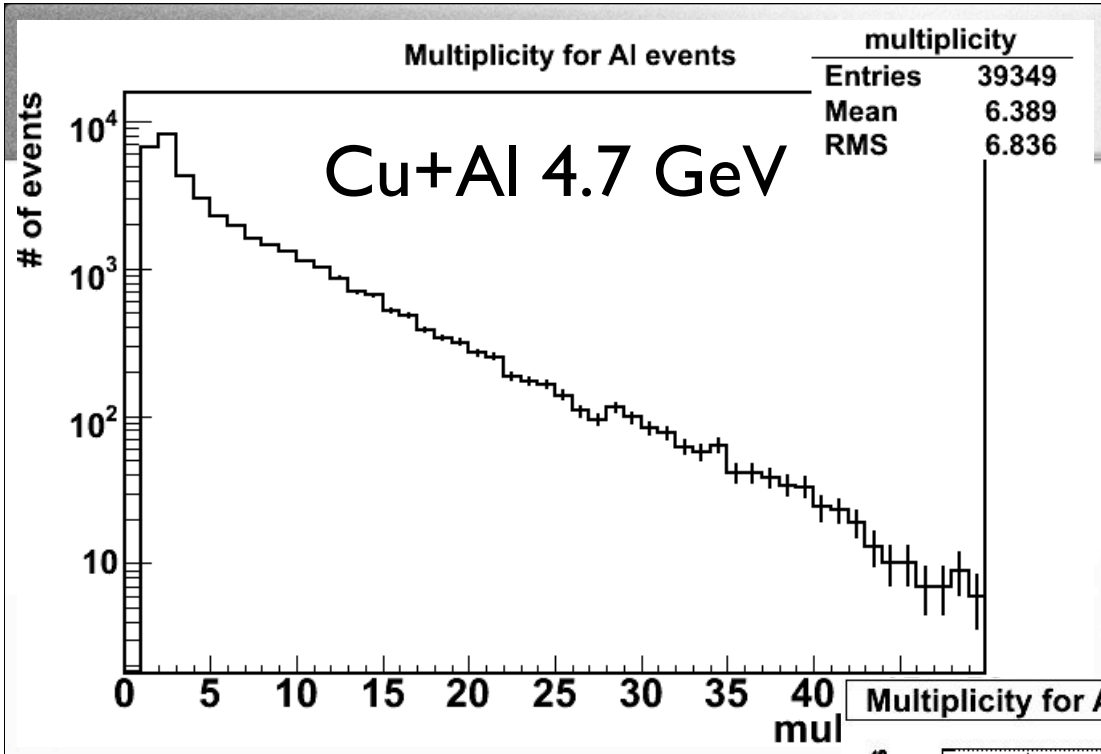
What if the critical point is here?

Or here?



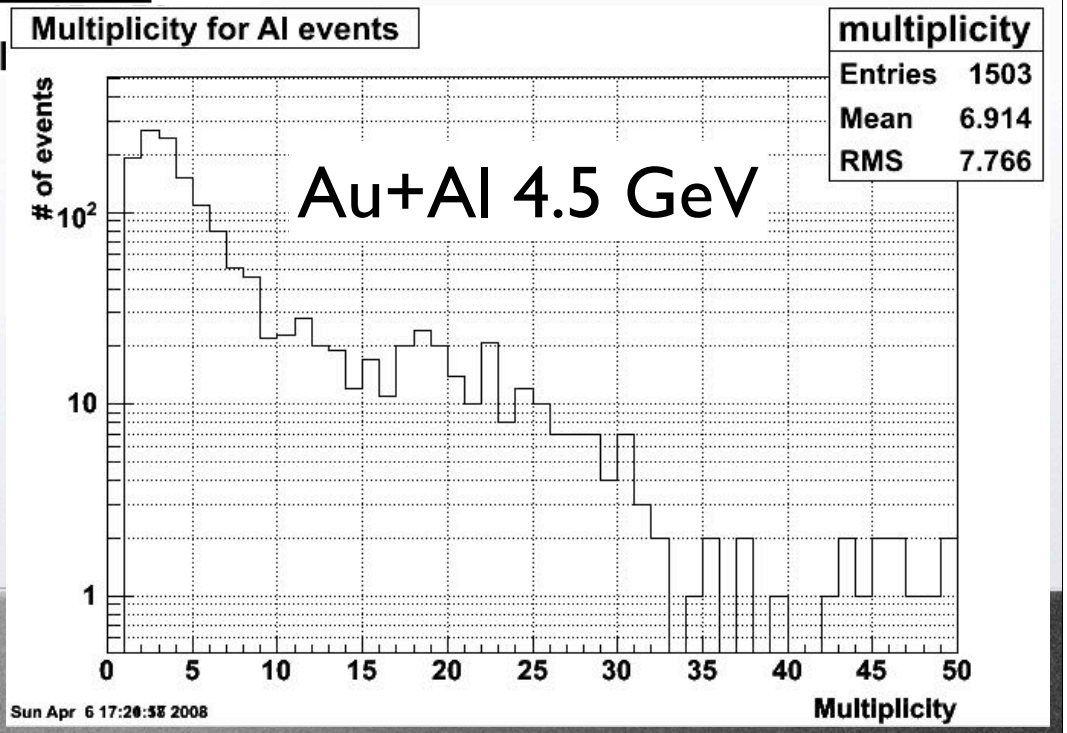
Fixed Target points


Magnet
EMC
CTB
TPC
EEMC
y=2
y=1.5
y=1
y=2
y=1.5
y=1
ZDC
FTPC
SVT
FTPC
ZDC
Al Beam Pipe
Be Beam Pipe
Al Beam Pipe
ToF

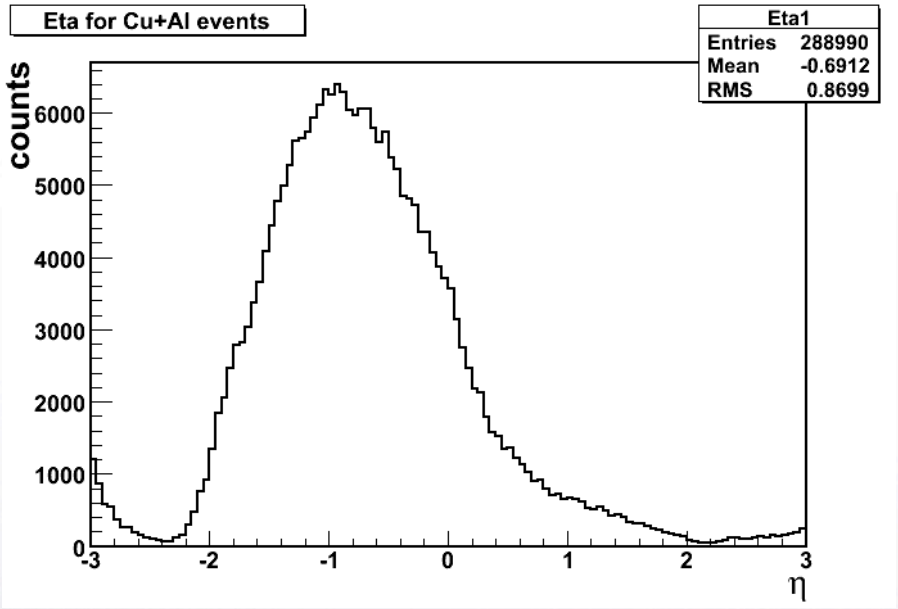


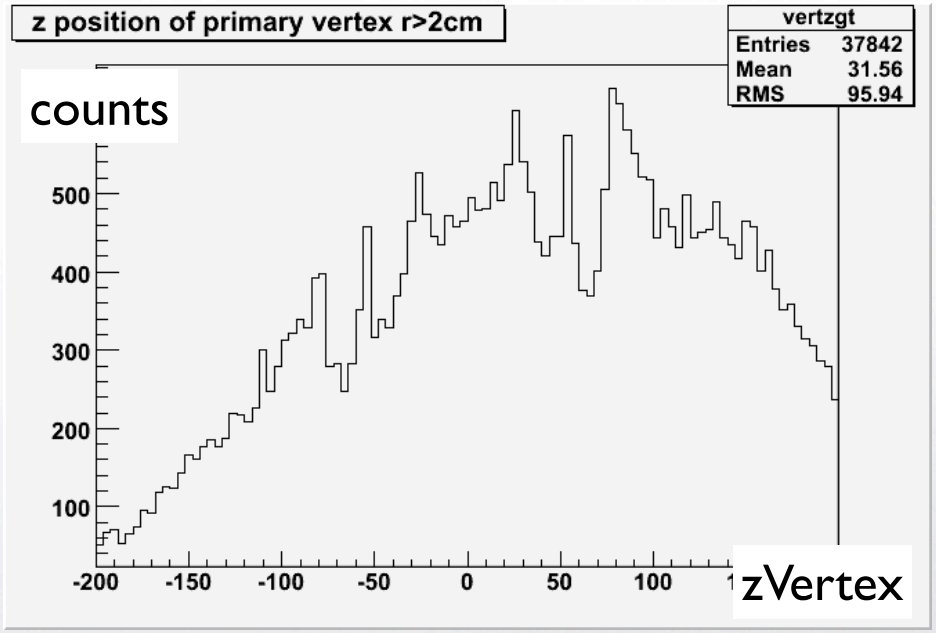
Beam+Pipe Cu+Al Cuts:

- |zVertex| > 75 cm
- rVertex > 2 cm
- multiplicity > 11
- $\Sigma\ p_z * zVertex < 0$



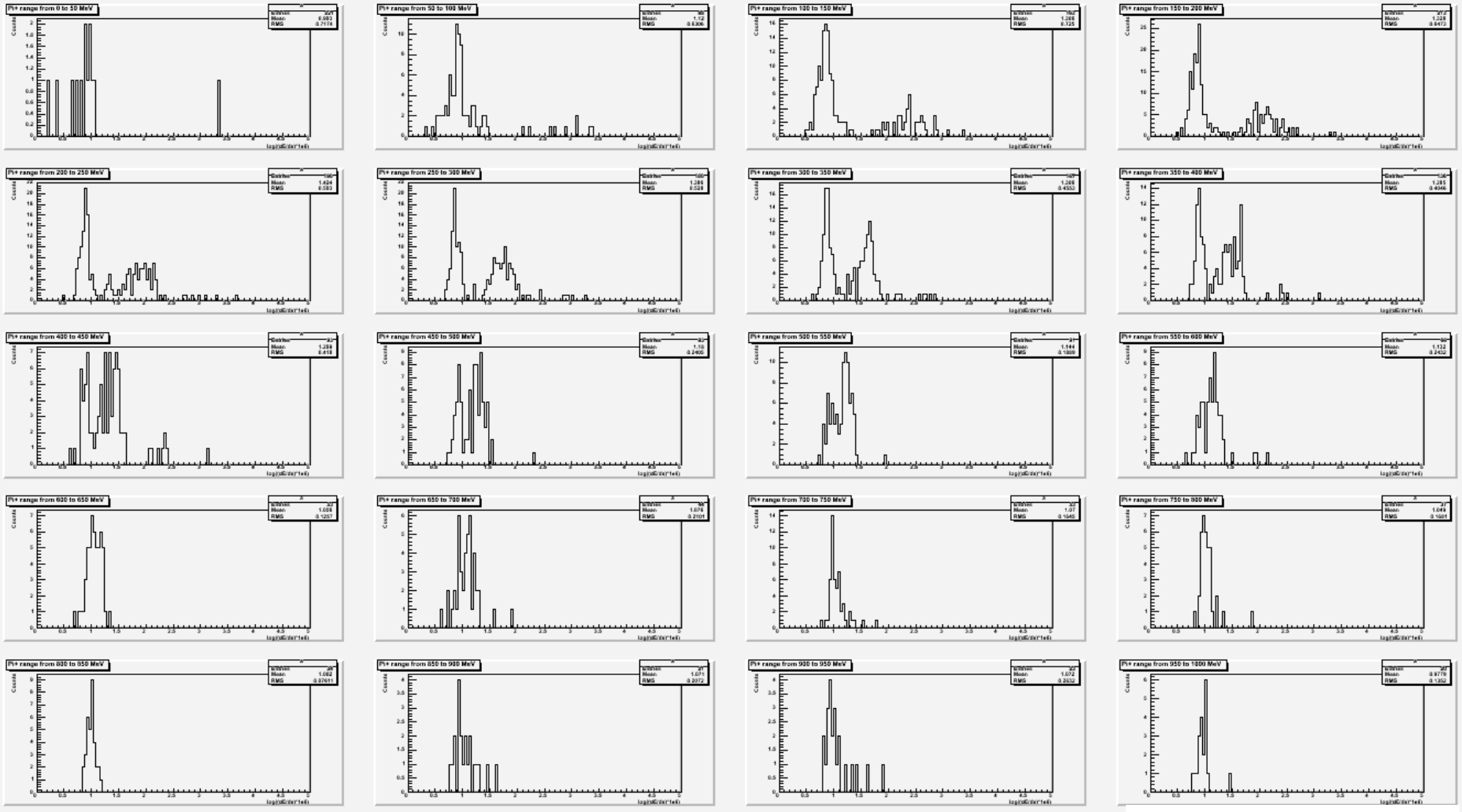
Event characteristics





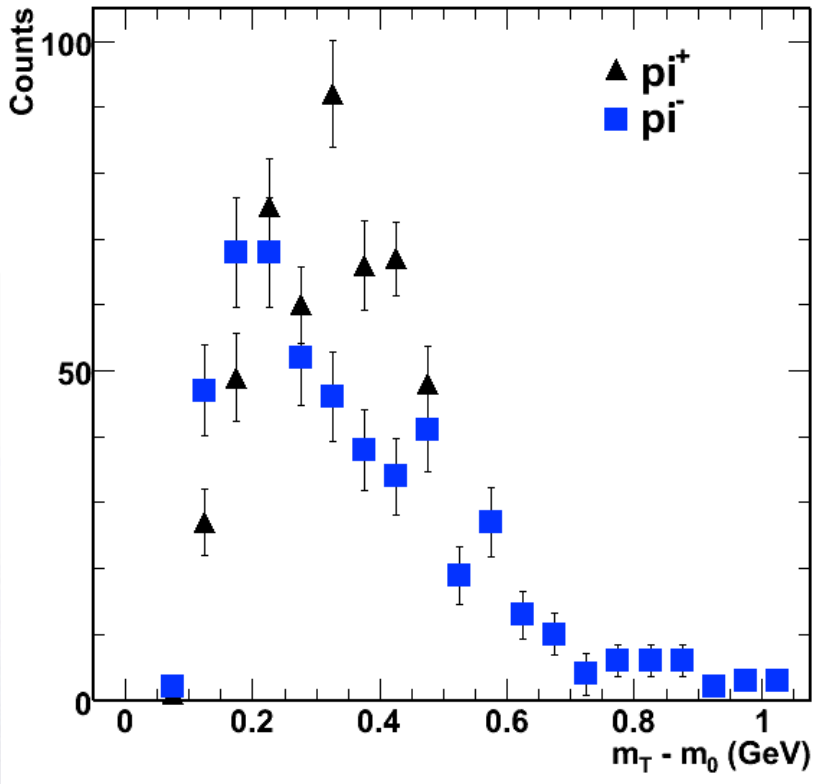
$m_T - m_0$
0 - 50 MeV

π^+ spectra
Cu+Al 4.7 GeV

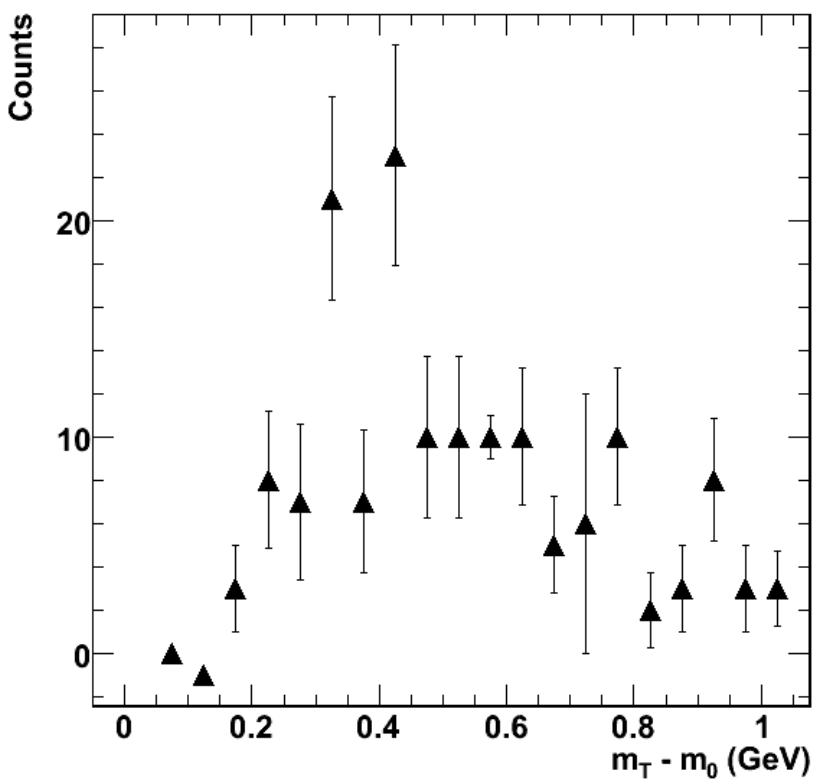


$m_T - m_0$
950 - 1000 MeV

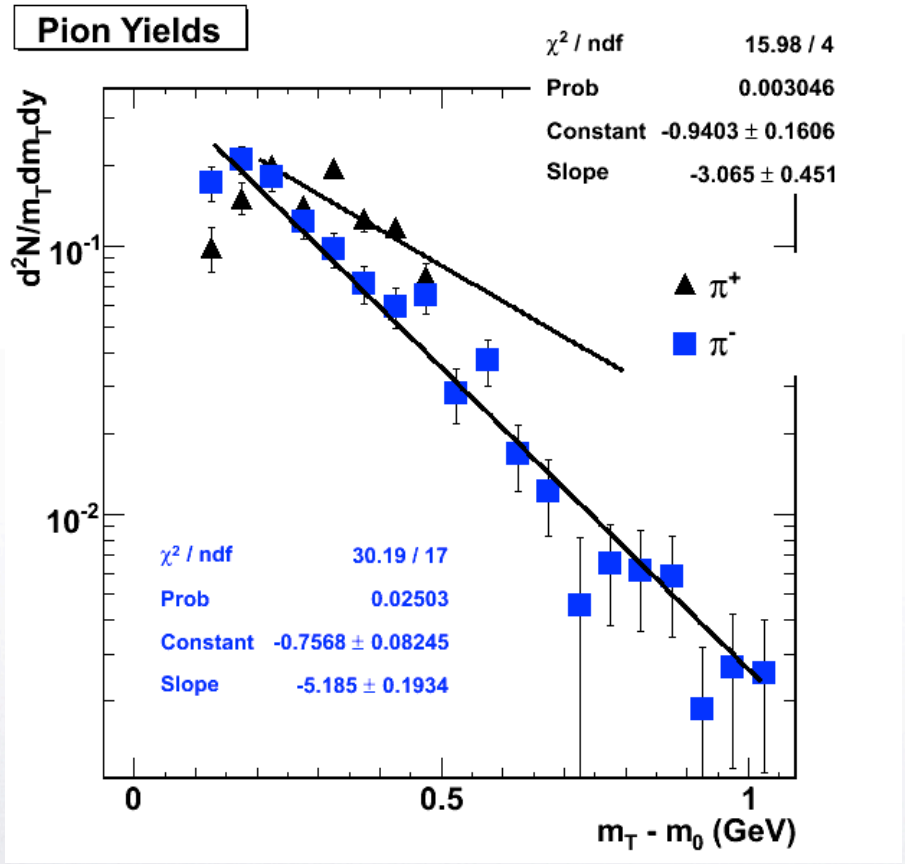
Raw Pion Yields

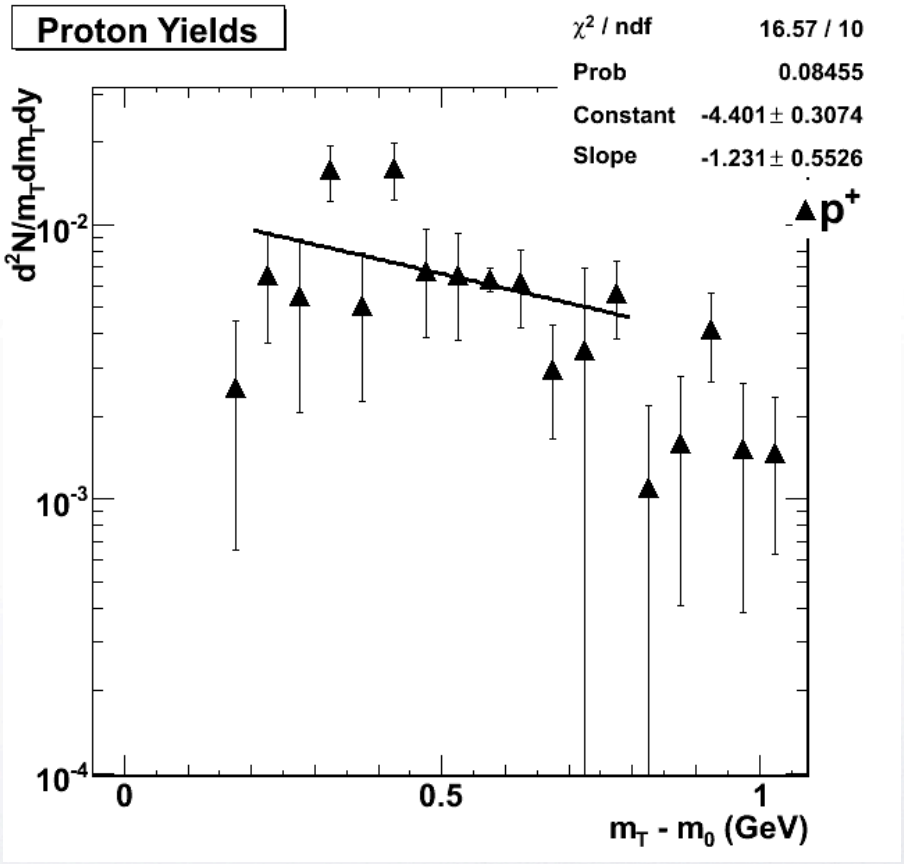


Raw Proton Yields



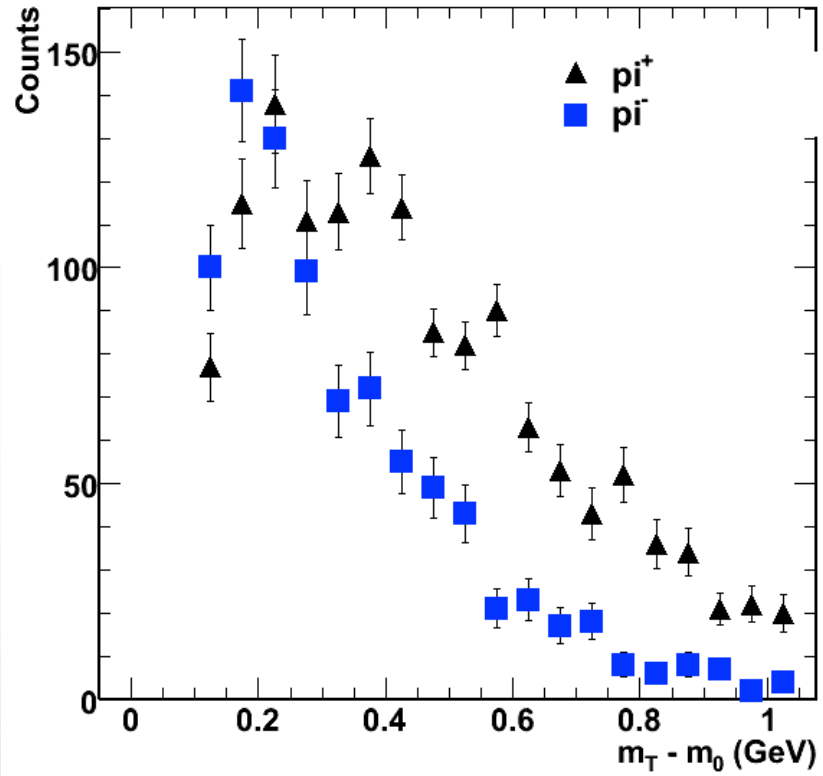
$y = 1.59 \pm 0.25$


Pion Yields
χ² / ndf 15.98 / 4
Prob 0.003046
Constant -0.9403 ± 0.1606
Slope -3.065 ± 0.451
π+
π-
χ² / ndf 30.19 / 17
Prob 0.02503
Constant -0.7568 ± 0.08245
Slope -5.185 ± 0.1934
d²N/m_T dm_T dy
10^-1
10^-2
0
0.5
1
m_T - m_0 (GeV)

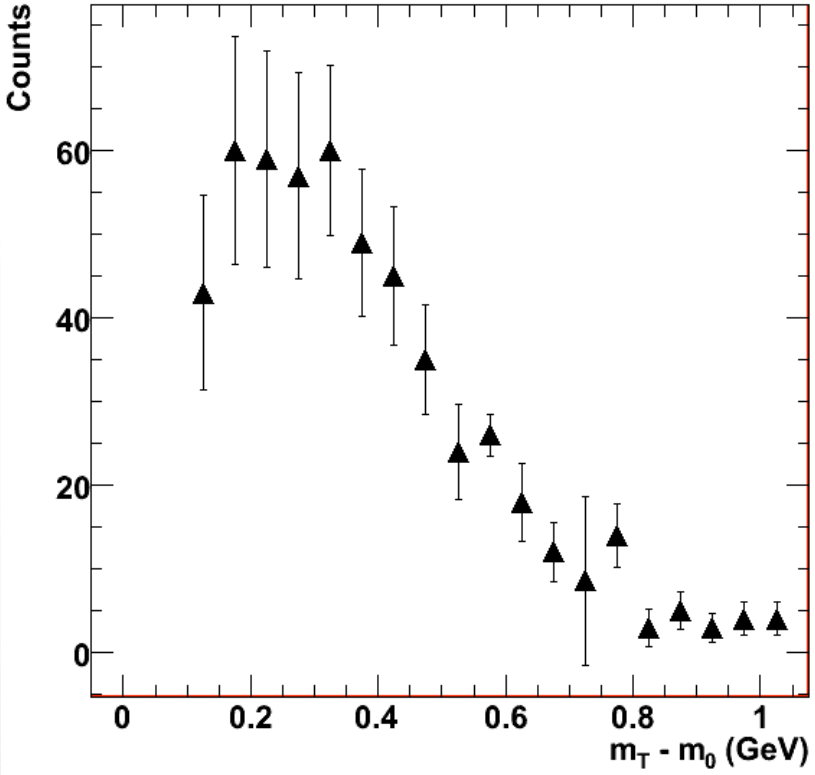

Proton Yields
χ² / ndf 16.57 / 10
Prob 0.08455
Constant -4.401 ± 0.3074
Slope -1.231 ± 0.5526
p+
d²N/m_T dm_T dy
10^-2
10^-3
10^-4
0
0.5
1
m_T - m_0 (GeV)

$$y = 1.59 \pm 0.25$$

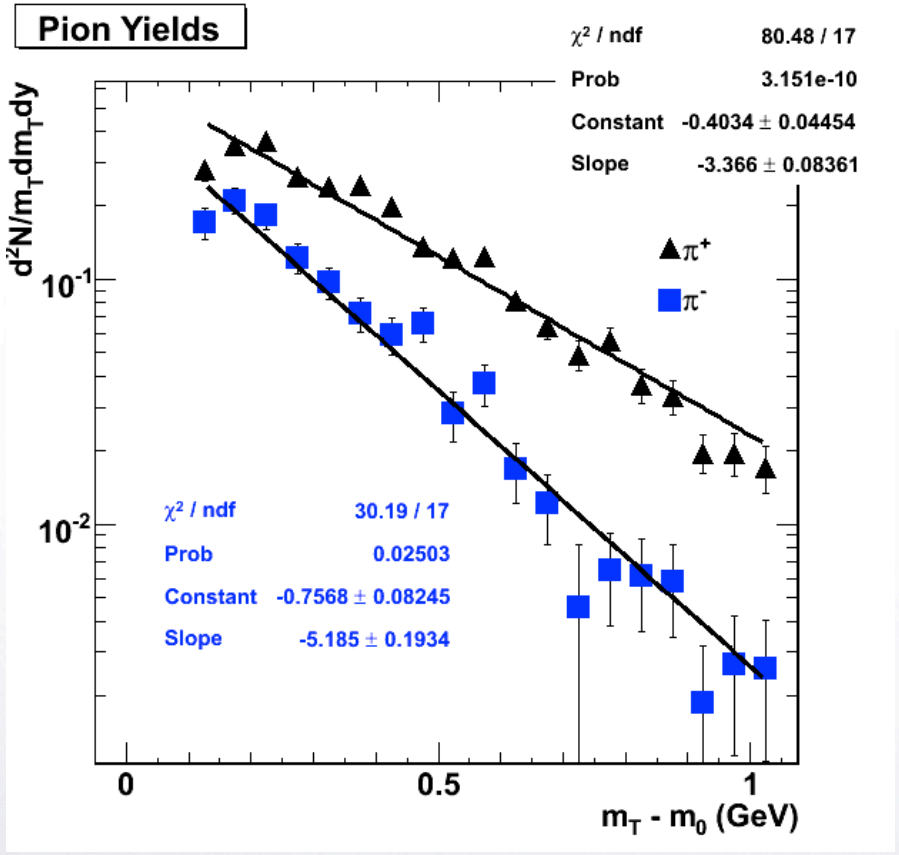
Raw Pion Yields

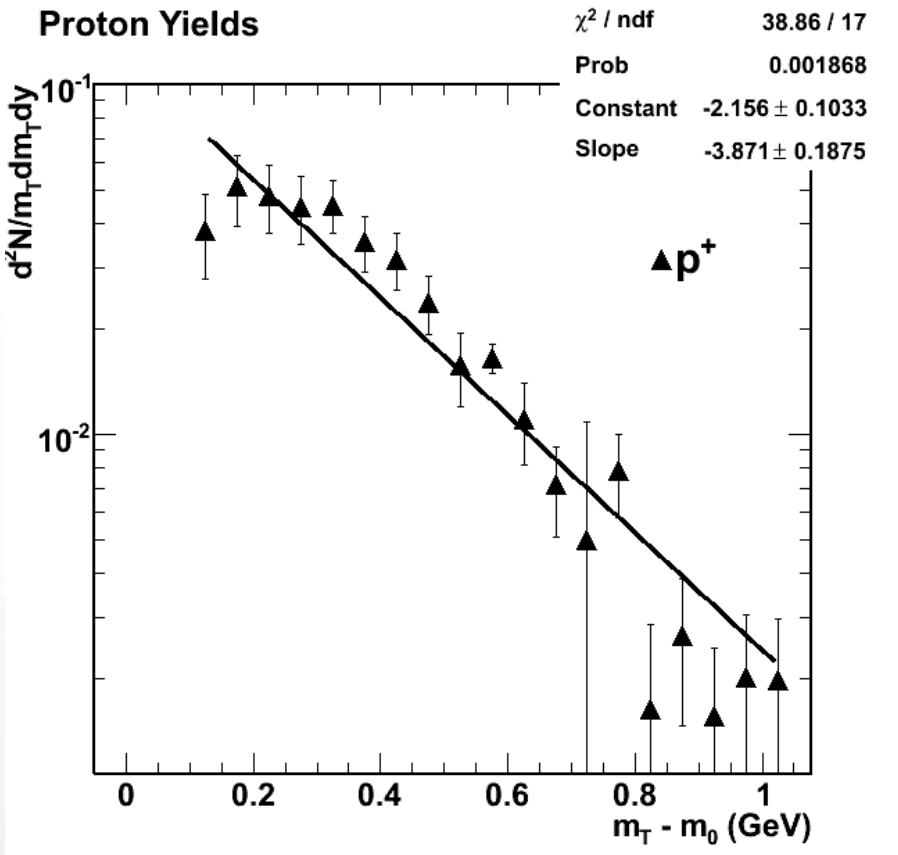


Raw Proton Yields



$y = 1.13 \pm 0.25$


Pion Yields
χ² / ndf 80.48 / 17
Prob 3.151e-10
Constant -0.4034 ± 0.04454
Slope -3.366 ± 0.08361
π⁺
π⁻
χ² / ndf 30.19 / 17
Prob 0.02503
Constant -0.7568 ± 0.08245
Slope -5.185 ± 0.1934
d²N/m_T dm_T dy
10⁻¹
10⁻²
0
0.5
1
m_T - m_0 (GeV)


Proton Yields
χ² / ndf 38.86 / 17
Prob 0.001868
Constant -2.156 ± 0.1033
Slope -3.871 ± 0.1875
p⁺
d²N/m_T dm_T dy
10⁻¹
10⁻²
0
0.2
0.4
0.6
0.8
1
m_T - m_0 (GeV)

$y = 1.13 \pm 0.25$

Conclusions and Outlook

- we have been able to extract yields and spectra from several species for fixed target collisions at lab rapidity
  - need to understand centrality
  - need to understand detector efficiency at high rapidities
  - need much better statistics - this study is a proof of principle
  - the ultimate aim is to get yields and slopes which compare favorably with published data in this energy range