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Meeting on hyperons in PANDA

SeeVogh Meeting

October 14th 2014

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Agenda

- Round-the-table presentation:
  - Name
  - Institute
  - Hyperon interest
- Organisation of the work involving hyperons
  - SeeVogh meetings: suitable day?
  - Session at the Collaboration meeting
  - Mailing list
- The scrutiny campaign
  - Example: Simulation of the $\bar{p}p \rightarrow \bar{\Omega}\Omega$ reaction
- Beyond the scrutiny: long-term plans for hyperons in PANDA.
- A.O.B.

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The scrutiny campaign

How do we organise this work in the best possible way?

- What do we need to do?
- What can we achieve?
- Who is willing to contribute?
- Example: the $\bar{p}p \to \bar{\Omega}\Omega$ reaction.

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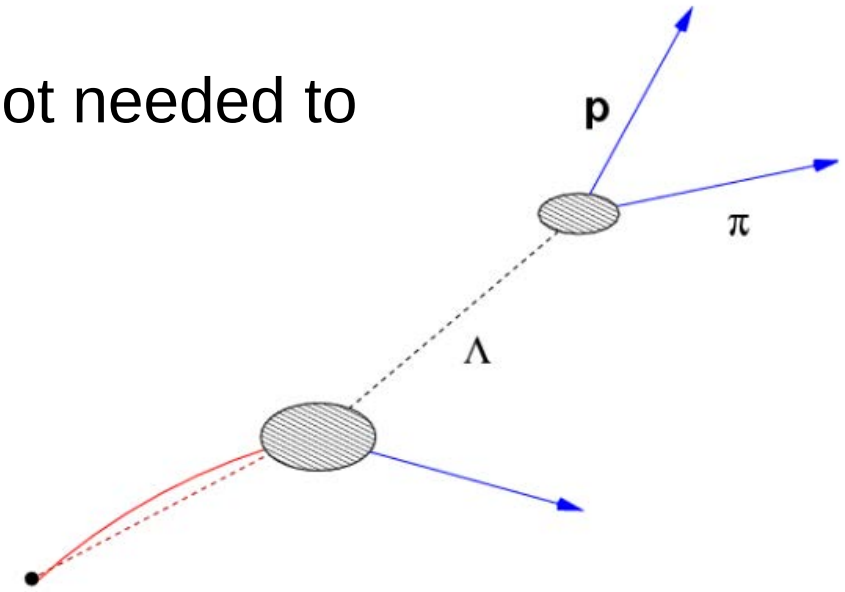
Performance study of the $\bar{p}p \to \bar{\Omega}\Omega$ reaction

- Weak decay → displaced vertices
  - Good spacial resolution required
  - More difficult to handle in reconstruction.
  - Background can be reduced to very low level.
- 6 final state particles.
- Particle identification usually not needed to reduce background

Applicable to most channels involving hyperons



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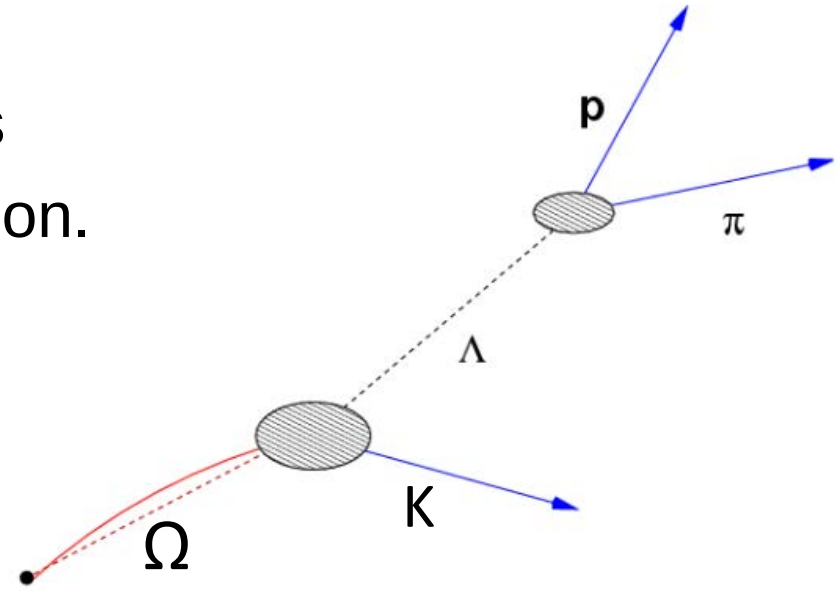
State of Pandaroot

- The displaced vertices of hyperons imply that:
  - Fastsim should not be used.
  - Realistic pattern recognition not yet ready.

Solution:

Full pandaroot simulations
with ideal pattern recognition.



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Some details…..

- Use standard macro recoideal_complete.C from /macro/run
- Set PropagateBackToIP(kFalse);
- Three different detector scenarios:
  - Full
  - No MVD/GEM
  - No FTS
- Comment out corresponding parts in all macros (I can put the macros I use at some accessible place).
- 10000 events for each case.
- Pandaroot revision:
- MC truth identification of pions, protons and kaons.

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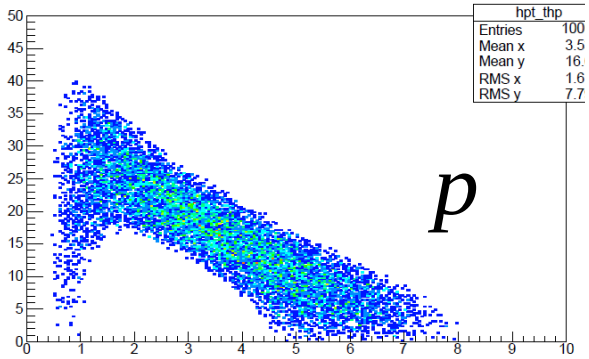
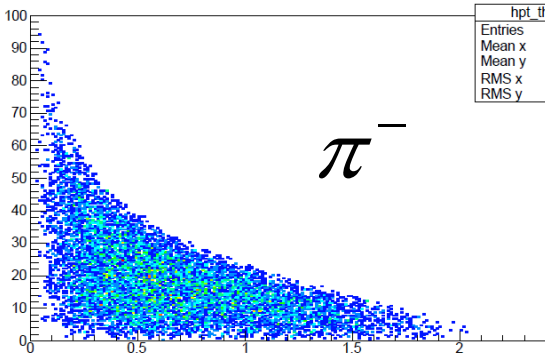
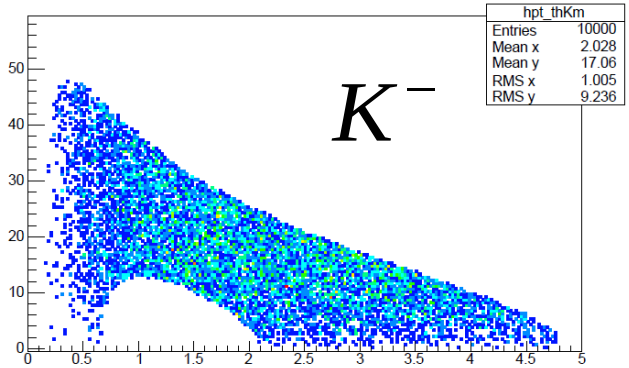
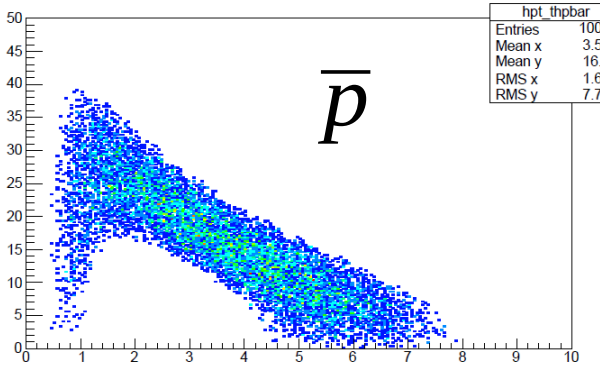
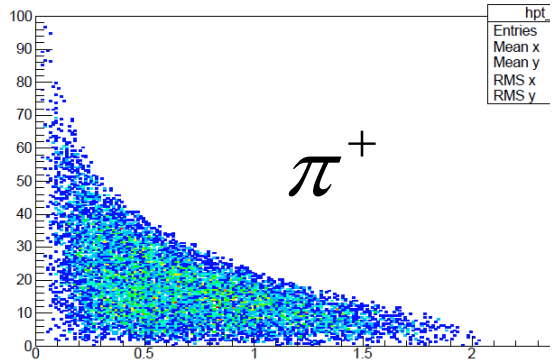
Phase space of $\bar{p}p \to \bar{\Omega}\Omega$ at 12 GeV/c

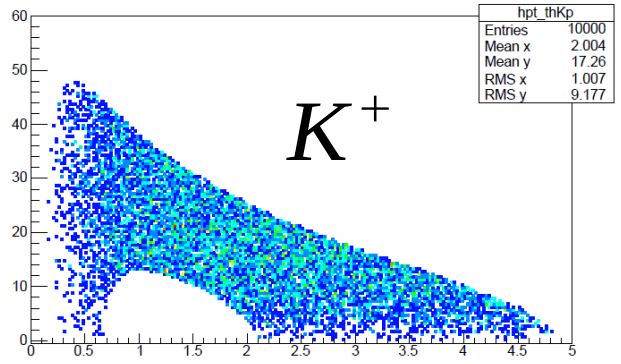












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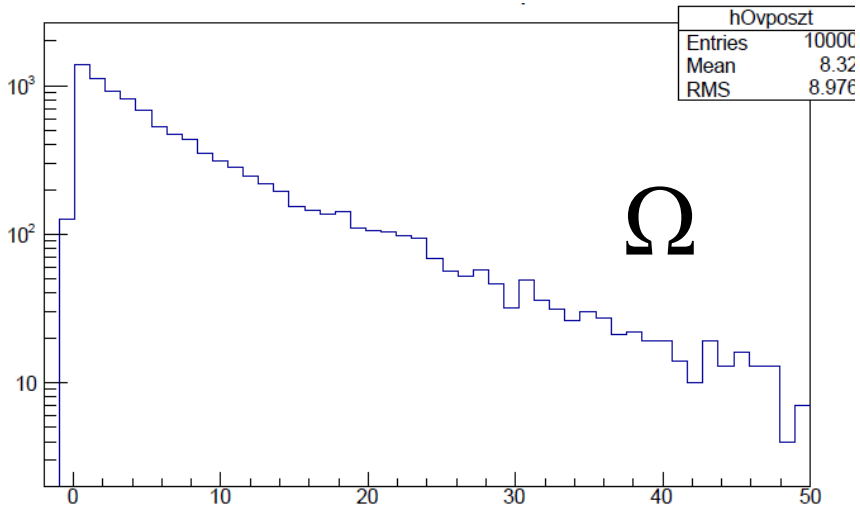
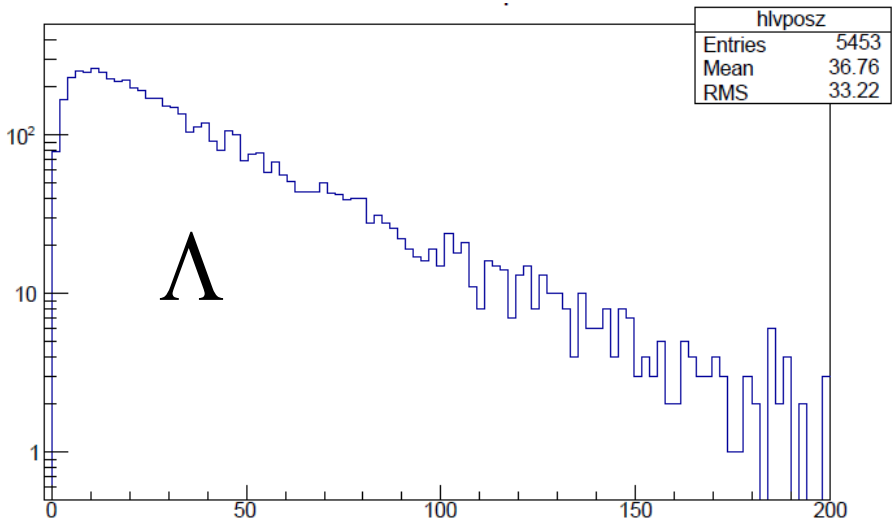
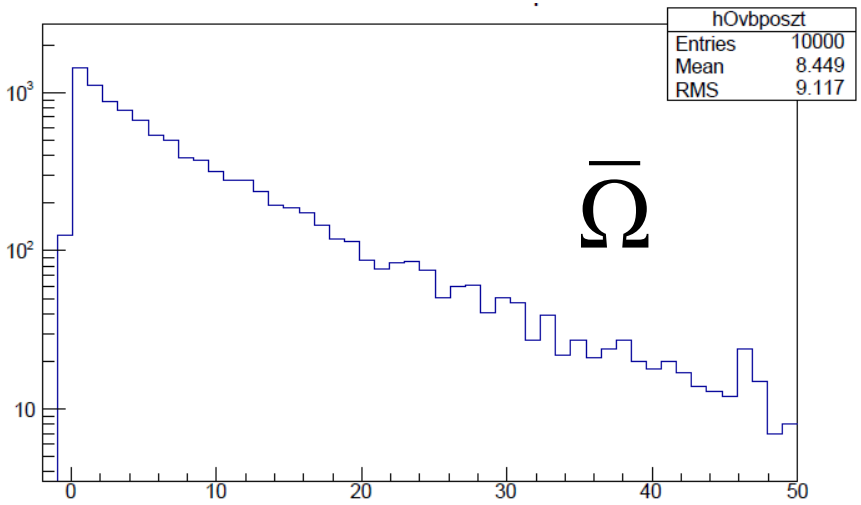
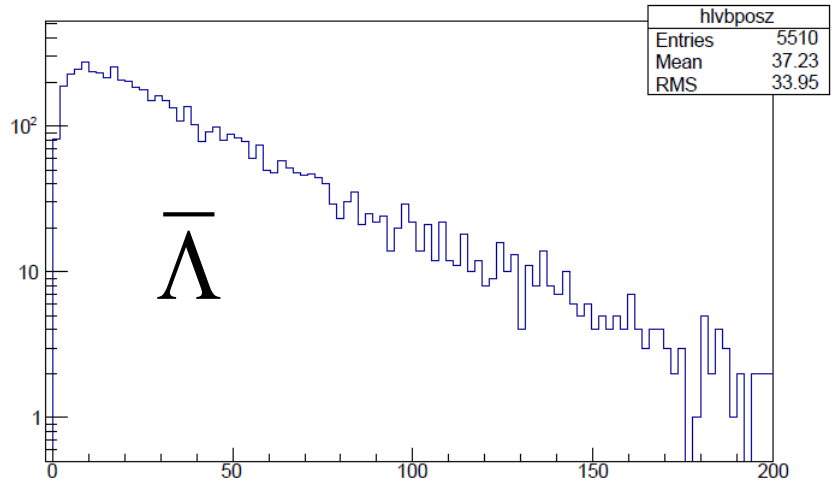
Vertex distributions









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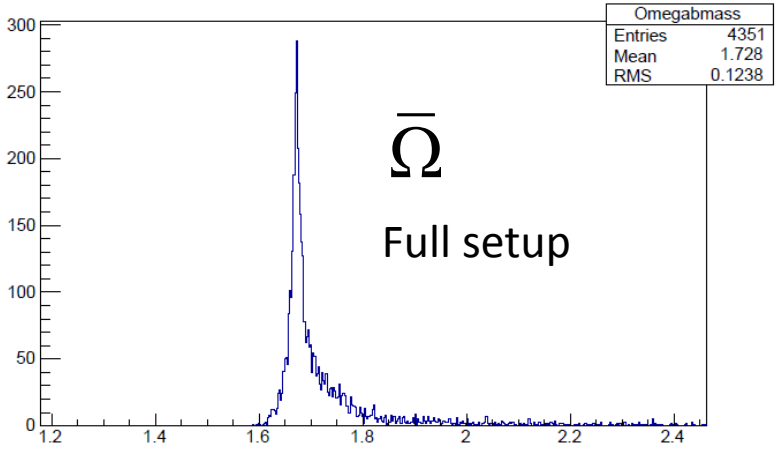

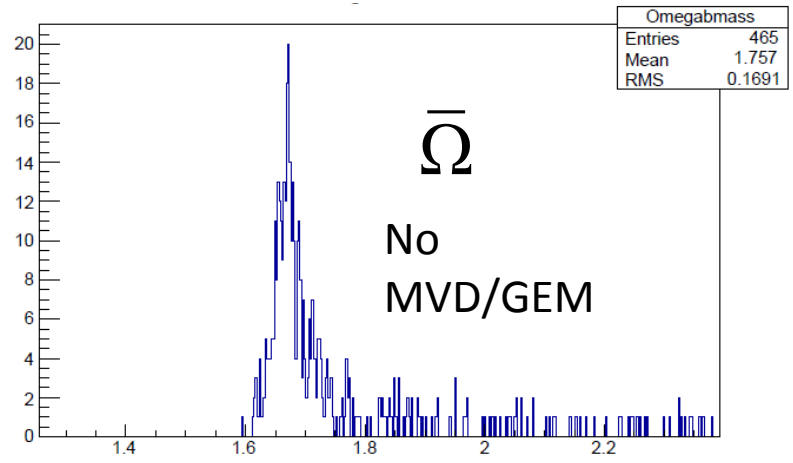

Case	Particle	Eff (%)
Full	Λ	45
	Λbar	34
	Ω	33
	Ωbar	24
	ΩΩbar	8.3
No FTS	Λ	31
	Λbar	23
	Ω	24
	Ωbar	15
	ΩΩbar	2.9
No MVD/GEM	Λ	23
	Λbar	8.9
	Ω	4.6
	Ωbar	2.5
	ΩΩbar	0.05

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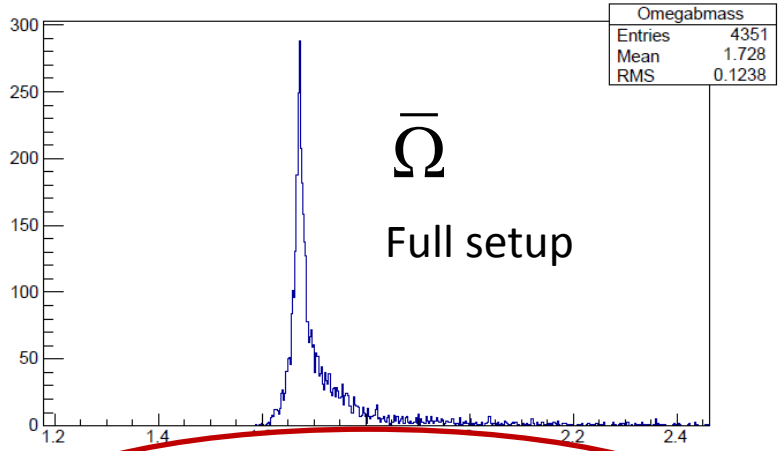
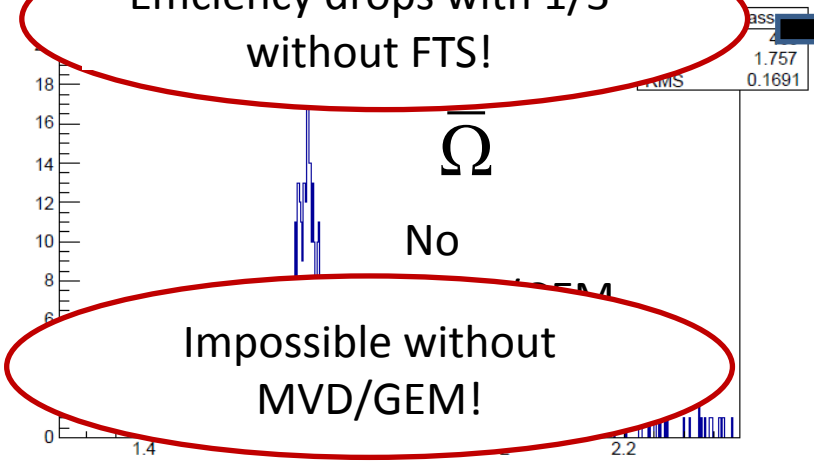


Efficiency drops with 1/3 without FTS!



Impossible without MVD/GEM!

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Question marks

- About 1/3 of the efficiency obtained with the old framework (thesis by Erik Thomé).

- Efficiency drop for antiprotons at ~20 degrees, according to Stefano due to missing mvd/gem tracking code. Details will be given at today's pandaroot meeting.

We need to investigate how trustworthy these numbers are.

- How precise numbers can we achieve?

- How precise numbers do we need to achieve?

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Long-term plans fr hyperon studies with PANDA

We need:

- Realistic pattern recognition that works for displaced vertices
  - In STT/MVD/GEM
  - In FTS
- Reconstruction of low energy particles