

Status of the target system for the hypernuclear experiment

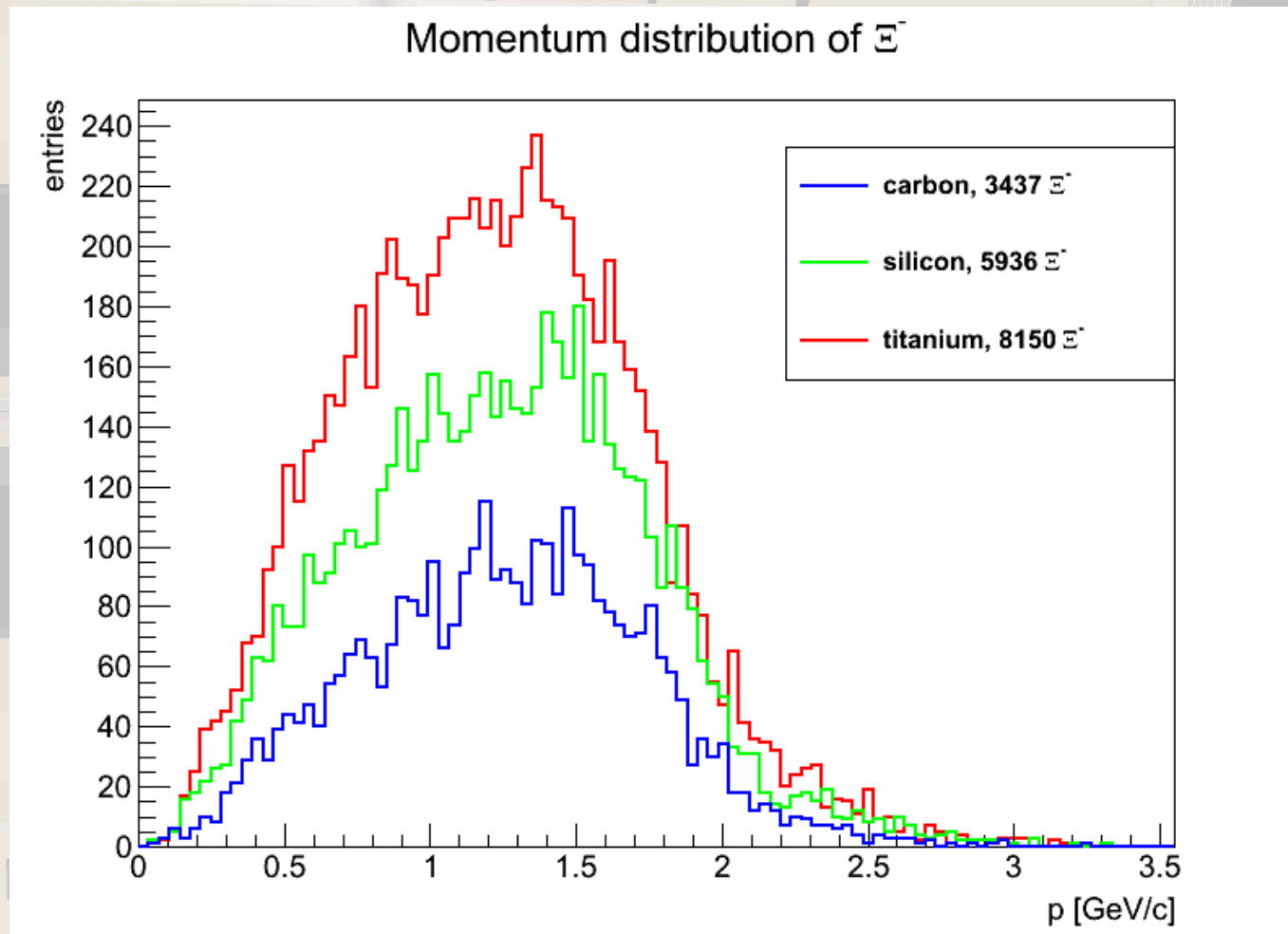
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PANDA-Meeting June 9th, 2015

Primary reaction

15.84 million reactions per GiBUU run with \bar{p} on ^{12}C , ^{28}Si , ^{48}Ti to produce Ξ^-

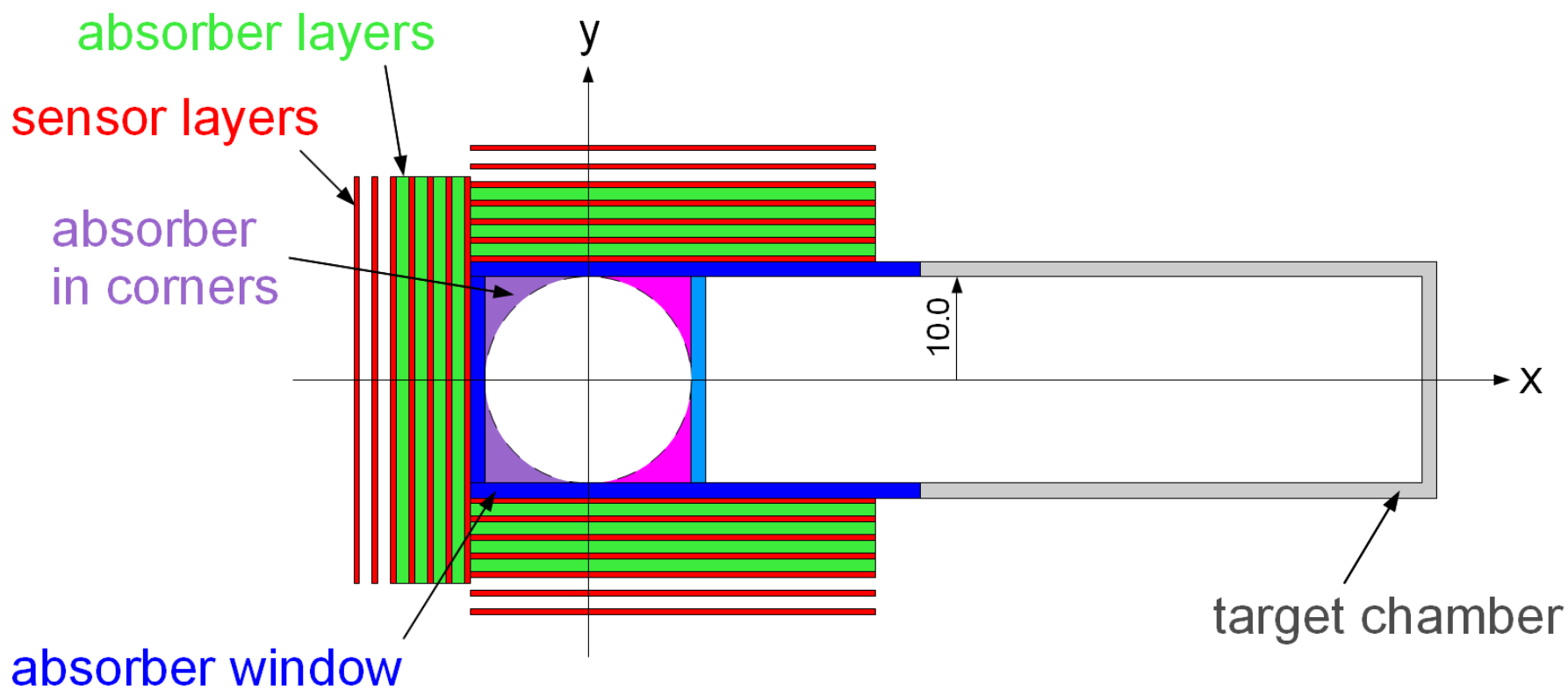


Increasing number
of Ξ^- for higher Z

but background (n, π)
and beam losses
have to be considered

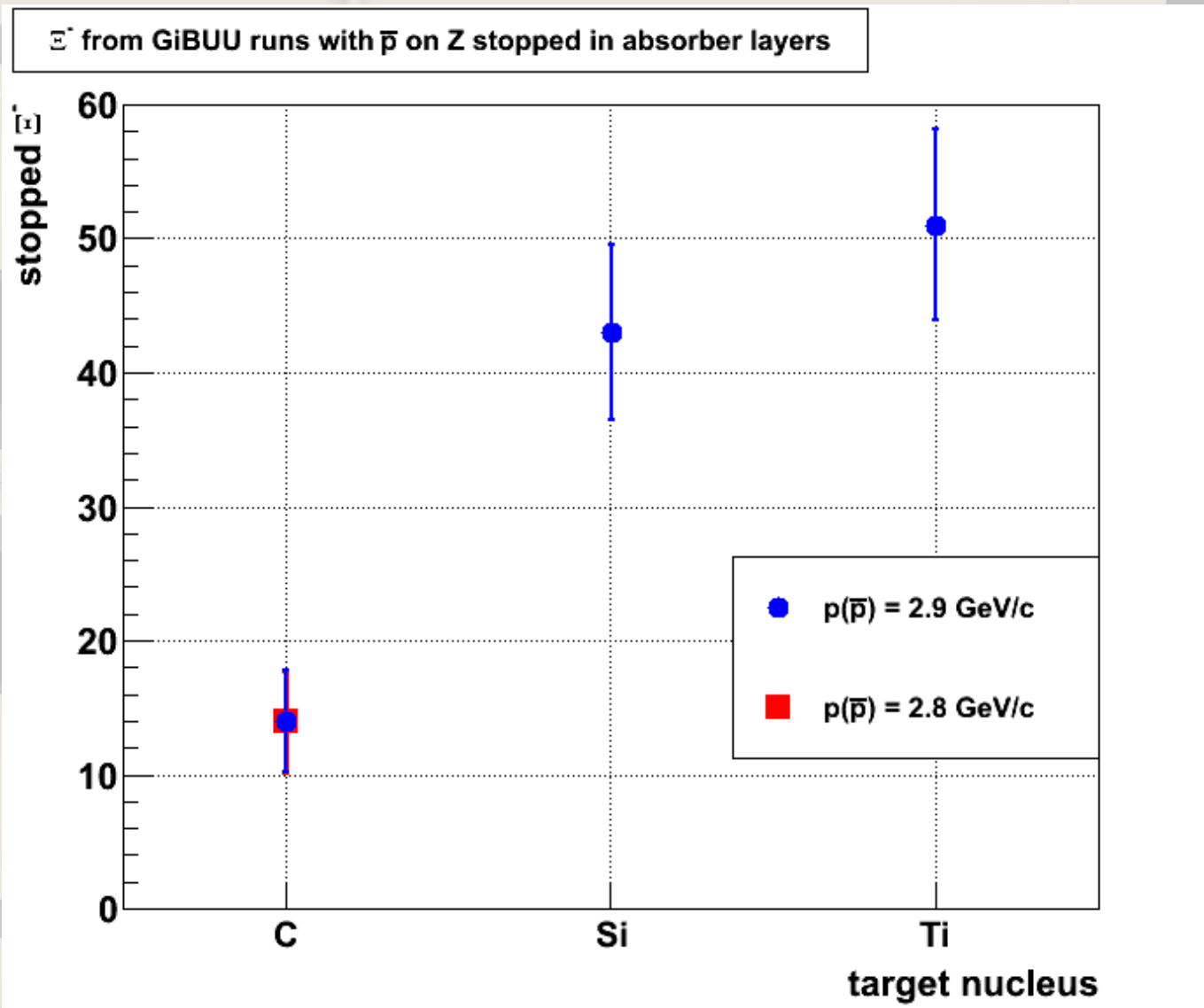
Geometry of the target system

Target chamber with absorber window



→ Geant4 simulation with Ξ^- from GiBUU

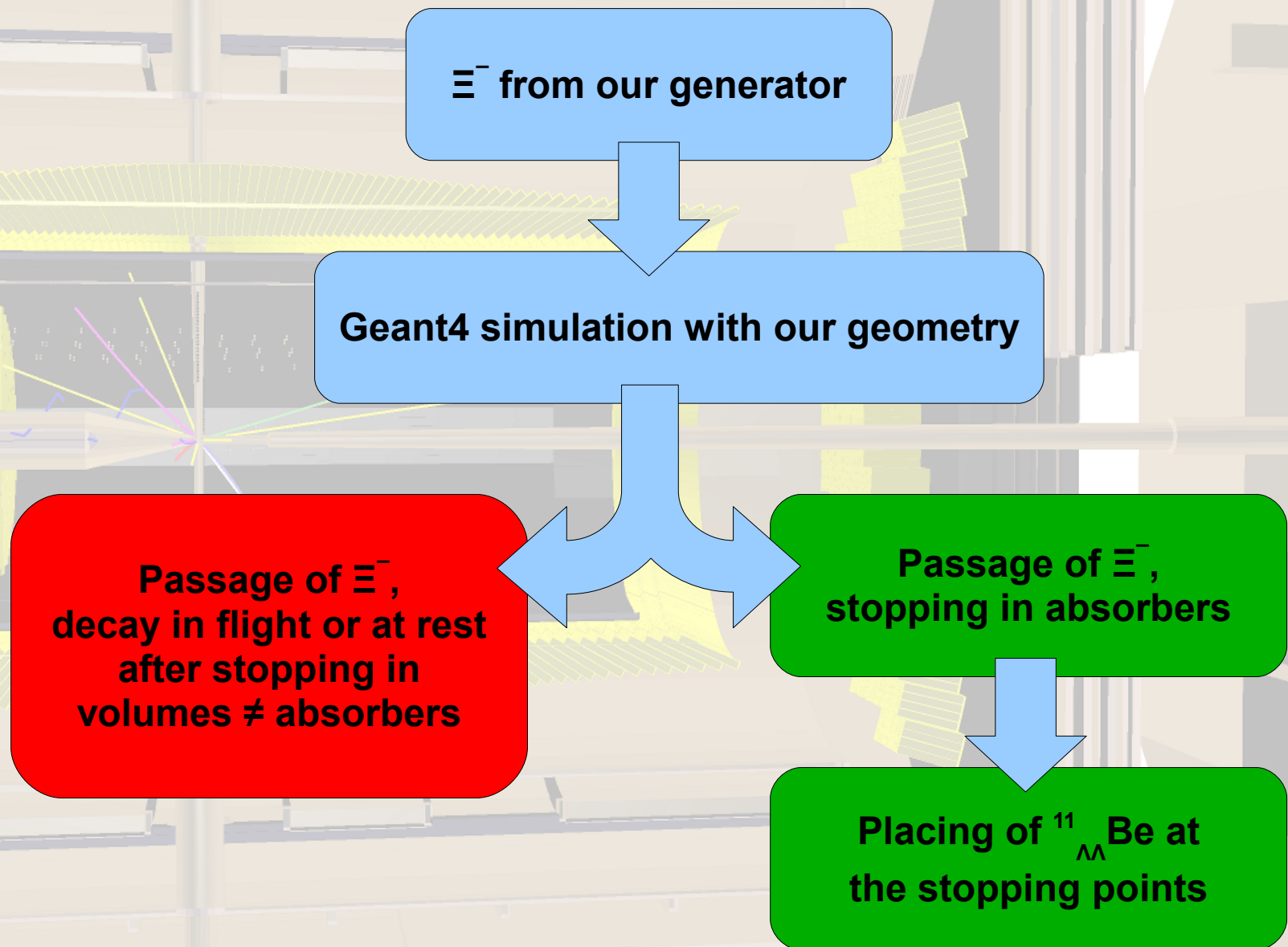
Stopped Ξ^- from GiBUU



Statistics too low to optimize the geometry

⇒ new generator for Ξ^- of parametrized GiBUU events

Stopping simulations

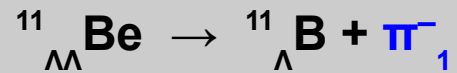


Detection of $^{11}_{\Lambda\Lambda}\text{Be}$

Concept: Pion tracking

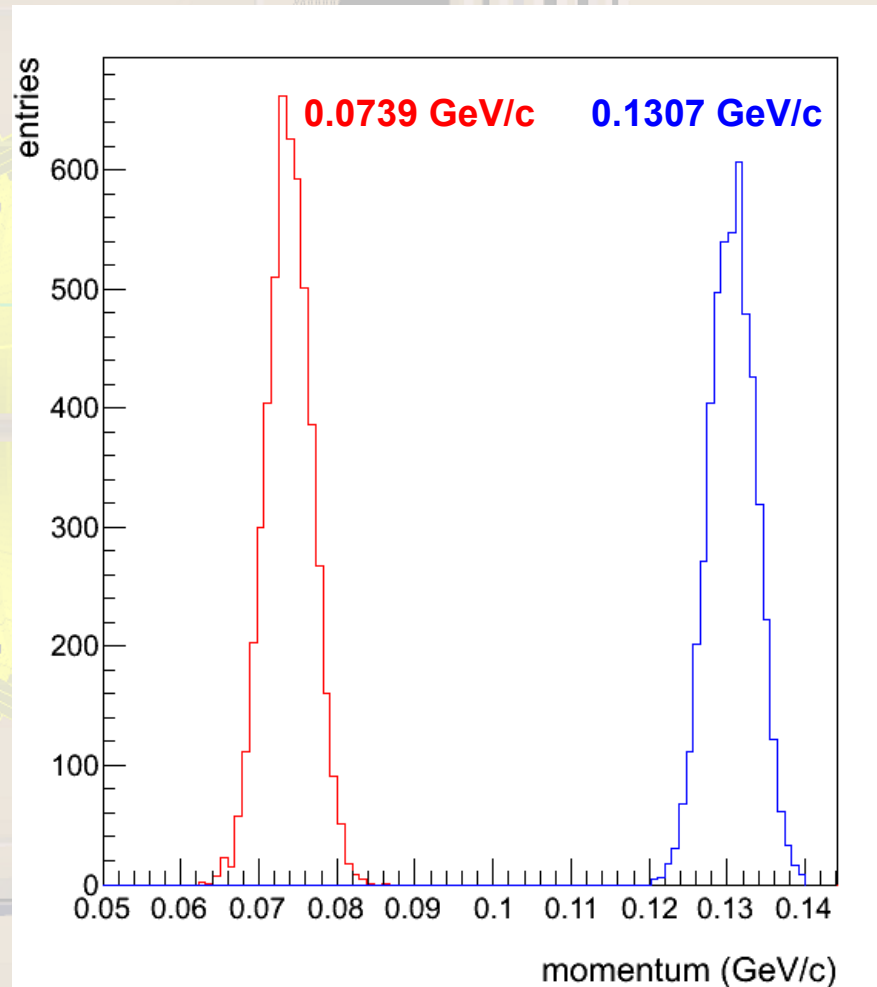
Simulation steps:

- phase space decay by Geant4



- smearing of the pion points in sensors with spatial resolution
- track finding and track fitting for π^{-}_1 and π^{-}_2
- momentum reconstruction

expected momentum distribution:



Pion tracking result

Reconstructed momenta for all pions:

result

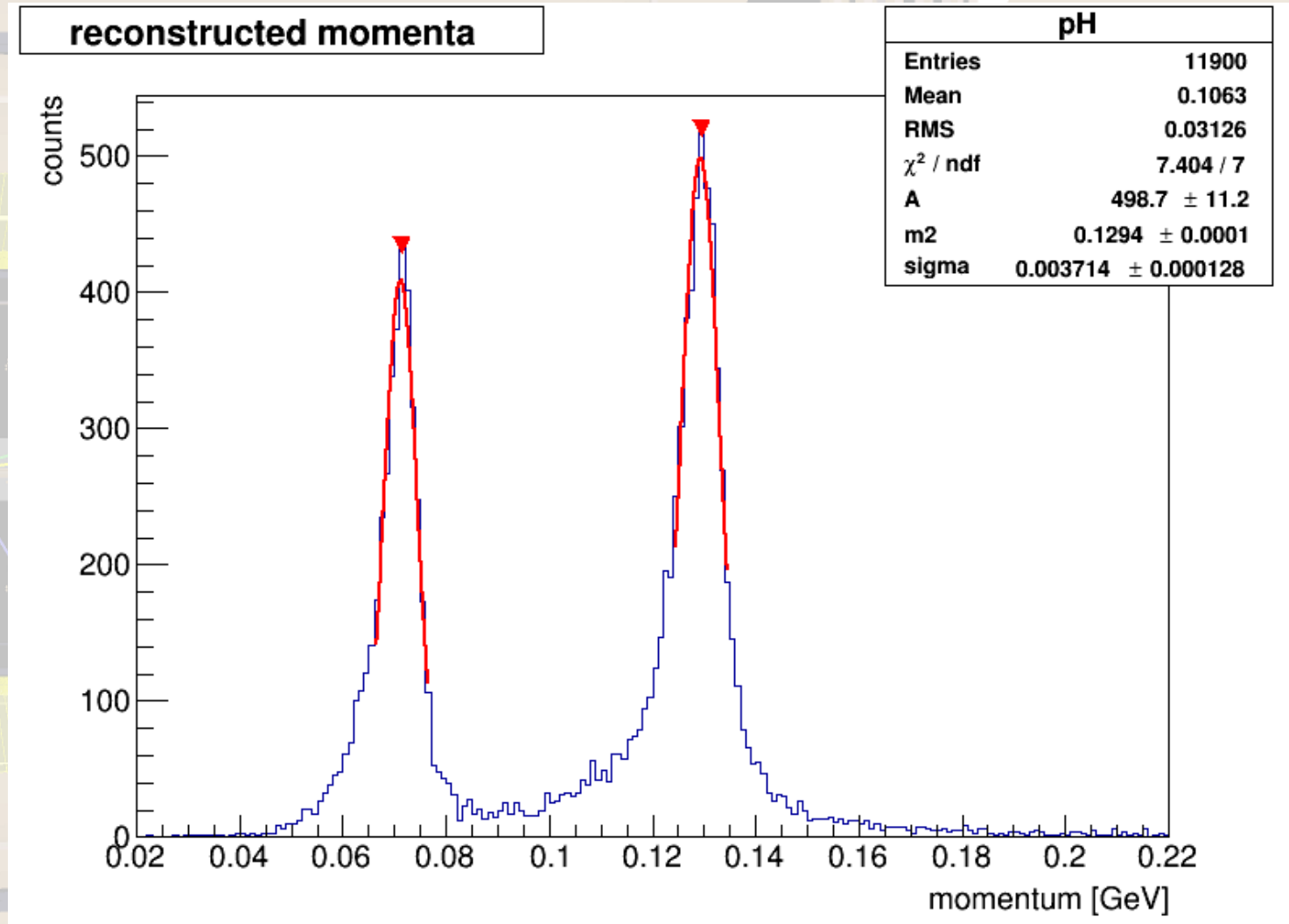
$p_1 = 129.39 \text{ MeV}/c$

$p_2 = 71.26 \text{ MeV}/c$

$\text{res}_1 = 6.7 \%$

$\text{res}_2 = 10.7 \%$

efficiency = 58.6 %



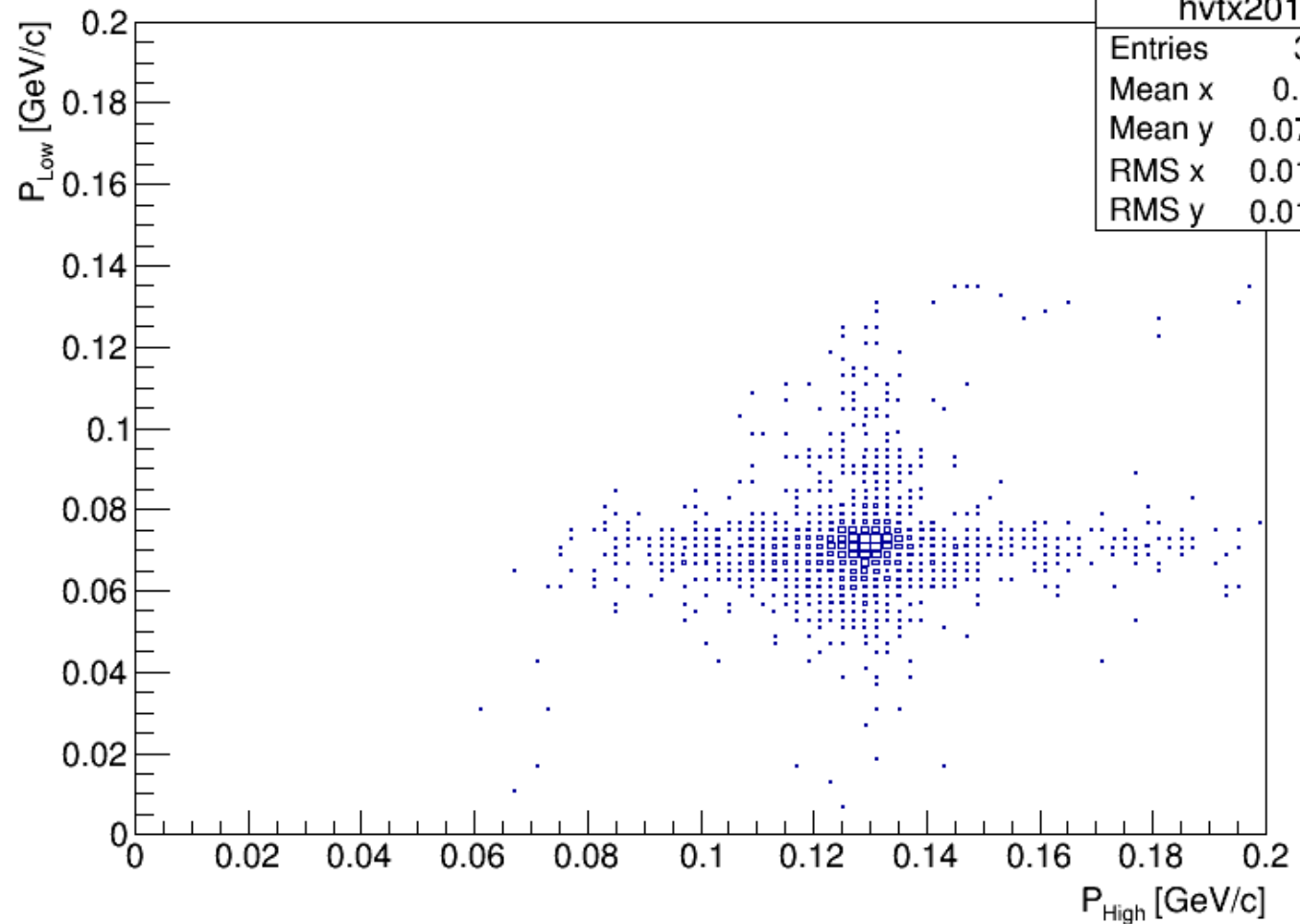
Pion tracking result

Reconstructed momenta for all pions:

result

efficiency = 33.3 %

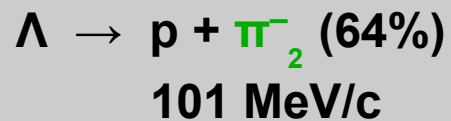
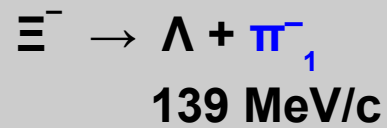
$\pi_L + \pi_H$ correlation



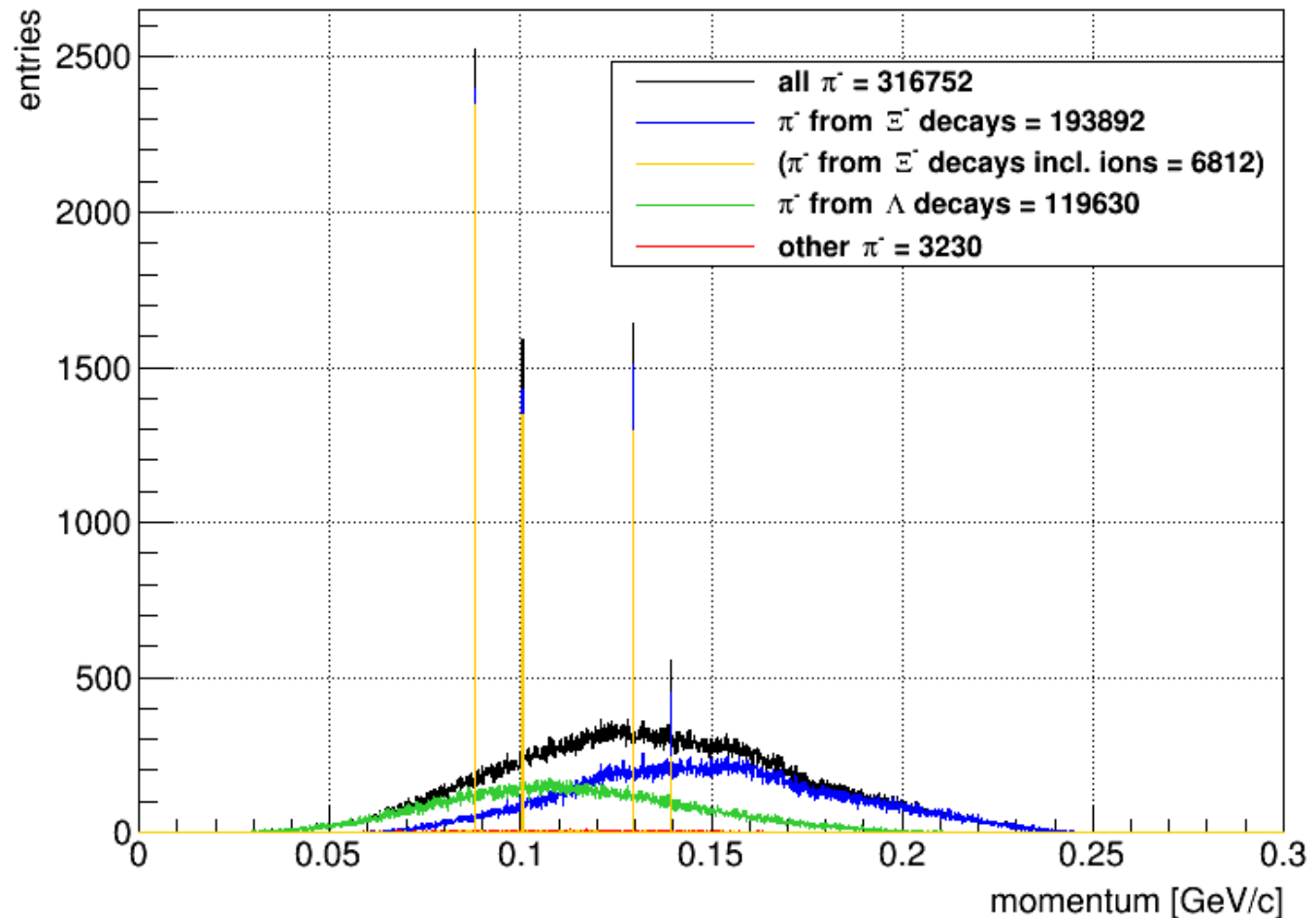
hvtx201	
Entries	3256
Mean x	0.1281
Mean y	0.07103
RMS x	0.01385
RMS y	0.01002

Pion background from Ξ^- decays

Analysis of the
stopping
simulation result

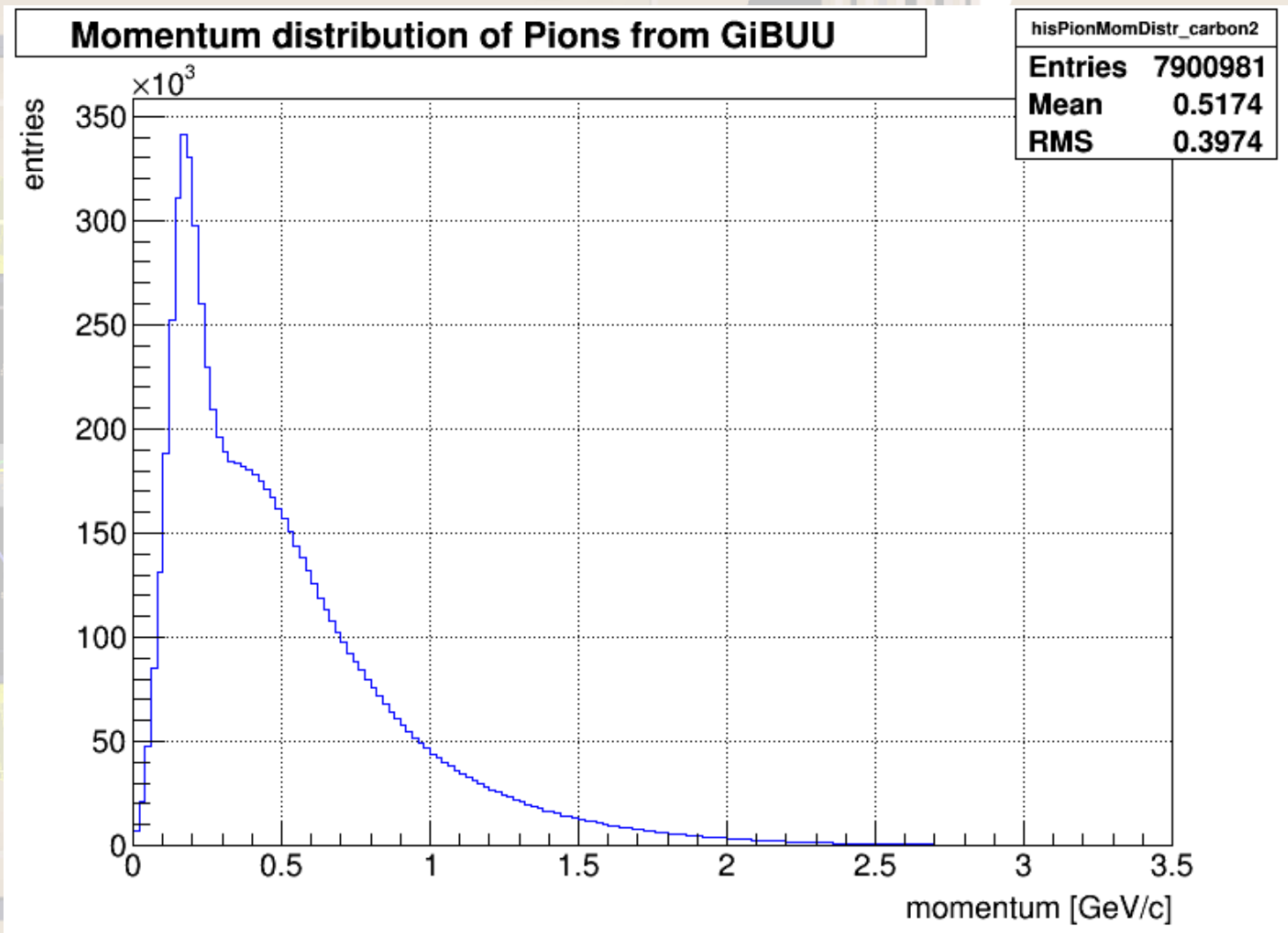


Momentum distribution of π^- at their vertex



Pion background from GiBUU

Analysis of the
GiBUU
simulation result



Outlook

- ongoing GiBUU simulations to get more statistics
- tracking of the background pions from Ξ^- decays and primary reactions
- taking pions from Ξ^- decays at rest into account (capture and conversion probability $\approx 5\%$)
- looking for signatures and properties of the background pions to cut on (as displaced vertices, transverse momentum and other observables)
- analyzing the possibility to tag the non mesonic weak decay of $^{11}_{\Lambda}\text{Be}$