

Ξ^- and Ξ^+ production in Pb+Pb
collisions at 40A·GeV
at  SPS

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1. Outline

- Motivation
- NA49 experiment
- Analyzed data sets and centrality bins
- Ξ -analysis
- Results:
 - Centrality dependence of Ξ^+/Ξ^- -ratio
 - Energy dependence of Ξ^+/Ξ^- -ratio
- Summary and outlook



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2. Motivation

- Measurement of multiple strange particles provide important information on hadronization features of heavy ion collisions
- Looking for qualitative changes (onset phenomena), when varying:
 - System size
 - Energy density
- Study of Ξ –production as function of:
 - Collision centrality
 - Beam energy
- Ξ^+/Ξ^- -ratio reflects changes in baryon density



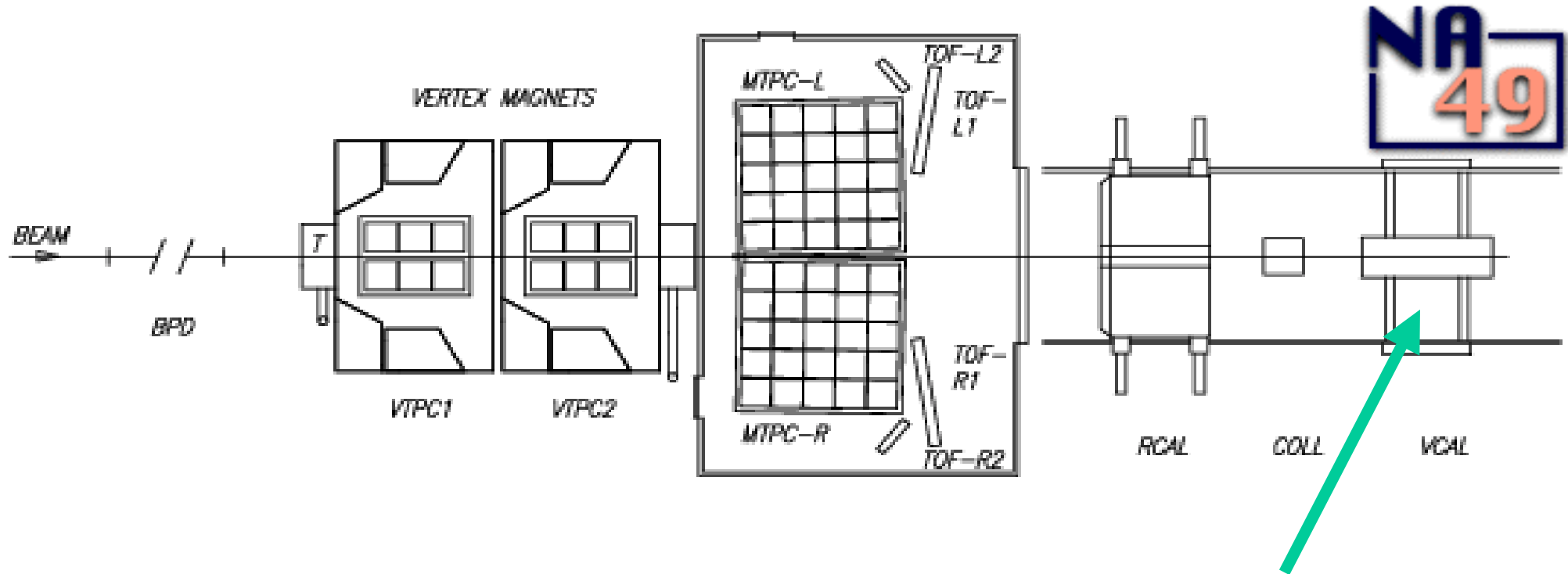
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3. NA49 experiment



Veto-Calorimeter
for centrality selection



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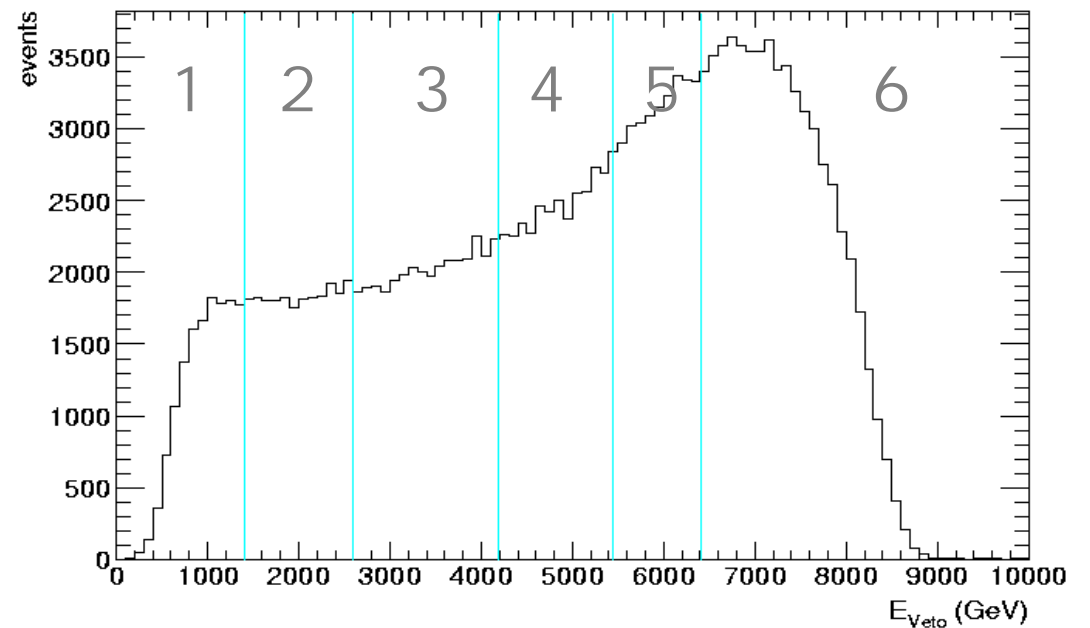
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4. Analyzed data sets

- Pb+Pb (minimum bias) at 40A GeV
- (Pb+Pb (7% most central) at 40A GeV, $N_{\text{evt}} = 700,000$, still to be analysed)

Bin	N_{evt}	$\sigma/\sigma_{\text{tot}}$ (%)	$\langle N_w \rangle$ (Glauber)
1	29780	5	366
2	45151	5 - 12.5	309
3	67241	12.5 - 23.5	242
4	64354	23.5 - 33.5	178
5	63279	33.5 - 43.5	132
6	117506	> 43.5	85



central



peripheral



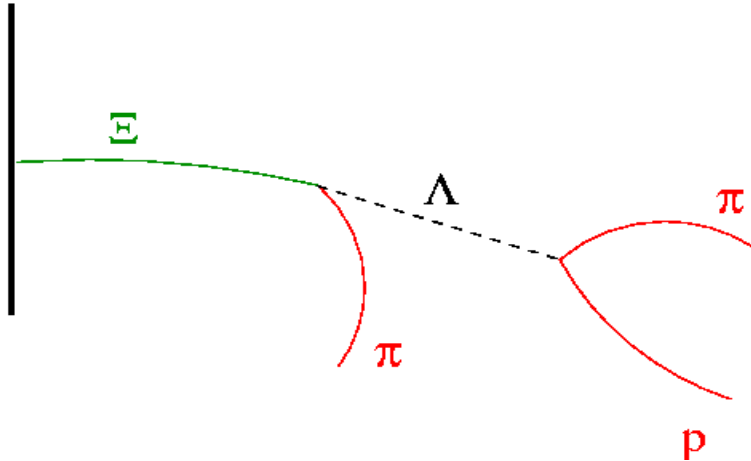
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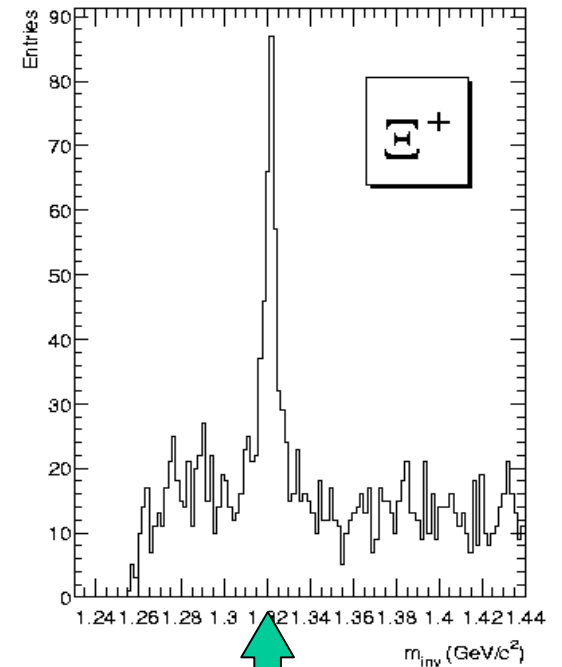
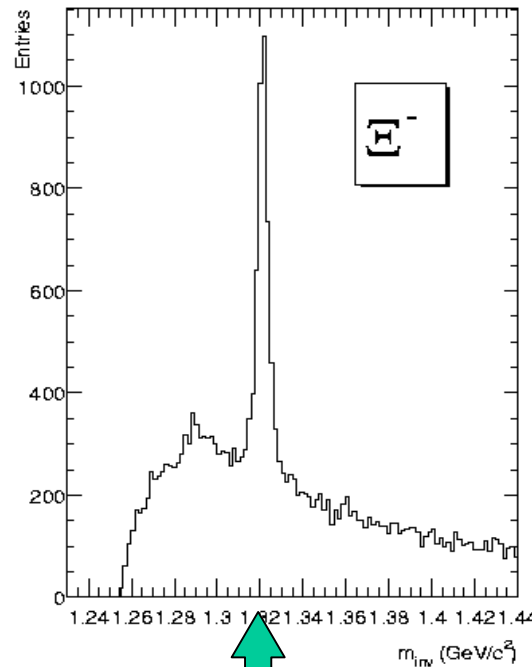


5. Ξ -analysis



- Geometrical cuts are used to reduce the background:
 - Impact parameter of Ξ
 - Impact parameter of Λ
 - Decay position of Ξ
 - Proton selection by dE/dx

Invariant mass-spectra at mid-rapidity



Ξ -mass = 1.321



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6. Phase space population

1.-4. centrality bin:

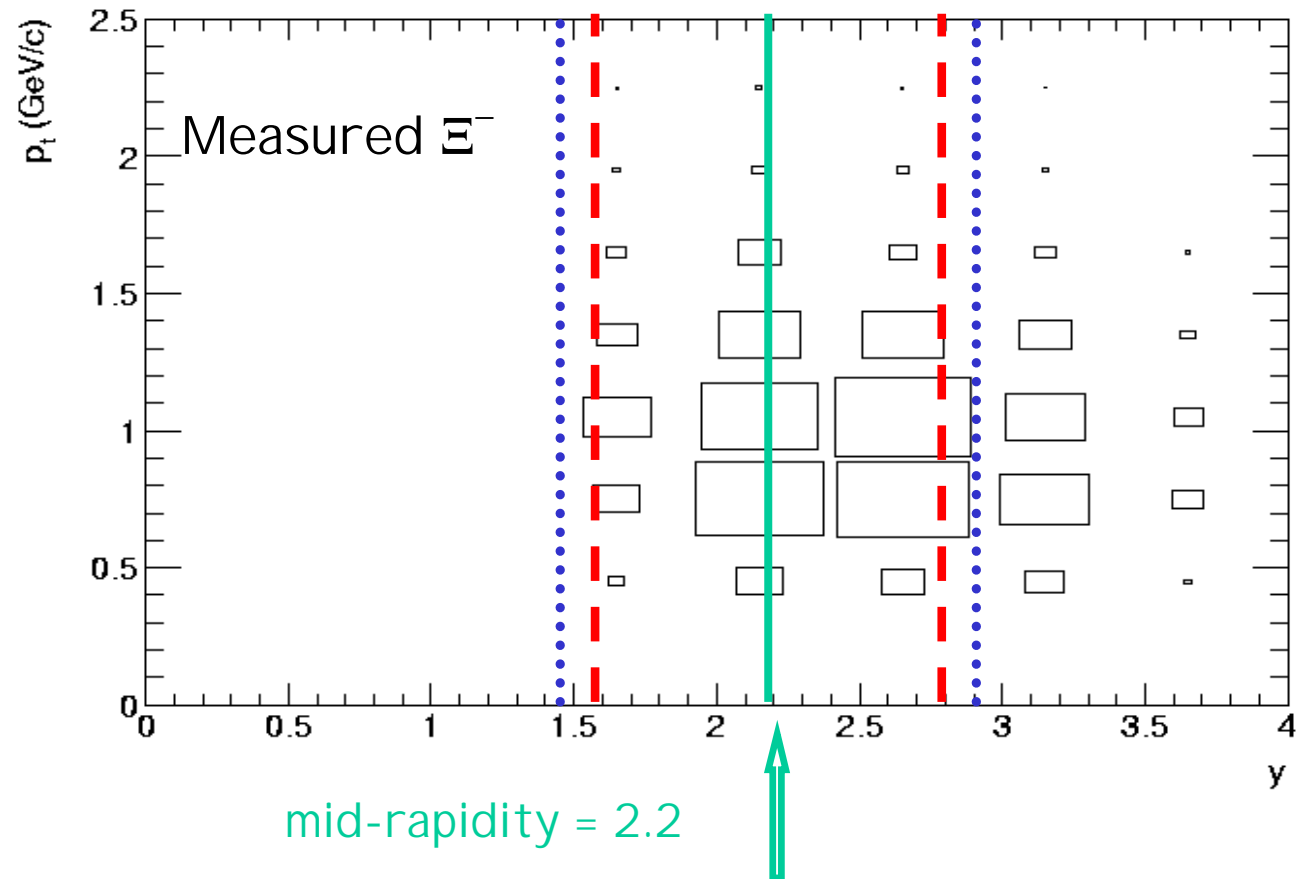
$$|y - y_{CM}| < 0.75$$

$$p_t > 0.3$$

5.+6. centrality bin:

$$|y - y_{CM}| < 0.6$$

$$p_t > 0.0$$



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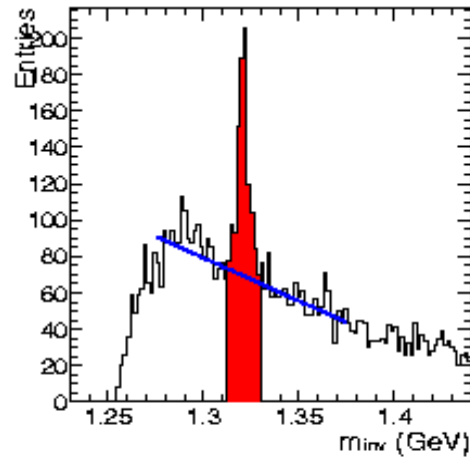
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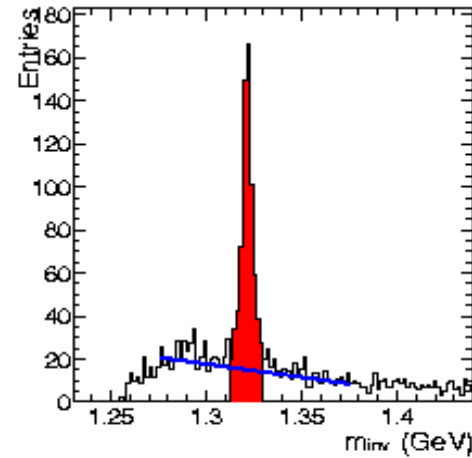
7. Invariant mass spectra at mid-rapidity

$[I]^-$

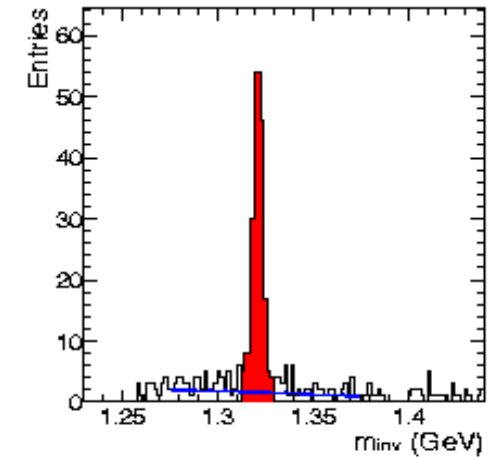
central



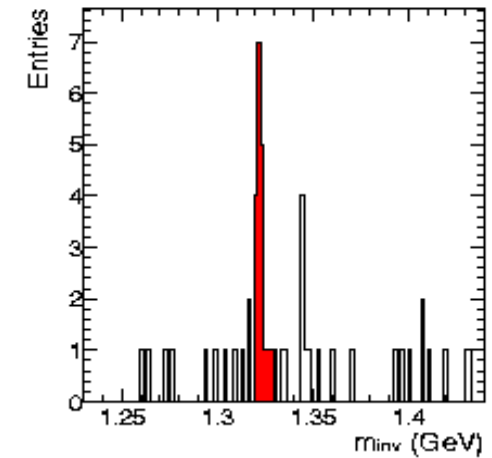
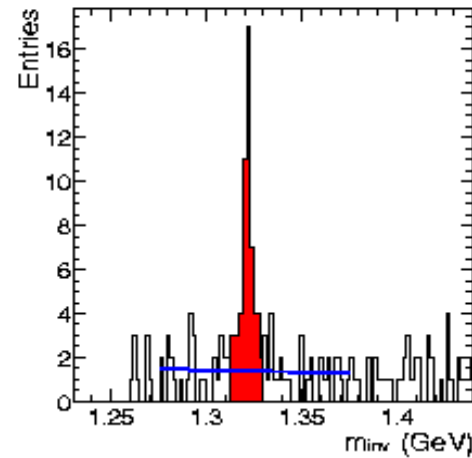
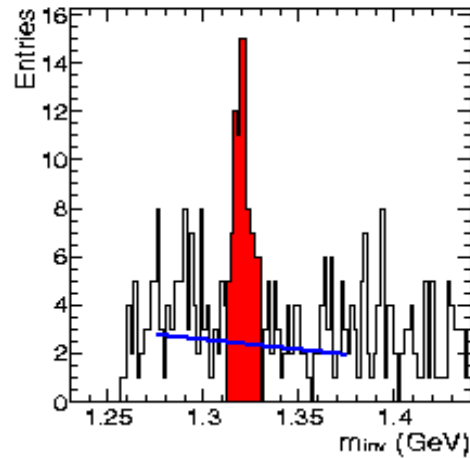
mid central



peripheral



$[I]^+$



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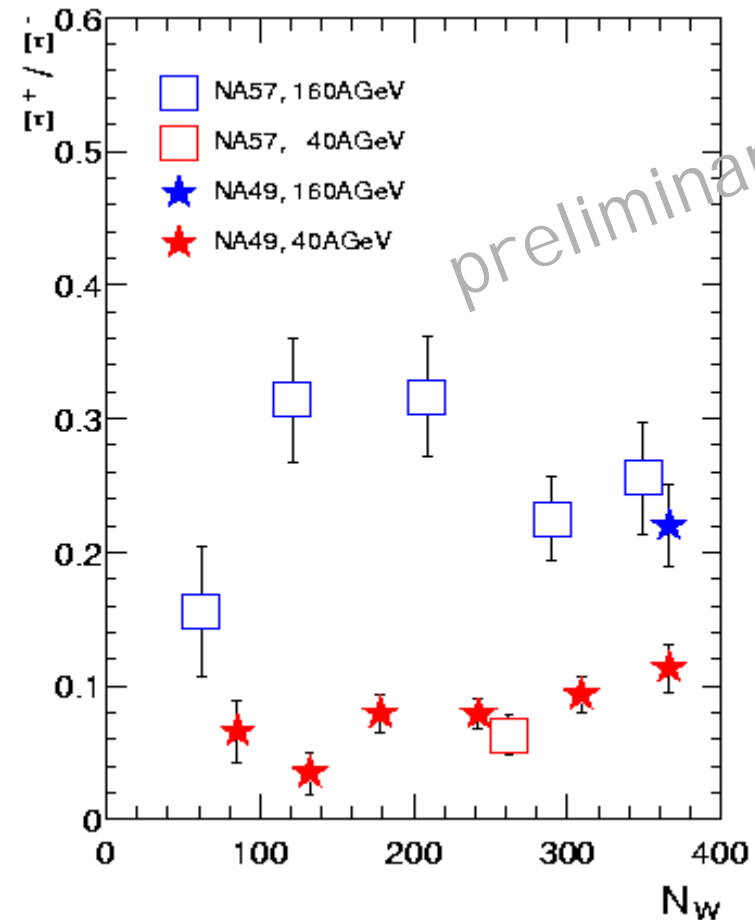
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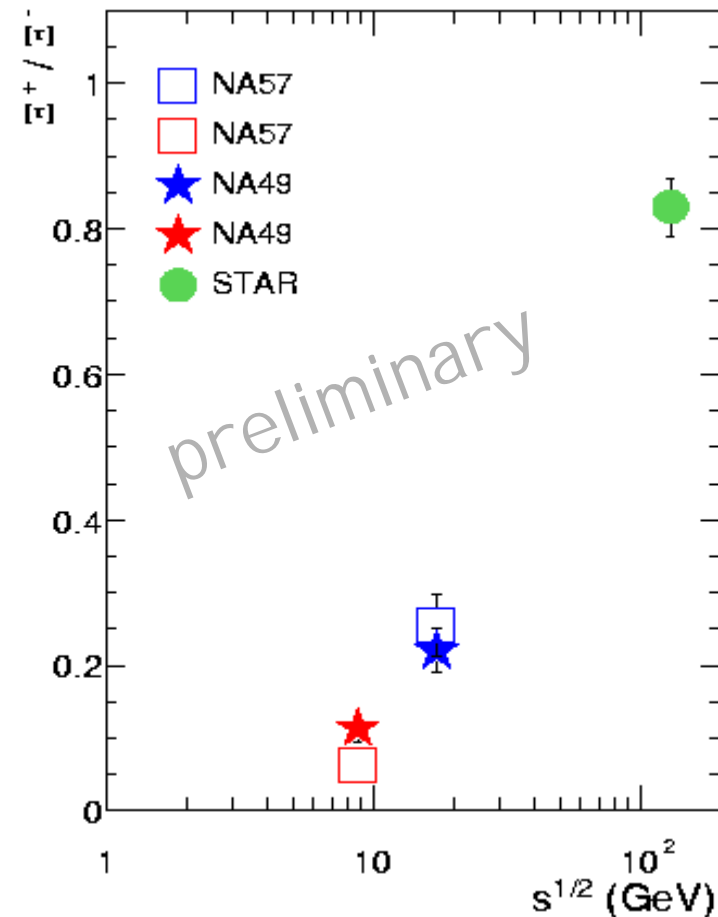
8. Centrality dependence of Ξ^+/Ξ^- -ratio

- The Ξ^+/Ξ^- -ratio has only a weak centrality dependence at 40 AGeV



9. Energy dependence of Ξ^+/Ξ^- -ratio

- All ratios at mid-rapidity
- All ratios for central collisions
- Reflecting decreasing baryon density
- The Ξ^+/Ξ^- -ratio increases with the energy



10. Hadron-gas model (F. Becattini et al.)

- The HG model (with partial strangeness saturation) predicts:

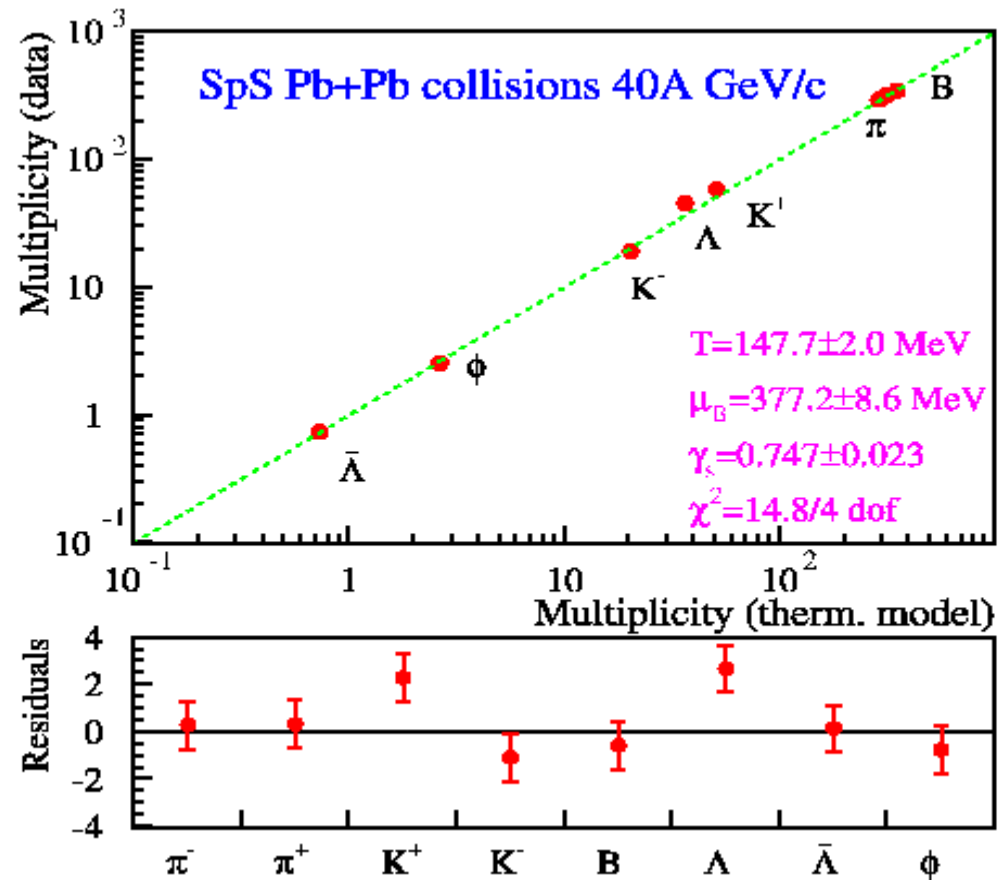
$$\Xi^+/\Xi^- = 0.06 \quad (4\pi)$$

- Measured:

$$\Xi^+/\Xi^- = 0.11 \pm 0.02$$

(mid-rapidity)

Close to hadron-gas model prediction



11. Summary and outlook

- **First results on centrality dependence of Ξ s at 40A GeV from NA49:**
 - Weak centrality dependence of Ξ^+/Ξ^- -ratio
 - The Ξ^+/Ξ^- -ratio increases with the energy
 - Measured Ξ^+/Ξ^- -ratio is close to the hadron-gas model
- **Outlook:**
 - Corrected spectra for Ξ^- and Ξ^+ at 40A GeV
 - 4π yields (40A GeV)
 - Ξ -analysis at 20, 30 and 80A GeV

