Hyperon production in Pb+Pb collisions

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SPS

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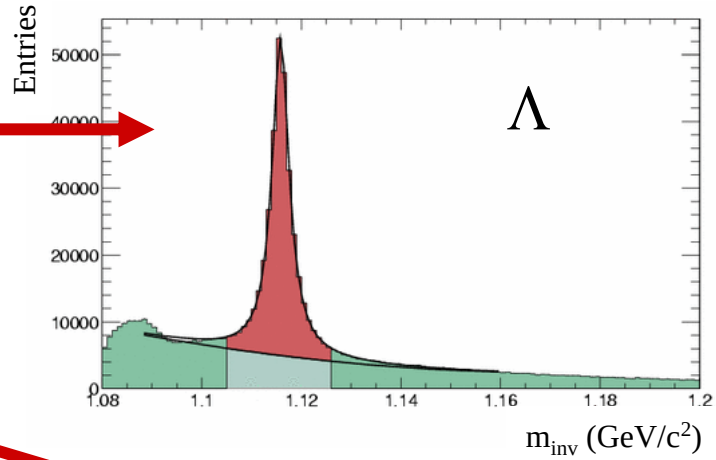
for the NA49 collaboration

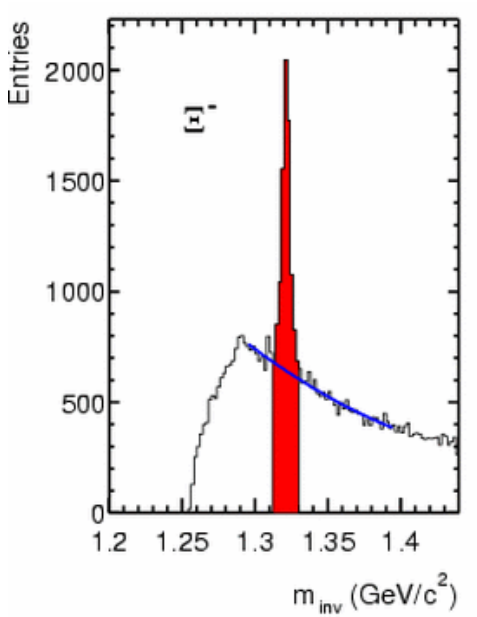
Outline

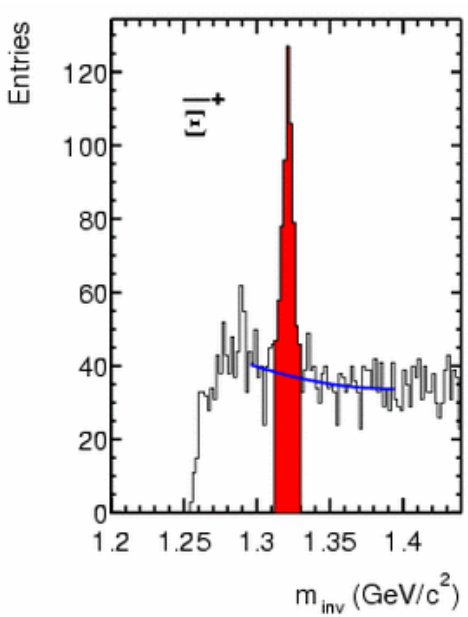
- New data: Ξ and Ω at 40AGeV, Λ at 30AGeV
- Transverse distribution
- Longitudinal distribution
- Energy dependence of hyperon production
- Centrality dependence of Ξ^- production at 40AGeV
- Summary and Outlook

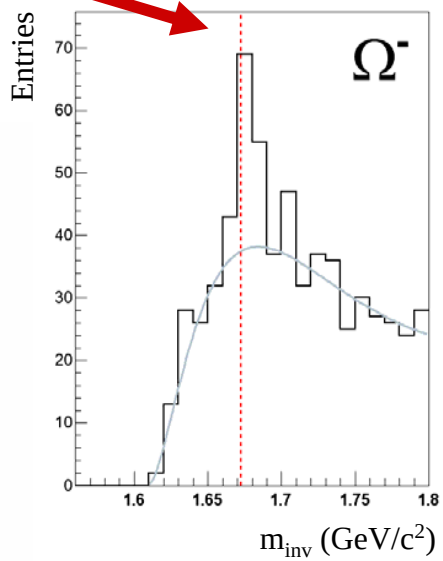
New data

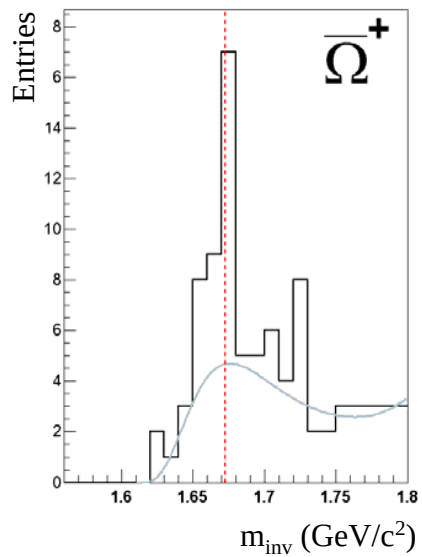
- **Λ at 30 AGeV**
- **Ξ and Ω at 40 AGeV**







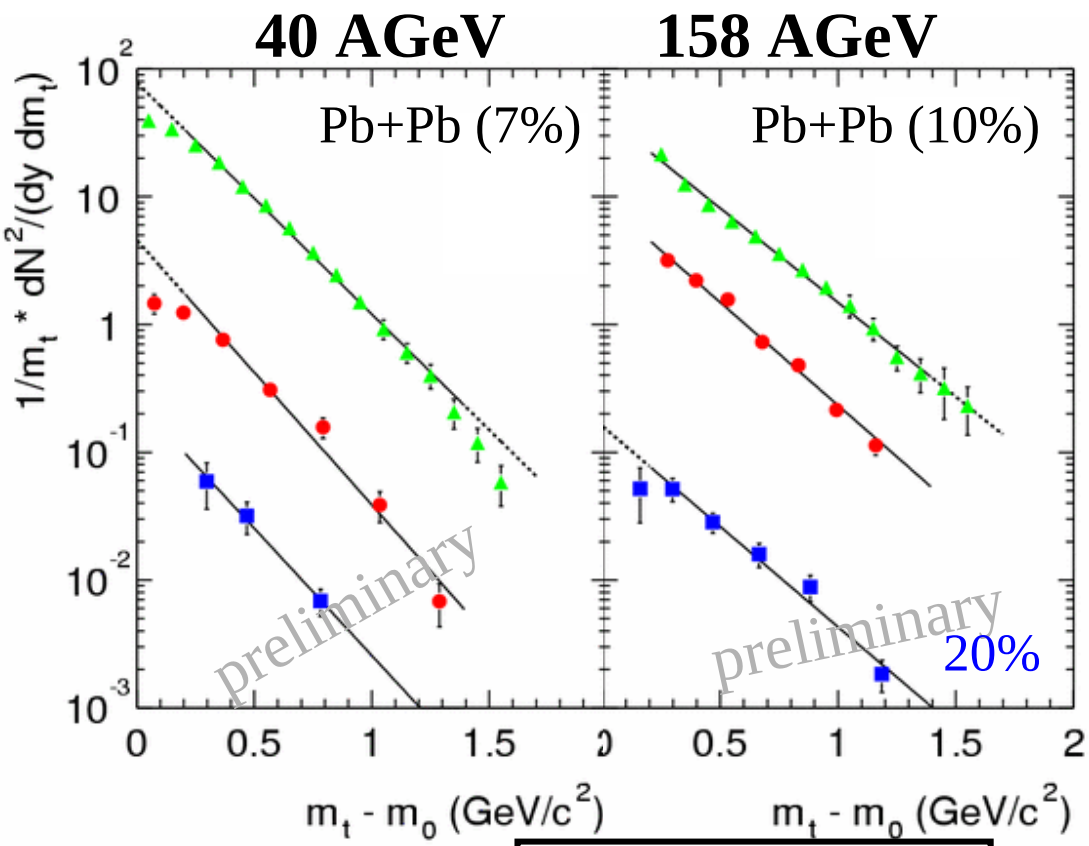




Transverse distribution: m_T –spectra

Exponential fit does not describe spectra very well at low and high m_T range.

T(MeV)	40GeV	158GeV
Ξ	210 ± 11	269 ± 7
Ω	218 ± 39	276 ± 23

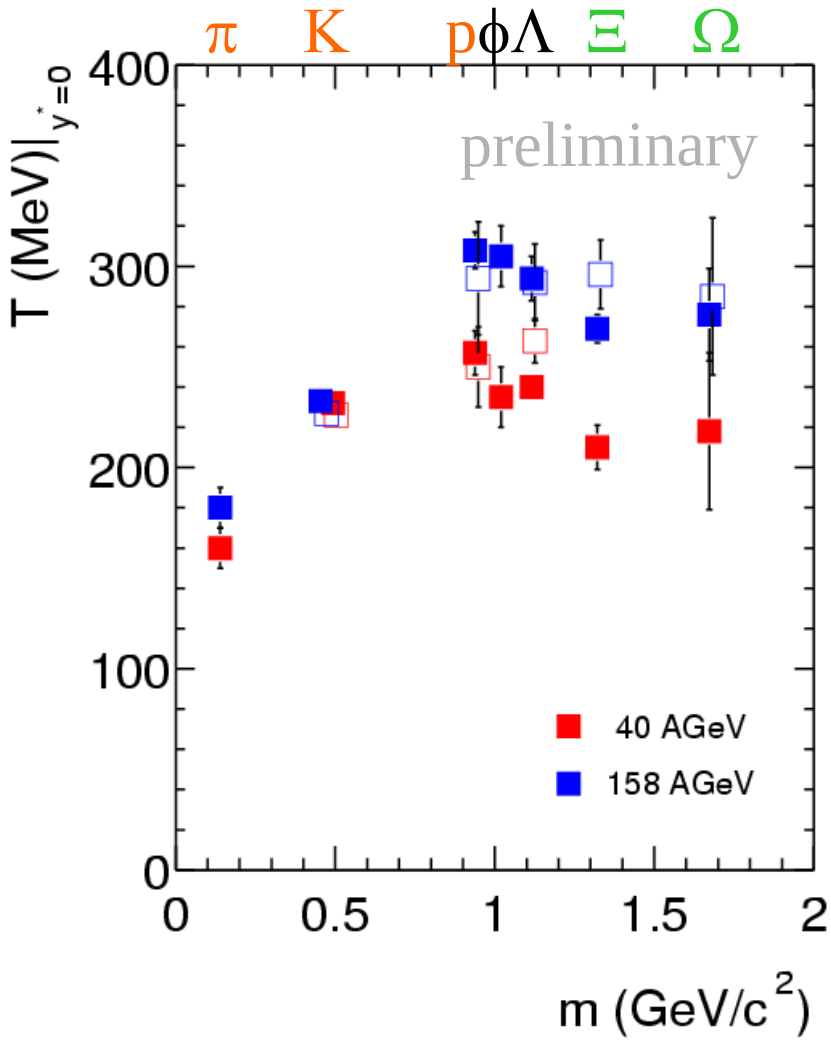


Λ at 40 and 158AGeV: nucl-ex/0311024
Ξ at 158AGeV: Phys. Lett. B 538 (2002) 275
Ω at 158AGeV: Nucl. Phys. A 715 (2003) 161c

Spectra at mid-rapidity
Fit range: 0.2-1.4

Transverse distribution: mass dependence of T

- Light particles show a linear increase of T with mass.
- For heavier particles T seems to saturate, but on different levels for different energies.



Open symbols: antiparticles

Transverse distribution: blast wave fit

Radial flow fit:

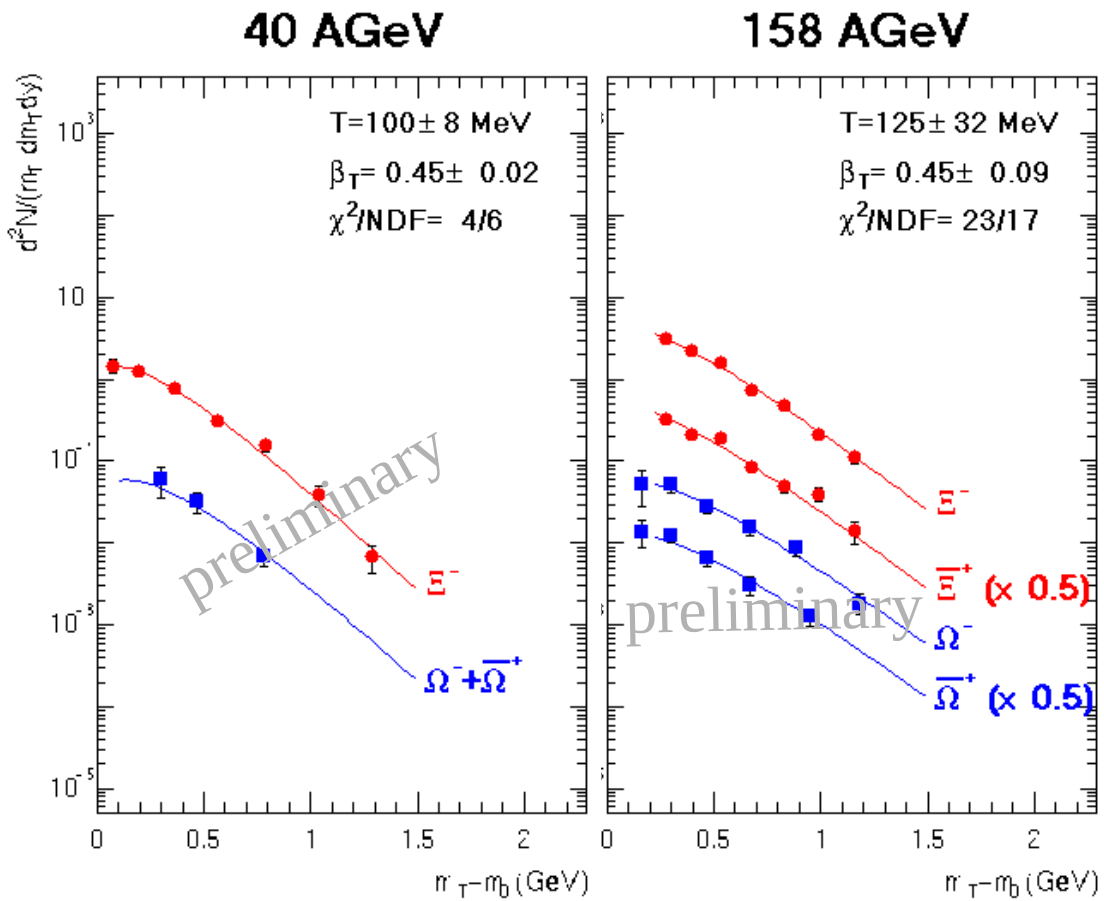
$$\frac{dN^2}{m_T dm_T dy} \propto m_T K_1\left(\frac{m_T \cosh\rho}{T}\right) I_0\left(\frac{p_T \sinh\rho}{T}\right)$$

$\rho = \text{atanh}\,\beta_T$

Schnedermann, Sollfrank, Heinz
Phys. Rev. C 48 (1993) 2462

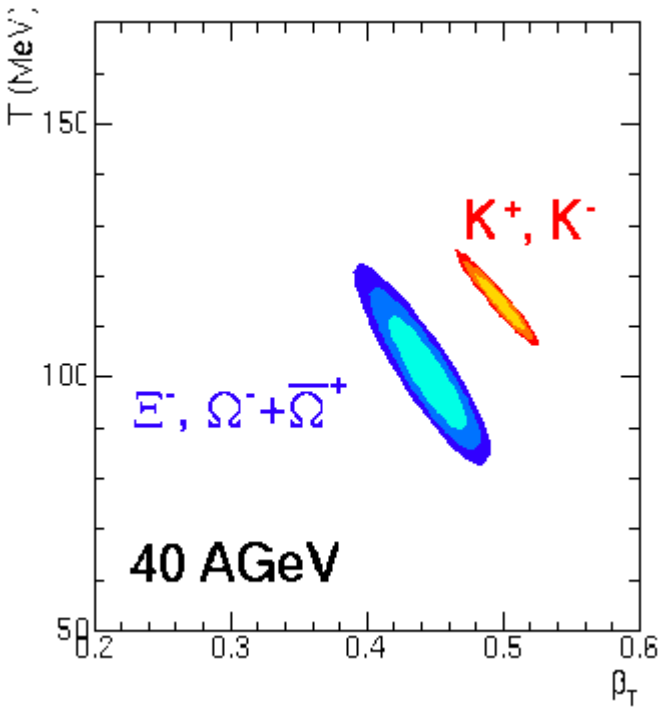
Good description of the spectra, also for low m_T range.

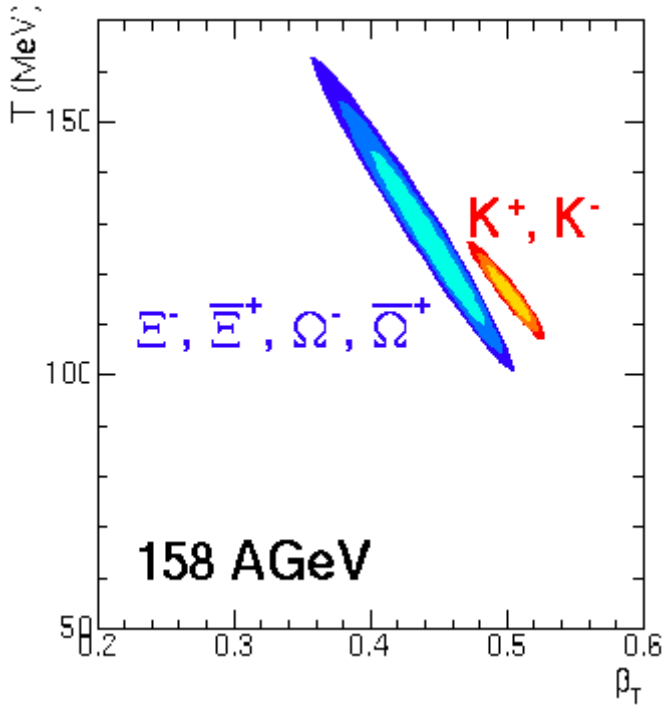
Similar parameters for both energy.



Same procedure for K^- and K^+

Transverse distribution: blast wave fit parameters



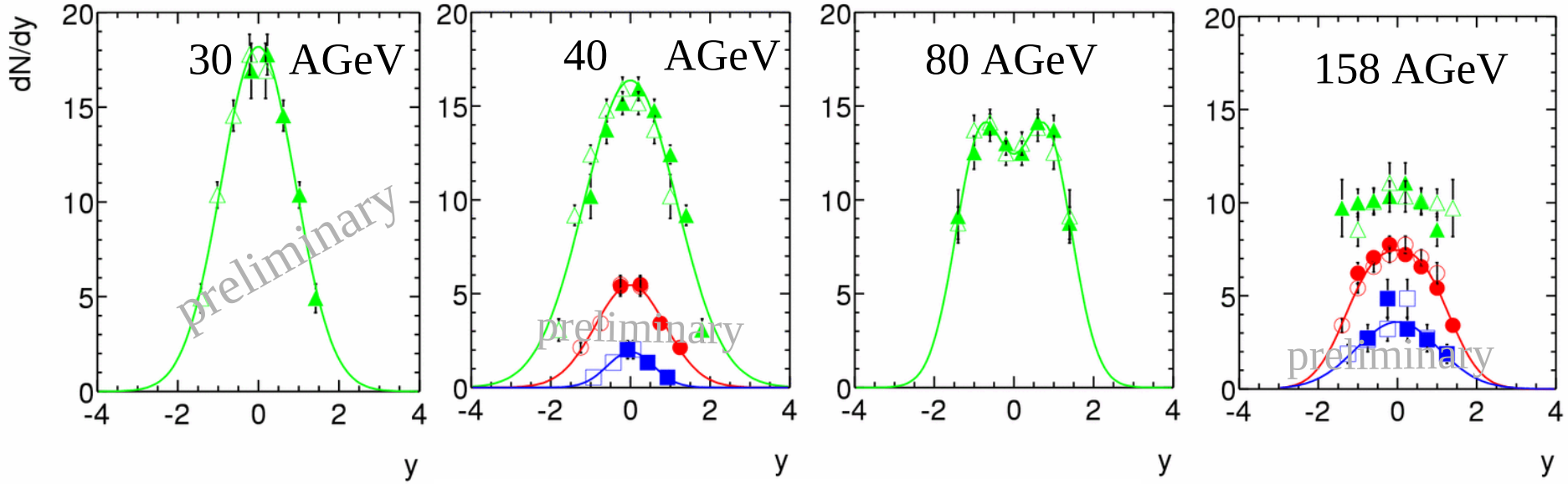


<u>40 AGeV</u>:
Slight differences of the parameters for $\Xi+\Omega$ and for K^-+K^+

<u>158 AGeV</u>:
Similar parameters

→ No evidence for early decoupling of Ξ and Ω

Longitudinal distribution: rapidity spectra



▲ Λ, ● Ξ, ■ Ω

- A clear evolution of shape of Λ is visible.
- No big change of shape of Ξ and Ω with energy.

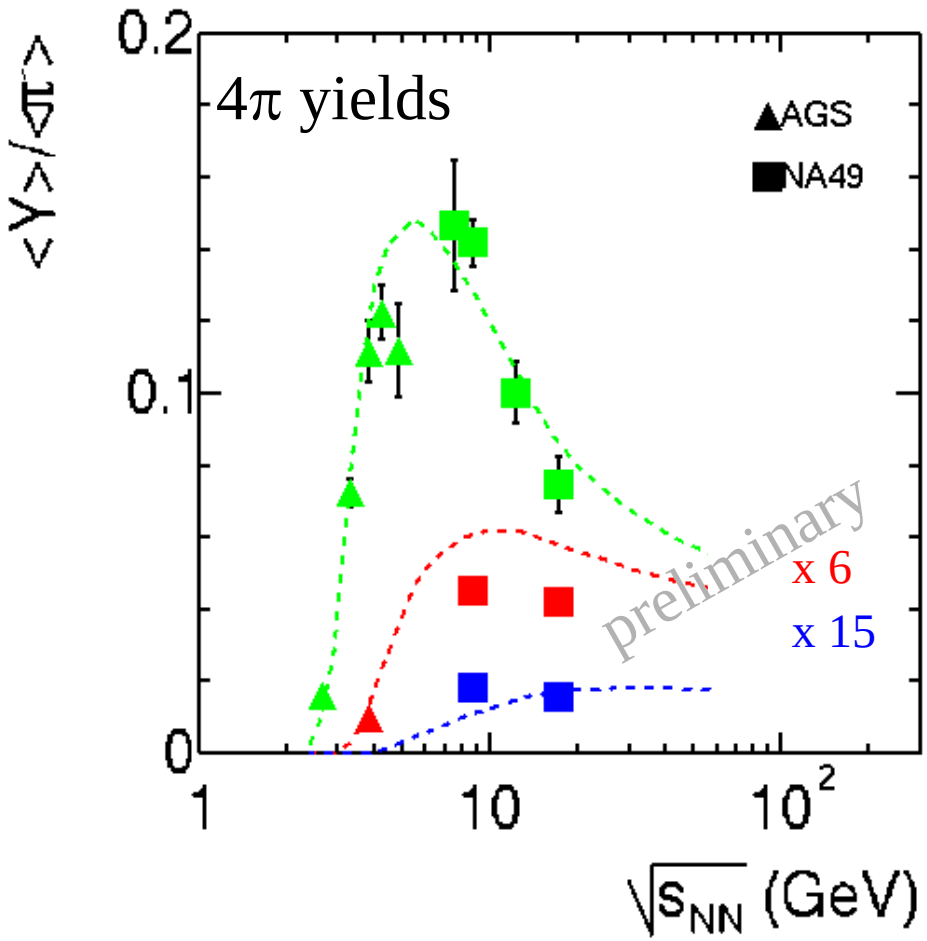
	30GeV	40GeV	80GeV	158GeV
<Λ>	40.3 ±2.0	45.6 ±1.9	47.4 ±2.8	44.1 ±3.2
<Ξ>	-	2.41 ±0.15	-	4.12 ±0.2
<Ω>	-	0.39 ±0.06	-	0.47 ±0.007

sys. error ~ 10%

Energy dependence of hyperon production

- Λs show a distinct maximum at 30AGeV.
- For Ξs and Ωs a weak maximum is indicated.

$Y = \Lambda, \Xi^-, \Omega^- + \bar{\Omega}^+$

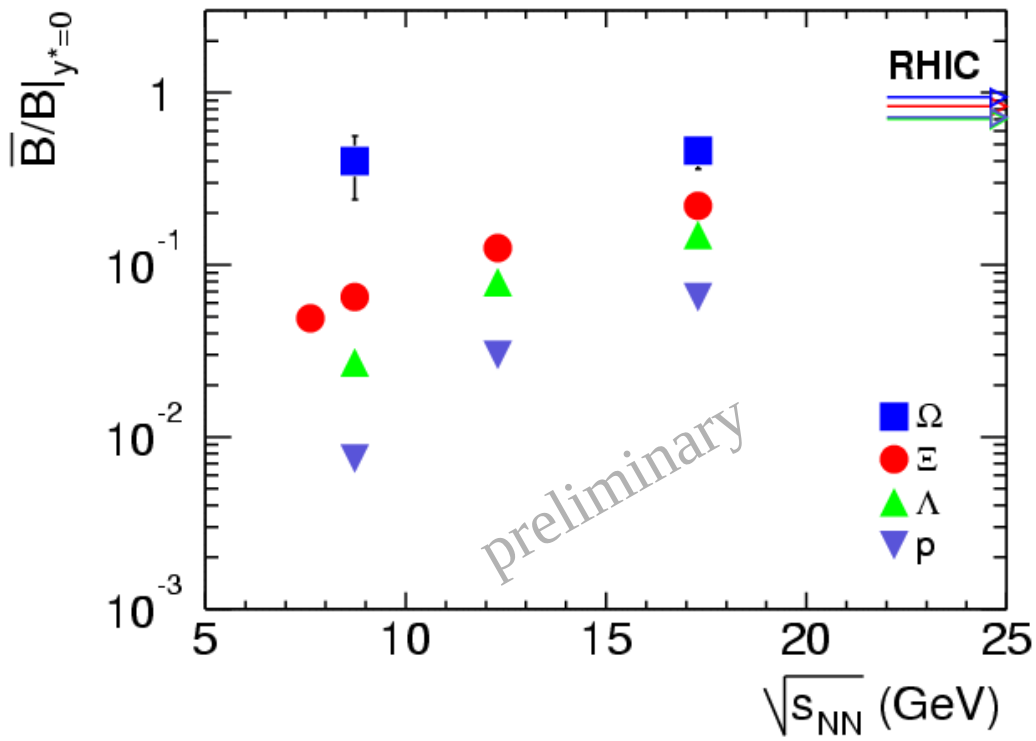


AGS data: E895

····· Hadron-gas model: Braun-Munzinger, Cleymans, Öschler, Redlich
Nucl. Phys. A697 (2002) 902

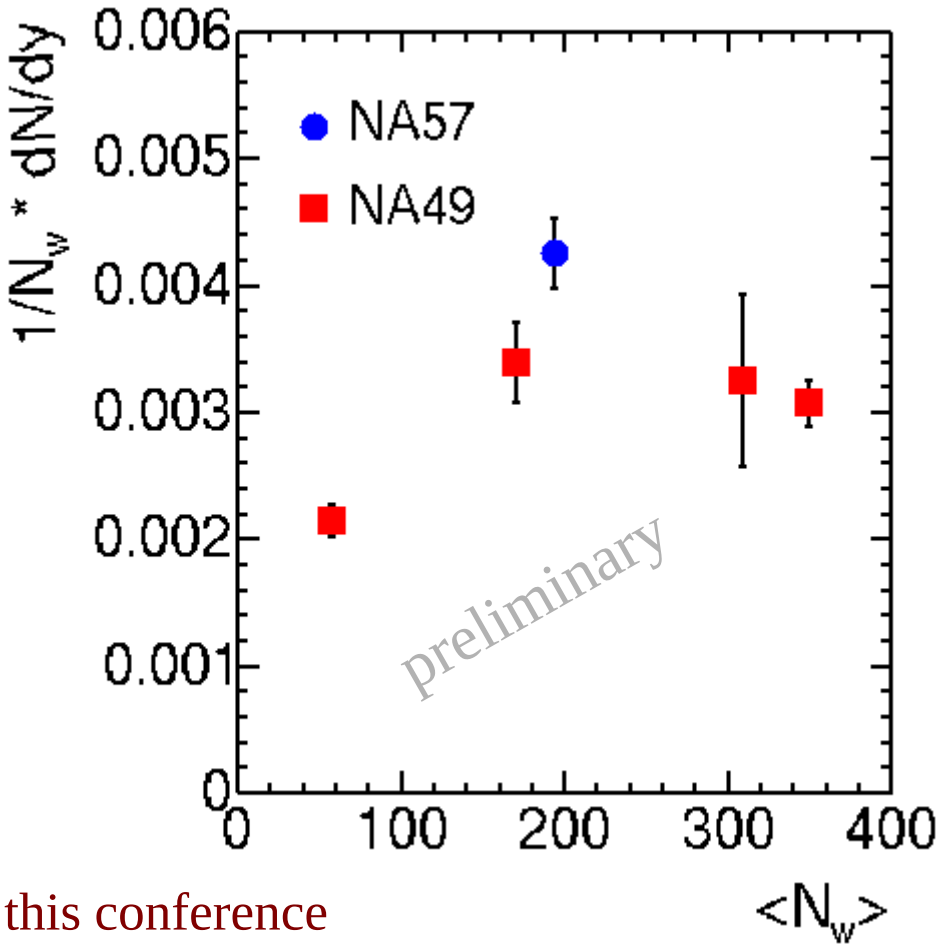
Energy dependence of $\bar{B}/B$ at mid-rapidity

Energy dependence of $\bar{B}/B$ changes with strangeness content of the particles.



Centrality dependence of Ξ^- at 40AGeV

At 40AGeV the Ξ^--production shows a saturation effect from mid-central to central reactions.



See also:
"System size dependence" poster at this conference presented by Ingrid Kraus

Summary

- **New data: Ξ, Ω at 40AGeV, Λ at 30AGeV in Pb+Pb collisions**
- **Transverse distributions:**
  - Mt-spectra: no good description by exponential fit but by blast wave fit
  - No evidence of early decoupling of Ξ and Ω
- **Longitudinal distributions:**
  - Rapidity spectra: clear evolution of shape of Λ from 30 to 158AGeV, Gausian shape for Ξ and Ω at 40 and 158AGeV
- **Energy dependence:**
  - Distinct maximum at 30AGeV for Λ/π^-,weak maximum for Ξ/π^- and Ω/π^-
  - $\overline{B}$/B-ratio: energy dependence changes with strangeness content
- **Centrality dependence of Ξ^-/N_W at 40AGeV:**
  - Increase from peripheral to mid-central and followed by saturation
- **Outlook:**
  - Complete analysis of hyperons with data at 20, 30, 40, 80, and 158AGeV