

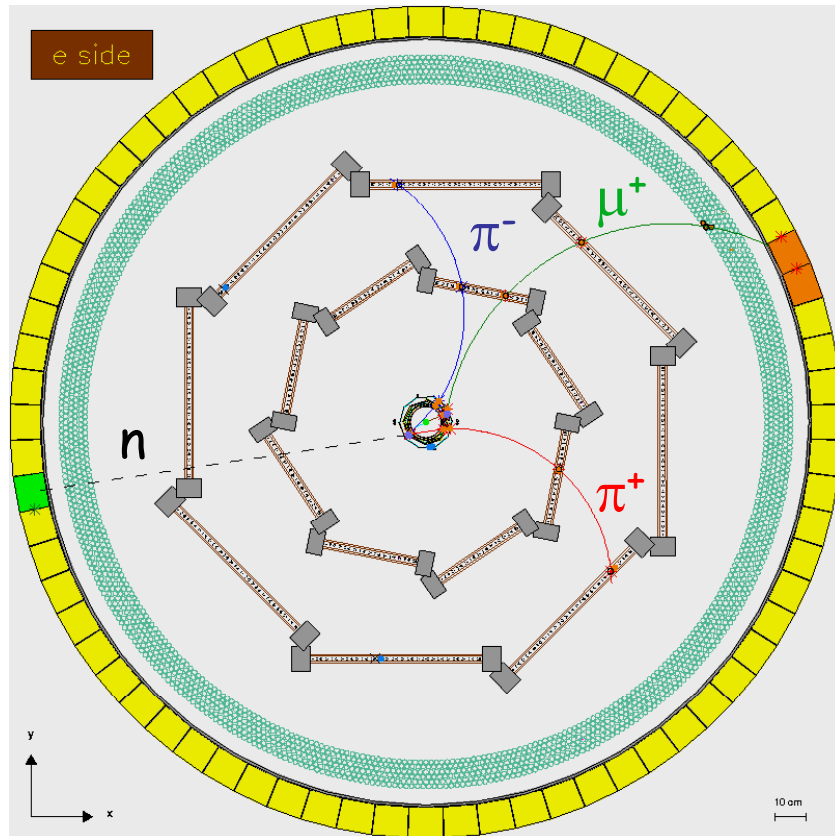
A study of the $K^-_{\text{stop}} A \rightarrow \Sigma^\pm \pi^\mp A'$ reaction

Nevio Grion, INFN - Trieste
FINUDA Collaboration

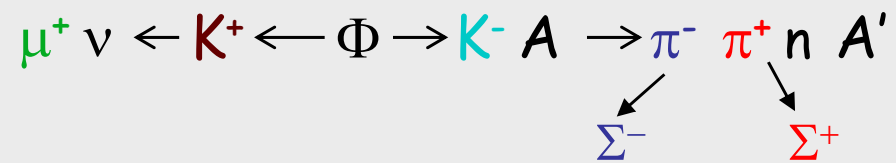
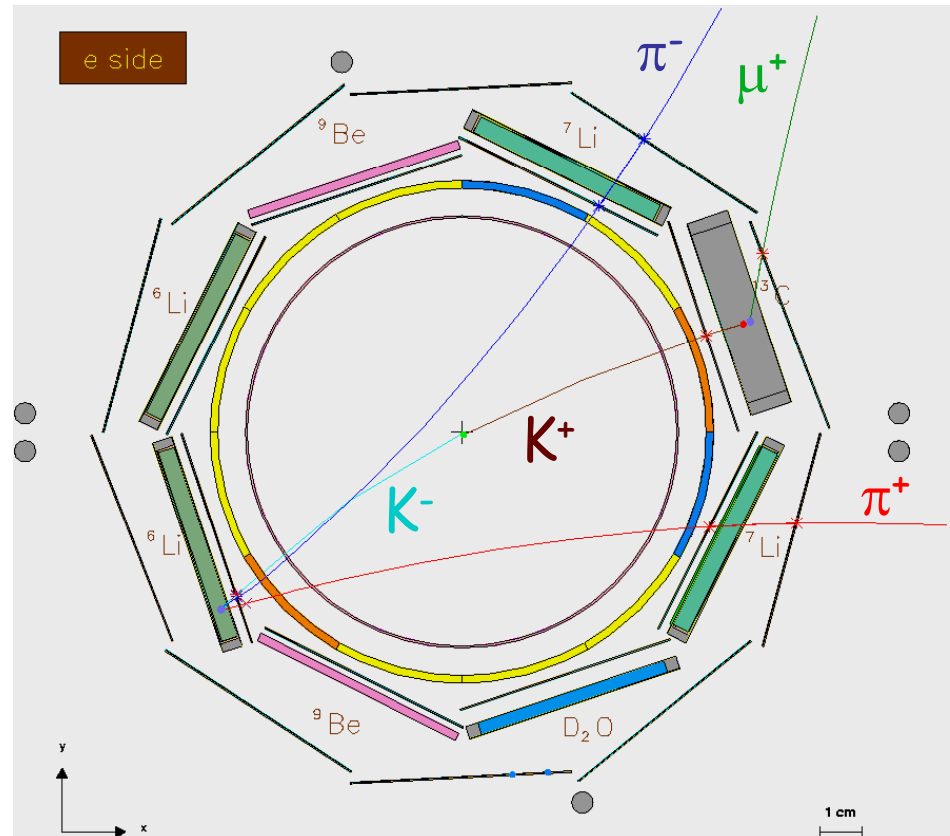
- Multiparticle detection, $n \pi^+ \pi^-$
- Event topology reconstruction
- Results & (still) open problems
- Conclusions

Topology of a $n\pi^+\pi^-$ event

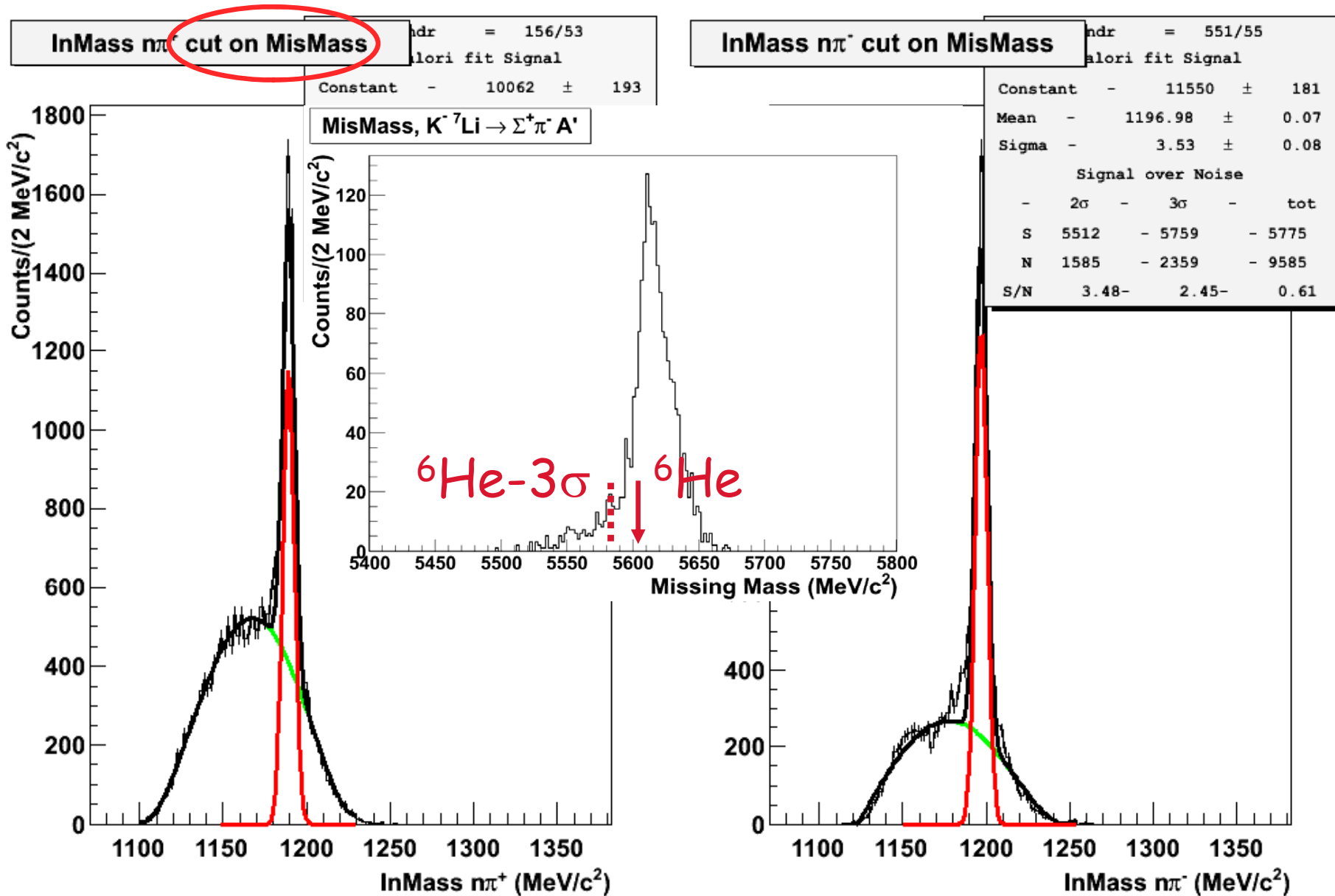
FINUDA spectrometer



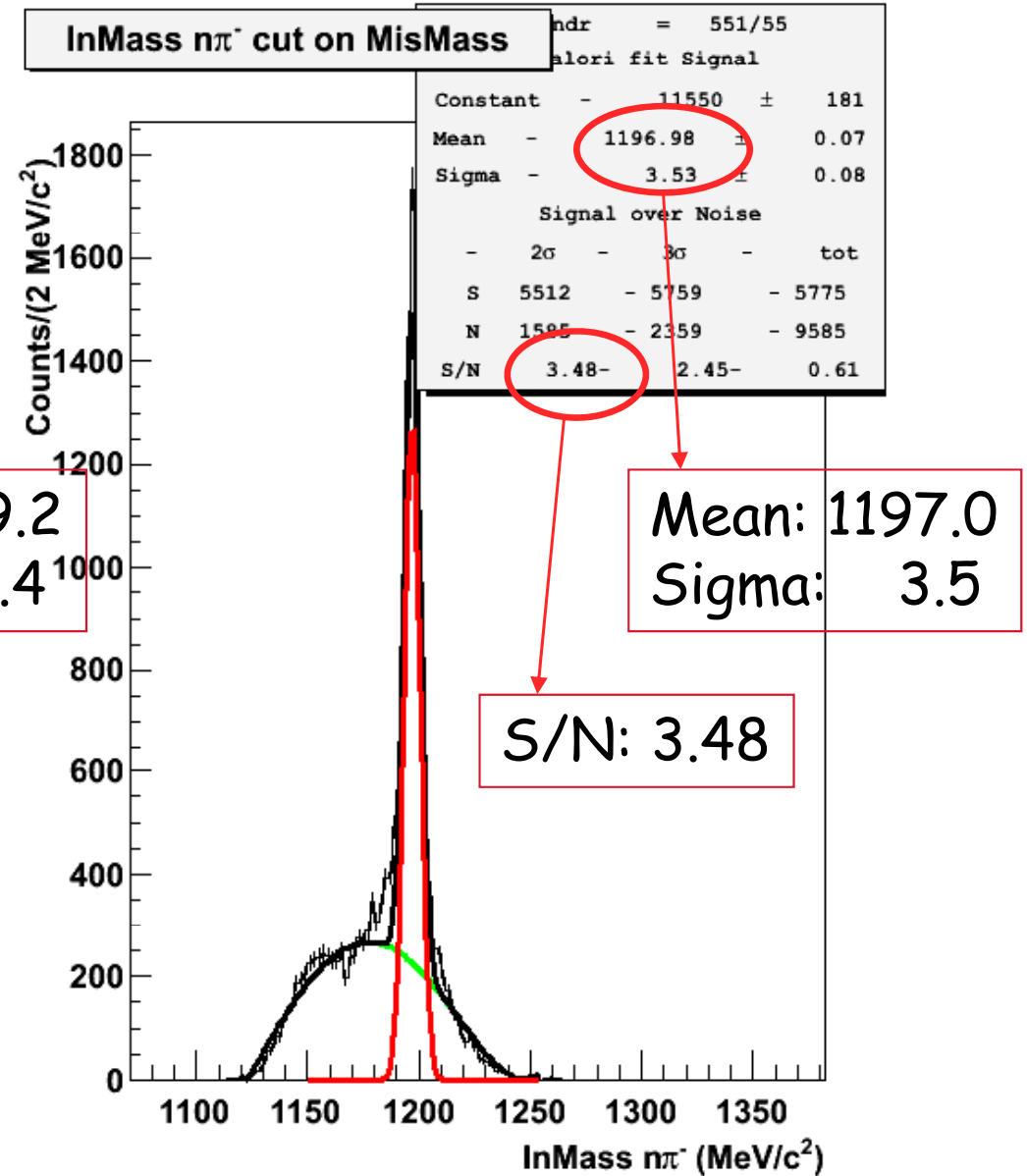
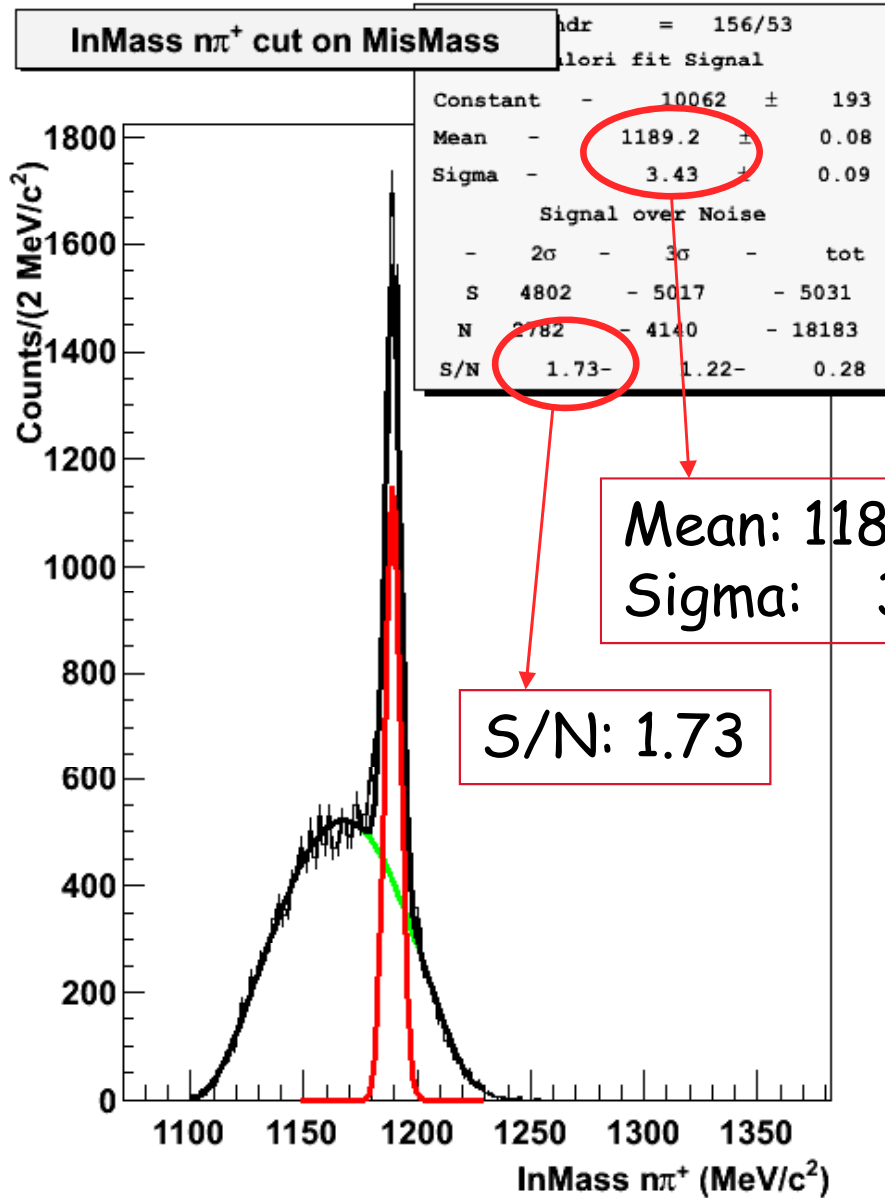
Central region



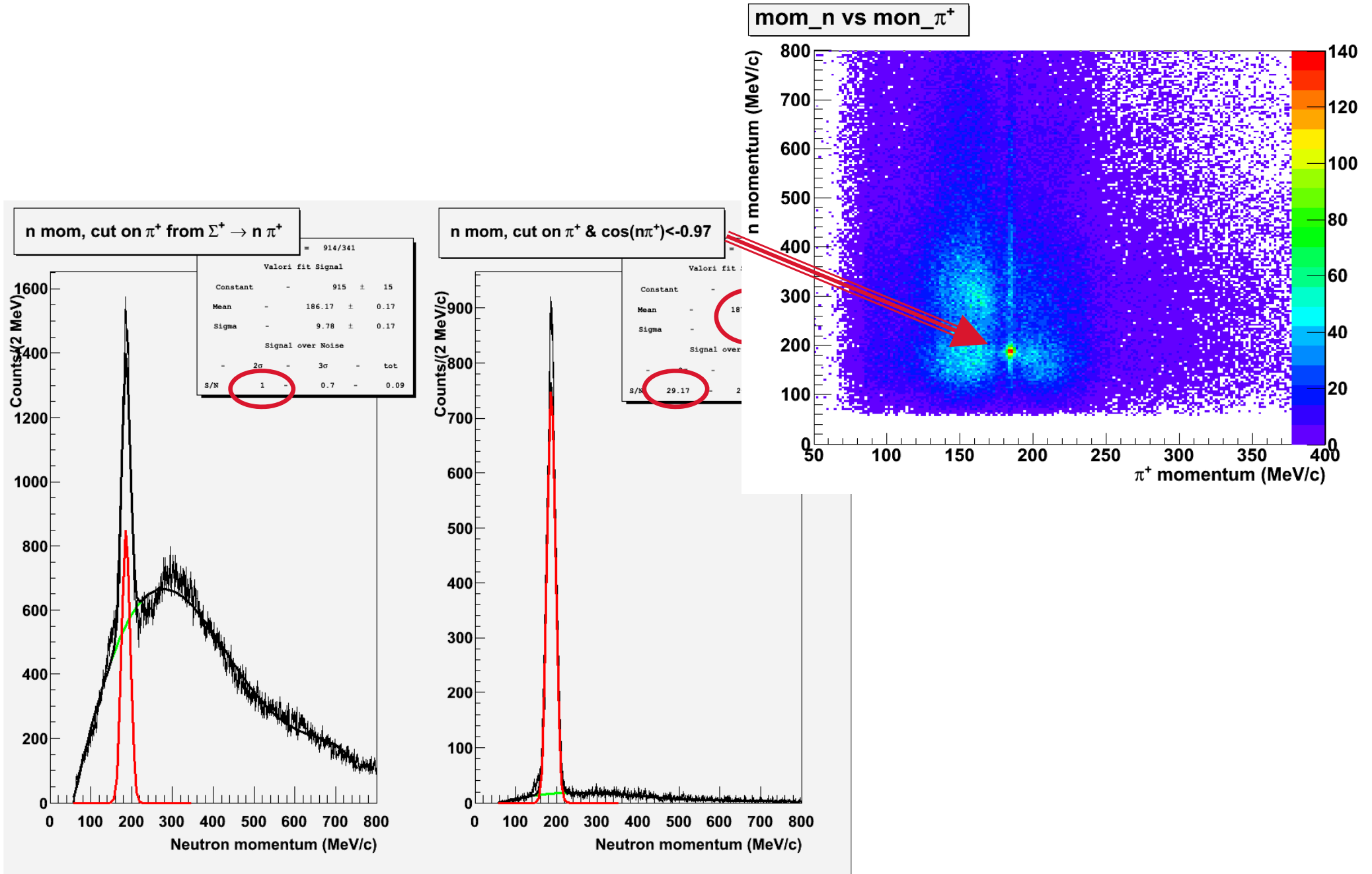
$n\pi^+$ and $n\pi^-$ invariant masses



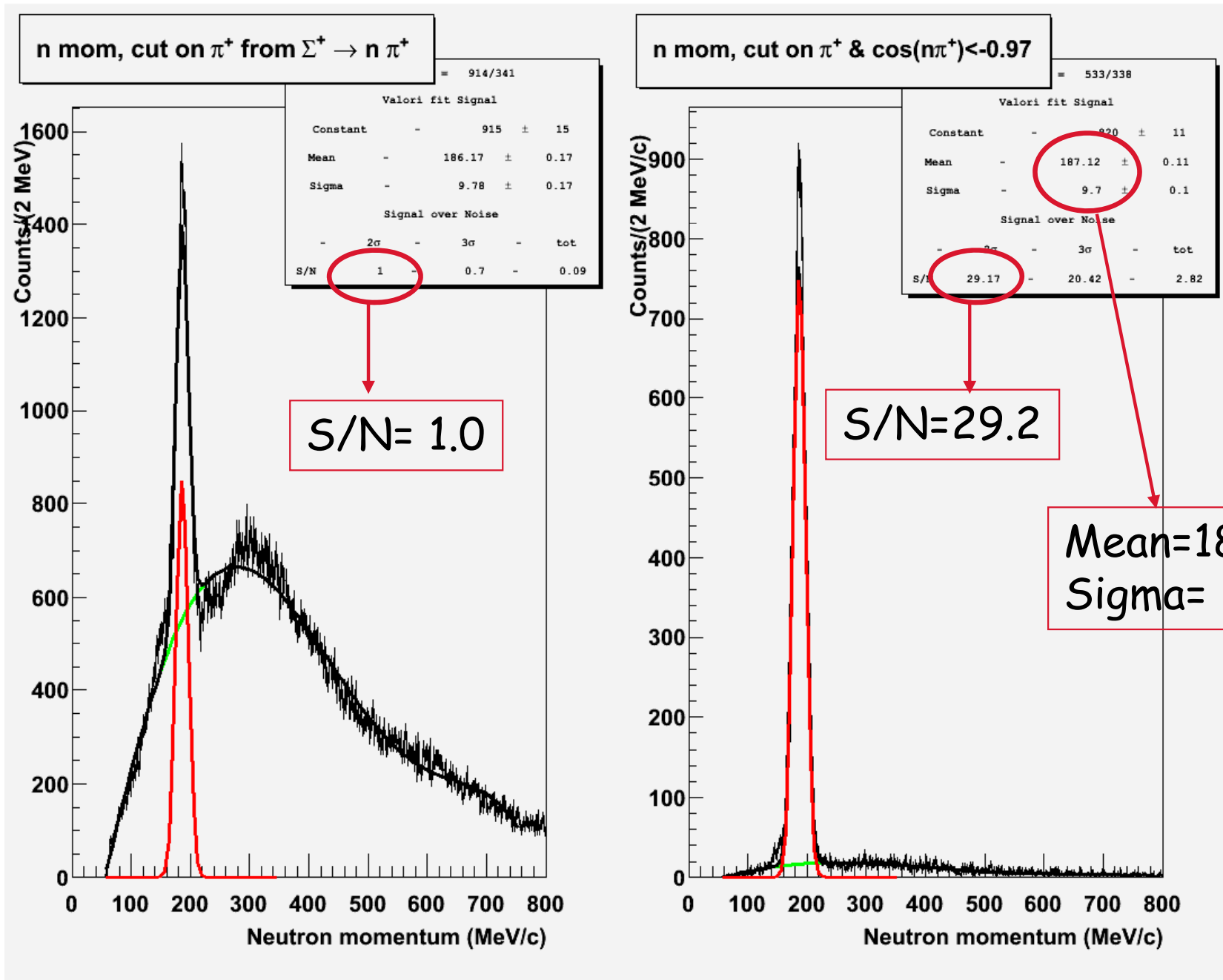
$n\pi^+$ and $n\pi^-$ invariant masses



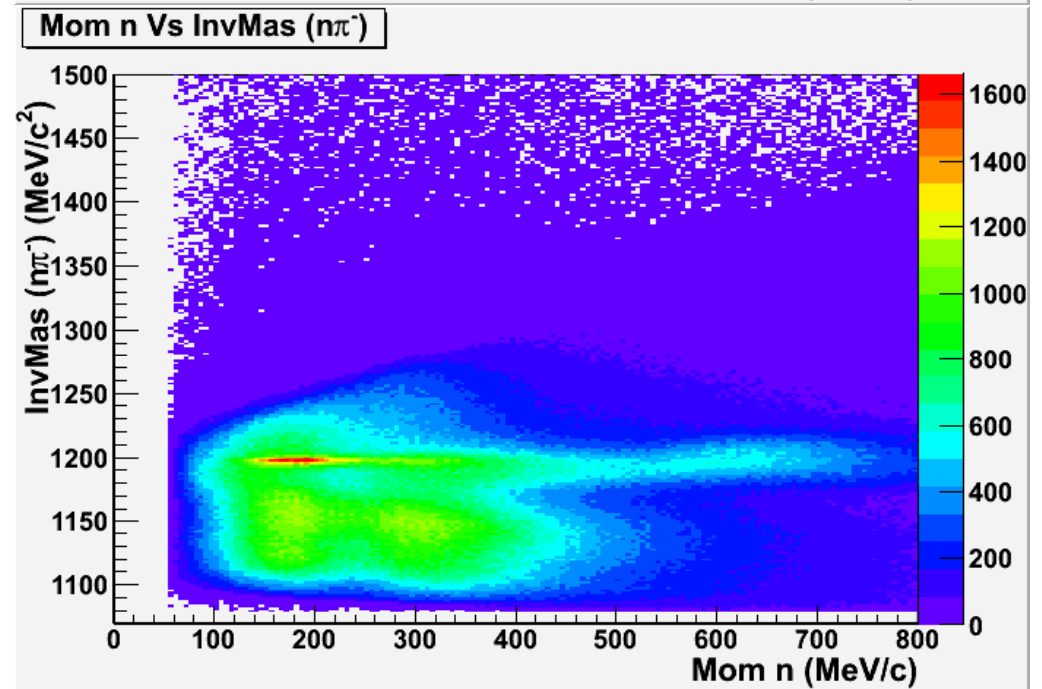
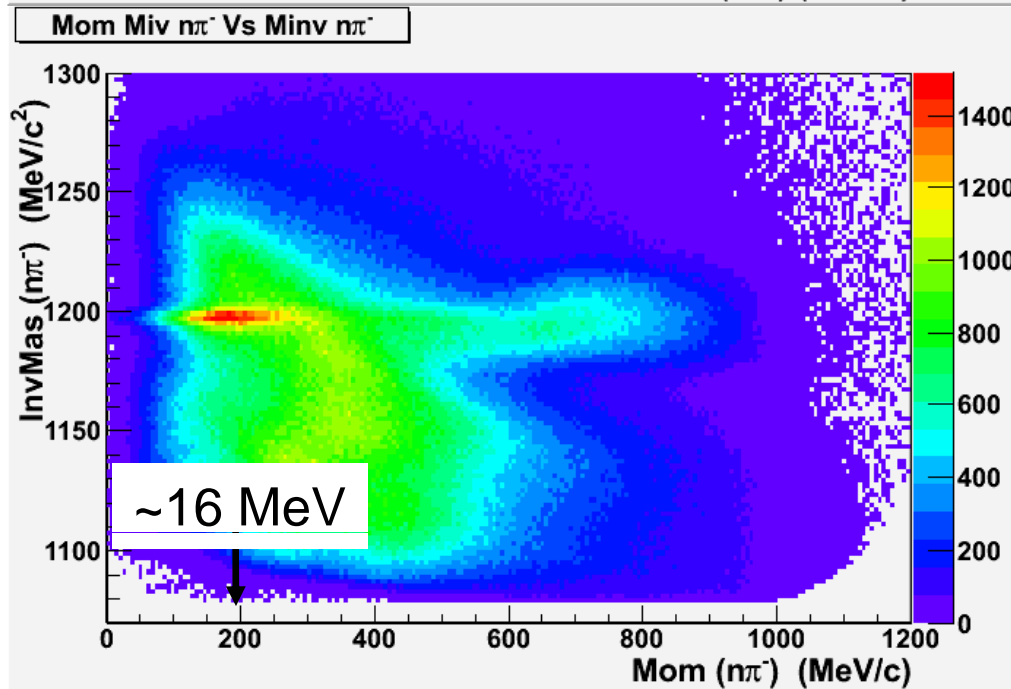
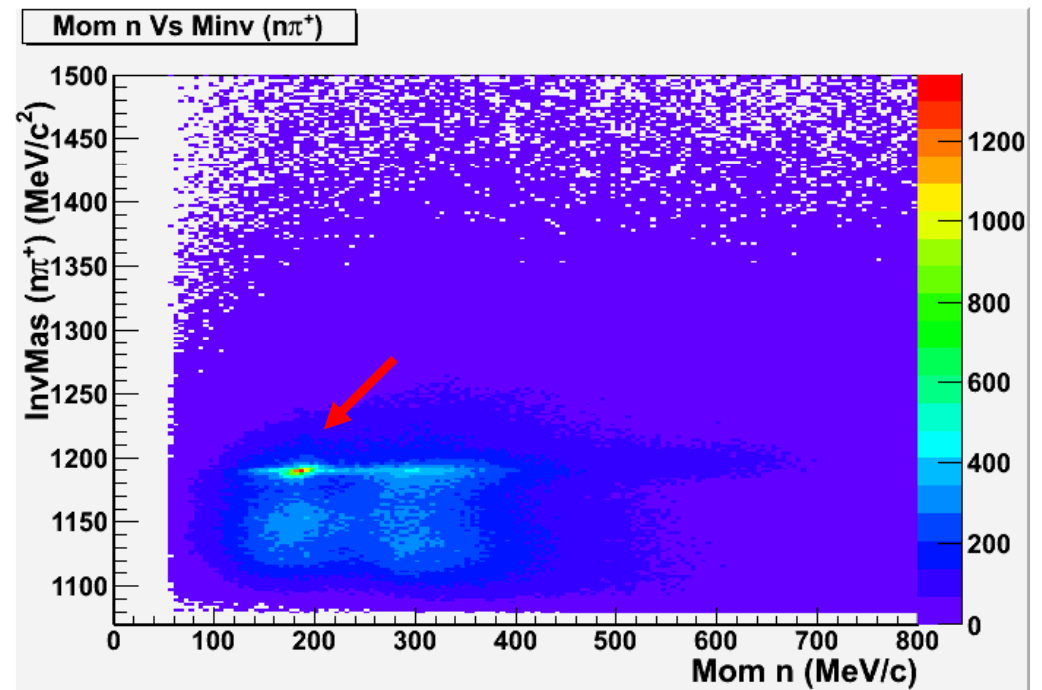
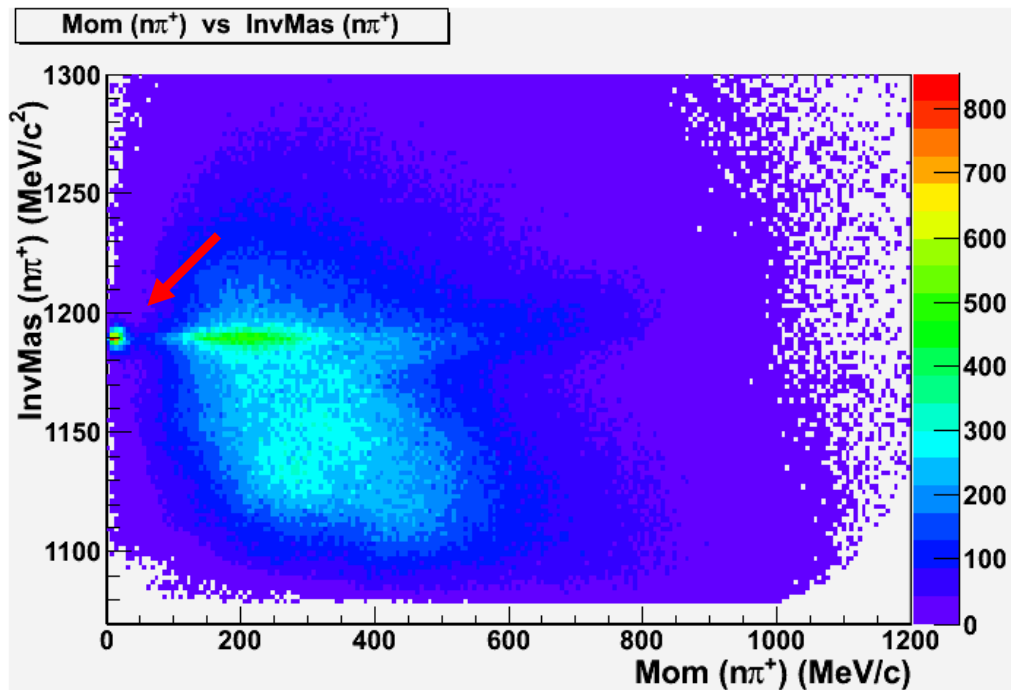
n (from $n\pi^+$) momentum distribution



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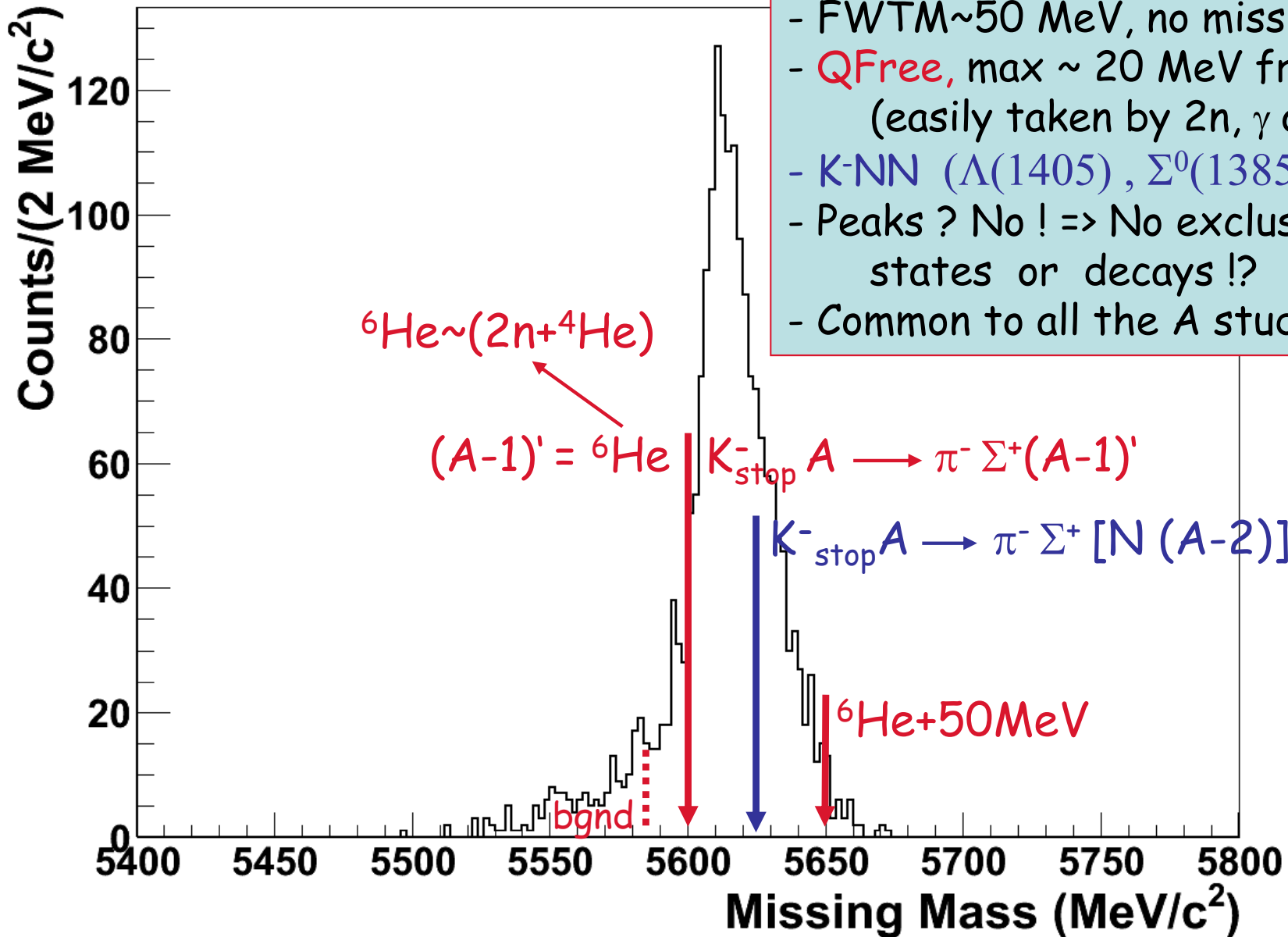


$n\pi^+$ VS $n\pi^-$



missing mass, $K^-_{\text{stop}} {}^7\text{Li} \rightarrow \Sigma^+ \pi^- A'$

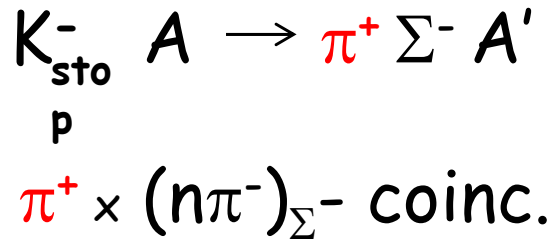
MisMass, $K^- {}^7\text{Li} \rightarrow \Sigma^+ \pi^- A'$



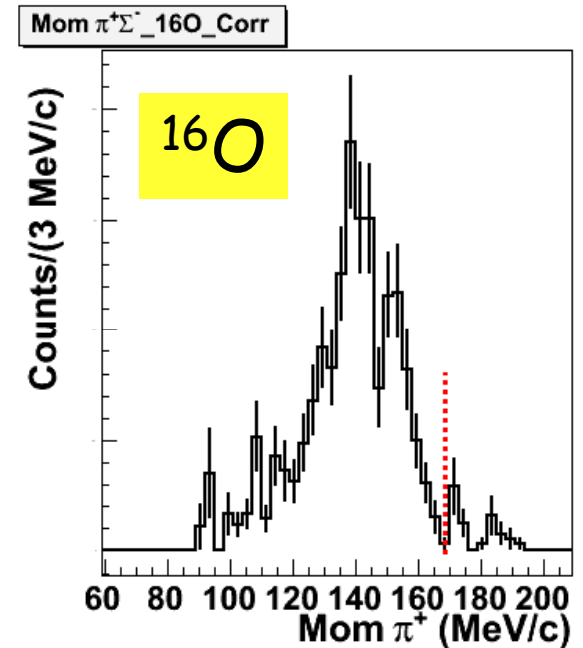
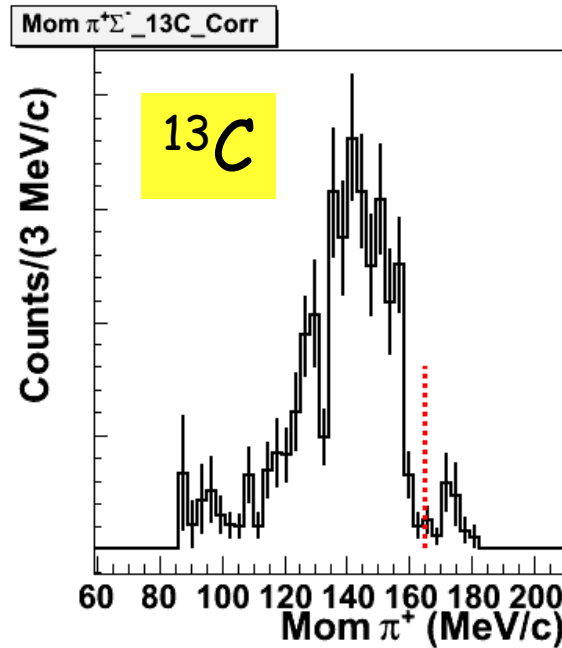
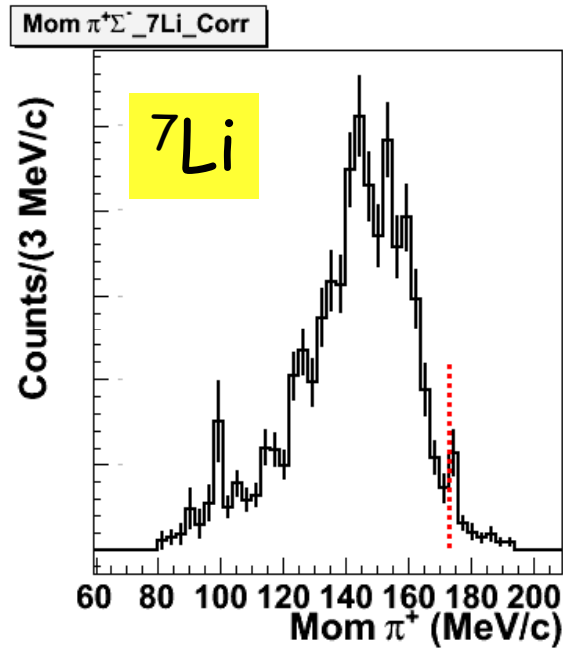
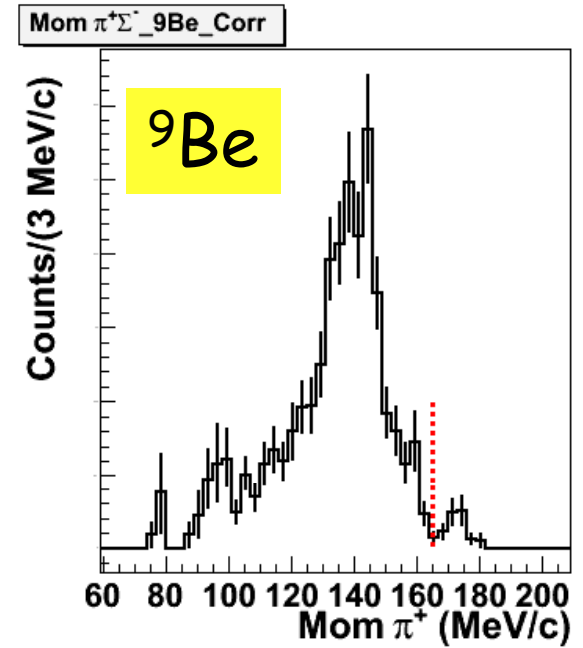
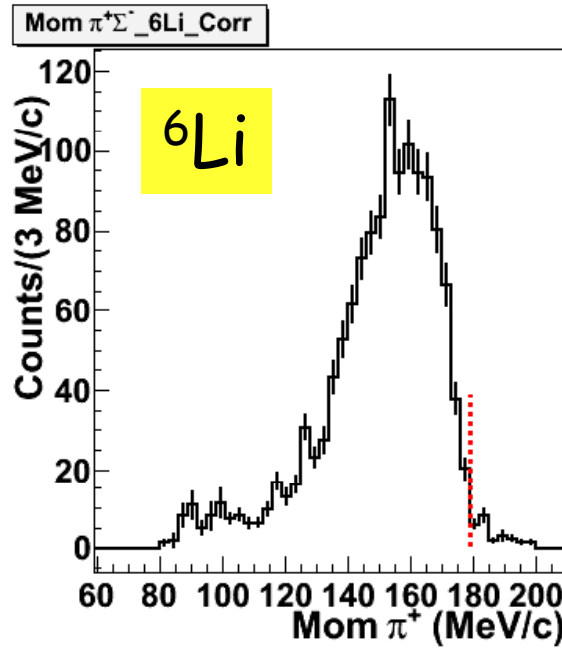
Missing Mass distribution

- FWTM ~ 50 MeV, no missing pions.
- **QFree**, max ~ 20 MeV from ${}^6\text{He}$ (easily taken by $2n$, γ or FSI)
- **K-NN** ($\Lambda(1405)$, $\Sigma^0(1385)$)
- Peaks? No! \Rightarrow No exclusive states or decays!?
- Common to all the A studied

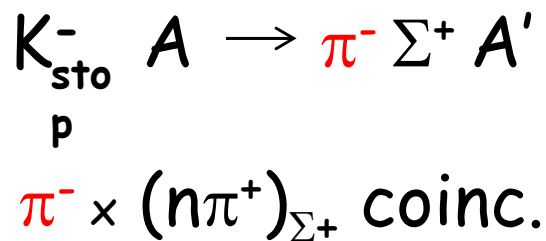
π^+ momentum distribution



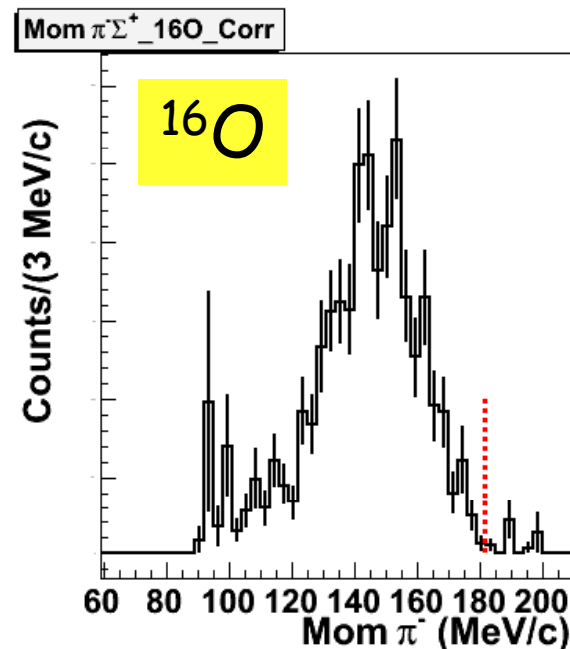
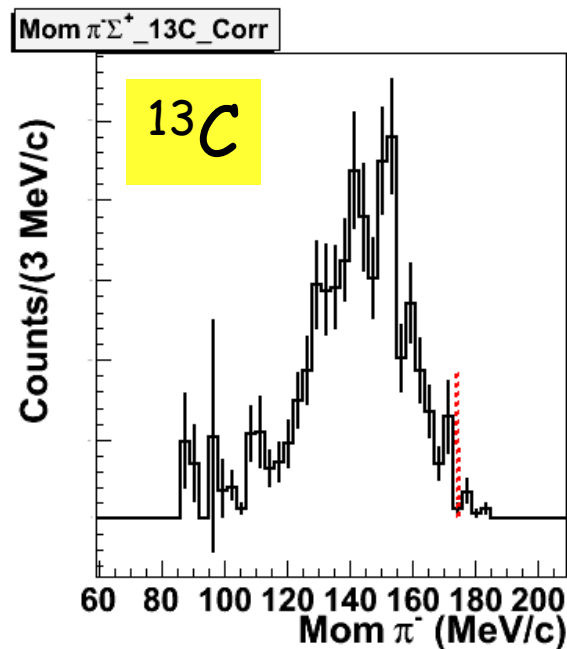
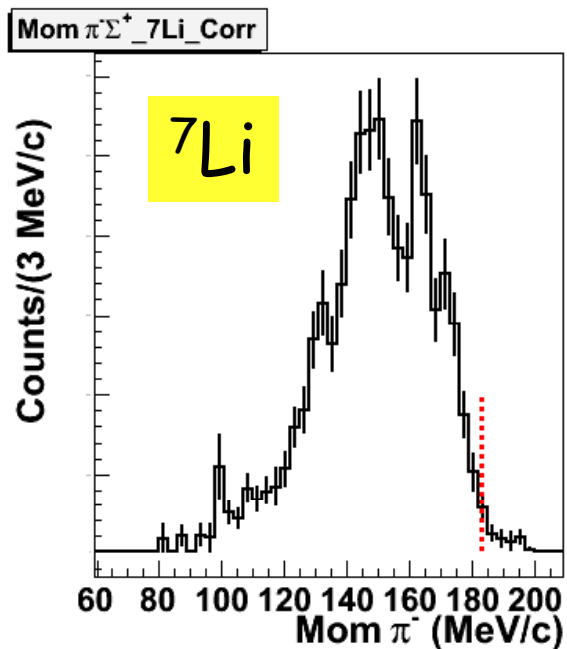
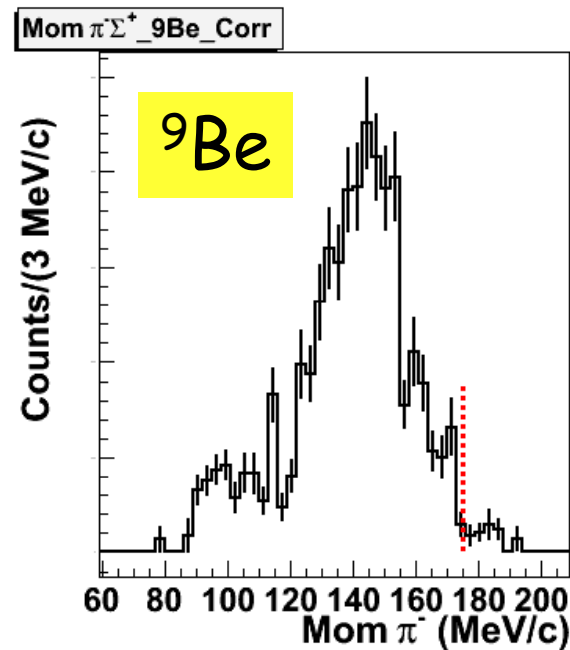
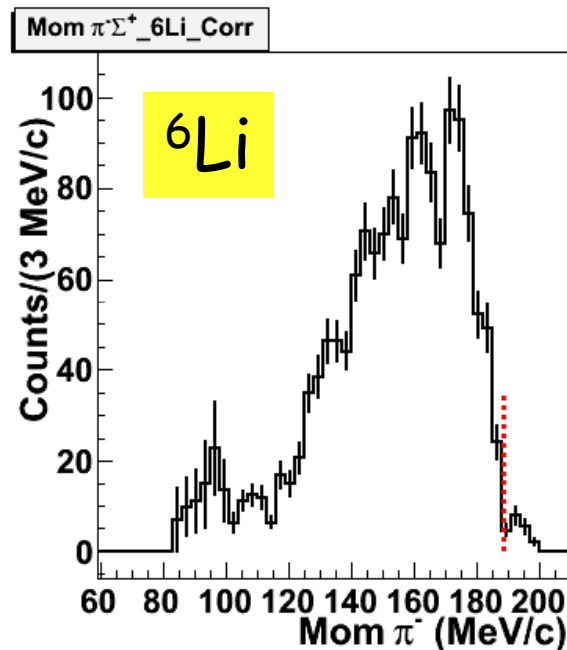
Σ^- bound



π^- momentum distribution



⋮
 Σ^+ bound

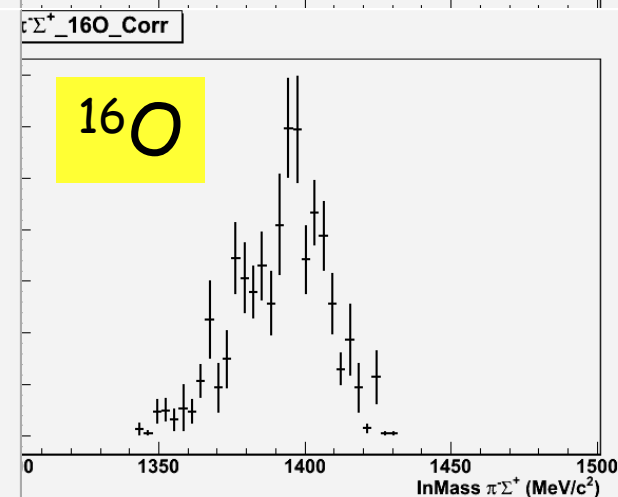
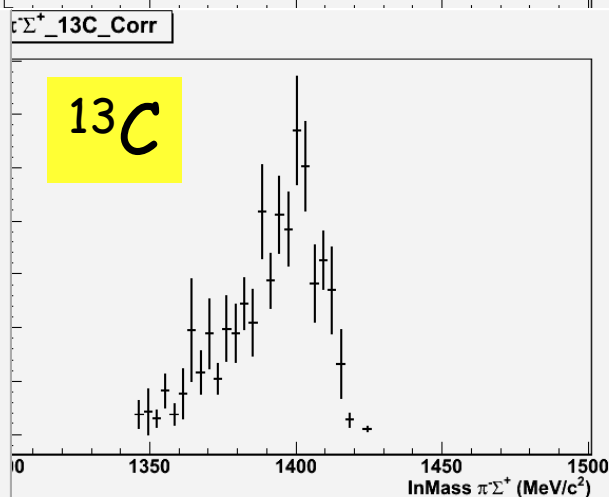
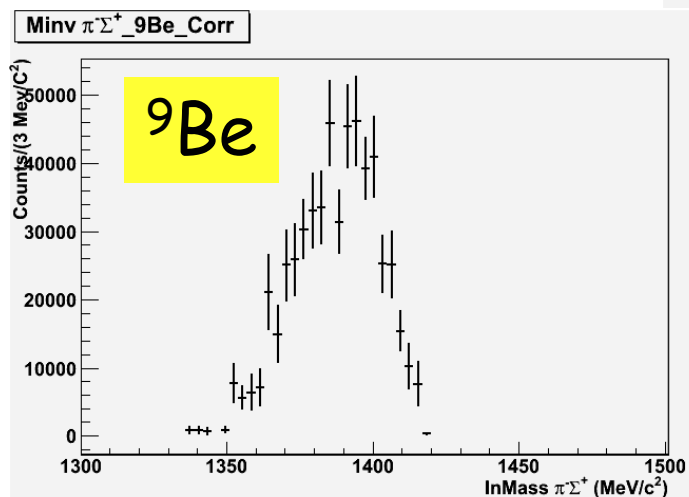
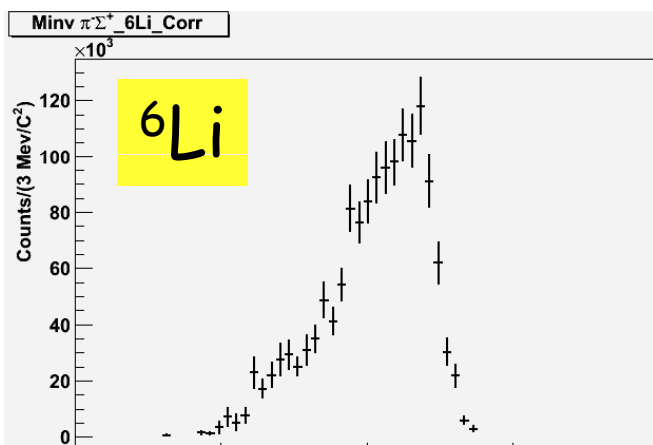


$$\Sigma^0(1385): K^-_{\text{stop}} A \rightarrow \pi^- \Sigma^+ N A'$$

$$\Lambda(1405): K^-_{\text{stop}} A \rightarrow \pi^- \Sigma^+ N A'$$

$$\text{QFree}: K^-_{\text{stop}} A \rightarrow \pi^- \Sigma^+ A'$$

$\pi^- \Sigma^+$ invariant mass

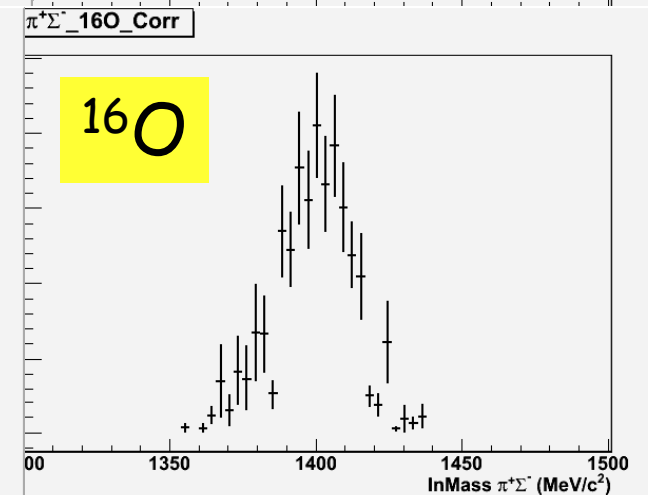
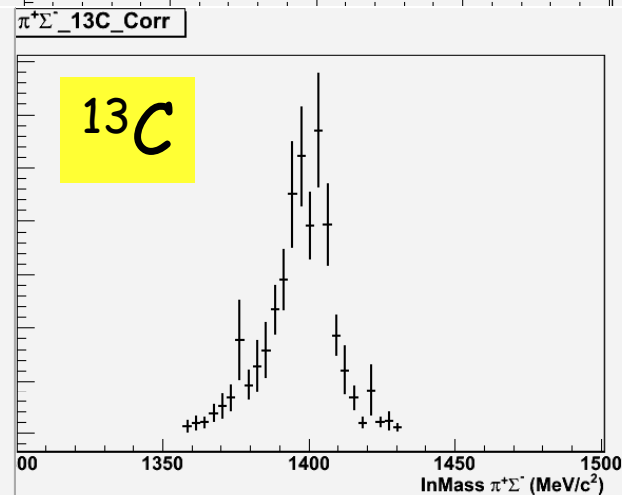
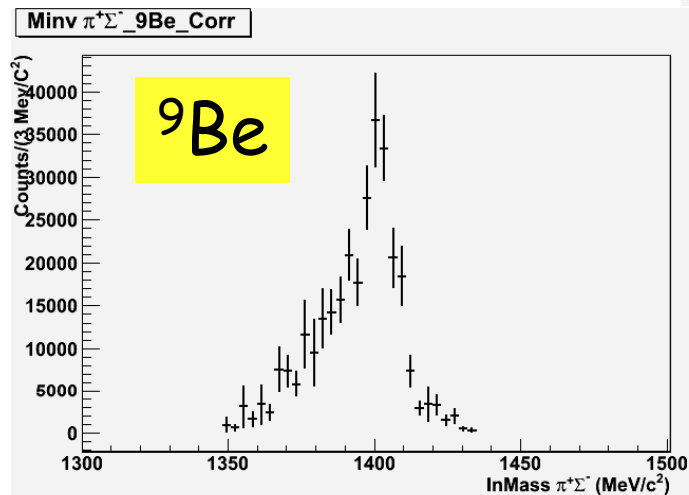
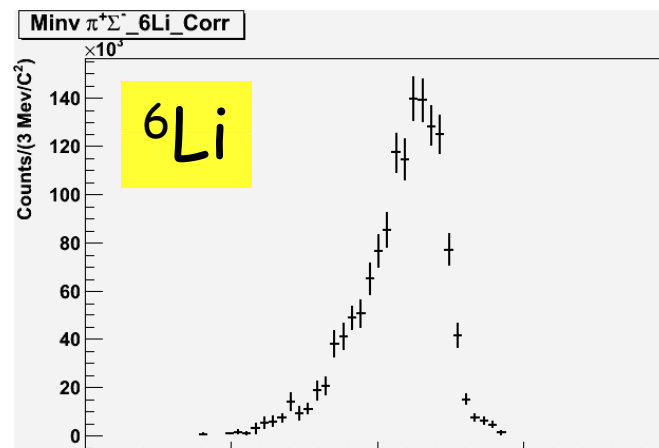


$$\Sigma^0(1385): K^-_{\text{stop}} A \longrightarrow \pi^+ \Sigma^- N A'$$

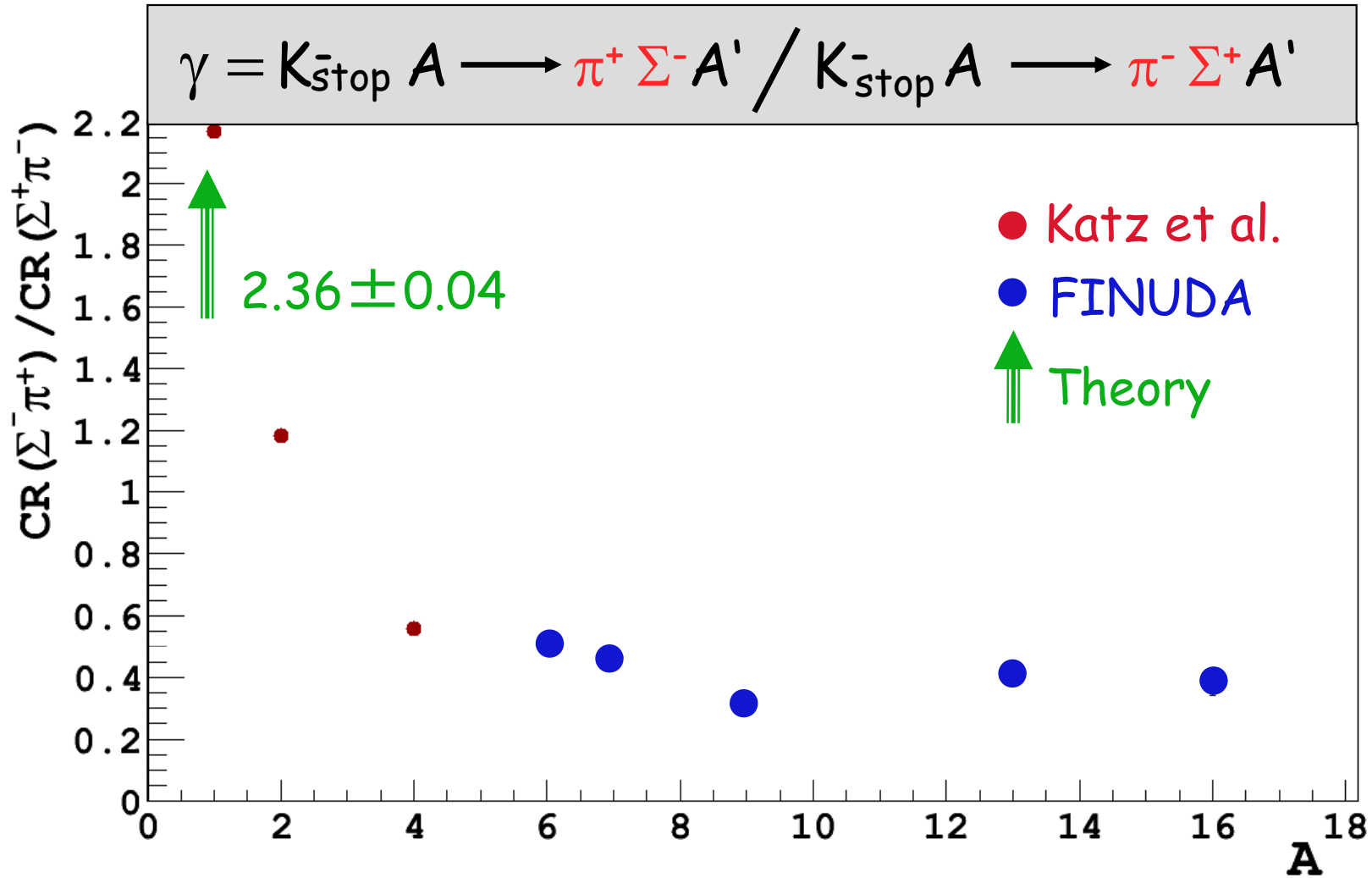
$$\Lambda(1405): K^-_{\text{stop}} A \longrightarrow \pi^+ \Sigma^- N A'$$

$$\text{QFree}: K^-_{\text{stop}} A \longrightarrow \pi^+ \Sigma^- A'$$

$\pi^+ \Sigma^-$ invariant mass



Ratio: $\Sigma^- \pi^+ / \Sigma^+ \pi^-$



● FINUDA corrected for acceptance syst. ~40%

● Phys Rev D (1970)1267

↑ Hardy et al Savard et al (2005)

Conclusions

- Improved analysis code: better pattern recognition and resolution.
 - ⇒ Expected increase of both statistics and S/N ratio.
- To do a systematic study of angular correlations, Dalitz plots and other correlated observables.
 - ⇒ Separate the QFree from $\Lambda(1405)$ from $\Sigma(1385)$ channels.
- Present data show:
 0. Inclusive spectra useless (or even misleading) !
 1. Σ from K-A have a different decay pattern: Σ^+ decay at rest
 Σ^- decay in flight !?
 2. Σ^- -hypernuclei (seem to) reappear in the $\pi^+ \Sigma^-$ channel !?
 3. The $\pi\Sigma$ inv. mass peaked at 1400-1420 MeV ⇒ $\Lambda(1405), \Sigma^0(1385)$
 4. Γ of missing mass spectra is narrow: 50-65 MeV FWTM for A
 - ⇒ no missing π 's, 10% of missing energy due to $2n, \gamma$ or FSI:
all these effects leave the reaction dynamics unaltered.