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Update on hyperon simulations

PANDA Collaboration Meeting

Jülich, 2014-12-09

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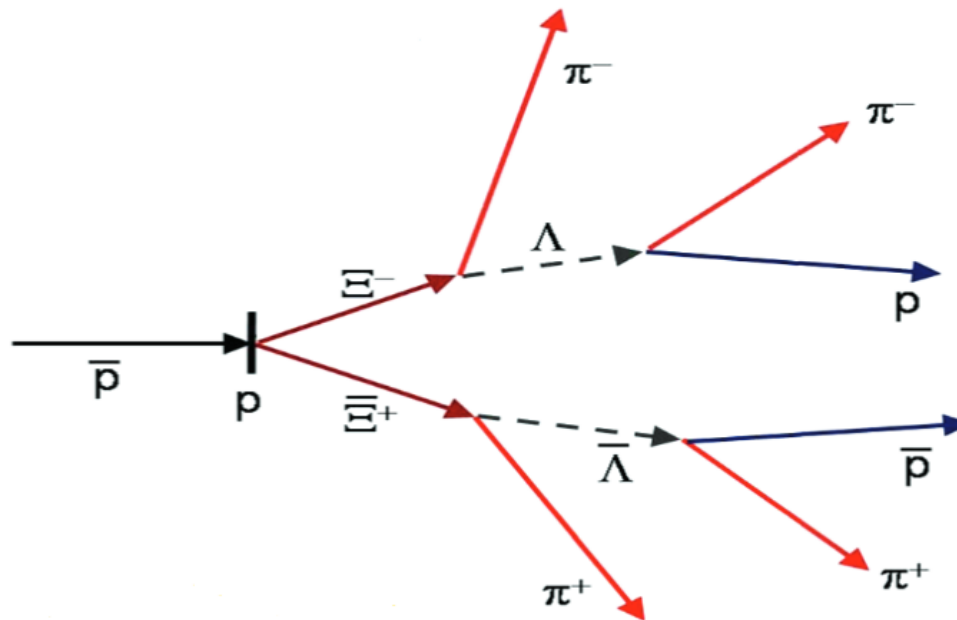
Outline

Today: focus on antiproton efficiency

- Prologue: the $\bar{p}p \rightarrow \bar{\Xi}^+ \Xi^-$ channel
- The $\bar{p}p \rightarrow \bar{\Lambda} \Lambda$ channel
- Tests with the box generator
- Summary



Prologue: the $\bar{p}p \rightarrow \bar{\Xi}^+ \Xi^-$ reaction



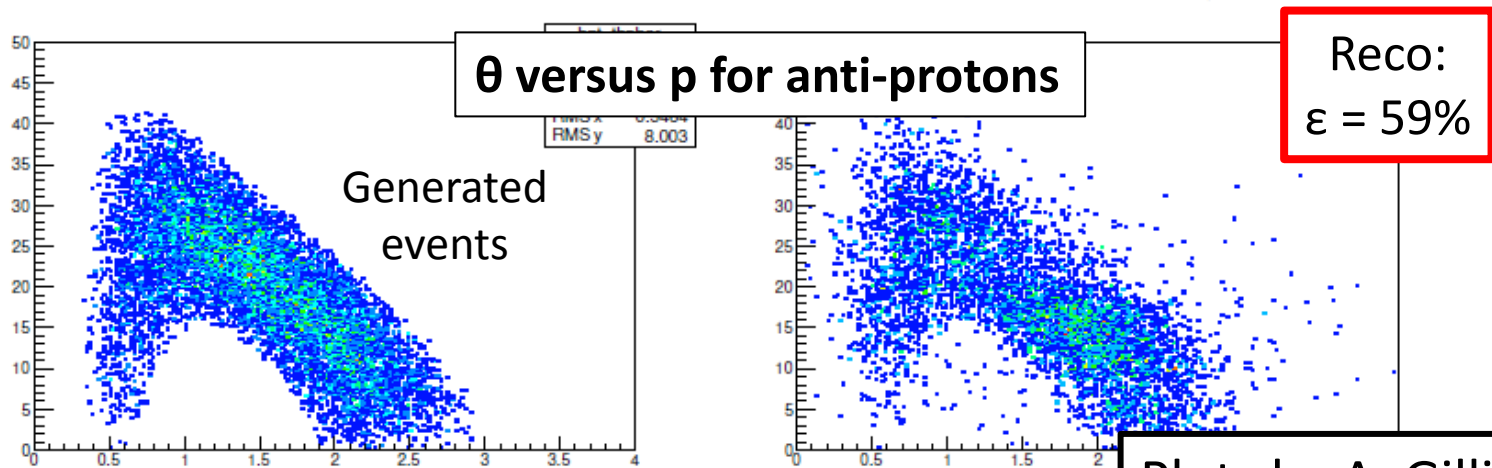
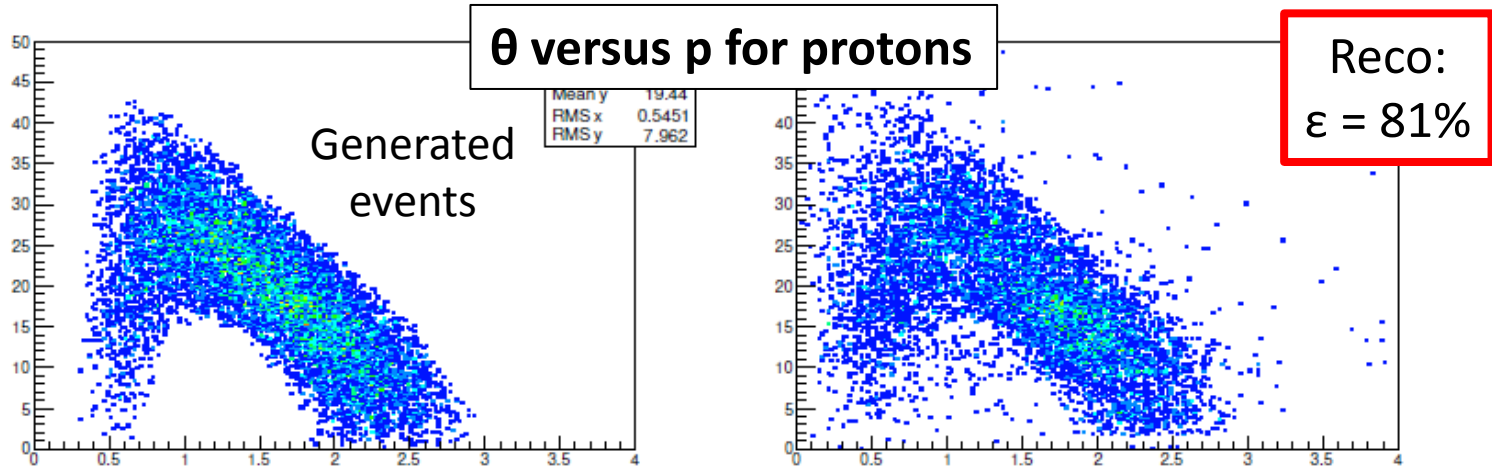
K.S. studied this channel briefly for the scrutiny campaign.

A. Gillitzer pursued a more detailed study:

- Oct2014 release
- Ideal pattern recognition
- Back propagation to IP switched off



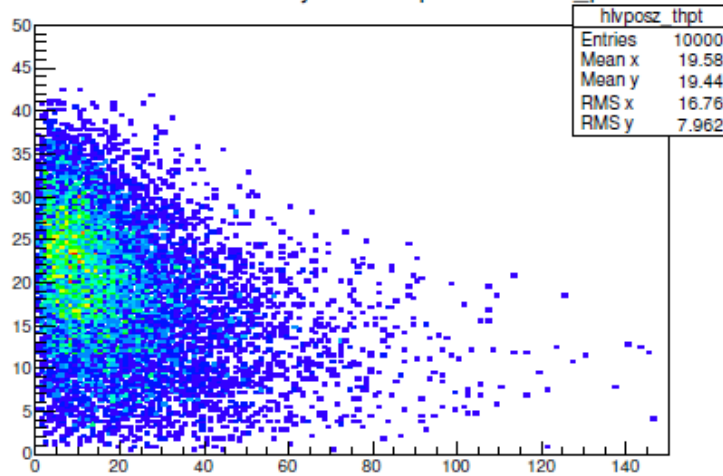
Prologue: the $\bar{p}p \rightarrow \bar{\Xi}^+ \Xi^-$ reaction



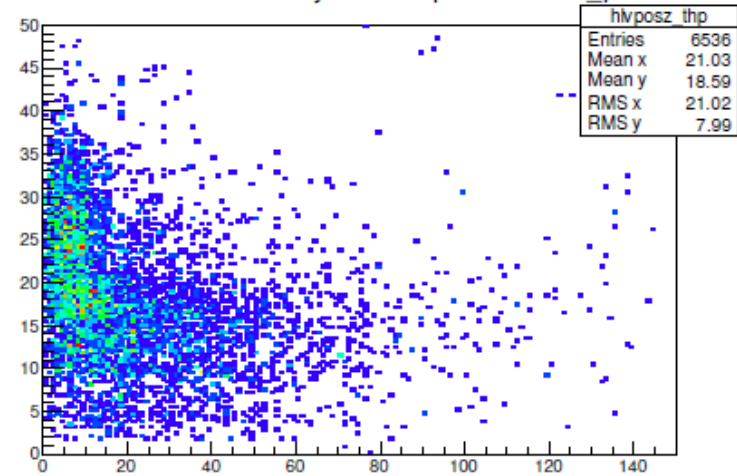


Prologue: the $\bar{p}p \rightarrow \bar{\Xi}^+ \Xi^-$ reaction

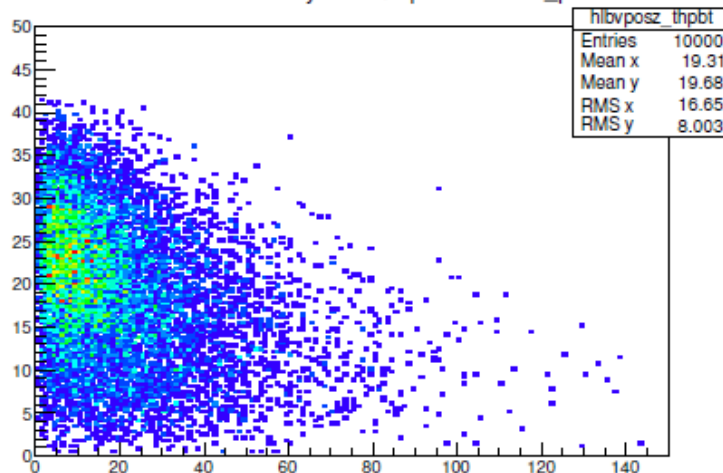
true lambda decay vertex z pos. vs. theta_p



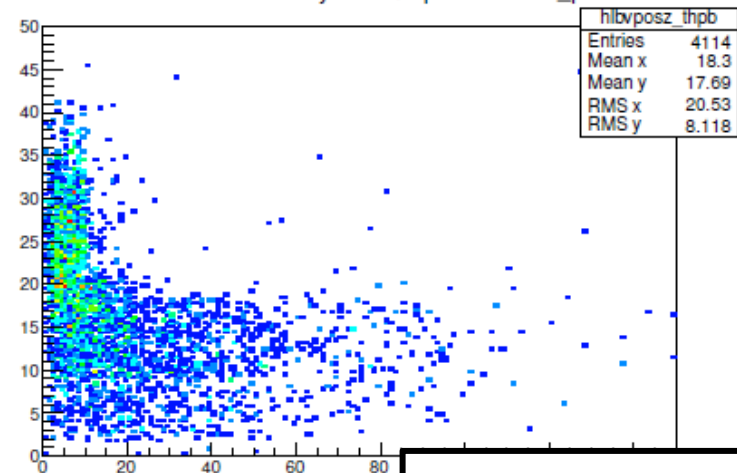
fitted lambda decay vertex z pos. vs. theta_p



true lambdabar decay vertex z pos. vs. theta_pbar



fitted lambdabar decay vertex z pos. vs. theta_pbar





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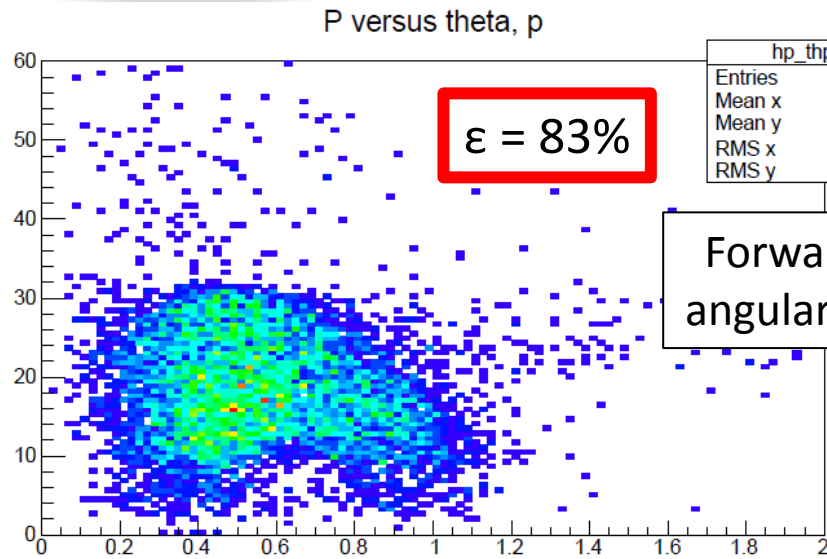
The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

- Pandaroot revision 26319
- Ideal pattern recognition
- Back propagation to IP switched off
- Both isotropic and forward peaking generators have been used.



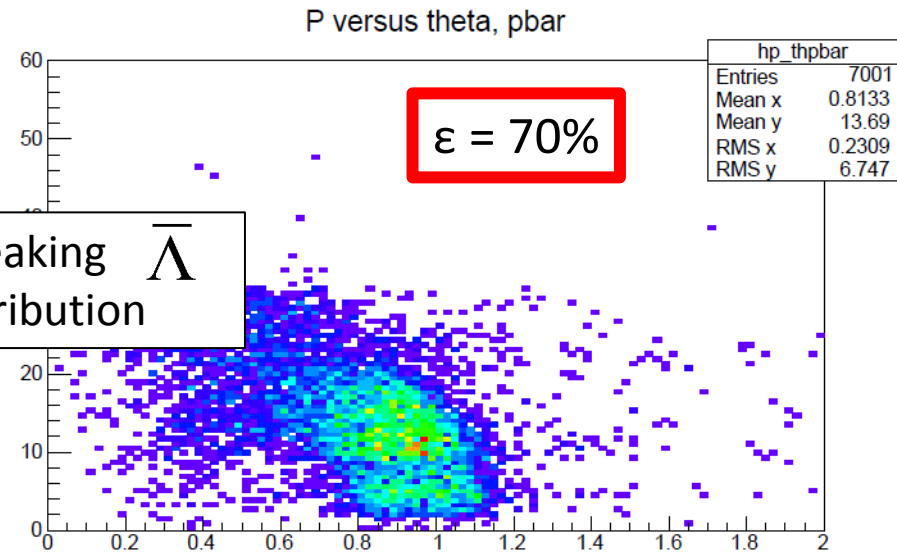
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The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

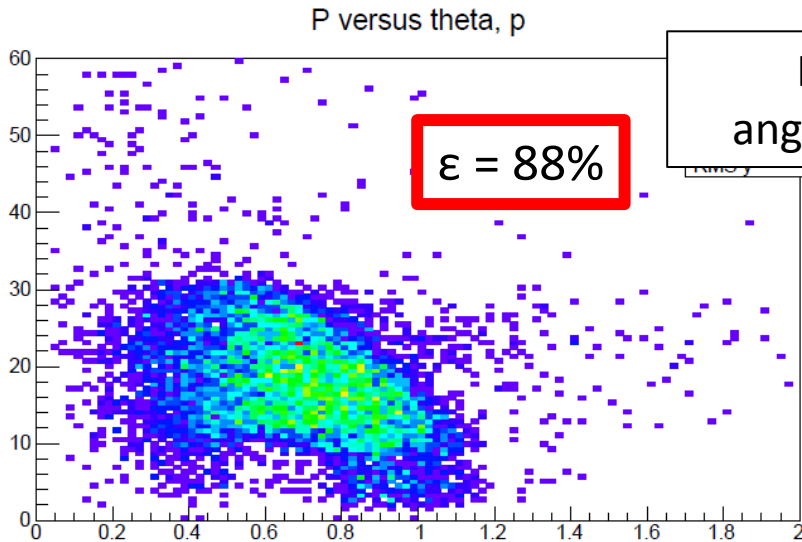


$\epsilon = 83\%$

Forward peaking $\bar{\Lambda}$
angular distribution

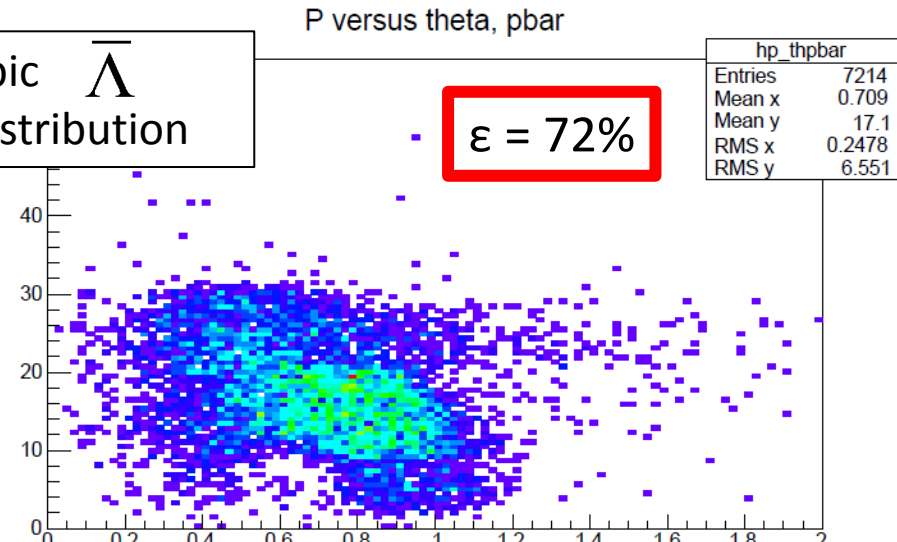


$\epsilon = 70\%$



$\epsilon = 88\%$

Isotropic $\bar{\Lambda}$
angular distribution



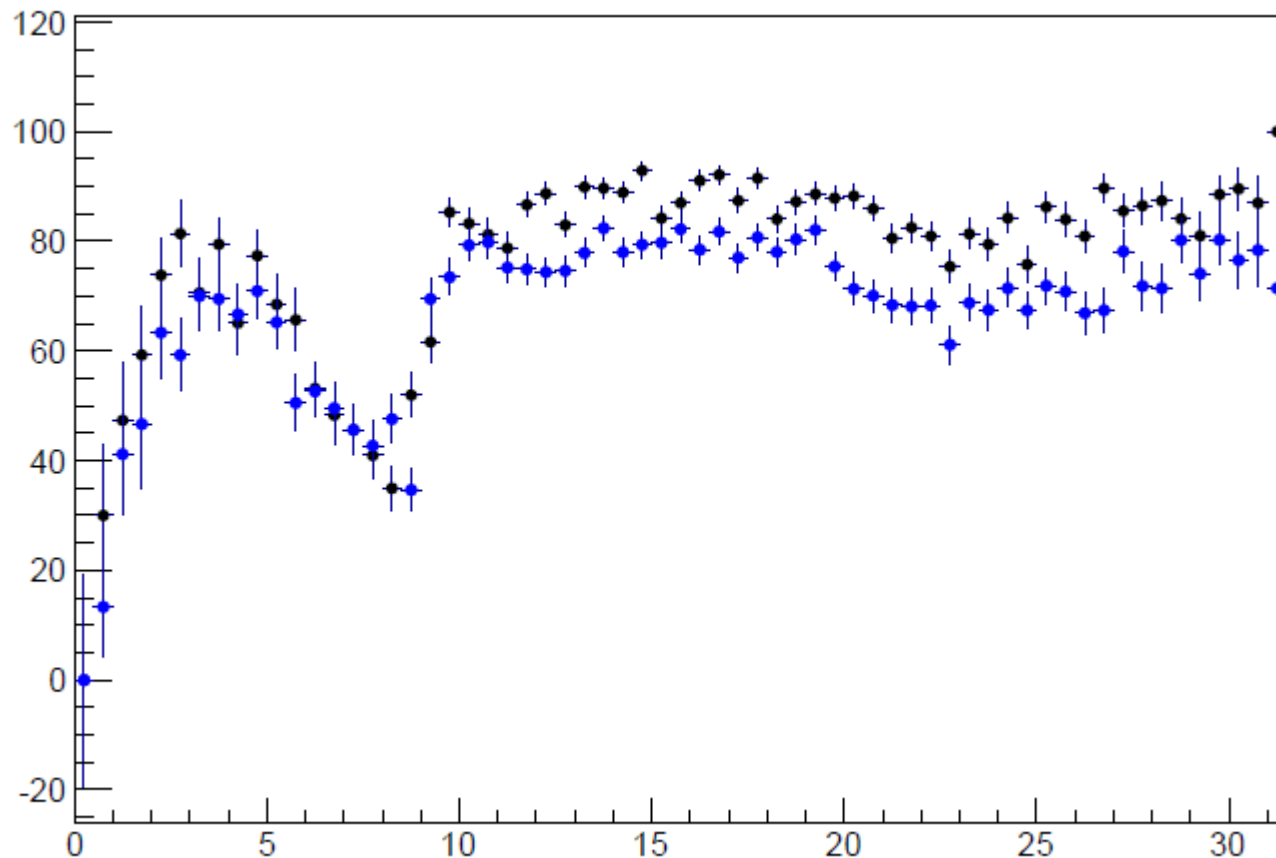
$\epsilon = 72\%$



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The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

Protons (black) and antiprotons (blue)



The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

- The yield of π^- is larger than that of π^+ :

Particle	Generator	ϵ (%)
π^+	fwp	65
π^-	fwp	70
π^+	isotrop	65
π^-	isotrop	74

Decay products from Λ are more often reconstructed than those of $\bar{\Lambda}$?



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The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

Do not remember this from my adventures last spring!

Did something change in the pandaroot code?

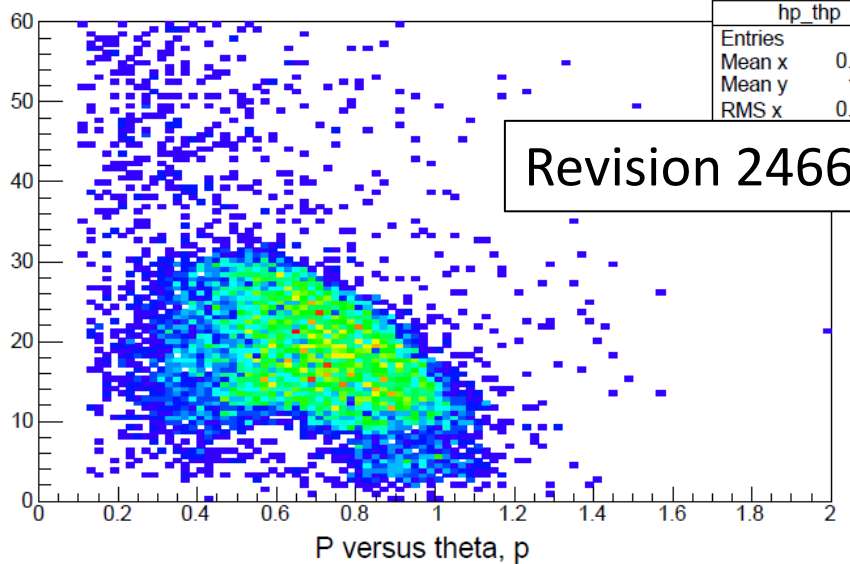
Let's go back to revision 24660 (presentation at CM, June 2014)



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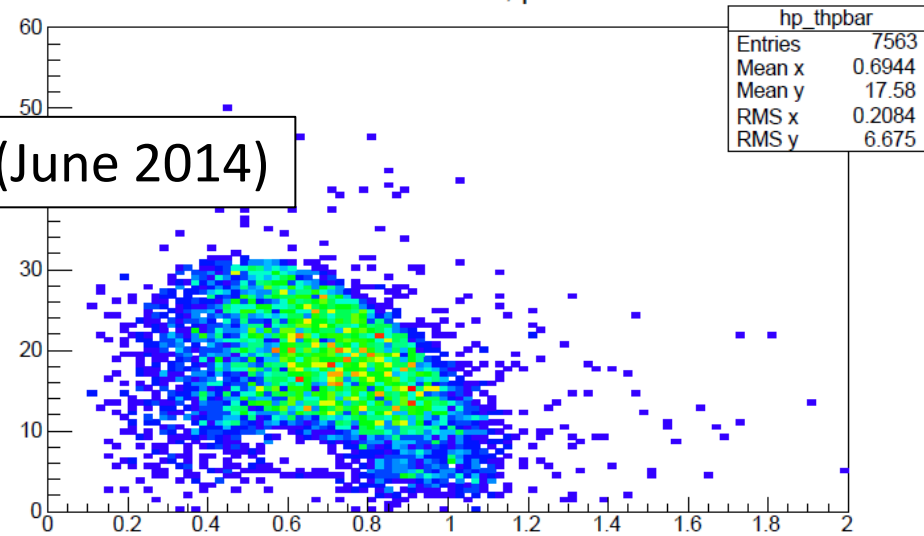
The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c

P versus theta, p

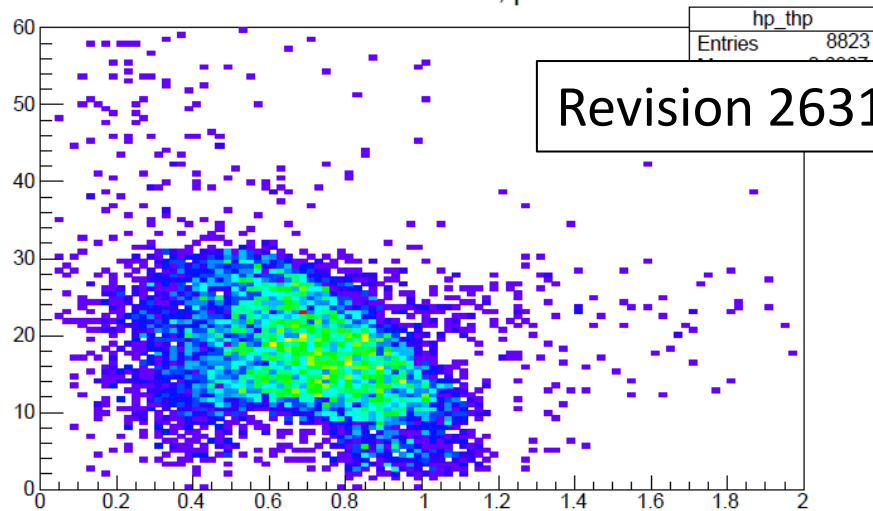


Revision 24660 (June 2014)

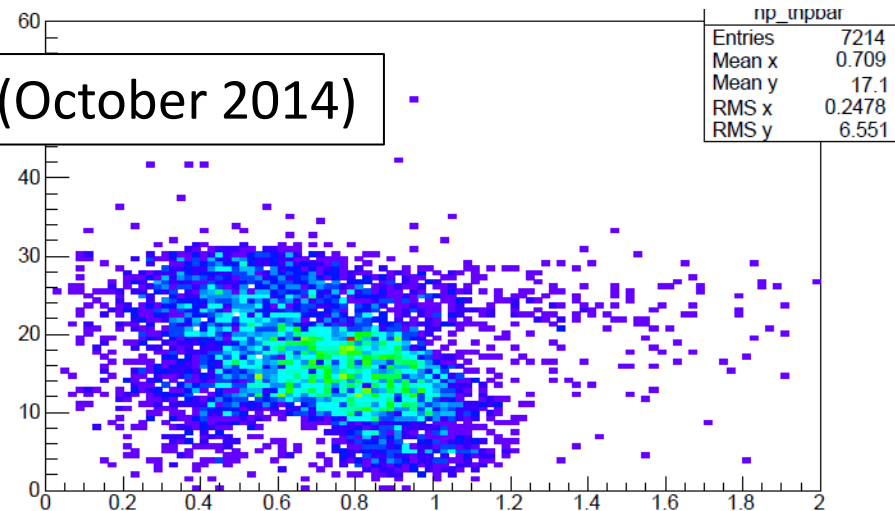
P versus theta, pbar



P versus theta, p



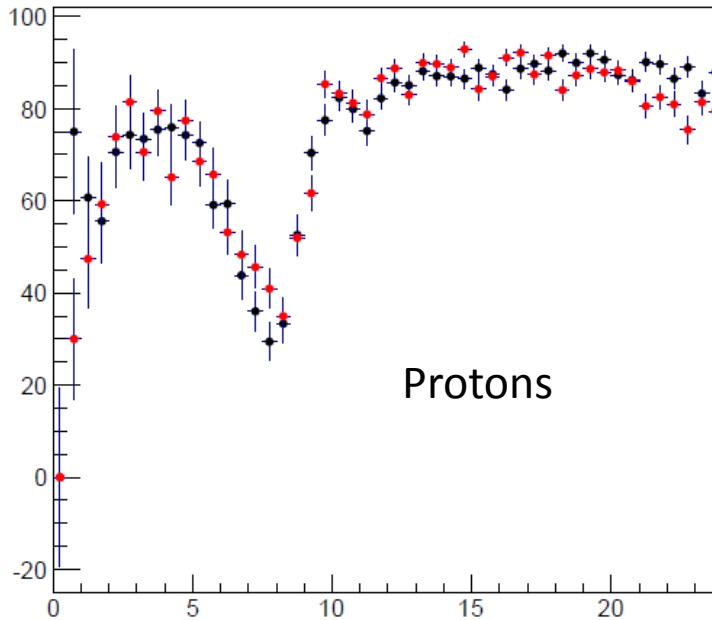
Revision 26319 (October 2014)





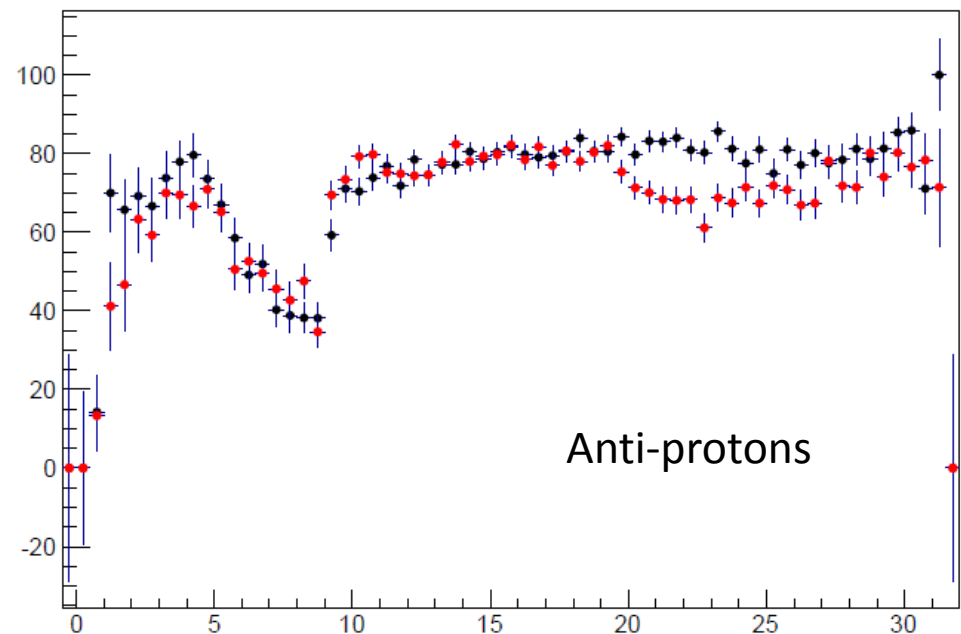
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The $\bar{p}p \rightarrow \bar{\Lambda}\Lambda$ reaction at 1.64 GeV/c



Revision 24660 (black)
Revision 26319 (red)

The efficiency drop was introduced recently and is stronger for protons than for anti-protons.





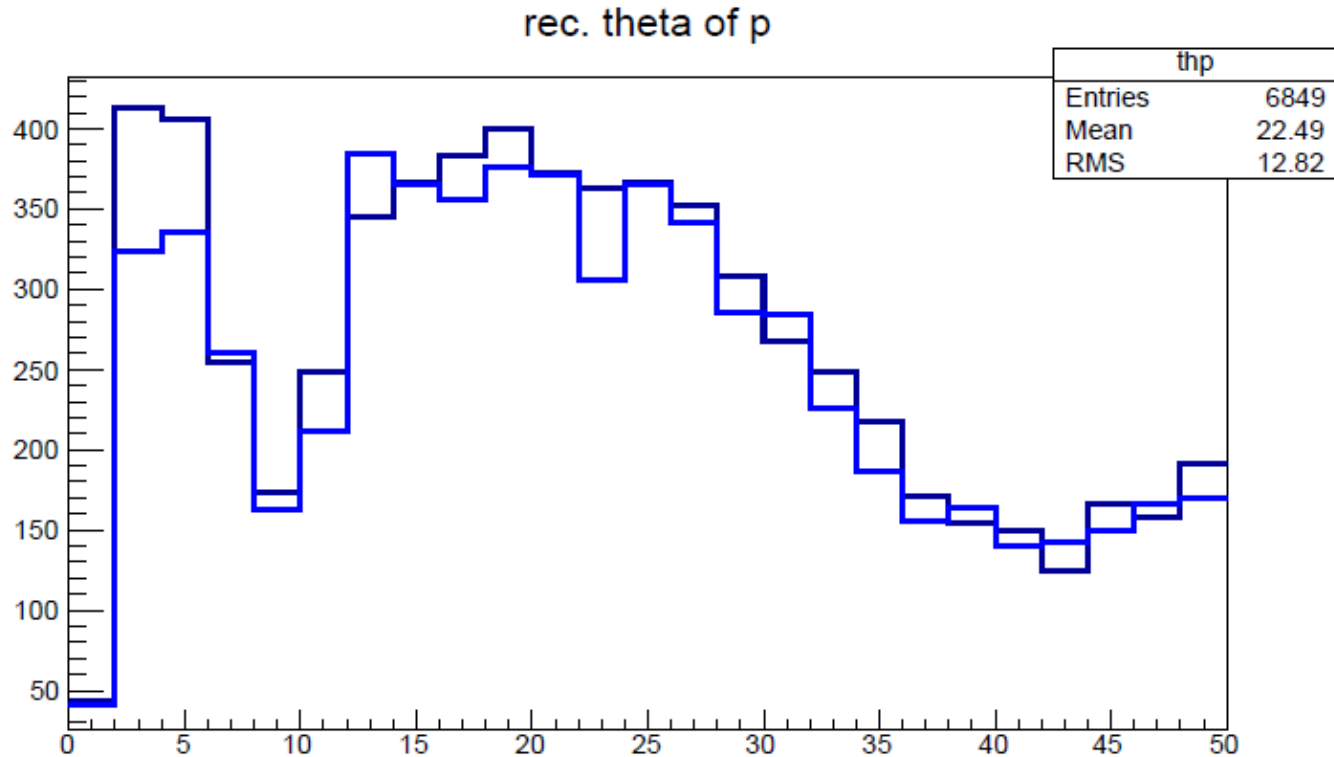
Box generator: protons and anti-protons

10000 events were generated within $0 < \theta < 50^\circ$ at 2 GeV/c.

Particle	Revision	x, y, z (cm)	ϵ (%)
proton	26319	0,0,0	91
anti-proton	26319	0,0,0	82
proton	26319	0,0,20	69
anti-proton	26319	0,0,20	64
proton	24660	0,0,0	94
anti-proton	24660	0,0,0	81
proton	24660	0,0,20	71
anti-proton	24660	0,0,20	65



Box generator



Antiprotons and protons generated at 2 GeV, 20 cm downstream from the interaction point.

More antiprotons than protons seem to be lost on the FTS.



Box generator: π^+ and π^-

10000 events were generated within $0 < \theta < 50^\circ$ at 2 GeV/c.

Particle	Revision	x, y, z (cm)	ϵ (%)
π^+	26319	0,0,0	87
π^-	26319	0,0,0	87
π^+	24660	0,0,0	89
π^-	24660	0,0,0	89

No difference between π^+ and π^-



Summary

- All hyperon channels have systematically lower reconstruction efficiency for antiprotons than for protons.
 - Seen also in box generator tests
- The yield of π^- is larger than that of π^+ .
 - Not reproduced with box generator.
- A visible effect around $\theta \sim 20$ degrees was introduced between June and October.
 - GEM dimensions?
 - Only seen for antiprotons.
 - Not reproduced with box generator.