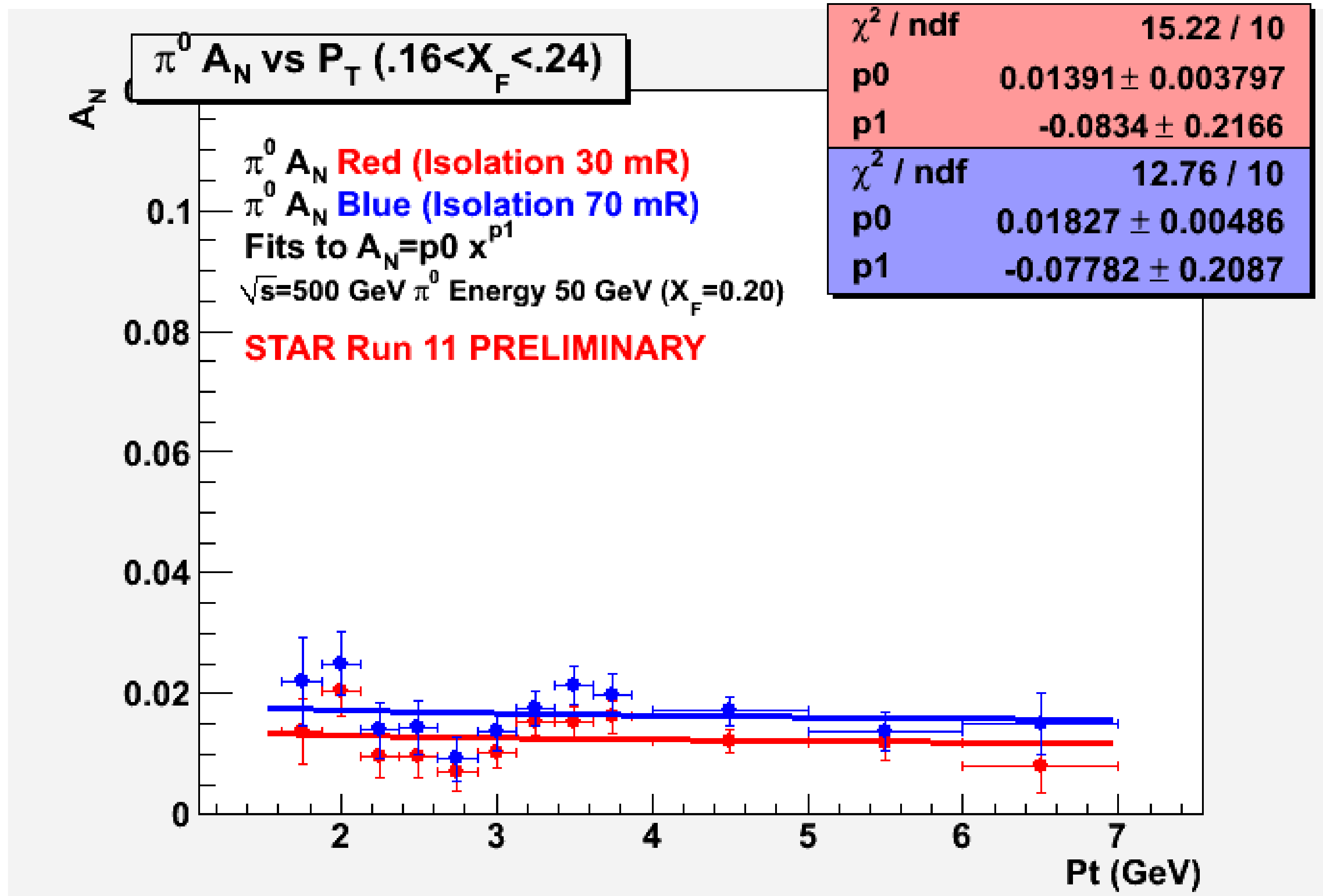
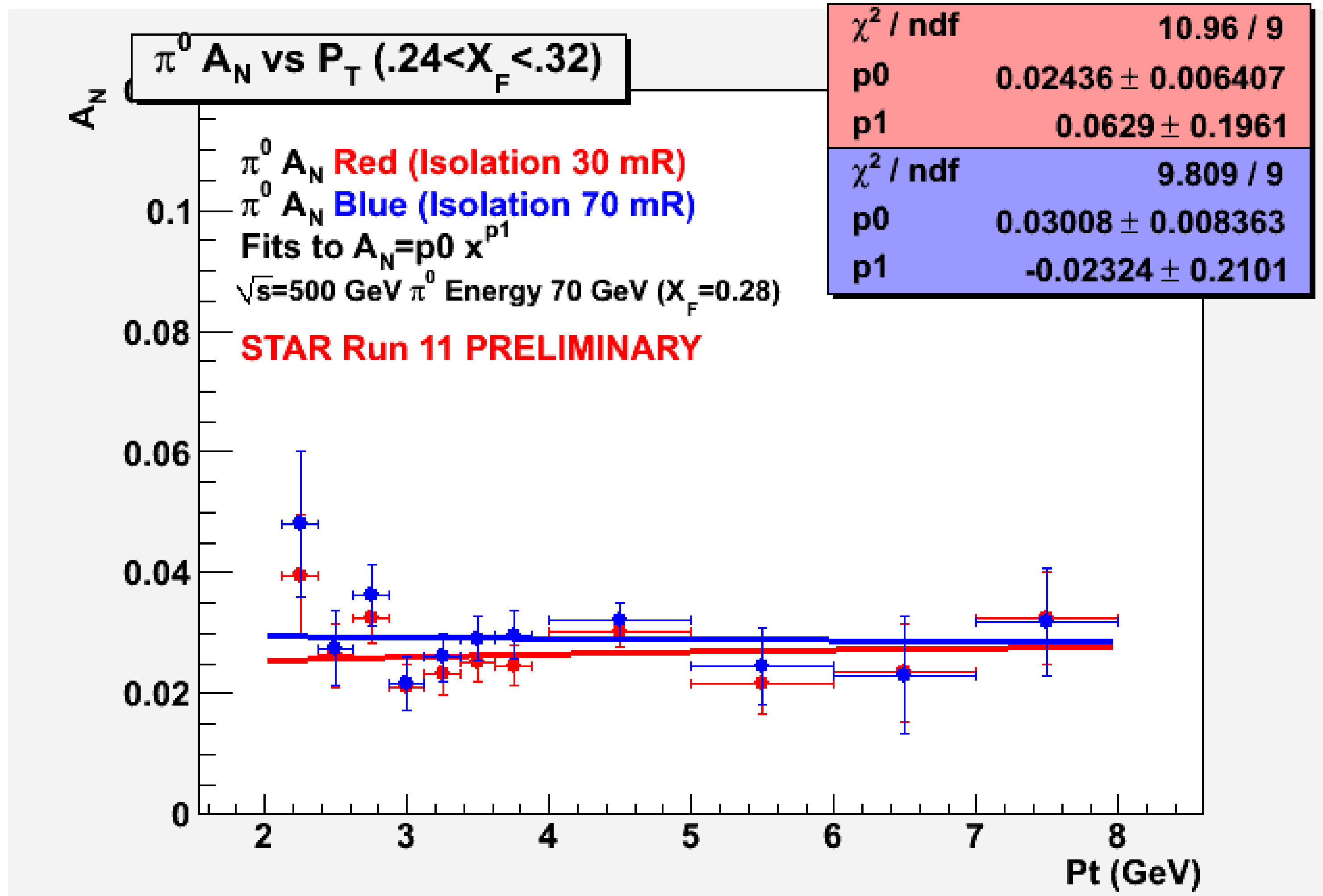
Extra

Transverse Single Spin π^0 Asymmetry vs P_T for small and large π^0 isolation cones.
Fits to power of P_T. (Errors shown are statistical)



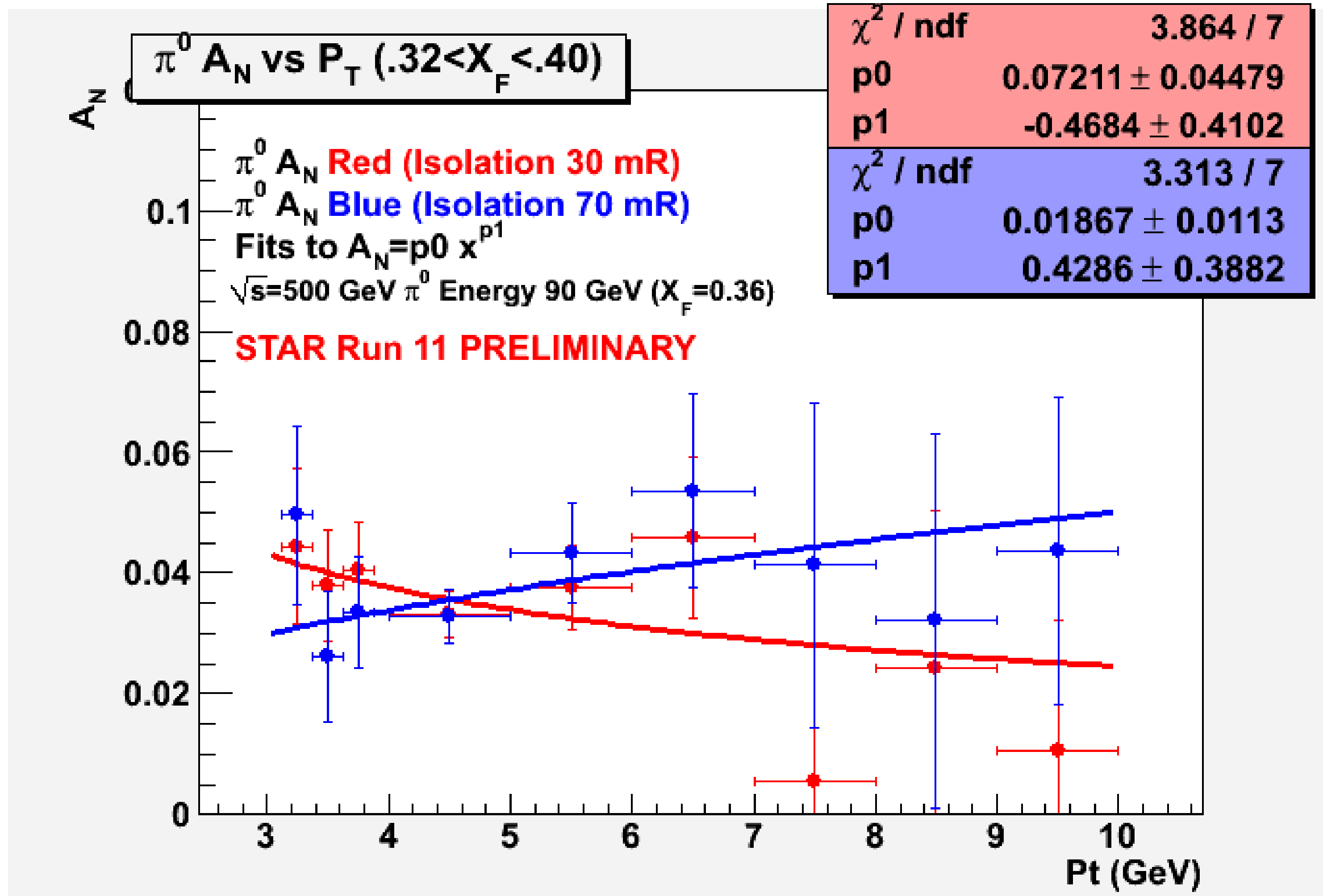
STAR

Transverse Single Spin π^0 Asymmetry vs P_T for small and large π^0 isolation cones. Fits to power of P_T. (Errors shown are statistical)



STAR

Transverse Single Spin π^0 Asymmetry vs P_T for small and large π^0 isolation cones. Fits to power of P_T. (Errors shown are statistical)



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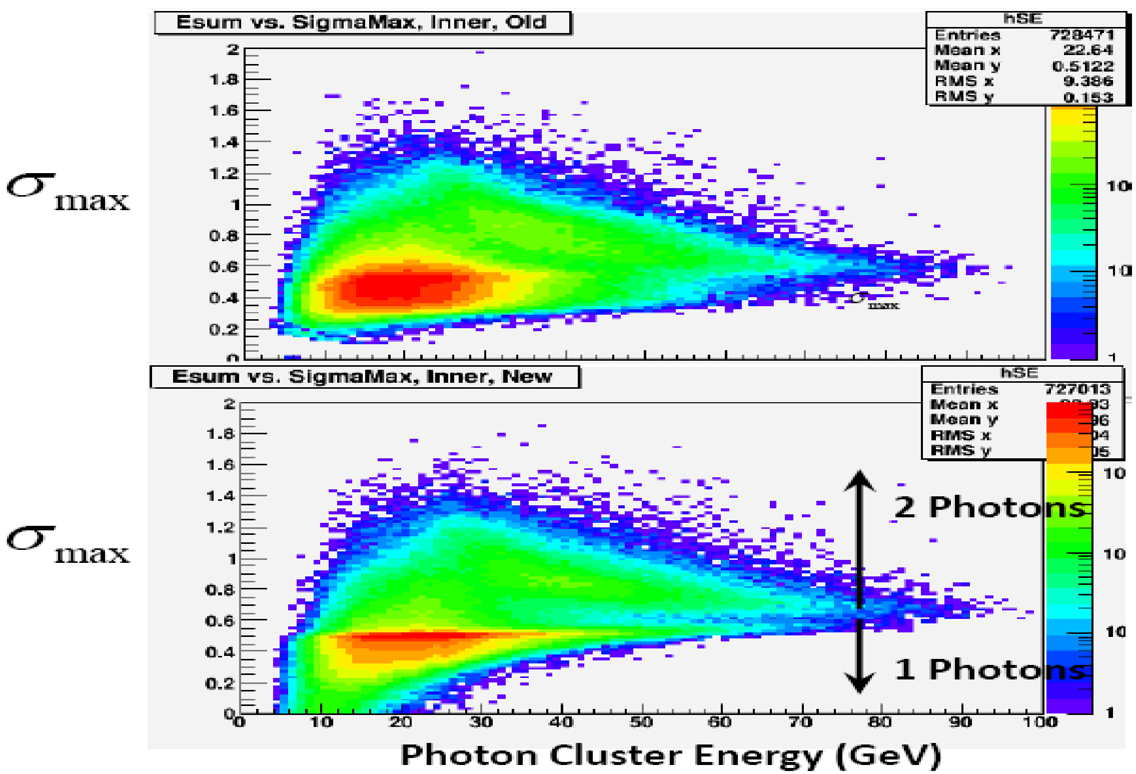
$$\Delta\sigma_x^{\,2} = \frac{\sum_{i\,(e_i>e_0)} (x_i - x_0)^2 \ln(e_i / e_0)}{\sum_{i\,(e_i>e_0)} \ln(e_i / e_0)} \qquad \Delta\sigma_x\Delta\sigma_y = \frac{\sum_{i\,(e_i>e_0)} (x_i - x_0)(y_i - y_0)\ln(e_i / e_0)}{\sum_{i\,(e_i>e_0)} \ln(e_i / e_0)}$$

Separation of single photon cluster from two photon cluster based upon distribution of shower energy along a preferred axis.

$$\sigma_{\max} \equiv Max\ Eigenvalue\ of \begin{bmatrix} \Delta\sigma_x^{\,2} & \Delta\sigma_x\Delta\sigma_y \\ \Delta\sigma_y\Delta\sigma_x & \Delta\sigma_y^{\,2} \end{bmatrix}$$



Old algorithm with Energy weighted moments

Improved algorithm with log energy weighted moments.

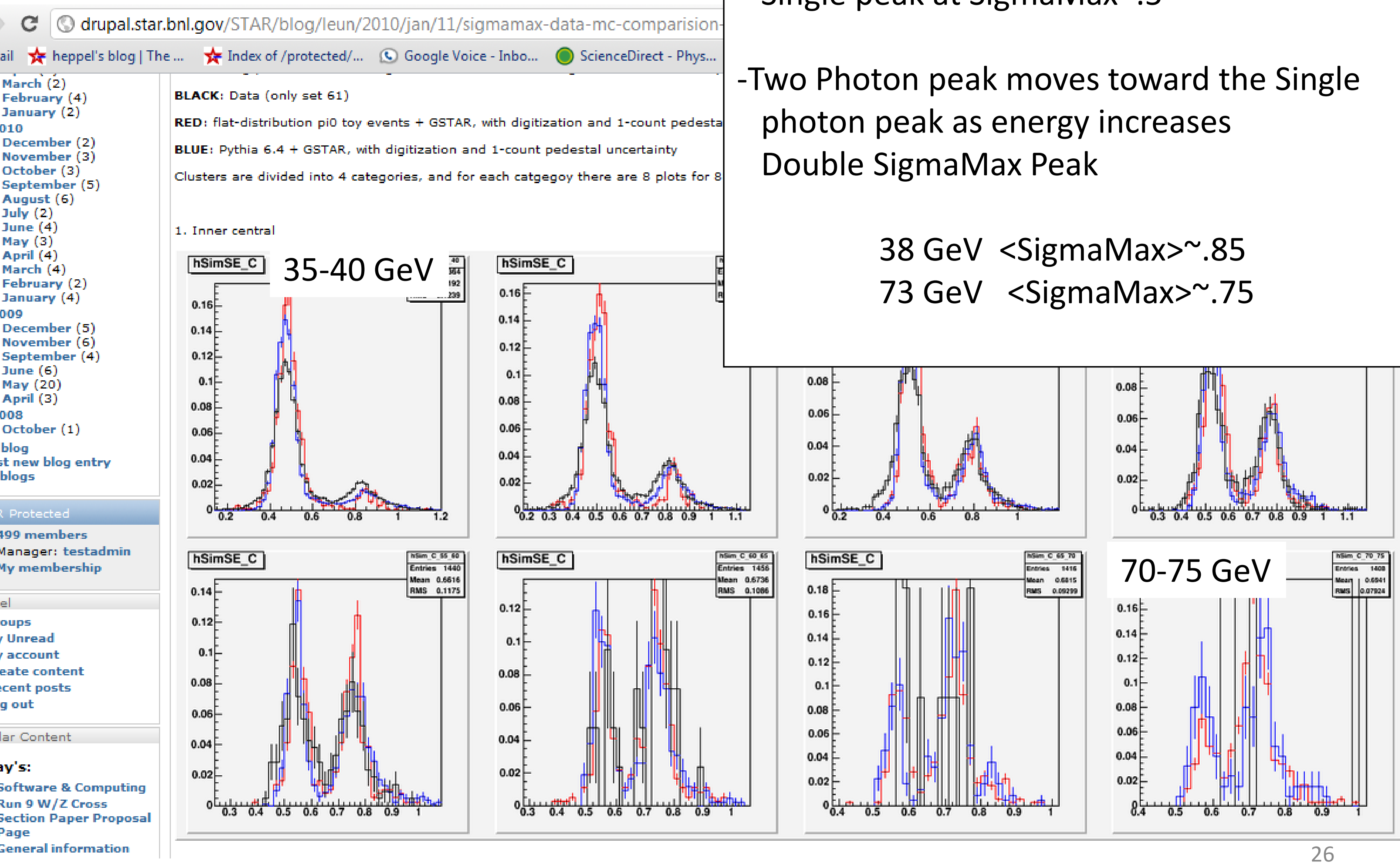
Provides clearer separation Between π^0 and single photon. Clusters up to ~80 GeV.

From Len's Analysis,

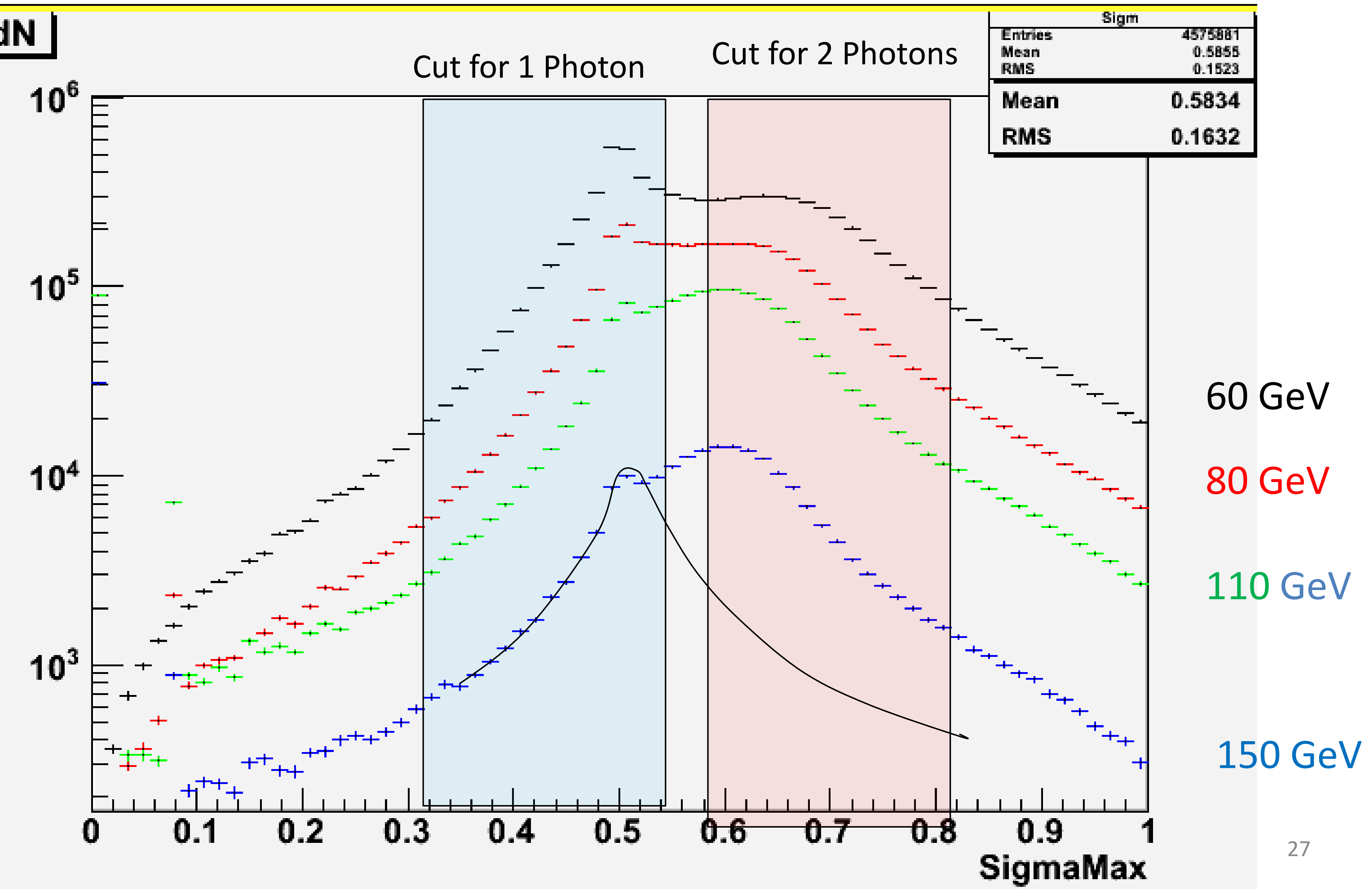
-Single Photon peak changes little with Energy
 Single peak at SigmaMax~.5

-Two Photon peak moves toward the Single photon peak as energy increases
 Double SigmaMax Peak

38 GeV <SigmaMax>~.85
73 GeV <SigmaMax>~.75

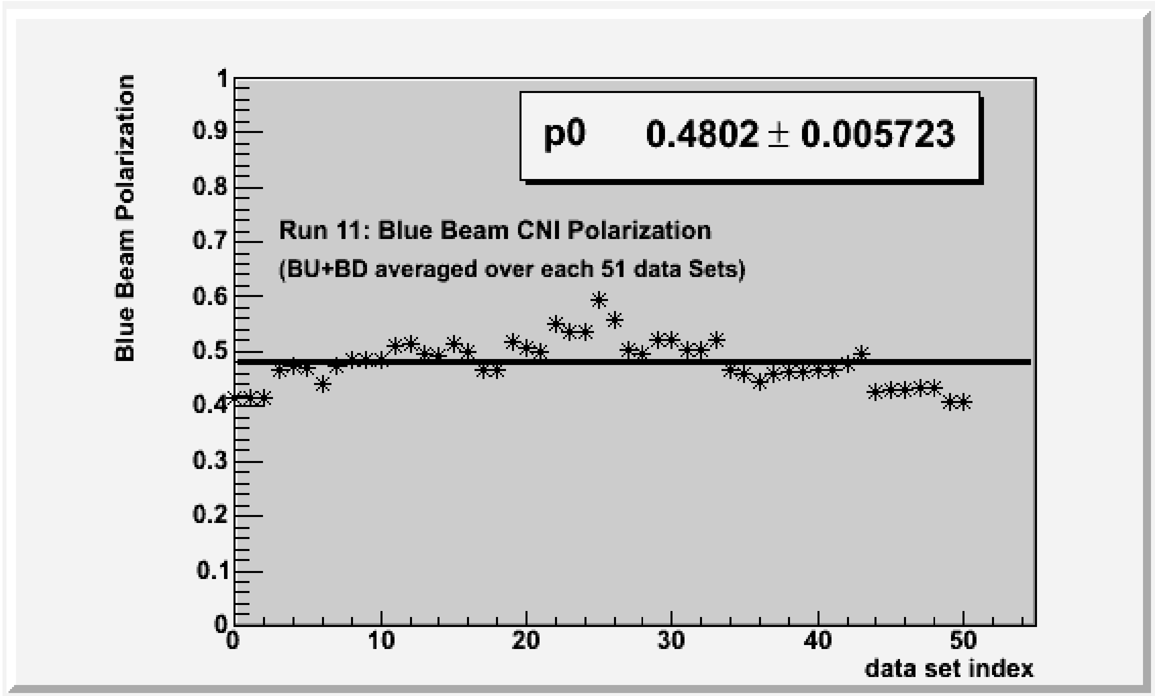


Run 11 distributions of SigmaMax as a indicator of single photon vs π^0 only slowly degrades with higher energy.



Blue Beam Polarization Measurements

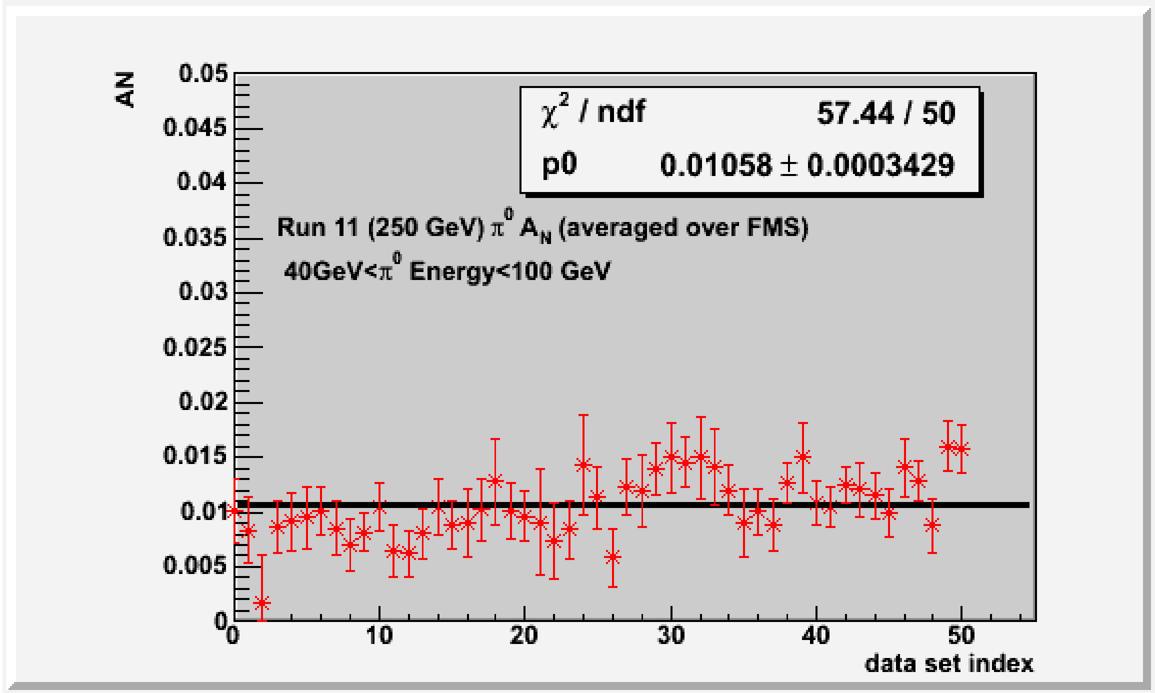
- CNI polarimeter data
- Average polarization for 51 consecutive time periods each data set represents ~ ½ day of running.



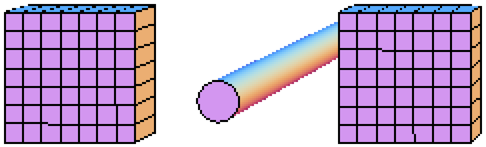
As from previous slide:

For the **"A_N vs cos(ϕ)"** fits to all FMS data divided into the 51 consecutive time periods.

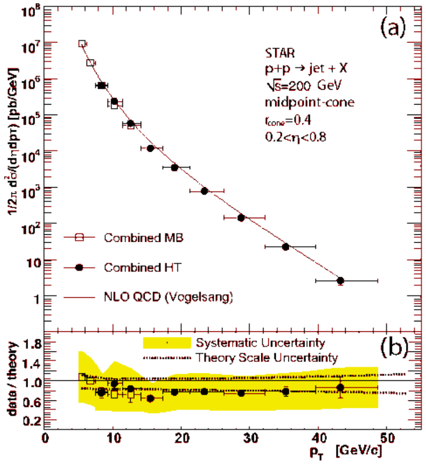
- 22.4 pb^{-1}
- 2.6< pseudorapidity<4.1
- 40 GeV < Energy π^0< 100 GeV
- Average polarization 48%
- Corrected each of of 51 sets (each set ~ ½ day of data)



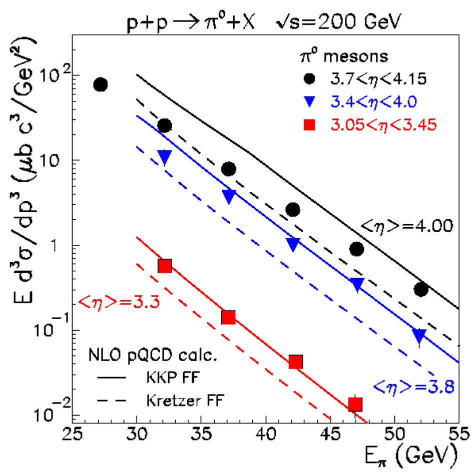
Unpolarized Cross Sections agree with Collinear Factorization PQCD

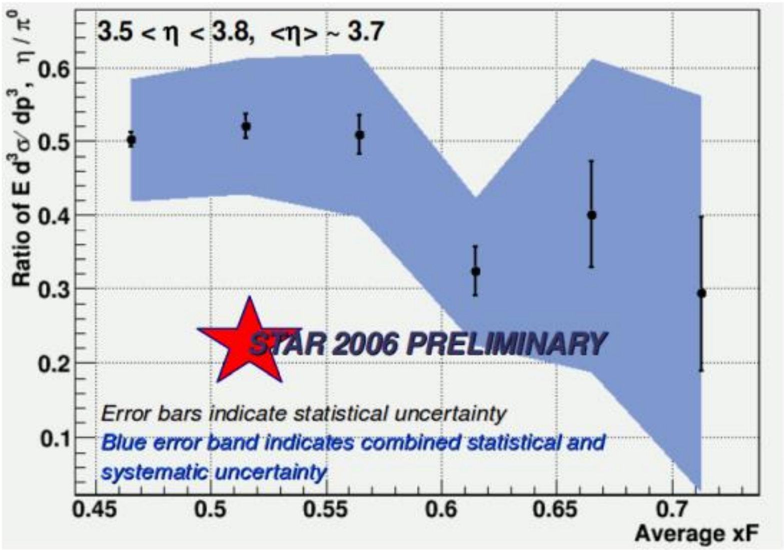


PRL 97, 252001



PRL 97, 152302



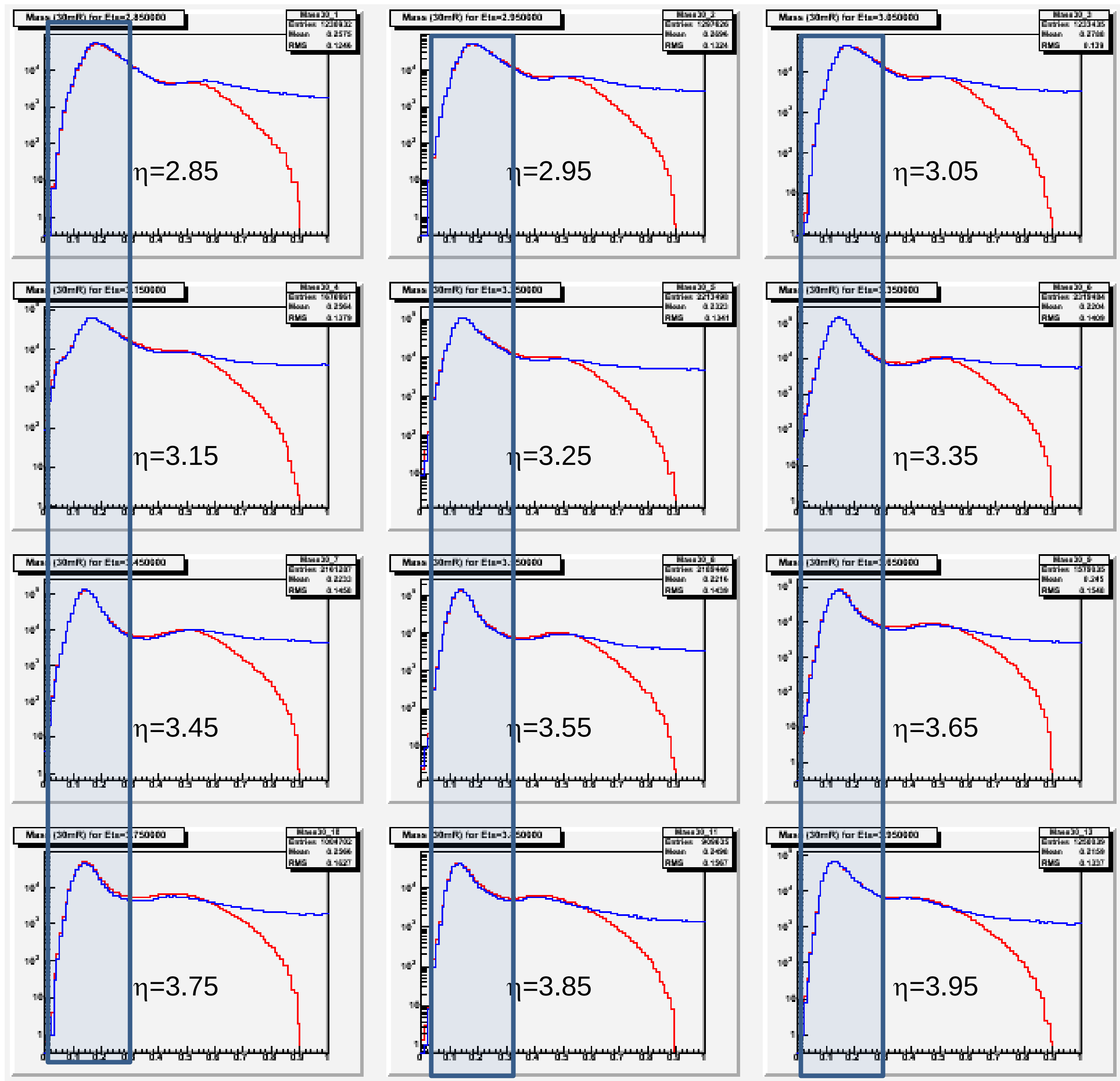


- Jet Mid-rapidity (Left) and Pi0 Forward Rapidity (right)
- Cross section for π^0 nominally consistent with NLO pQCD.
- Cross section for η (with nominal fragmentation) may also be consistent.

STAR

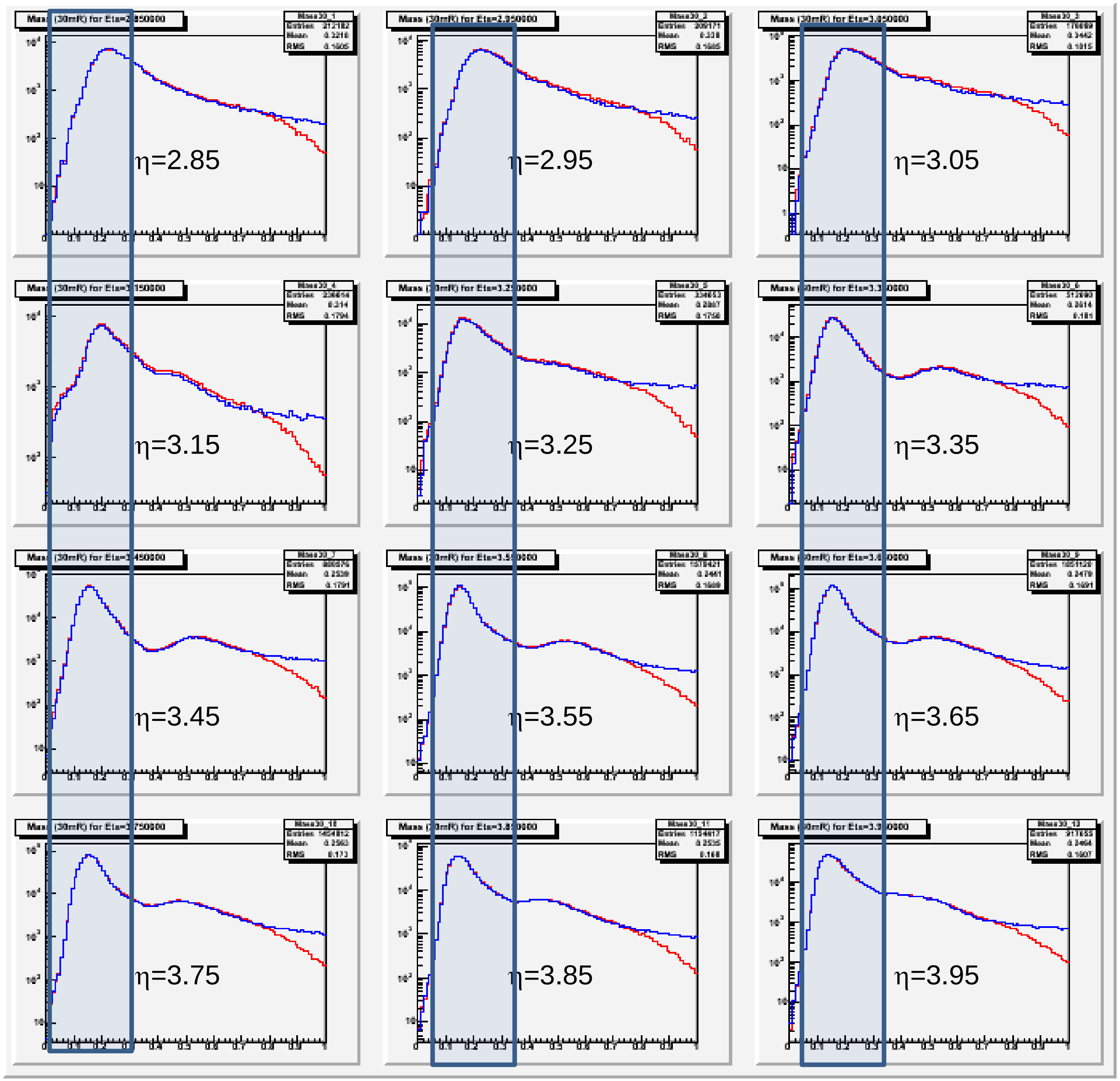
Mass Distribution in η bins (40<E<60 GeV)   r=1.53

Red=(cone 30 mR)   Blue=**1.53** (cone 70 mR)



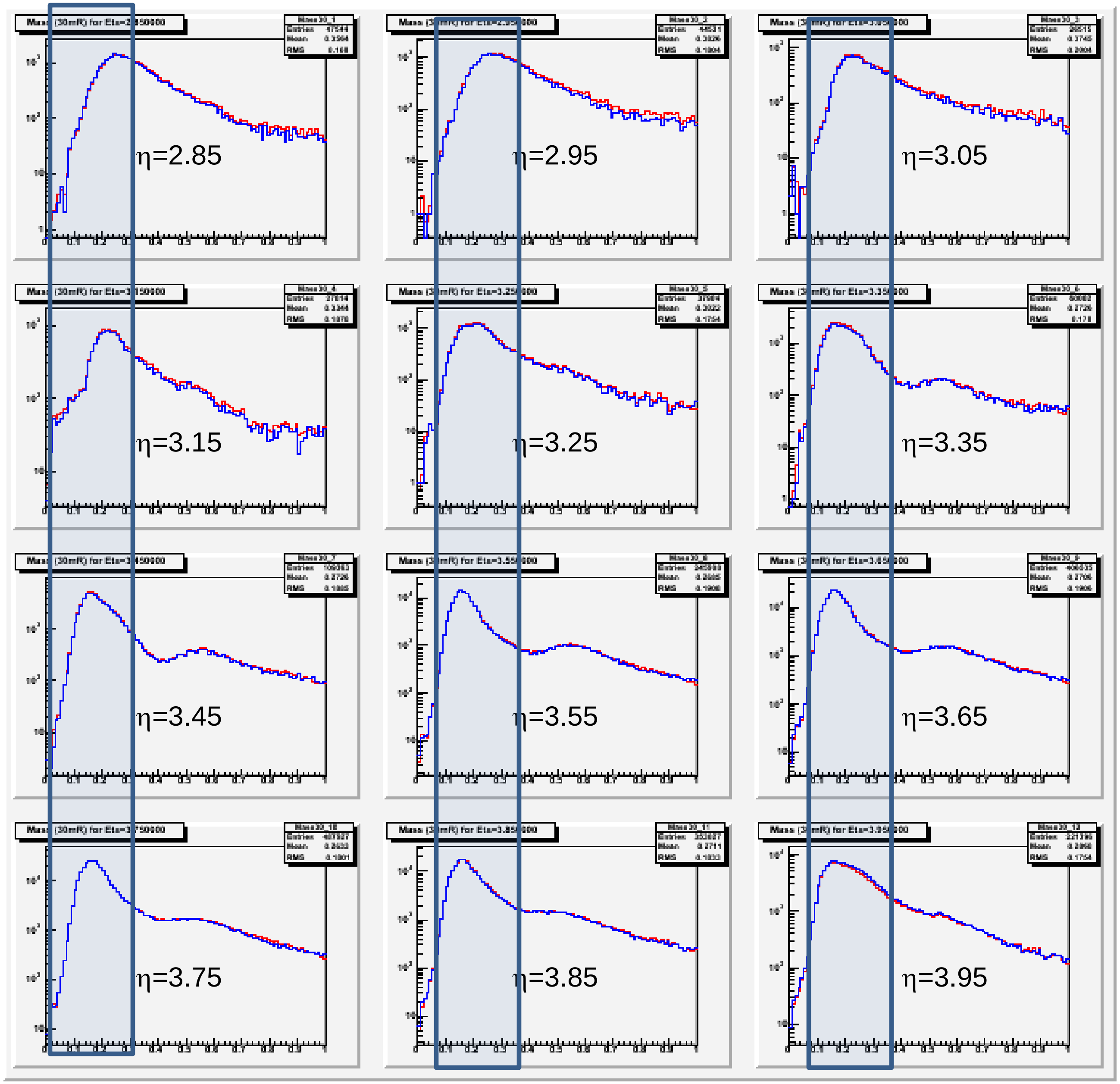
Mass Distribution in η bins (60<E<80 GeV) r=1.41

Red=(cone 30 mR) Blue=**1.41**(cone 70 mR)



Mass Distribution in η bins (80<E<100 GeV) r=1.37

Red=(cone 30 mR) Blue=**1.37**(cone 70 mR)



Calculate the **asymmetry** and **error** associated with the "Extra Events" that are included in the 30 mR cone but not the 70 mR Cone

Let p be the average "blue" beam polarization.

Let A_{N30} be the Asymmetry for the 30mR cone

Let A_{N70} be the Asymmetry for the 70mR cone

Let ΔA_{N30} and ΔA_{N70} be the Errors.

Let N_{30} and N_{70} be the numbers of events.

$$pA_{N30} = \frac{N_{u30} - N_{d30}}{N_{u30} + N_{d30}} = \frac{N_{u30} - N_{d30}}{N_{30}}$$

$$pA_{N70} = \frac{N_{u70} - N_{d70}}{N_{70}}$$

$$p\Delta A_{N30} \sim \frac{1}{\sqrt{N_{30}}}$$

$$p\Delta A_{N70} \sim \frac{1}{\sqrt{N_{70}}}$$

Assume

E=50 GeV: r=1.51

E=70 GeV: r=1.41

E=90 GeV: r=1.31

$$\frac{N_{30}}{N_{70}} = r$$

$$\frac{N_{30}}{N_{30} - N_{70}} = \frac{r}{r-1}$$

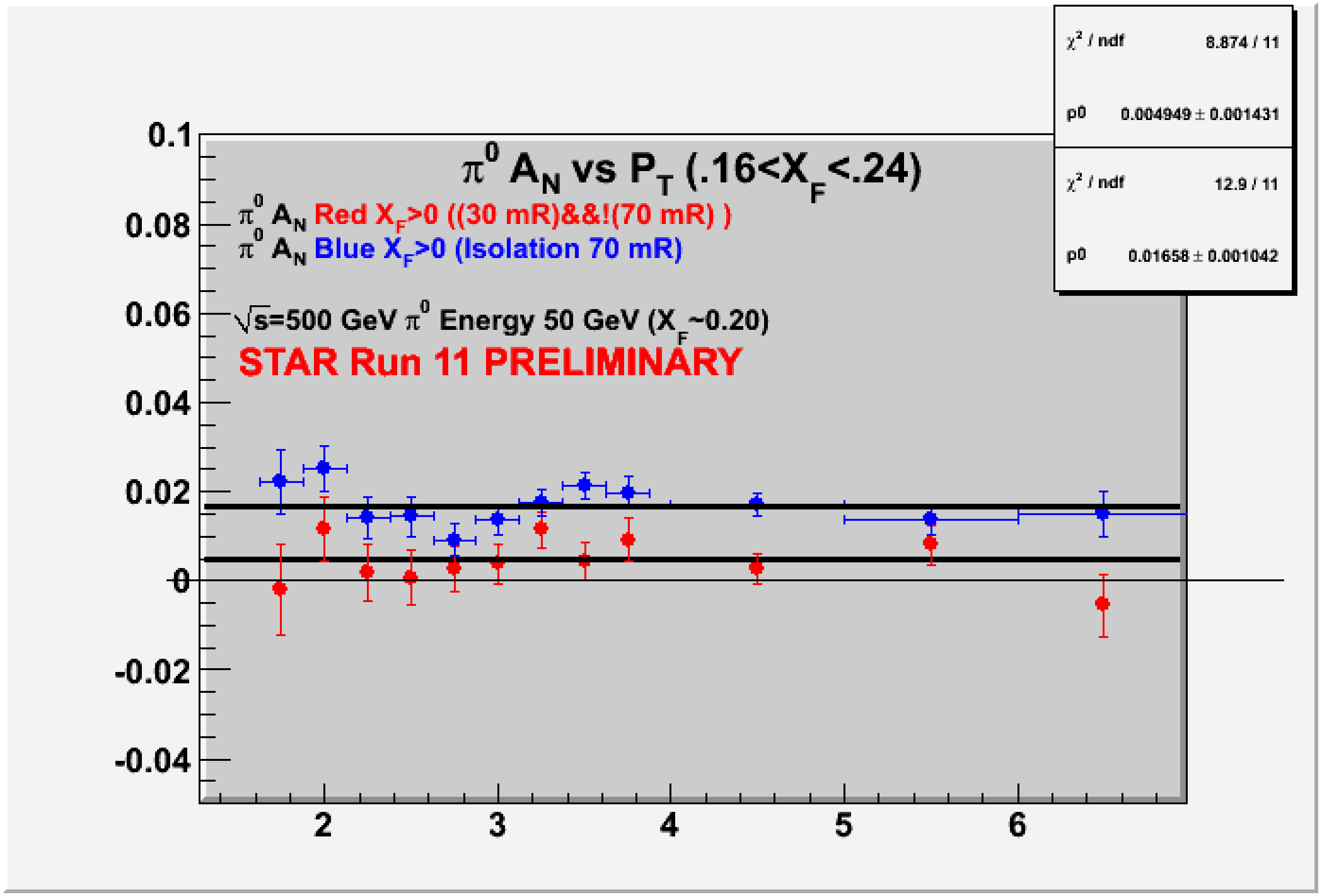
$$\frac{N_{70}}{N_{30} - N_{70}} = \frac{1}{r-1}$$

$$A_{ring} = \frac{r}{r-1} A_{N30} - \frac{1}{r-1} A_{N70}$$

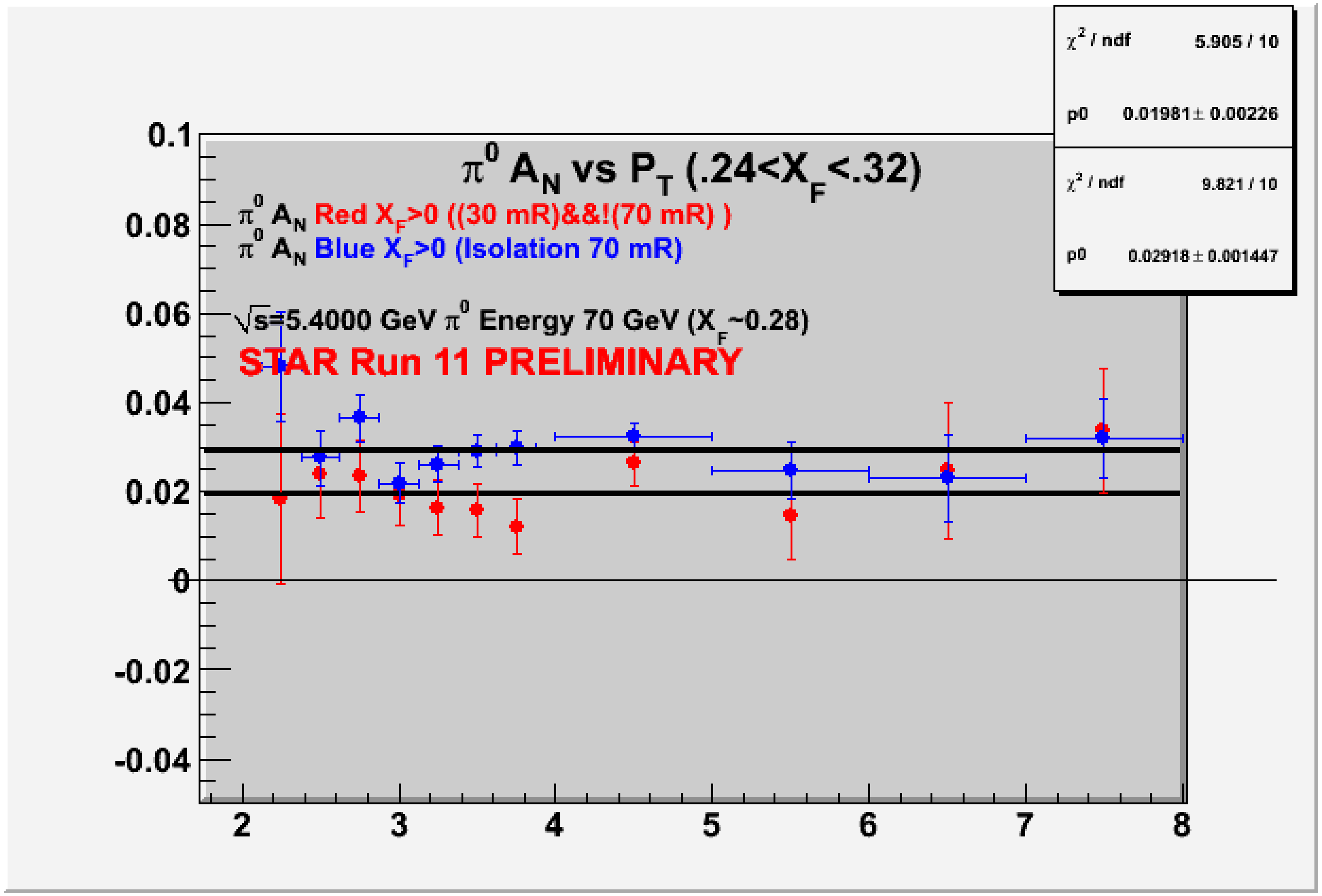
$$\Delta A_{ring} = \frac{1}{\sqrt{N_{ring}}} = \frac{1}{\sqrt{N_{30} - N_{70}}}$$

$$= \frac{1}{\sqrt{N_{70}}} \frac{1}{\sqrt{r-1}} = \Delta A_{N70} \frac{1}{\sqrt{r-1}}$$

Compare Fits to constant A_N
Red= 30mR cone but not 70 mR cont
Blue=70mR cone
Difference : (1.66% - .49%)=1.17%   (8 sigma difference)



Compare Fits to constant A_N
Red= 30mR cone but not 70 mR cont
Blue=70mR cone
Difference 2.92% - 1.98%=0.94%   (4 sigma difference)



Compare Fits to constant A_N
Red= 30mR cone but not 70 mR cont
Blue=70mR cone
Difference 3.57% - 3.44% = 0.13% (0.4 sigma difference)