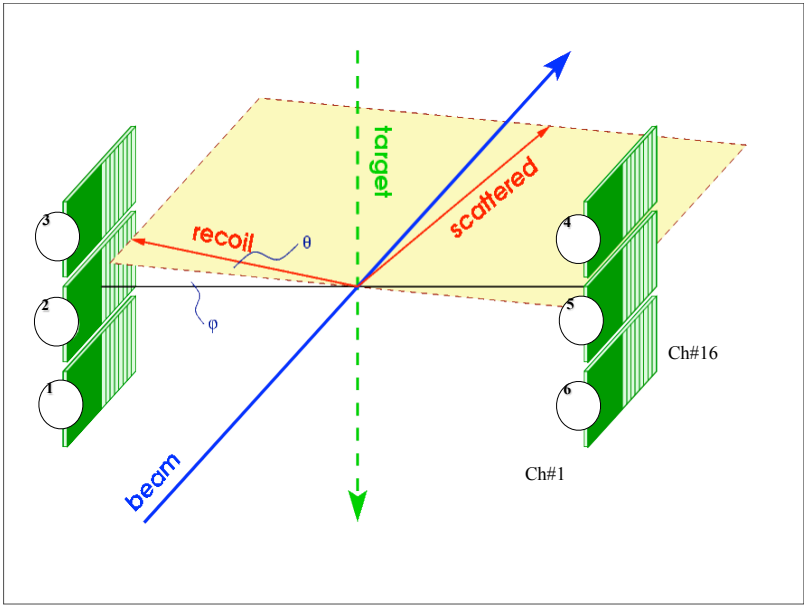
DETECTOR GEOMETRY



Friday, May 6, 2011

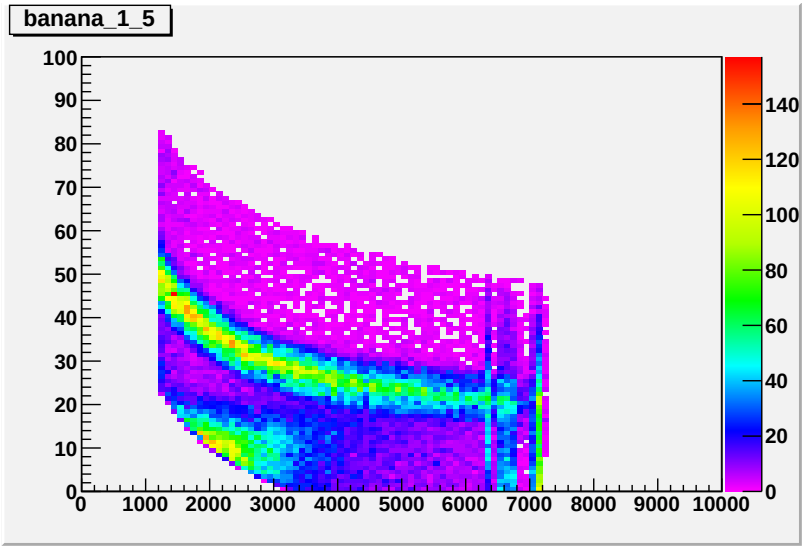
Elastic proton identification

The main problem is to identify a clean sample of elastically scattered protons

Start with energy-time of flight correlation

$$t \;=\; L \cdot \sqrt{\frac{m_p}{2 \cdot T_R}}$$

Elastic proton identification



ANGLE-ENERGY CORRELATION

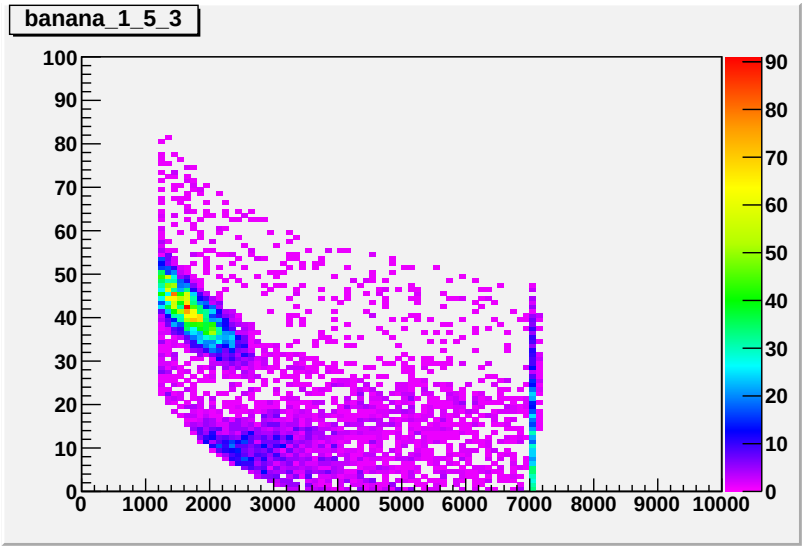
There is a correlation between scattering angle and kinetic energy of scattered proton:

$$M_x^2 = m_p^2 + t - 2E_1T_R + 2p_1p_R\sin\theta_R$$

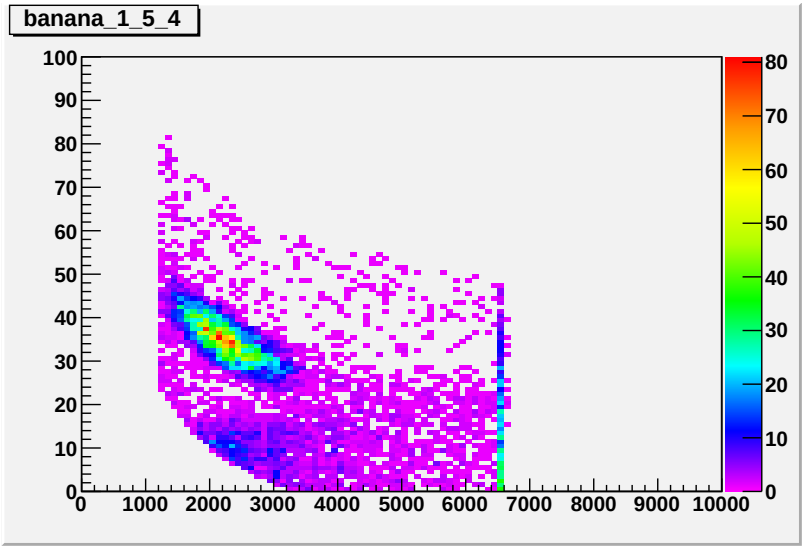
for small angles:

$$T_R \approx 2m_p\theta_R^2$$

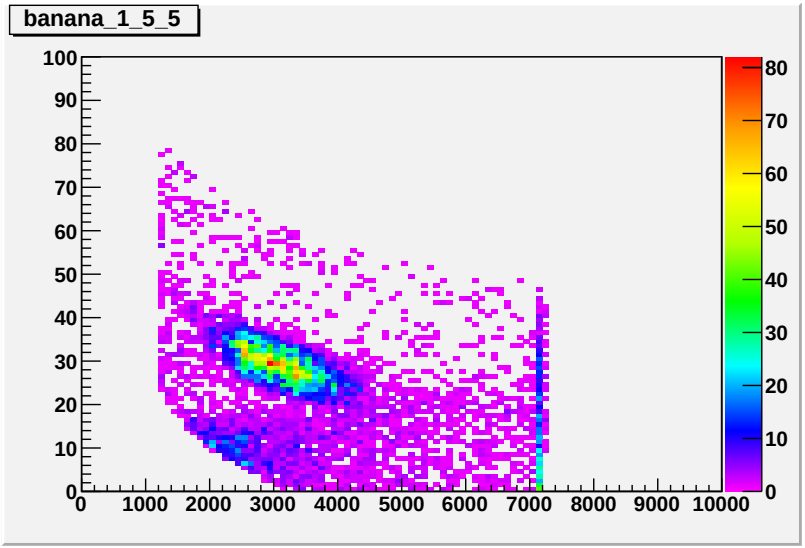
STRIP-ENERGY CORRELATION



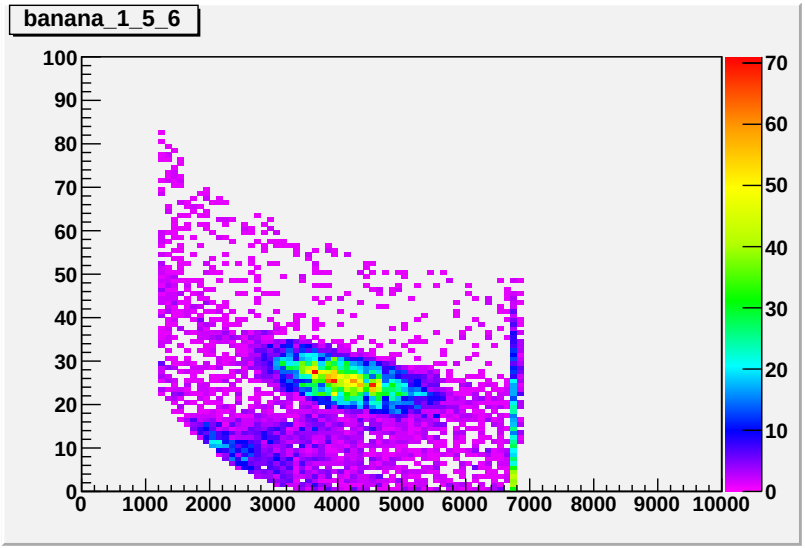
STRIP-ENERGY CORRELATION



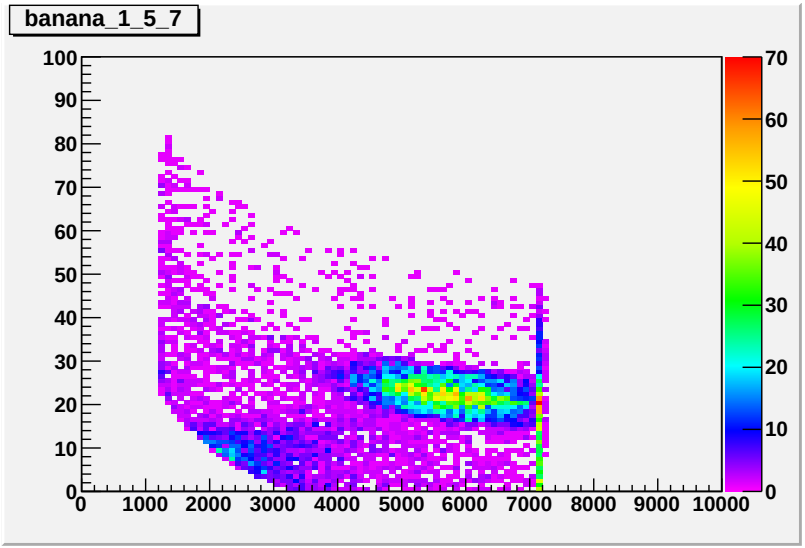
STRIP-ENERGY CORRELATION

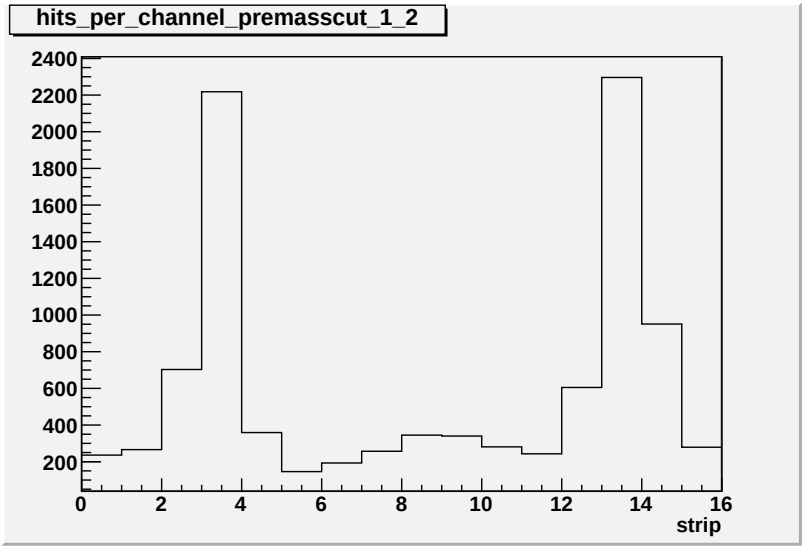


STRIP-ENERGY CORRELATION

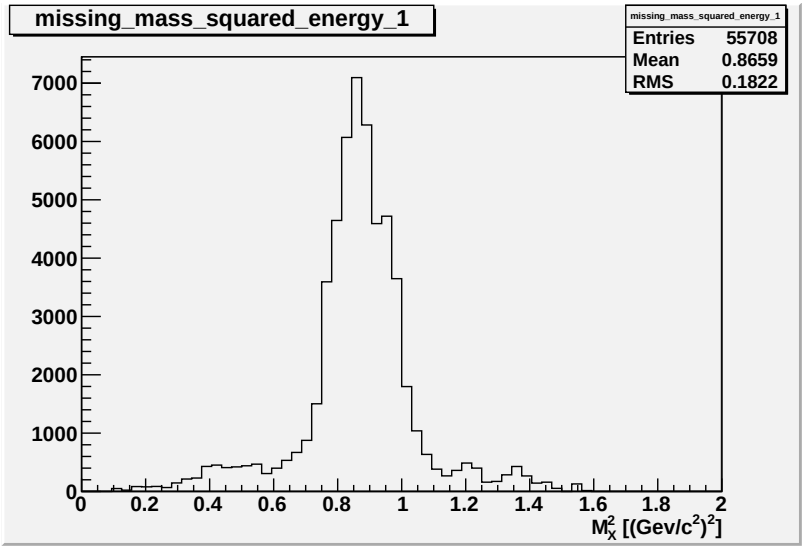


STRIP-ENERGY CORRELATION

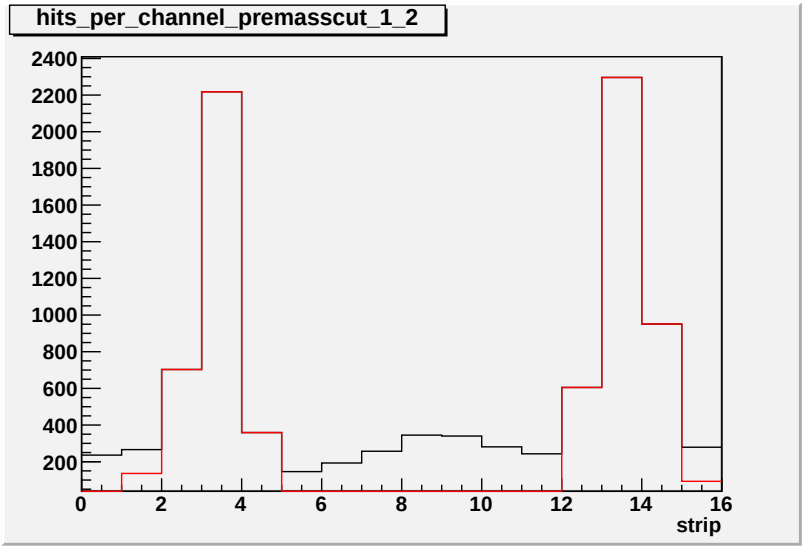




in a given energy bin, only a few strips will contain elastic signal. All strips contain background from hjet tail scattering.


missing_mass_squared_energy_1
missing_mass_squared_energy_1
Entries 55708
Mean 0.8659
RMS 0.1822
7000
6000
5000
4000
3000
2000
1000
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2
M_X^2 [(Gev/c^2)^2]

BACKGROUND ESTIMATION

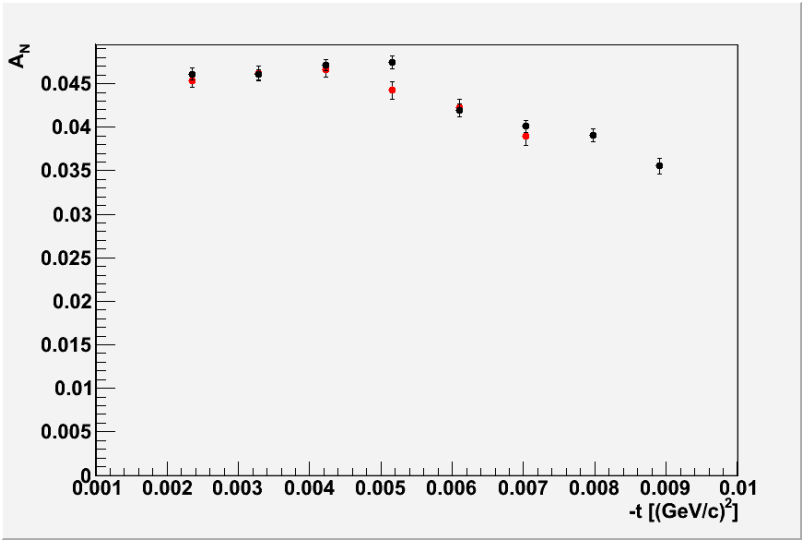


$$A_N = \frac{1}{P_t}\frac{\sigma^R_{0d} - \sigma^L_{0d}}{\sigma^R_{0d} + \sigma^L_{0d}} = \frac{1}{P_t}\frac{\sigma^R_{0u} - \sigma^L_{0u}}{\sigma^R_{0u} + \sigma^L_{0u}} = \epsilon_N / P_t$$

alternatively,

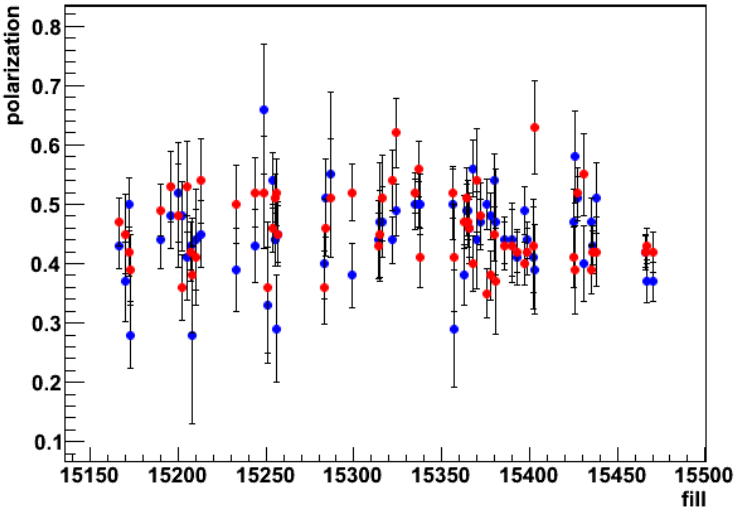
$$\epsilon_N = \frac{\sqrt{N^L_{0u} N^R_{0d}} - \sqrt{N^L_{0d} N^R_{0u}}}{\sqrt{N^L_{0u} N^R_{0d}} + \sqrt{N^L_{0d} N^R_{0u}}}$$

Then we scale up the A_N according to the estimated unpolarized background

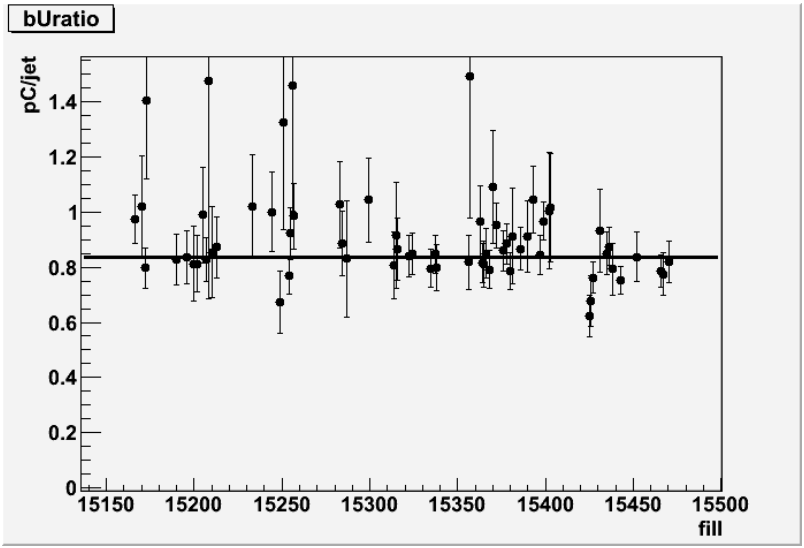


250 GeV, red = run9, black = run11

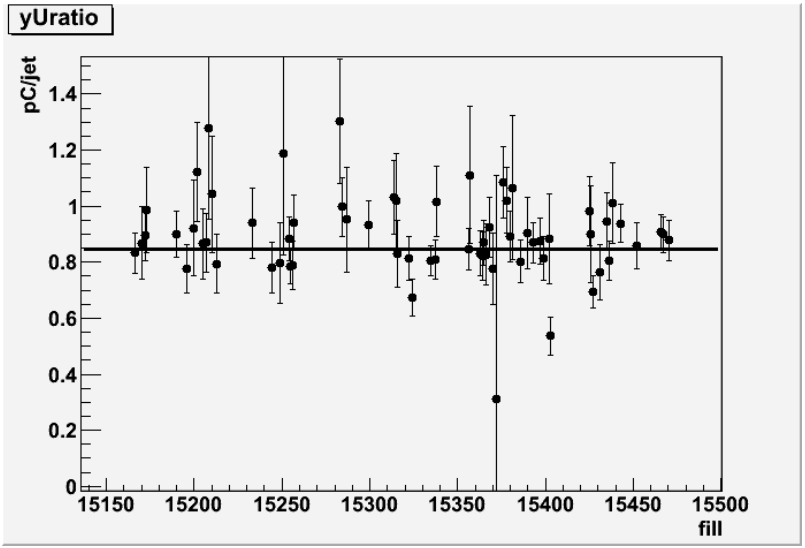
$$P_b = \frac{\epsilon_b}{\epsilon_N} P_t$$



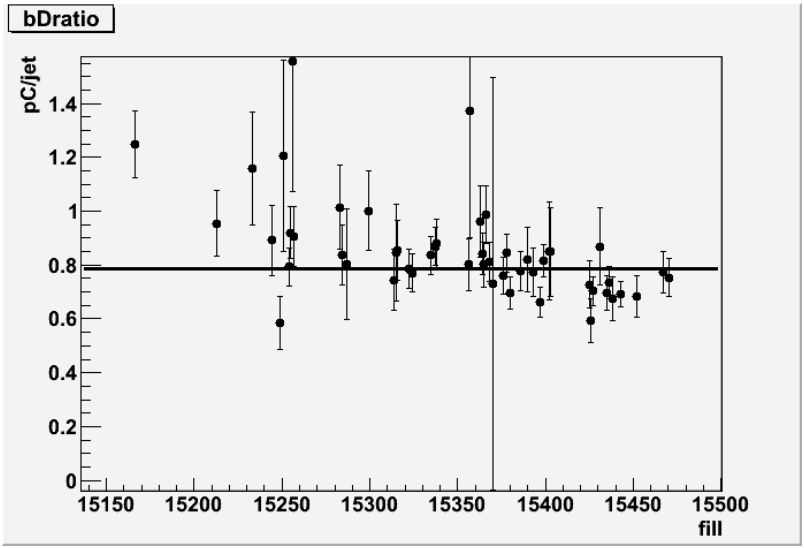
RATIO TO PC


bUratio
pC/jet
1.4
1.2
1
0.8
0.6
0.4
0.2
0
15150
15200
15250
15300
15350
15400
15450
15500
fill

RATIO TO PC


yUratio
pC/jet
1.4
1.2
1
0.8
0.6
0.4
0.2
0
15150
15200
15250
15300
15350
15400
15450
15500
fill

RATIO TO PC


bDratio
pC/jet
1.4
1.2
1
0.8
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0.4
0.2
0
15150
15200
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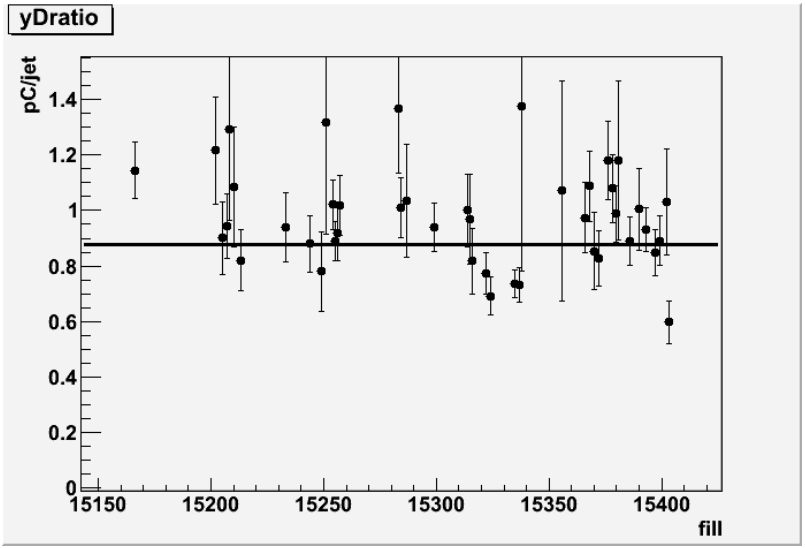
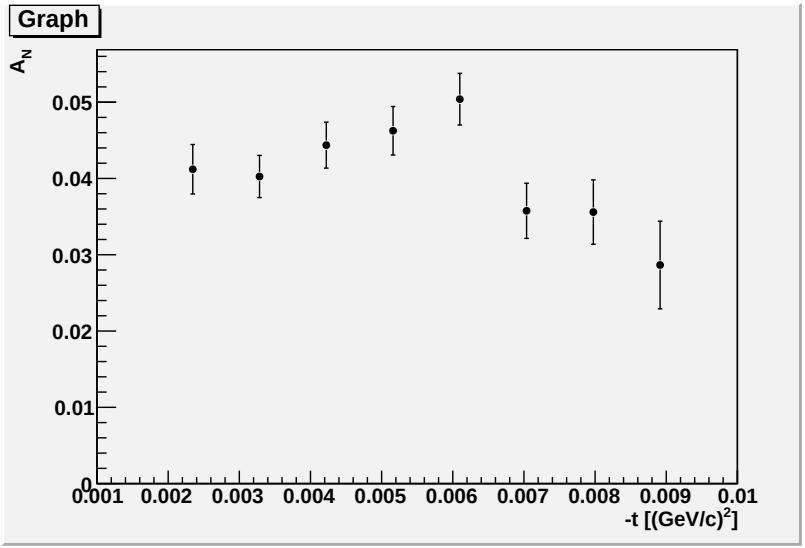
15300
15350
15400
15450
15500
fill


yDratio
pC/jet
1.4
1.2
1
0.8
0.6
0.4
0.2
0
15150
15200
15250
15300
15350
15400
fill

INJECTION ENERGY (PRELIMINARY)



INJECTION ENERGY (PRELIMINARY)

Blue Polarization:
$61\% \pm 4.3\%$

Yellow Polarization:
$65\% \pm 4.8\%$