

# Status of $\Omega$ Analysis in Central Pb+Pb at 40 A·GeV

Michael C. Mitrovski  
NA49 Collaboration meeting  
08.10.2003  
CERN

---

Collaboration meeting - CERN - 08.10.2003



# Outline

- **Status of  $\Omega$  analysis in Pb+Pb at 40 A·GeV**
  - **Cut Variables**
  - **Simulation**
  - **$\Omega$  Invariant Mass Spectra and corrected midrapidity yield**
  - **$p_t$  - spectra**
  - **$y$  - spectra**
- **$\bar{B} / B$  - Ratio.**
- **Multistrange Hyperon Ratio.**
- **$\Omega / \pi$  - Ratio.**
- **Outlook.**

# Status of $\Omega$ analysis

- 579k 40 A·GeV central (7%) Pb+Pb  
 (00C,std-/00W,std+) Events analyzed.

## Event Cuts :

### std- -Data :

- Vertex Iflag (0.45 %)
- $Z_{\text{fit}}$  (-581.5;-580.6) (0.03 %)
- $X_{\text{bpd}} - X_{\text{fit}}$  (-0.08;0.1) (0.04 %)
- $Y_{\text{bpd}} - Y_{\text{fit}}$  (-0.082;0.041) (0.23 %)

### std+ -Data :

- Vertex Iflag (0.25 %)
- $Z_{\text{fit}}$  (-581.5;-580.65) (0.08 %)
- $X_{\text{bpd}} - X_{\text{fit}}$  (-0.1;0.08) (0.02 %)
- $Y_{\text{bpd}} - Y_{\text{fit}}$  (-0.060;0.041) (0.43 %)

---

$\approx 1.53 \%$

# Cut Variables



## $\Omega$ Candidate :

- $Z_{\text{vertex}} > -555 \text{ cm}$
- $|X_{\text{target}}| < 0.5 \text{ cm}$
- $|Y_{\text{target}}| < 0.25 \text{ cm}$
- $\Xi$  mass excluded
- $K + \Lambda$  vertex same side
- $p_t > 0.9 \text{ GeV}/c$

## Daughter $\Lambda$ candidate :

- GSI type
- $|Y_{\text{target}}| > 0.4 \text{ cm}$
- $dE/dx$  of decay proton
- Mass cut  $\Lambda (\pm 5 \text{ MeV})$

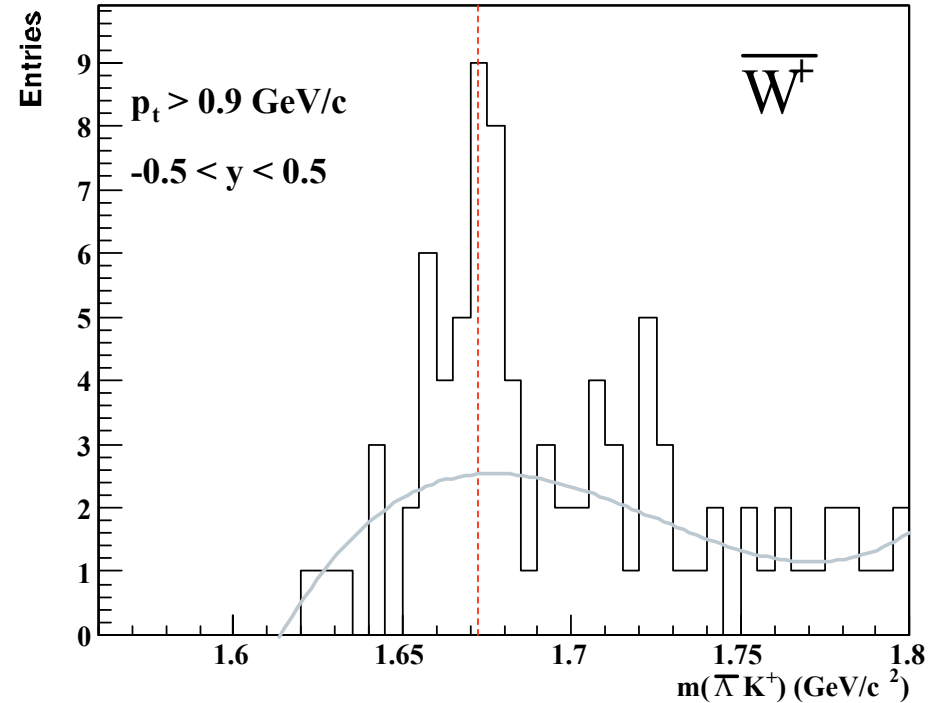
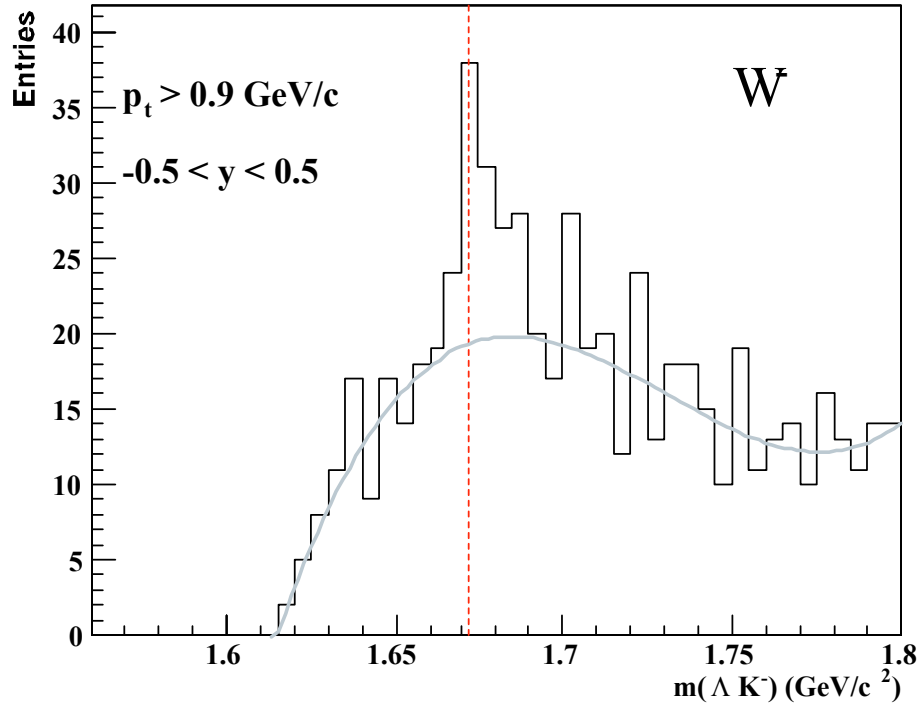
## Daughter Kaon candidate :

- $|b_y| > 1.0 \text{ cm}$
- $dE/dx$  of decay Kaon

# Simulation

- Generated particles :
  - only  $\Omega^-$
  - gaussian  $y$  distribution ( $\sigma = 1$ )
  - Boltzman type  $p_t$  distribution  
( $T = 300$  MeV)
  - only decay  $\Omega \rightarrow \Lambda K$
- GEANT + full reconstruction
- All analysis cuts applied
- With embedding in real data
- Procedure :
  - Generate particles
  - GEANT
  - Filter particles
  - *Empty event* reconstruction
  - Select particles for embedding
  - Embedding + matching
- Values :
  - Generated : 2084000
  - Reconstructed : 110285
  - Embedded : 51025
  - Matched : 587

# $\Omega$ Invariant Mass Spectra



# Corrected $\Omega$ midrapidity yield



• Integrated signal :

$$\Omega^- = 42.3 \pm 12.3$$

$$\overline{\Omega^+} = 17.3 \pm 5.7$$

$$\frac{\overline{\Omega^+}}{\Omega^-} = 0.41 \pm 0.18$$

• Corrected yield :

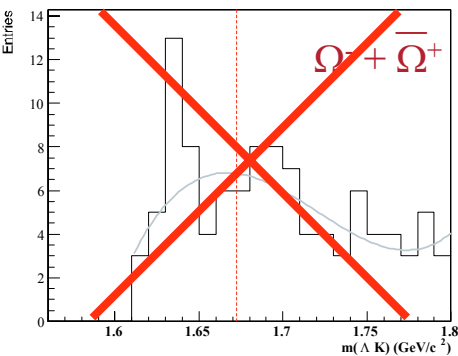
$$\Omega^- = 0.12 \pm 0.03$$

$$\overline{\Omega^+} = 0.048 \pm 0.016$$

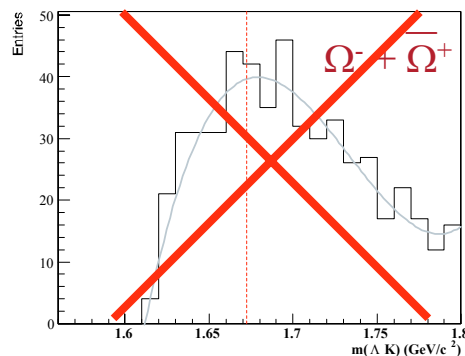
$$\frac{\overline{\Omega^+}}{\Omega^-} = 0.41 \pm 0.18$$

# Pt-spectra

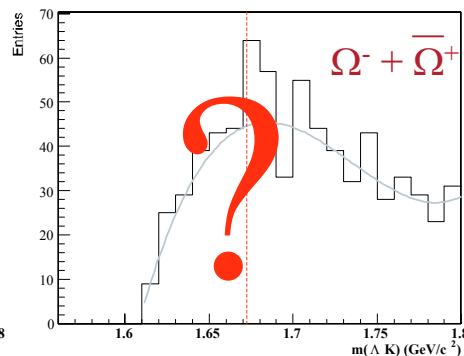
0.0 - 0.3 GeV/c



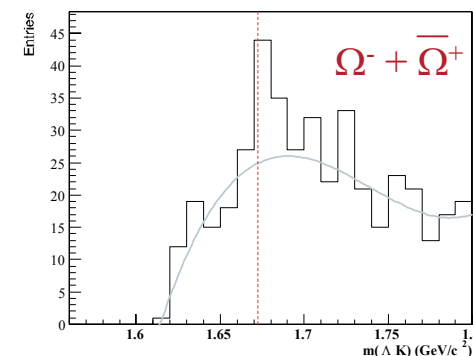
0.3 - 0.6 GeV/c



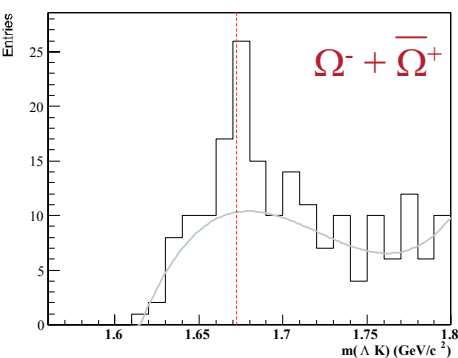
0.6 - 0.9 GeV/c



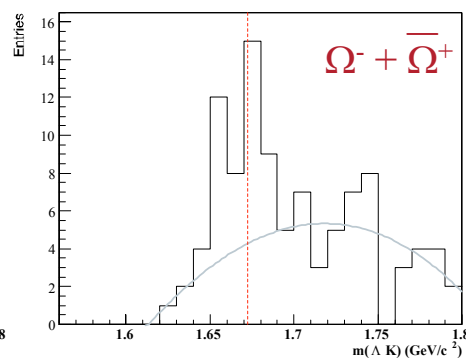
0.9 - 1.2 GeV/c



1.2 - 1.5 GeV/c

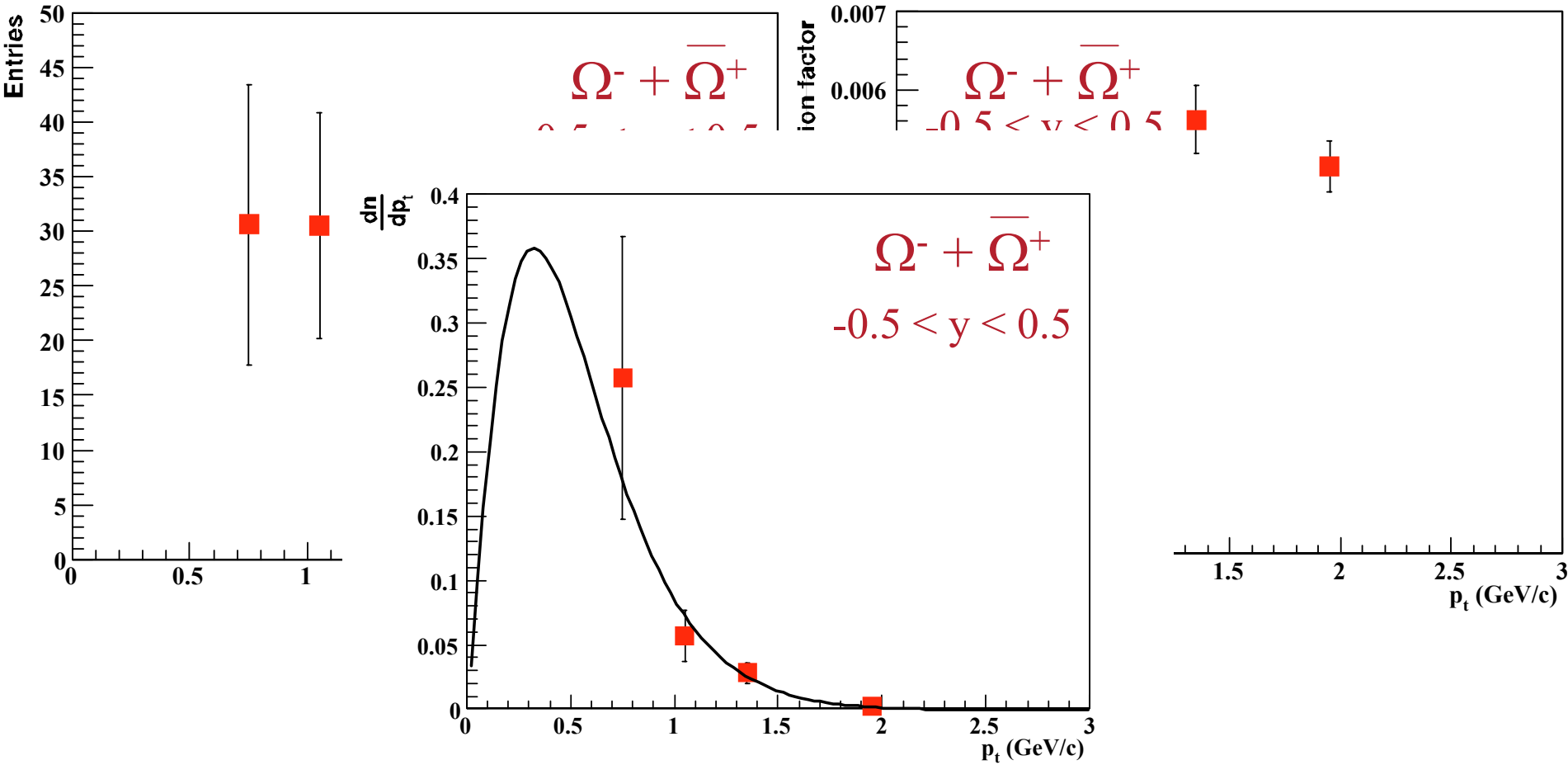


1.5 - 2.4 GeV/c

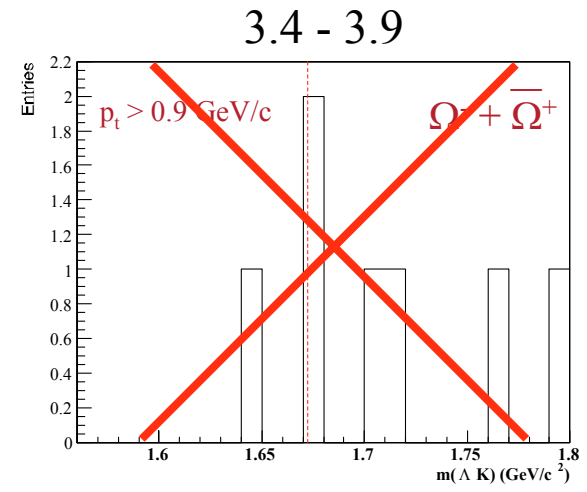
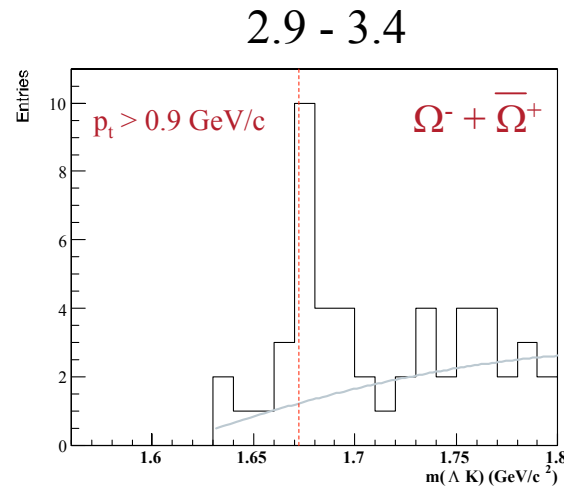
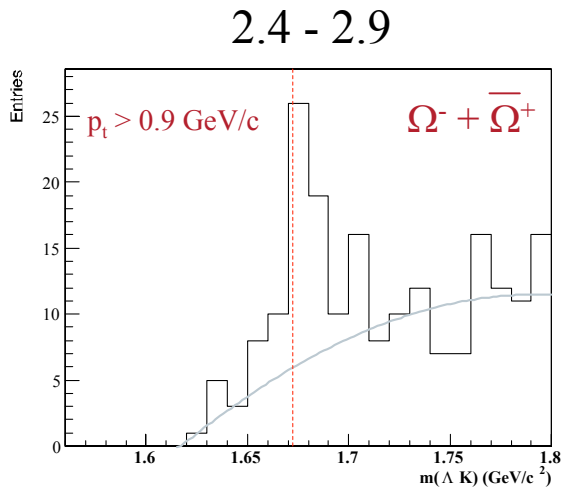
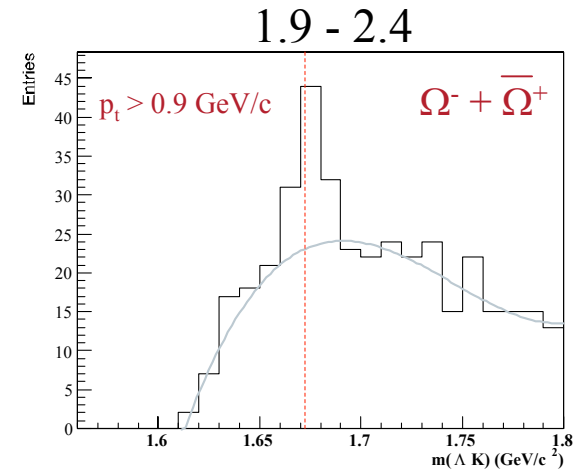
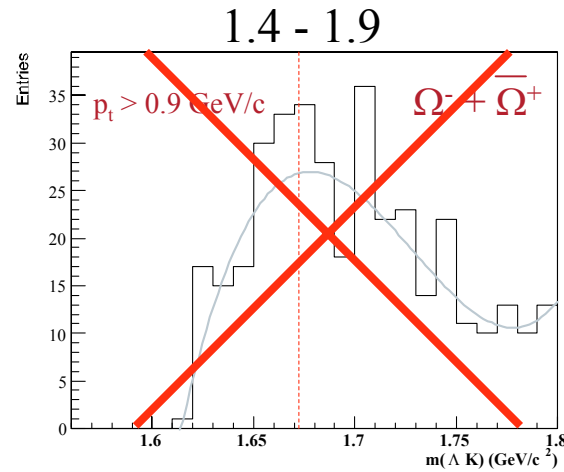
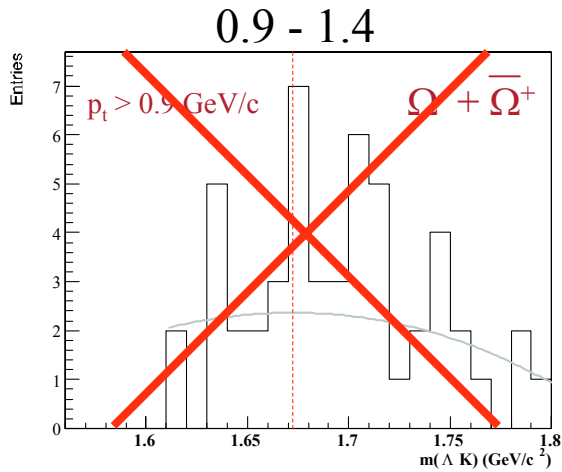




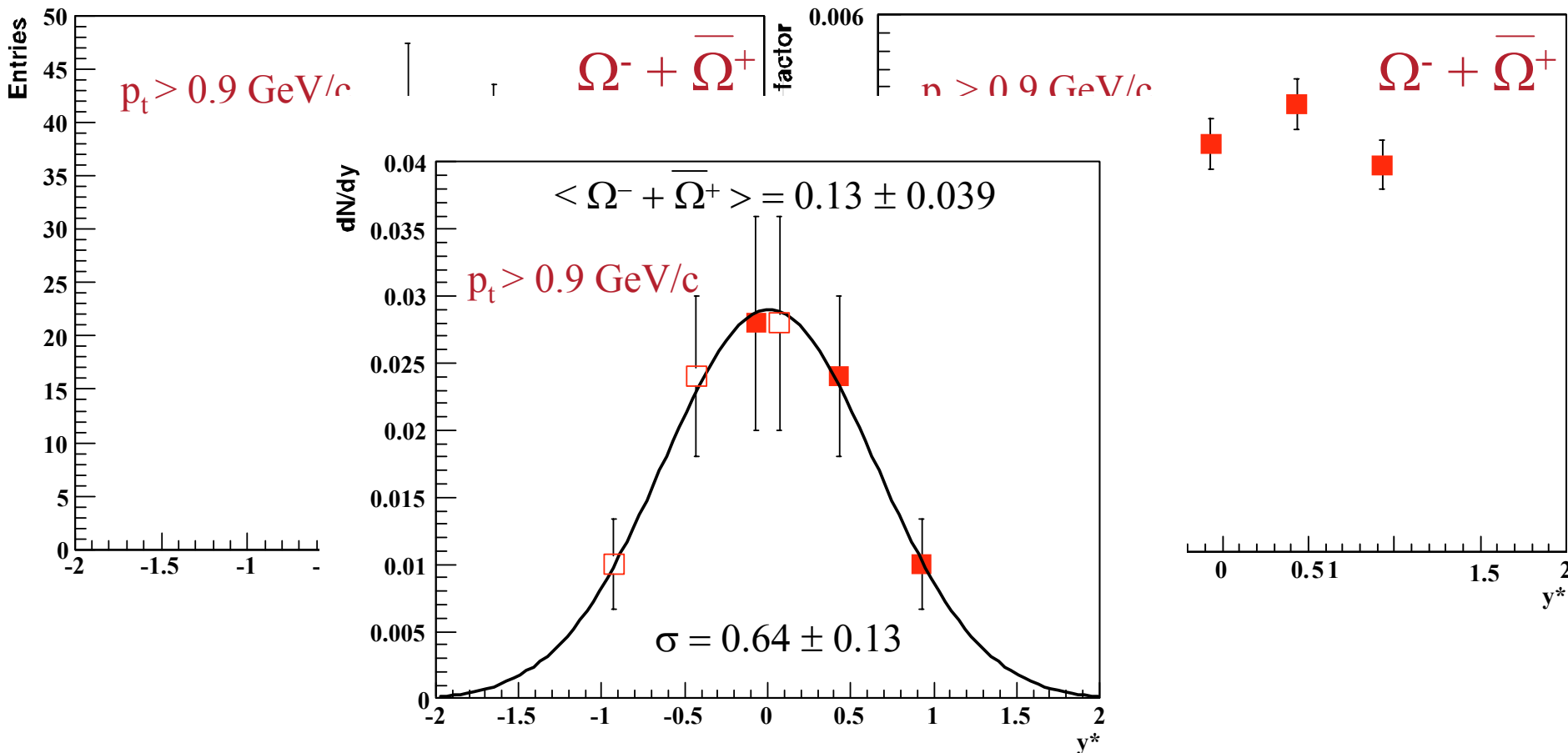
# Pt-spectra



# $\Lambda$ -spectra



# y-spectra



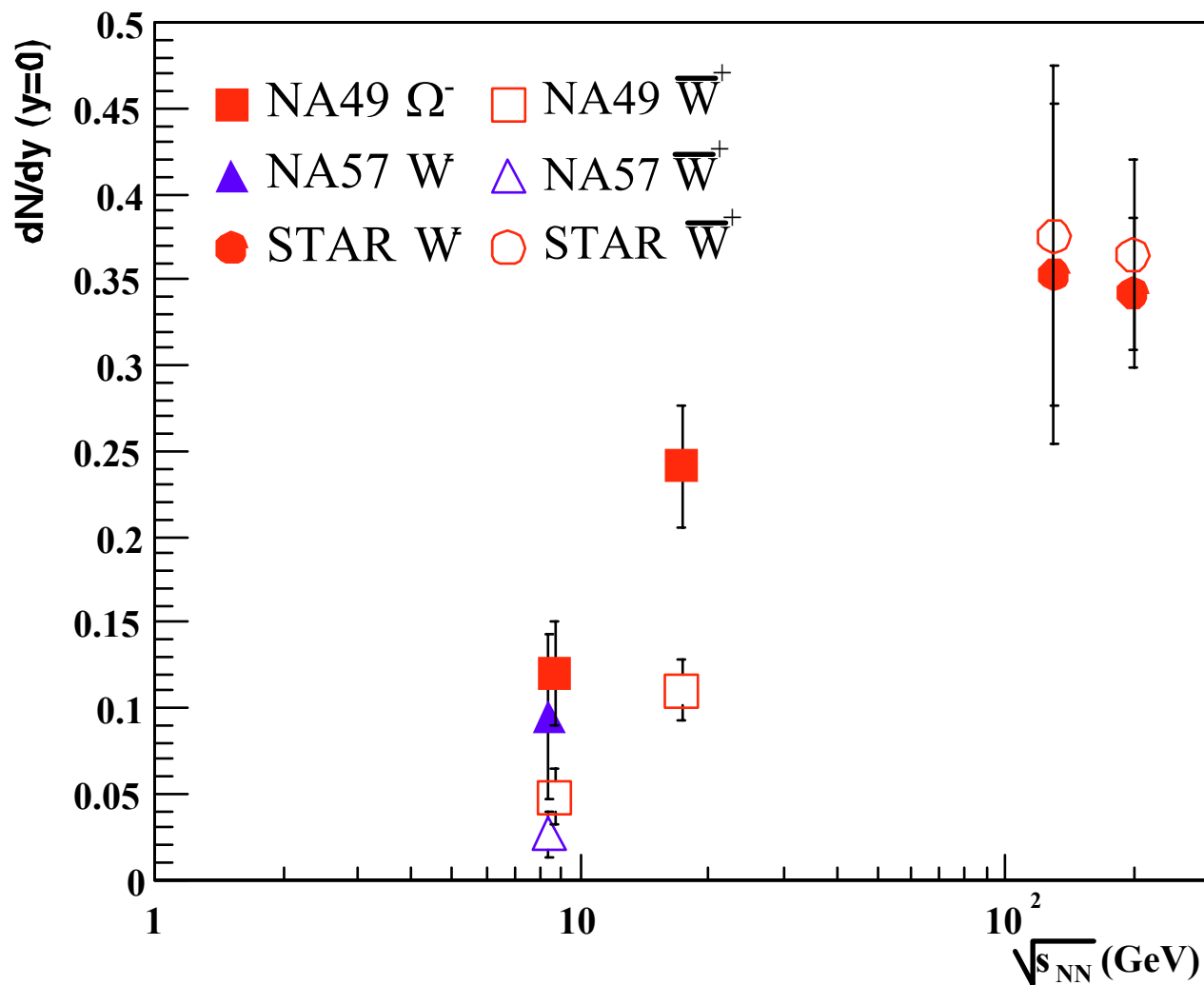
---

# Study of systematic error

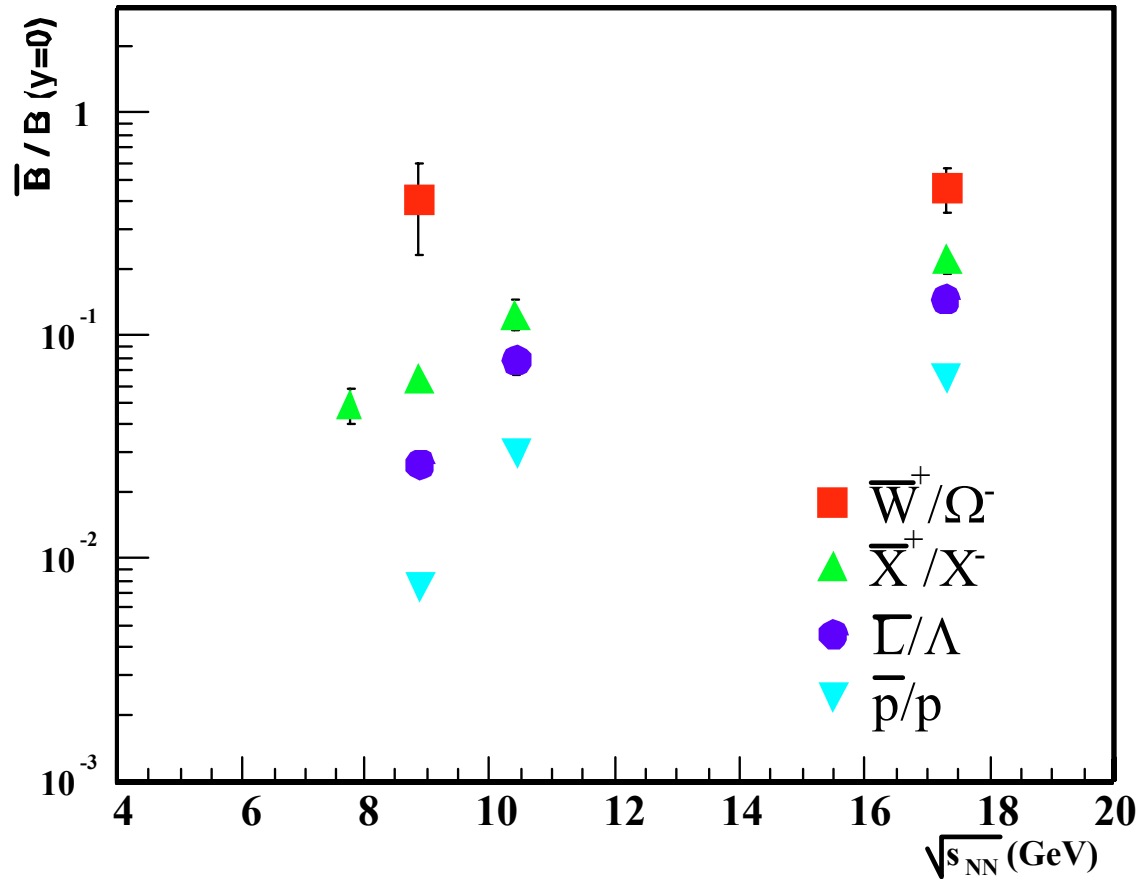


- New fit method.
- Stability check with variation of cuts.
  - $X_{\text{target}}$
  - $Y_{\text{target}}$
  - $Z_{\text{vertex}}$
  - Mass cut  $\Lambda$
  - width of  $\Omega$  Signal

# $\Omega$ midrapidity yield

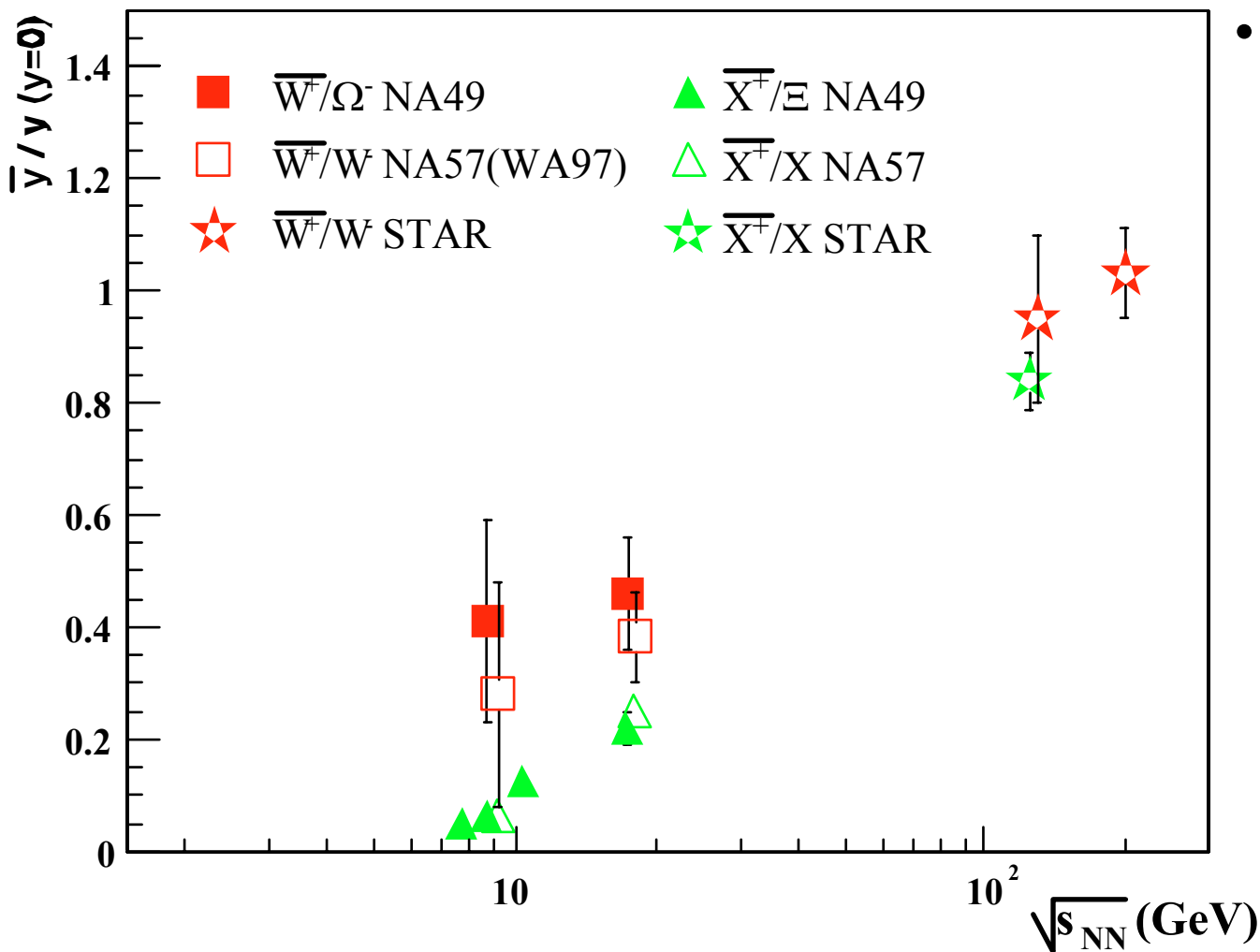


# $\bar{B} / B$ Ratio



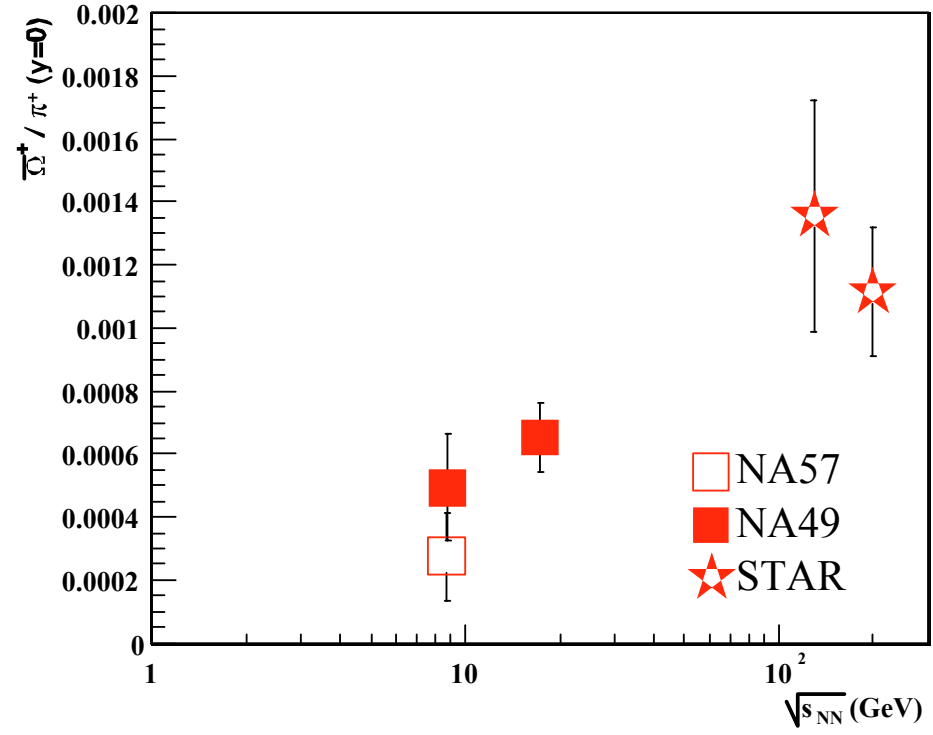
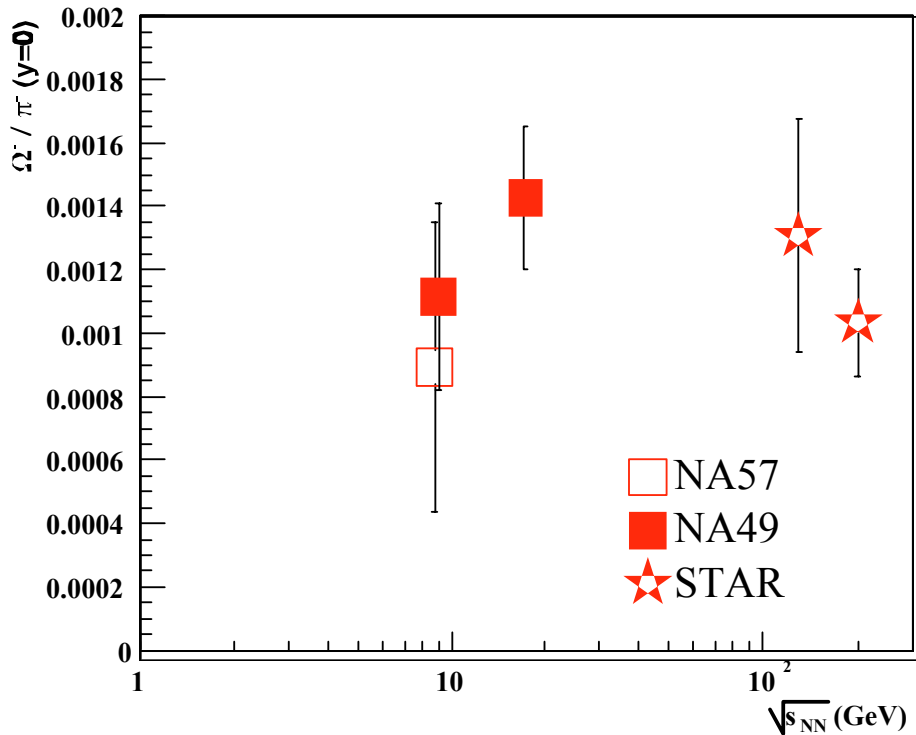
- Energy dependence of  $\bar{B} / B$  ratio gets weaker with increasing strangeness content at CERN SPS.

# Multistrange Hyperon Ratio



- The ratio increases from SPS to RHIC energies for  $\Omega$  and  $\Xi$ .

# $\Omega / \pi$ Ratio



- No energy dependence for  $\Omega^- / \pi^-$  ratio (note large errors).

- Increasing of  $\Omega^+ / \pi^+$  from SPS to RHIC energies.



# Outlook

## 40 A·GeV :

- Simulation of  $\Omega^+$ .
- Further studies of systematic error.
- Final yields.
- Final spectra.
- Final efficiency.

## Upcoming :

- Diploma.
- $\Omega^-$ ,  $\Omega^+$  - Signal at 20 (?), 30 and 80 A·GeV Pb+Pb (?).
- $\Omega^-$ ,  $\Omega^+$  - spectra and yields at 20 (?), 30 (?) and 80 (?) A·GeV Pb+Pb.
- Publication.

Talk for multistrange Hyperons (QM 2004)