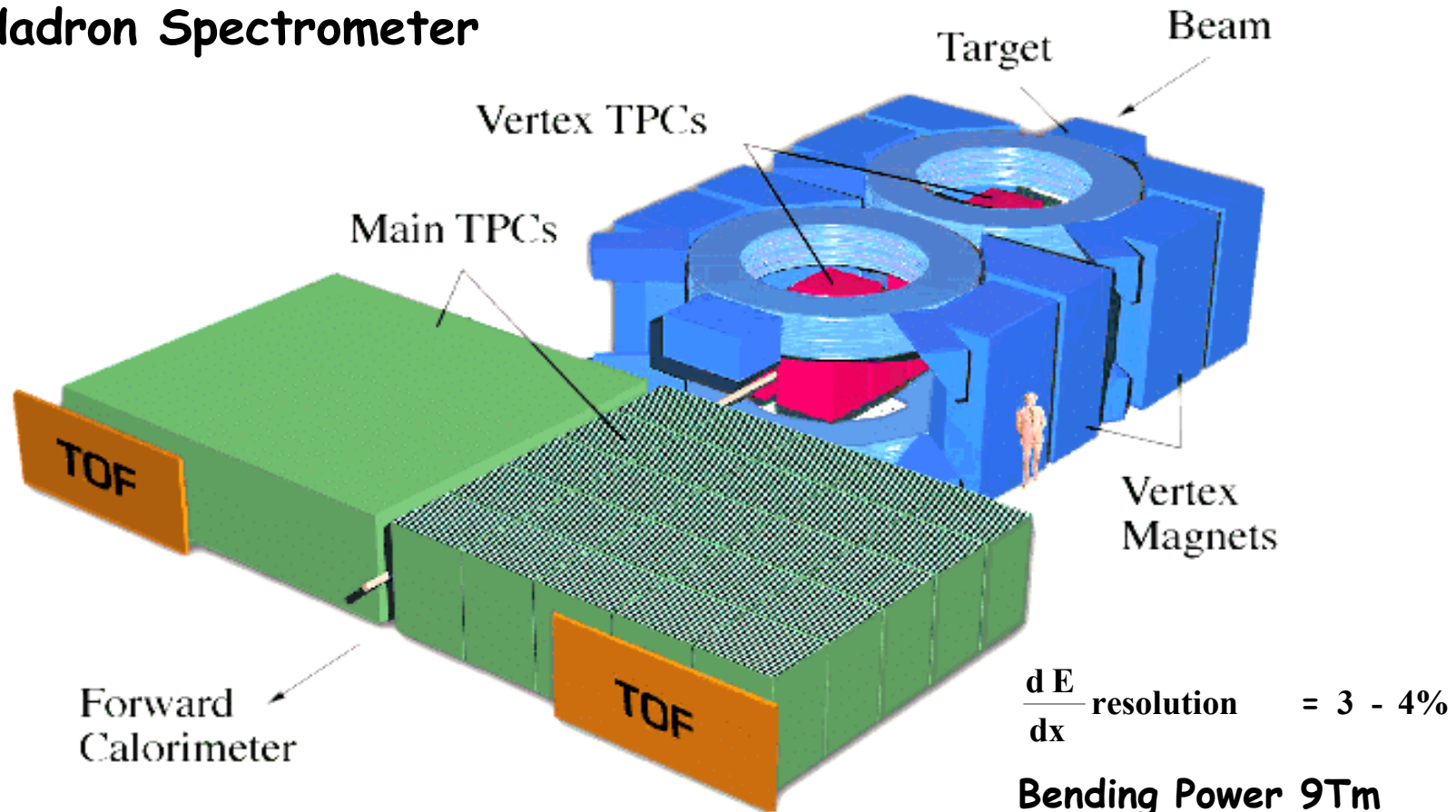


# NA49 Experiment at CERN-SPS

## Hadron Spectrometer



$$\frac{dE}{dx} \text{ resolution} = 3 - 4\%$$

**Bending Power 9Tm**

$$\frac{\sigma(p)}{p^2} = 0.3 \cdot 10^{-4} (\text{GeV}/c)^{-1}$$

## Motivation

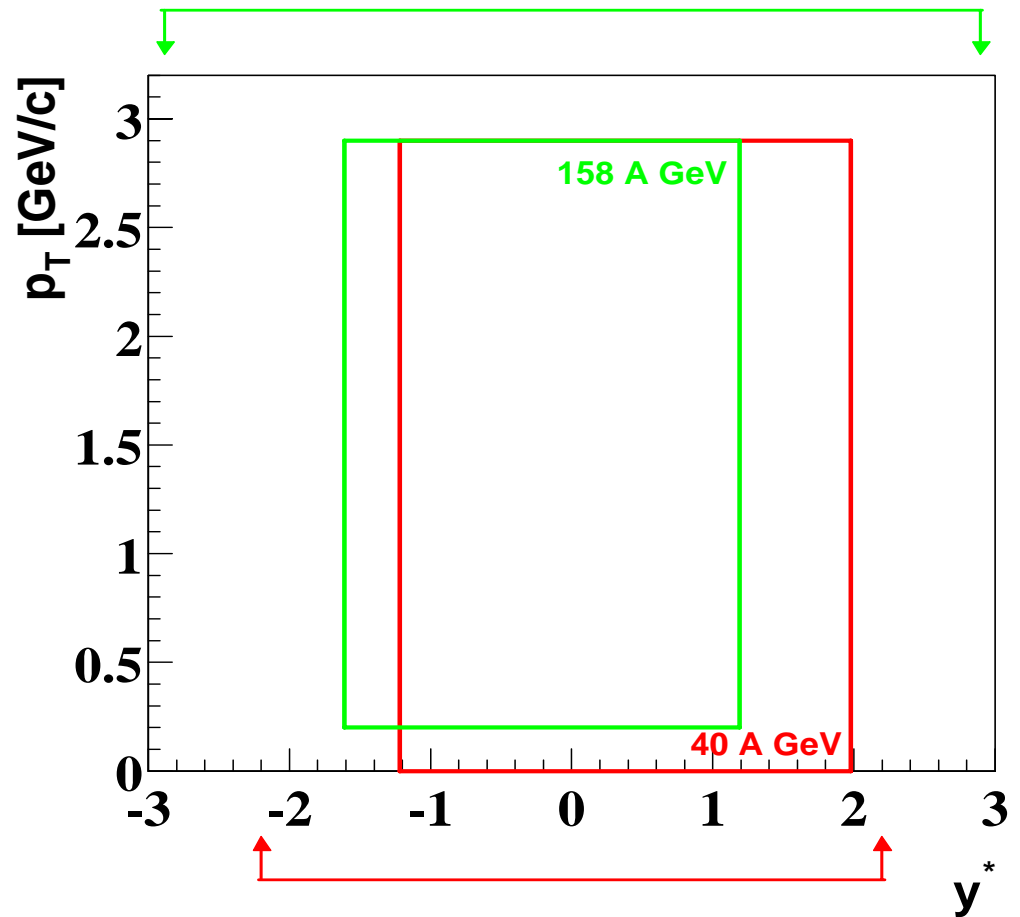
- Excitation Function for  $\Lambda$ -Production  
-> This Talk: 40,80 and 158 AGeV
- Special Interest in the Region between  
top AGS ( $\sim 11$  AGeV) and low SPS (40 AGeV)  
-> Because there are  
high Baryon Density Effects at mid-rapidity
- Our Contribution is the Result  
that the Net-Hyperon Density has a Maximum
- SIS 200 at GSI (10-40 AGeV)

## Acceptance Regions for Lambdas

### Analysed Data:

central Pb+Pb Events

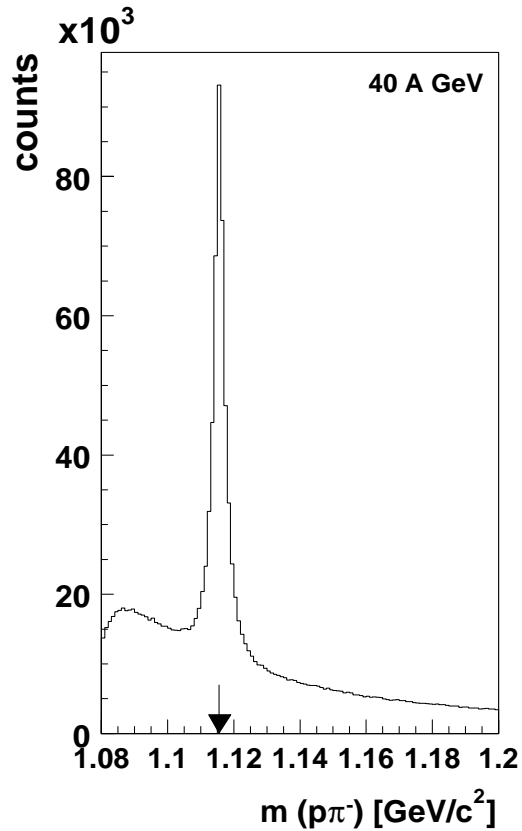
- 380k @ 40 AGeV  
7% cross-section  $\rightarrow \langle N_p \rangle \approx 349$
- 300k @ 80 AGeV  
7% cross-section  $\rightarrow \langle N_p \rangle \approx 349$
- 400k @ 158 AGeV  
10% cross-section  $\rightarrow \langle N_p \rangle \approx 335$



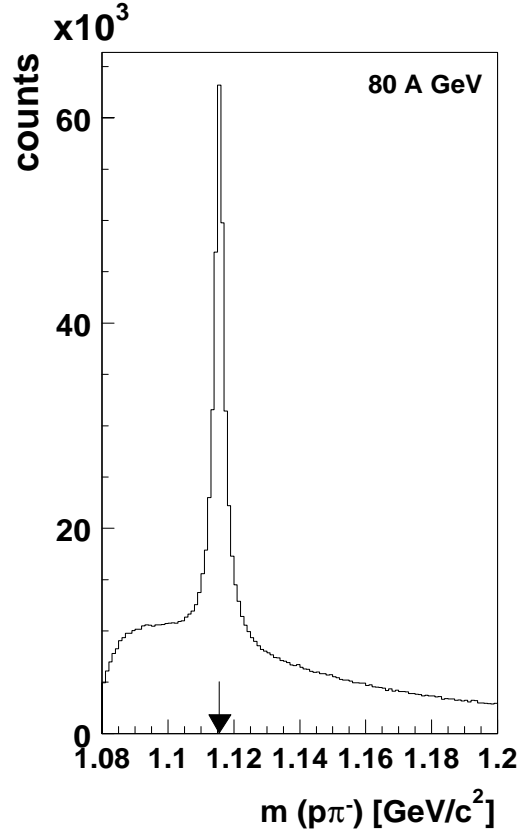
Large Acceptance

# Invariant Mass for $\Lambda$ -Hypothesis

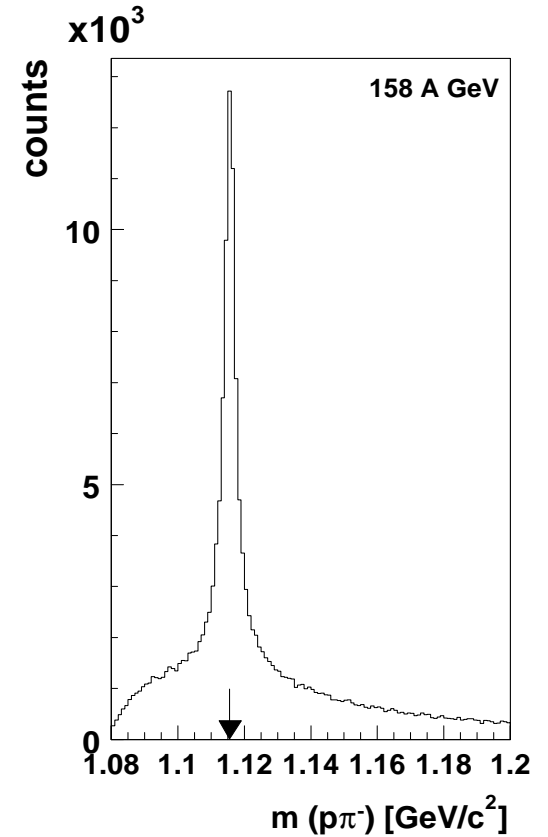
NA49 preliminary



$\sigma_{\text{mass}} = 2.0\text{MeV}$   
340,000 raw Lambdas



$\sigma_{\text{mass}} = 1.9\text{MeV}$   
220,000 raw Lambdas



$\sigma_{\text{mass}} = 2.2\text{MeV}$   
54,000 raw Lambdas

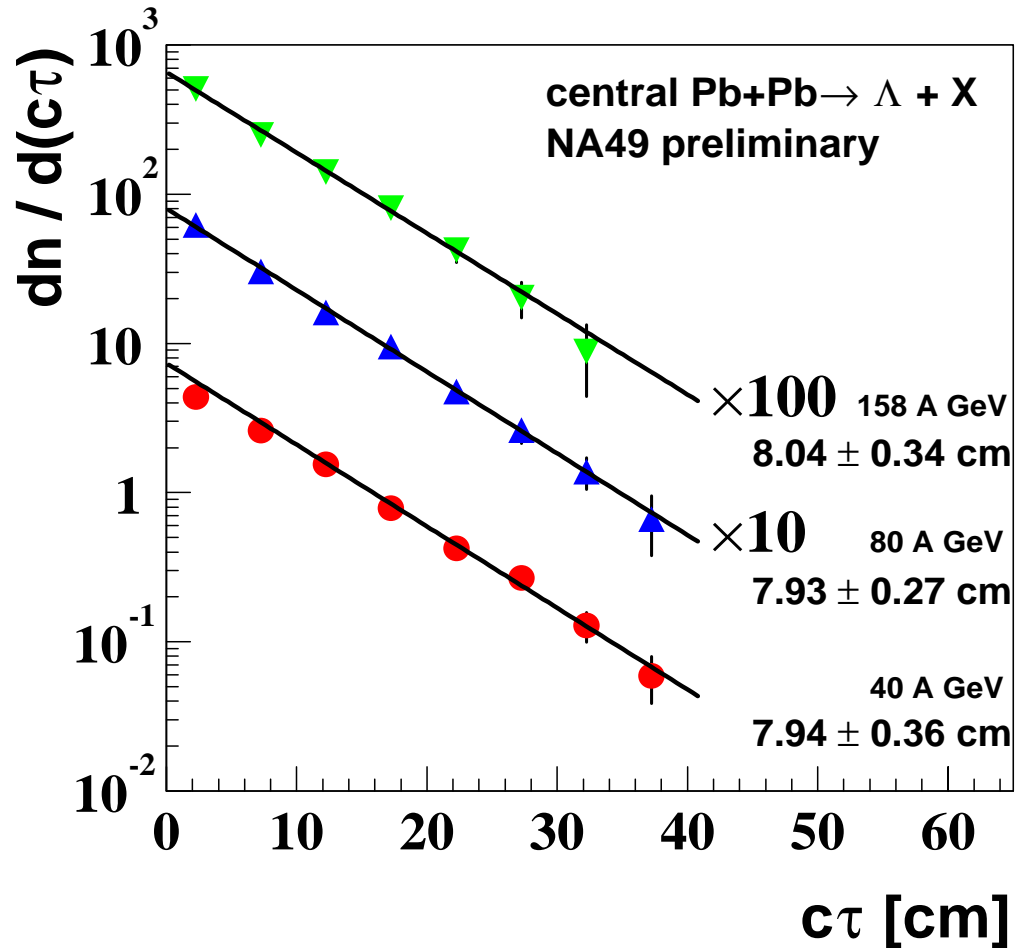
# Lambda Analysis

- Lambdas are reconstructed by their Decay Topology



- Corrections for

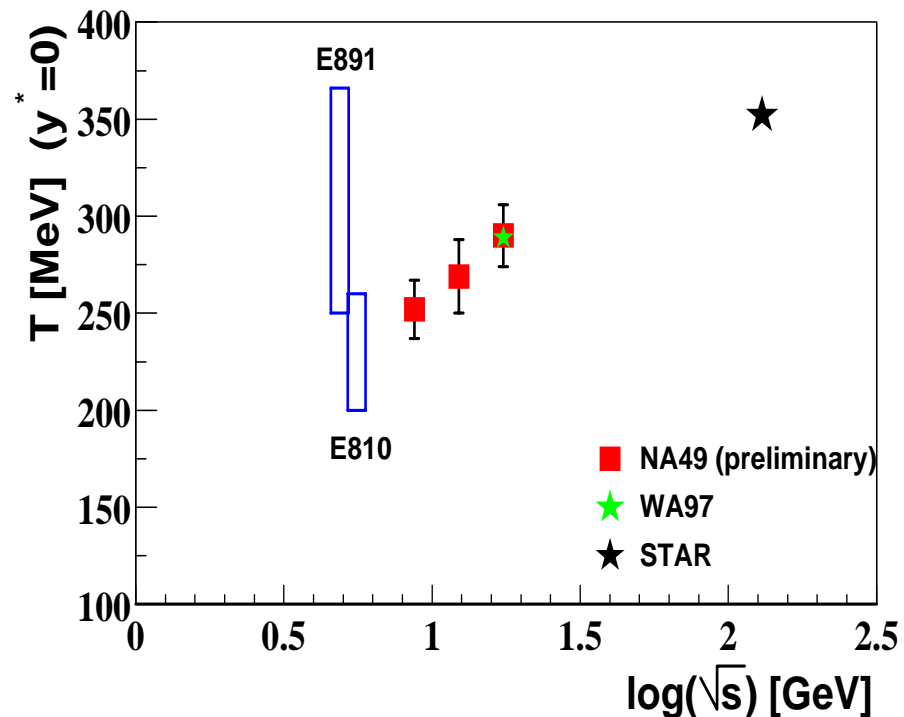
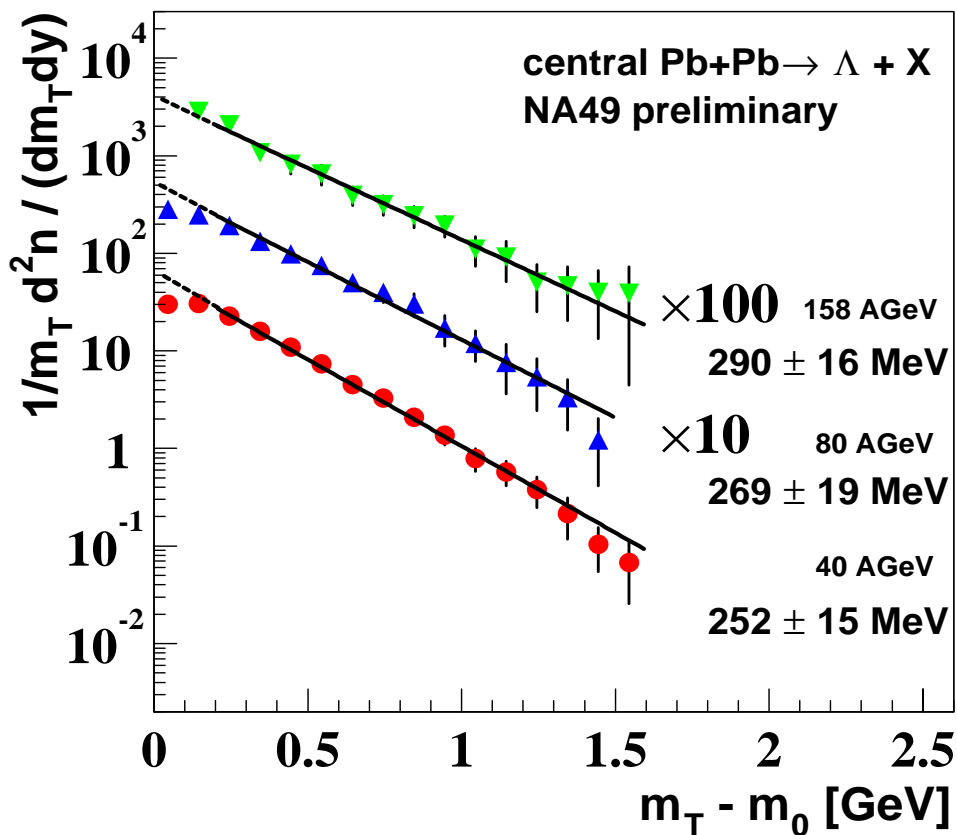
- Background
- Geometrical Acceptance
- Efficiency
- Branching Fraction



PDG:  $c\tau = 7.89$  cm

# Transverse Mass for Lambdas

$$|y^*| \leq 0.5$$

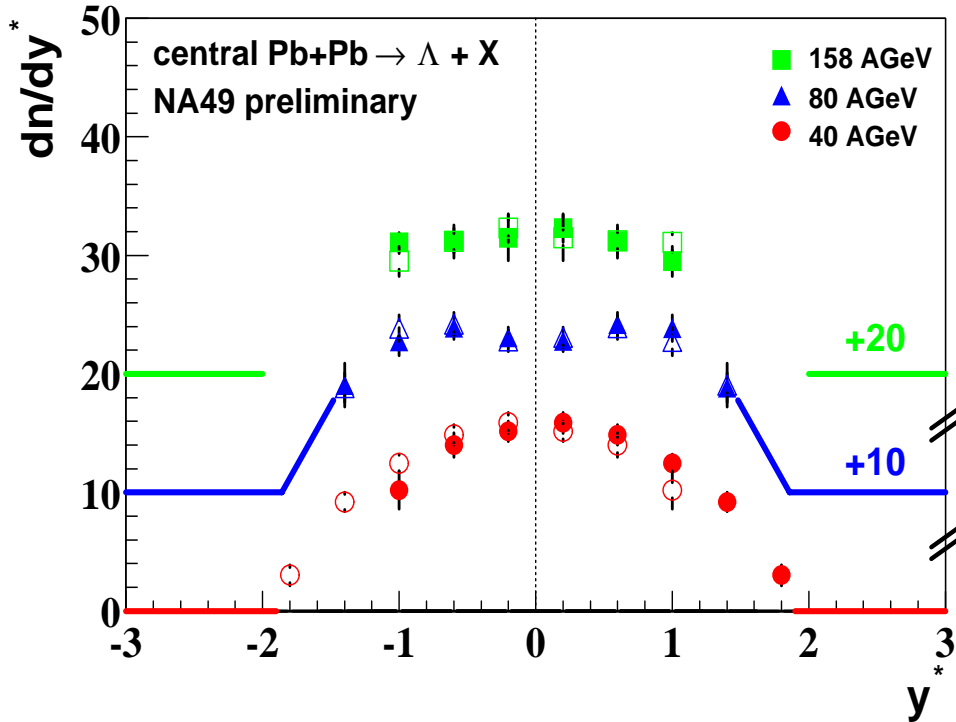


-> Different Slopes

$$\frac{1}{m_T} \frac{d^2n}{d(m_T)dy} \propto \exp\left(\frac{-m_T}{T}\right)$$

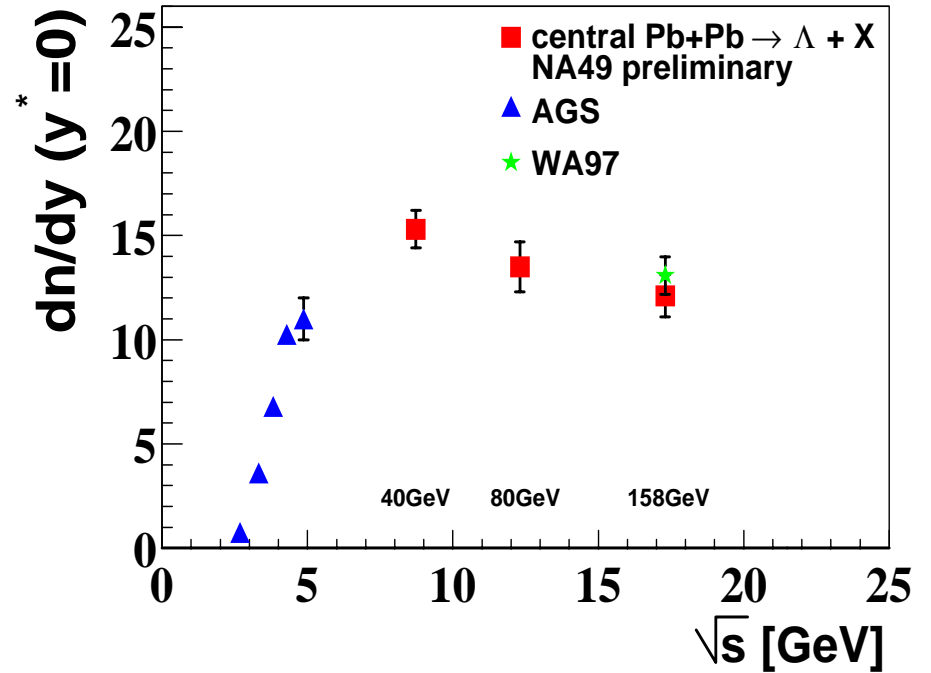


# Rapidity Spectra for Lambdas



-> The Shape is changing

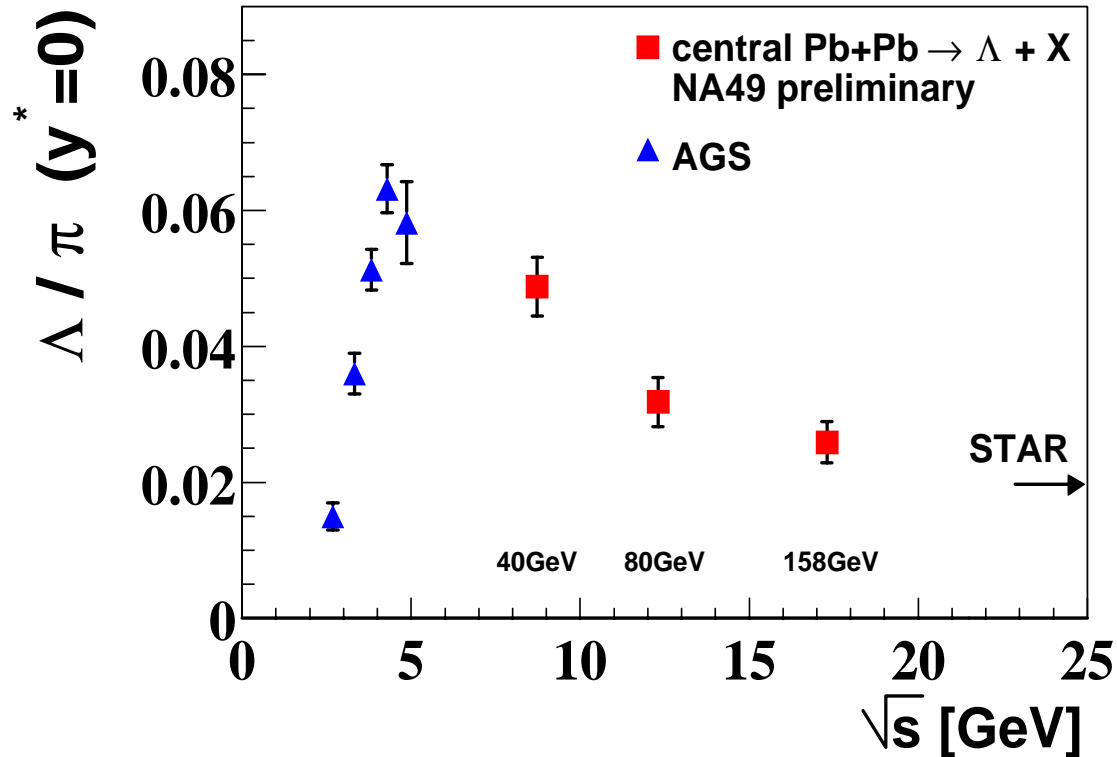
$\Lambda$  yield  
at mid-rapidity



-> highest Rapidity Density  
at or below 40 AGeV

# Energy Dependence 1

$\Lambda/\pi$  ratio  
at mid-rapidity



$$\pi = 1.5 \cdot (\pi^+ + \pi^-)$$

E895: D. Best, QM'99

E891: nucl-ex/9803006

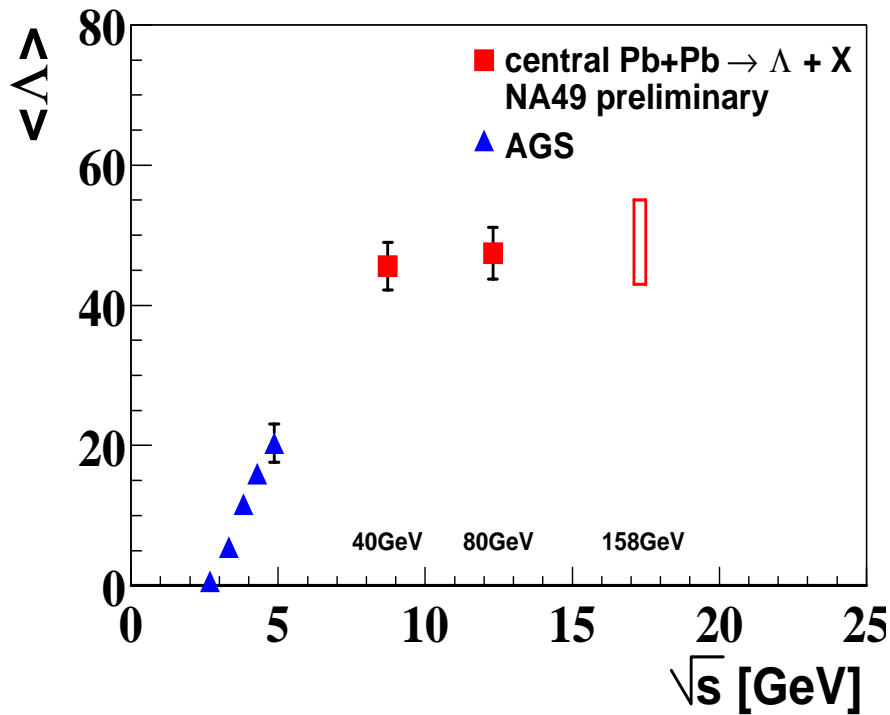
-> Effect of highest Rapidity Density  
is even enhanced in  $\Lambda/\pi$  ratio



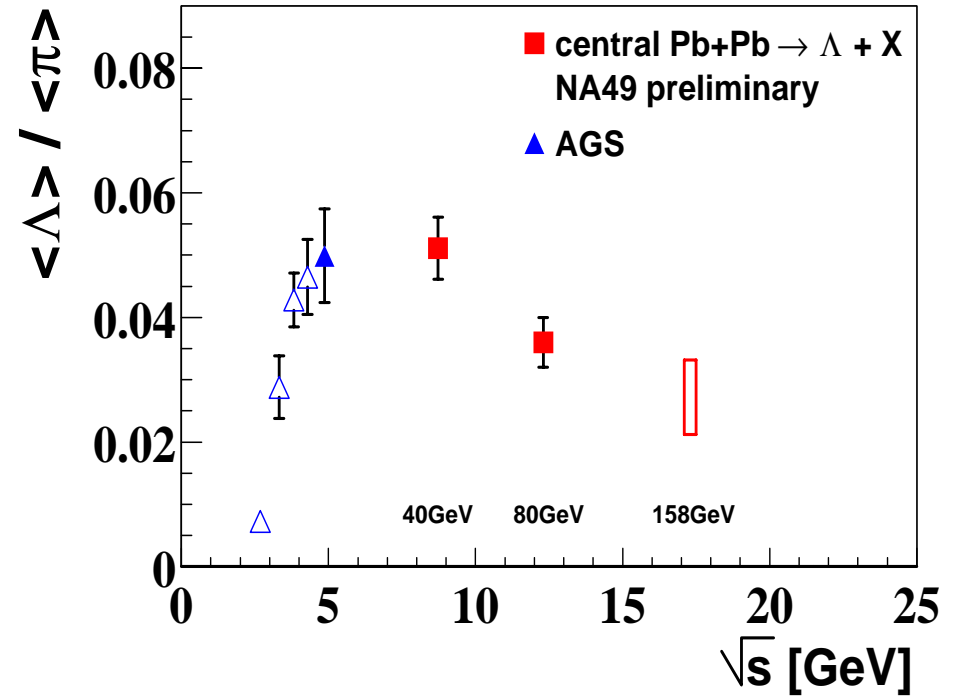
# Energy Dependence 2

## 4 $\pi$ -values

total yields



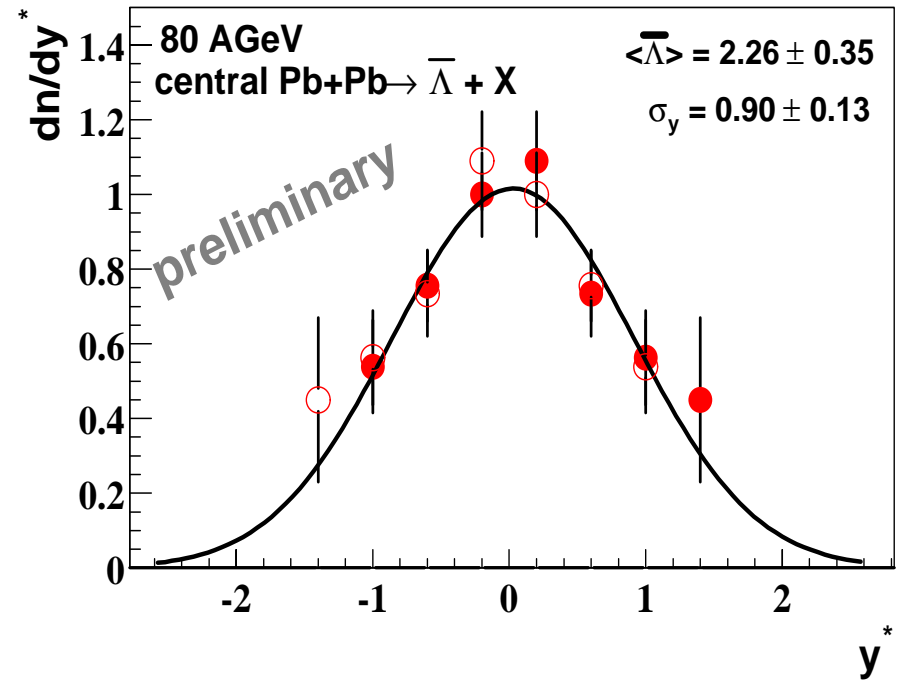
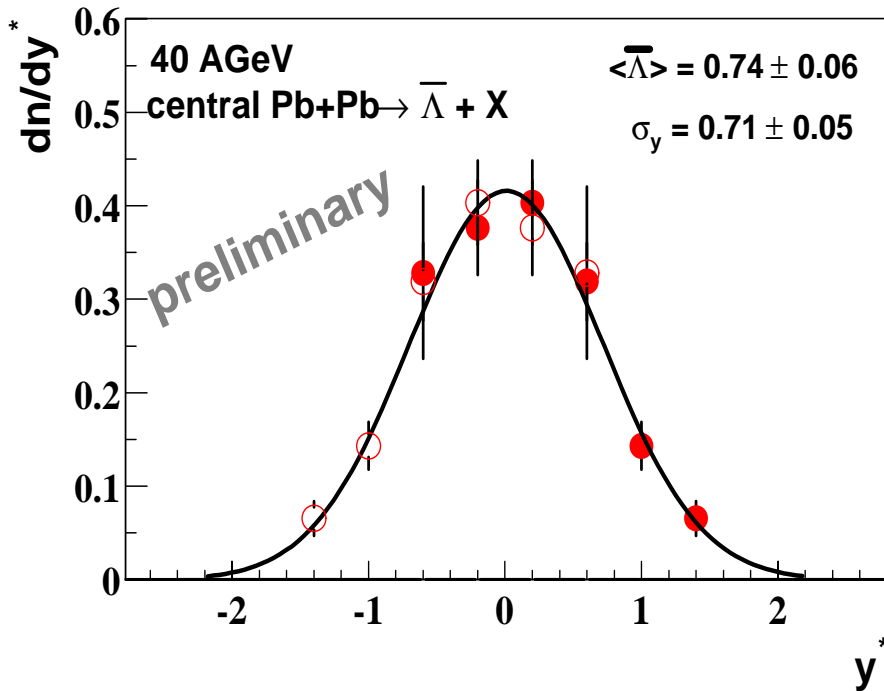
$\Lambda/\pi$  ratios



-> Non-monotonic  
Energy Dependence

E891: C. Pinkenburg, QM2001

# First Results on Antilambdas



40  $\rightarrow$  80 AGeV:  $\rightarrow$  Rapidity Distribution becomes broader  
 $\rightarrow$  Maximum increases by a factor of 2.5

## $\bar{\Lambda}/\Lambda$ ratios

NA49 preliminary	$\bar{\Lambda}/\Lambda$	
	mid-rapidity	$4\pi$
40 AGeV	$0.025 \pm 0.0023$	$0.016 \pm 0.0018$
80 AGeV	$0.079 \pm 0.01$	$0.048 \pm 0.005$

$$\bar{\Lambda}/\Lambda = 0.023 \pm 0.001$$

( $y^*=0$ ) NA57, QM2001

- $\bar{\Lambda}/\Lambda$  ratio increase by a factor  $\sim 3$   
40- $\rightarrow$ 80 AGeV for mid-rapidity and  $4\pi$

-> Effect of Baryon Density

## Summary and Outlook

- **First Results for 40 and 80 AGeV are available**  
also  $\pi$ , K: see talk T.Kollegger, Friday 9:00
- **Energy Dependence of  $\Lambda$ -Production**  
 $\Lambda/\pi$  ratio at 40 AGeV higher than in 158 AGeV  
-> Evidence of Non-monotonic Behavior
- **Inverse Slope ( $y^*=0$ ) seems to increase slightly with increasing Energy -> Transverse Flow**

Next: -  $\bar{\Lambda}$  Spectra

- $\Lambda$  in C+C collisions at 158 AGeV -> system size dependence
- $\Xi$  at 40 and 80 AGeV and  $\Omega$  at 158 AGeV
- $\phi$  at 40 and 80 AGeV

## The NA49 Collaboration

S.V. Afanasiev, T. Anticic, J. Bächler, D. Barna, L.S. Barnby, J. Bartke, R.A. Barton, L. Betev, H. Bialkowska, A. Billmeier, C. Blume, C.O. Blyth, B. Boimska, M. Botje, J. Bracinik, F.P. Brady, R. Bramm, R. Brun, P. Buncic, L. Carr, D. Cebra, G.E. Cooper, J.G. Cramer, P. Csato, P. Dinkelacker, V. Eckardt, F. Eckhardt, D. Ferenc, P. Filip, H.G. Fischer, Z. Fodor, P. Foka, P. Freund, V. Friese, J. Gal, R. Ganz, M. Gaździcki, G. Georgopoulos, E. Gladysz, J.W. Harris, S. Hegyi, C. Höhne, G. Igo, P. Jacobs, P.G. Jones, K. Kadija, A. Karev, V.I. Kolesnikov, T. Kollegger, M. Kowalski, I. Kraus, M. Kreps, B. Lasiuk, M. van Leeuwen, P. Levai, A.I. Malakhov, S. Margetis, C. Markert, B.W. Mayes, G.L. Melkumov, A. Mischke, J. Molnar, J.M. Nelson, G. Odyniec, G. Palla, A.D. Panagiotou, K. Perl, A. Petridis, M. Pikna, L. Pinsky, A.M. Poskanzer, D.J. Prindle, F. Pühlhofer, J.G. Reid, R. Renfordt, W. Retyk, H.G. Ritter, D. Röhrich, C. Roland, G. Roland, A. Rybicki, T. Sammer, A. Sandoval, H. Sann, E. Schäfer, N. Schmitz, P. Seyboth, F. Sikler, B. Sitar, E. Skrzypczak, R. Snellings, G.T.A. Squier, R. Stock, H. Ströbele, T. Susa, I. Szentpetery, J. Sziklai, M. Toy, T.A. Trainor, S. Trentalange, T. Ullrich, D. Varga, M. Vassiliou, G.I. Veres, G. Vesztergombi, S. Voloshin, D. Vranic, F. Wang, D.D. Weerasundara, S. Wenig, A. Wetzler, C. Whitten, N. Xu, T.A. Yates, I.K. Yoo, J. Zaraneek, J. Zimanyi