HERA-B pentaquark search

The interaction: pN at 920 GeV ($\sqrt{s}$=41,6 GeV)

The HERA-B detector:

- High resolution spectrometer:
- Good particle ID for protons and Kaons (RICH)

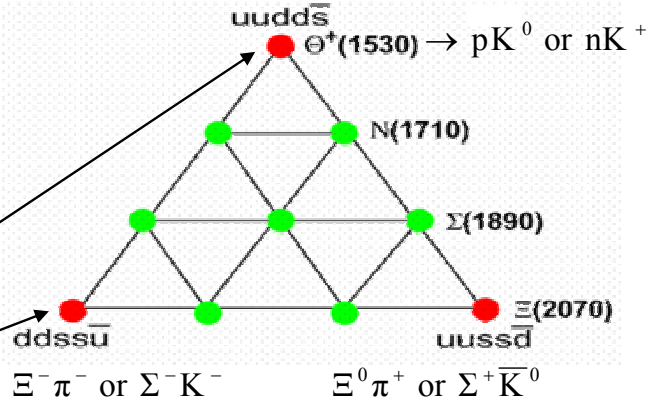
The data sample:

~ 210x10^6 Minimum Bias events

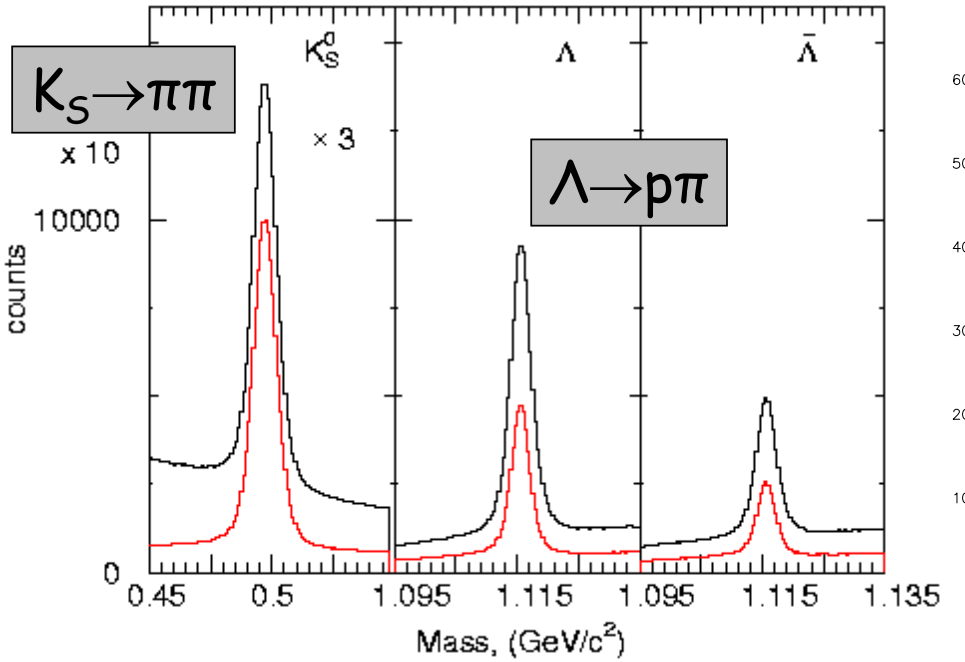
Possibility to search simultaneously for two pentaquark states in different final states:

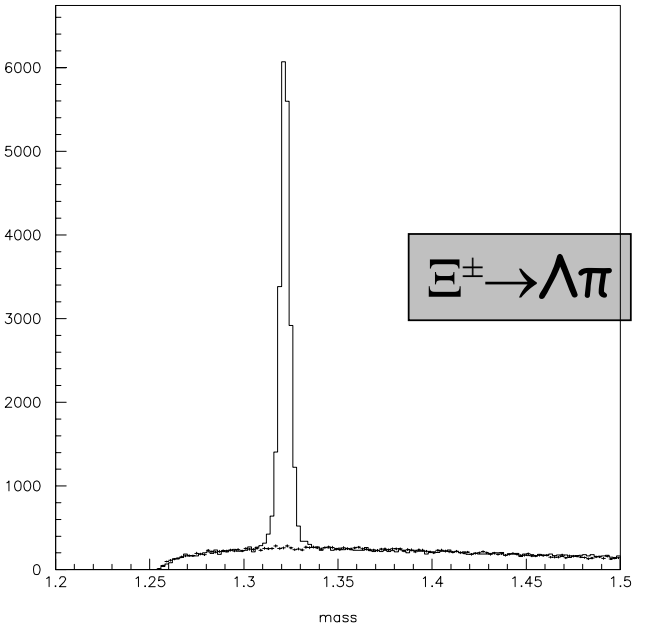
$\Theta^+ \rightarrow pK_s$ (M~1530 MeV)

$\Xi^{--} \rightarrow \Xi^-\pi^-$ (M~1860 MeV)



HERA-B K_s and Ξ signals reconstructed in the full Minimum Bias sample:





Statistics and experimental resolutions:

~3.400.000 K_s,	σ ~ 4,9 MeV
~940.000 Λ, ~450.000 $\bar{\Lambda}$	σ ~ 1,8 MeV
~11.300 Ξ^-, ~7.700 Ξ^+,	σ ~ 2,6 MeV

Pentaquark search in pK_S final state

Strategy: exploit the very large statistics on K_S and apply a strong PID on proton.

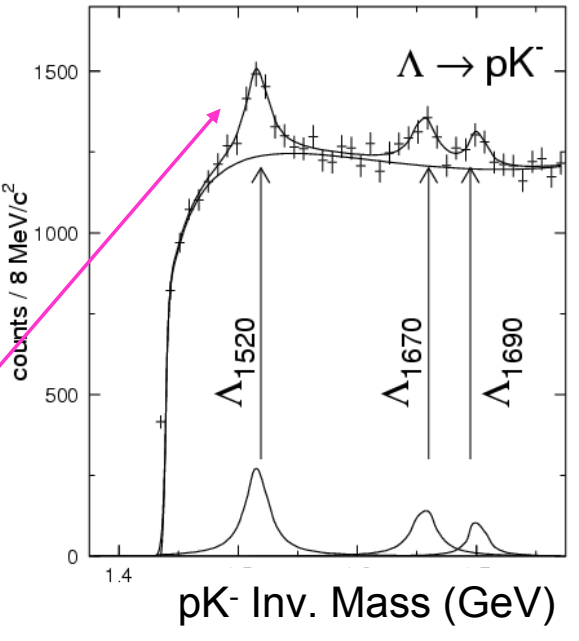
Applied cuts:

- detached K_S vertex
- K_S & Λ mass window
- Suppression of Λ contamination
- primary vertex request
- PID with proton likelihood (>0,95)

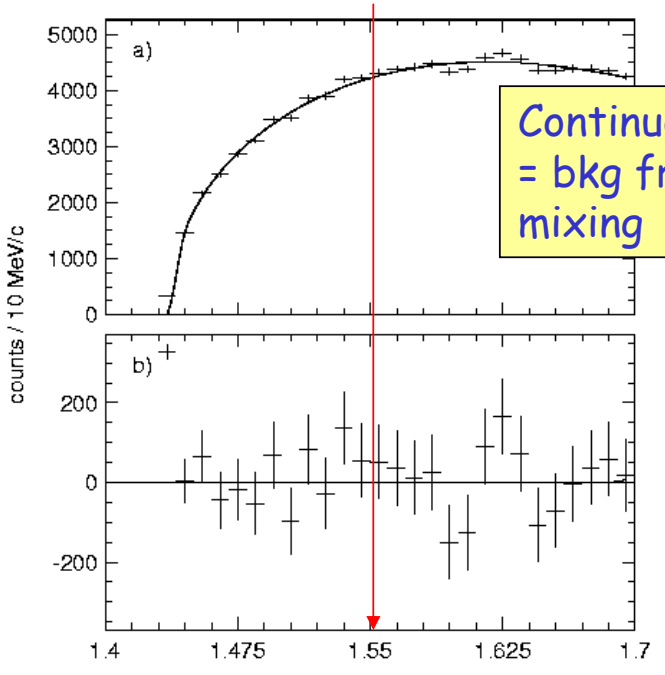
(implies a p cut at 20 GeV/c)

Check of the PID performances on the reconstruction of $\Lambda(1520) \rightarrow pK^-$ (part of the total statistics)

- proton likelihood >0,95
- kaon likelihood >0,75



Pentaquark search in pK_S final state



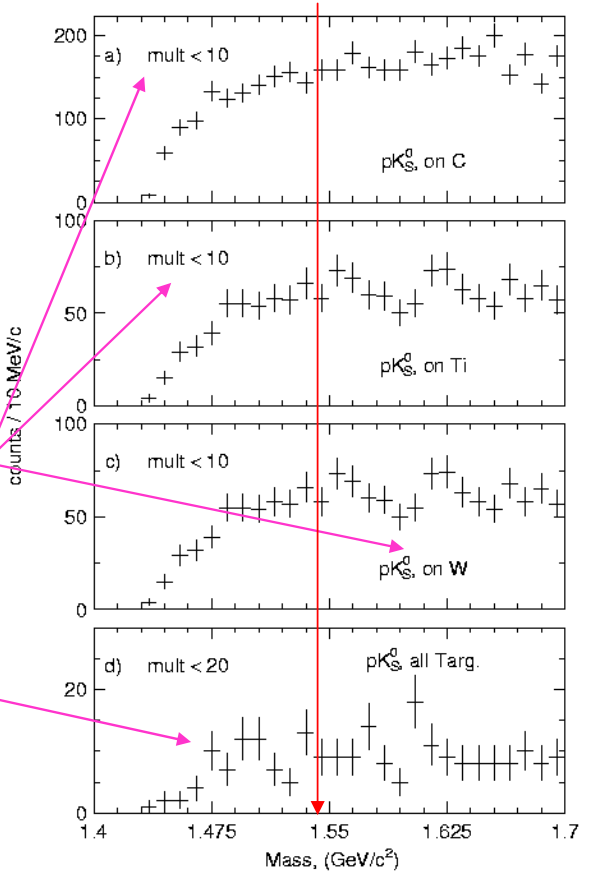
pK_S Inv. Mass (GeV)

Continuous line
= bkg from event mixing

Many systematic studies:

- Multiplicity cut
-Different materials

- Λ Tag in the event

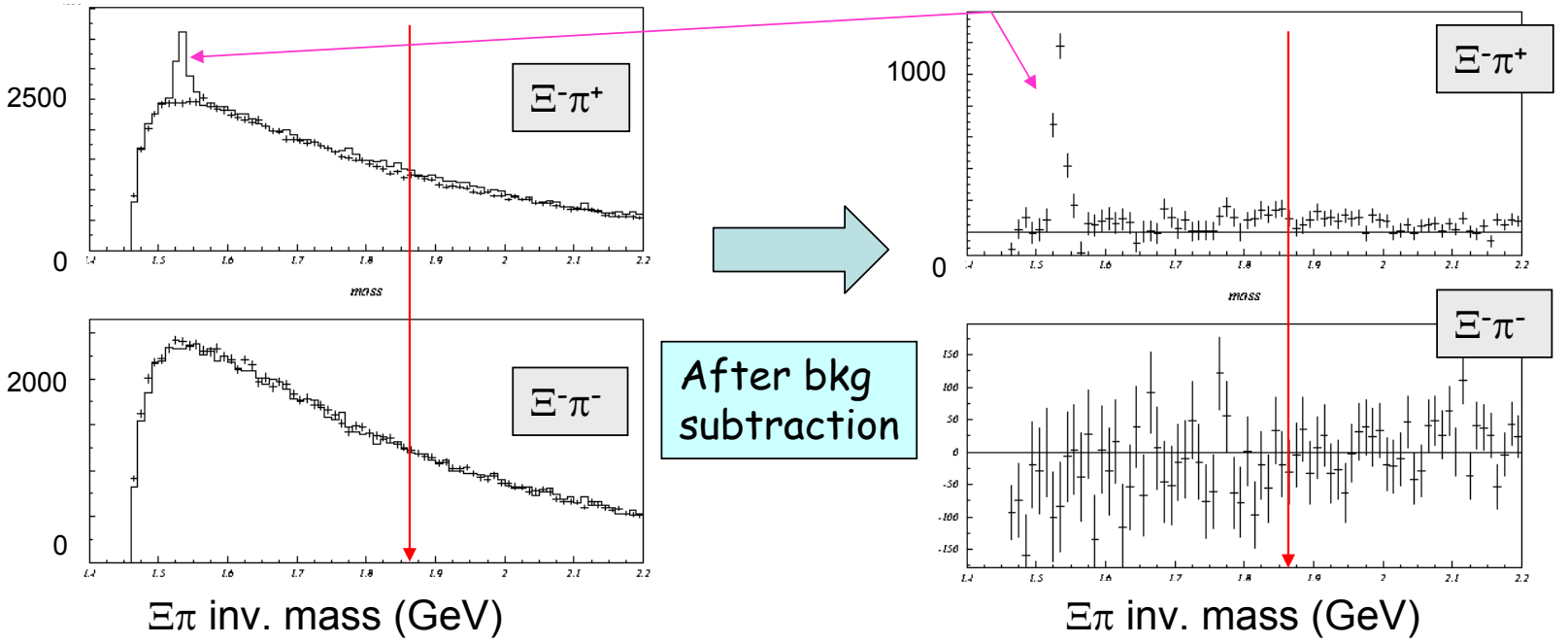


-No narrow signal visible !
-Work ongoing on Upper limit

Pentaquark search in Ξπ final state

Analysis similar to NA49: combination of charged Ξ and π.
Bkg subtraction by using event mixing

Very prominent signal from $\Xi^0(1530) \rightarrow \Xi^-\pi^+$



- No narrow signal visible !
- Work ongoing on Upper limit

HERA-B present status

- Exploited the large statistics and high resolution of the detector: ~3,4x10^6 K_S and ~2x10^4 Ξ
- Clear signals from $\Lambda(1520) \rightarrow pK^-$, $\Xi^0(1530) \rightarrow \Xi^-\pi^+$ reconstructed
- First preliminary results show NO EVIDENCE for narrow pentaquark states.
- Detailed systematic studies ongoing
- Upper limit on cross section BR·σ under evaluation:

→ Important for comparison with other results.