

TOF detectors related simulations studies and software development

Dominik Steinschaden

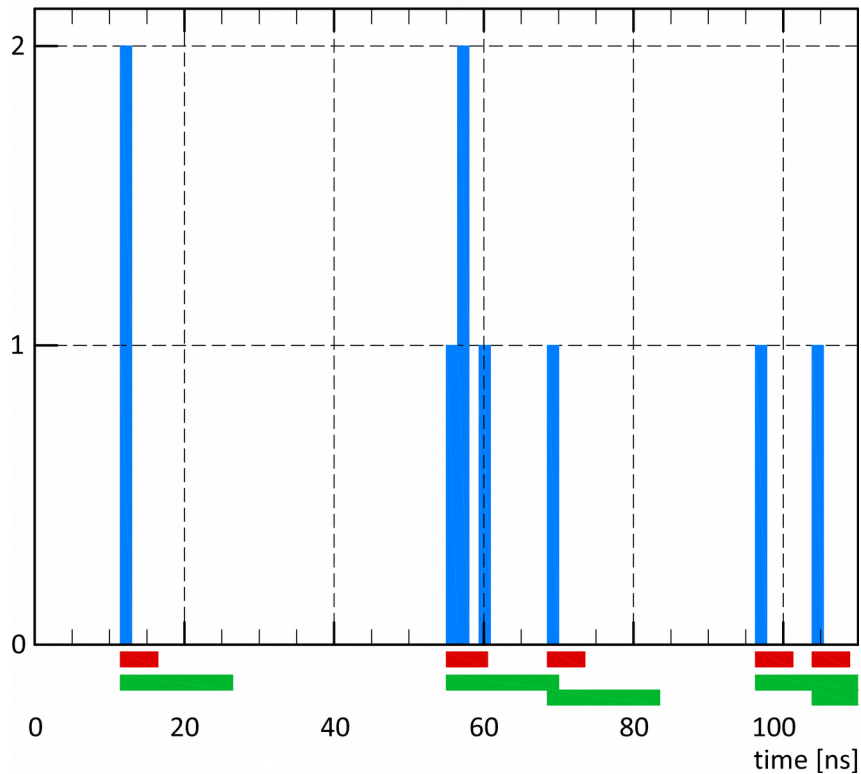
GSI, 8.3.2017

Contents

- Event determination
- Online reconstruction and filtering
 - Uppsala University
 - First simulation studies

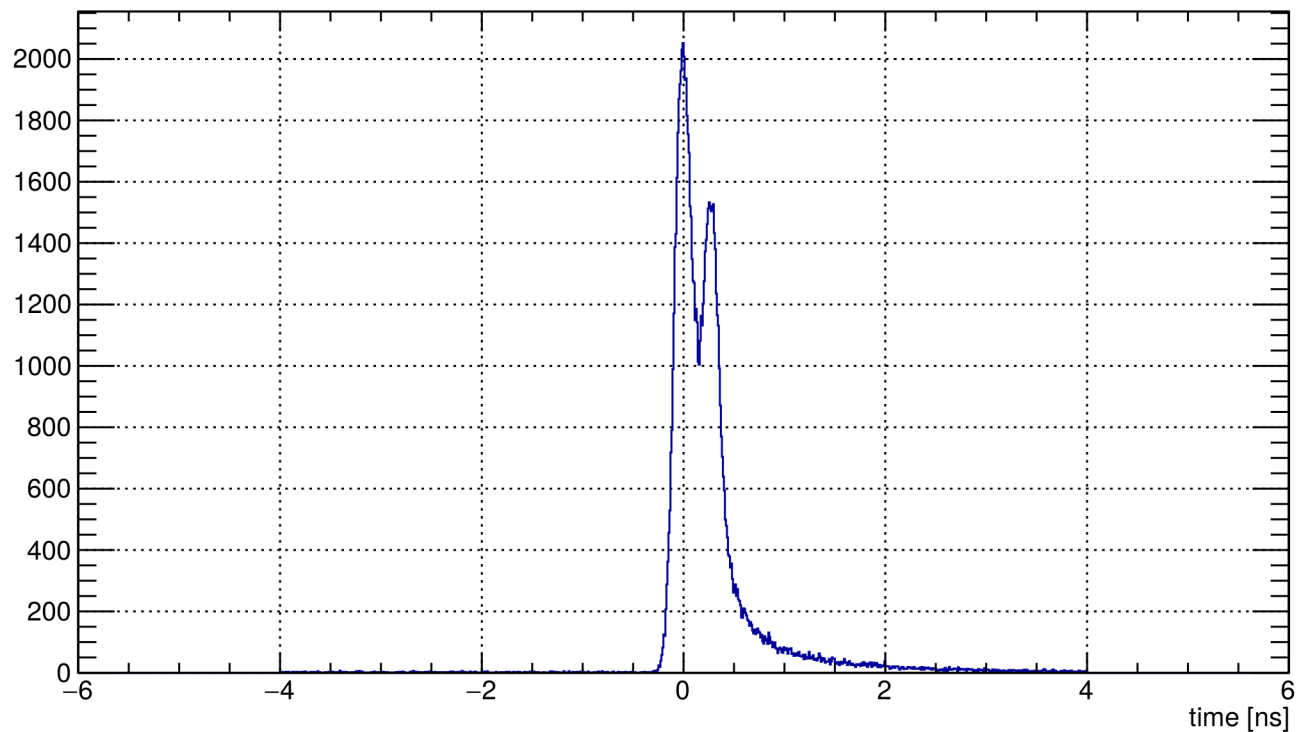
Event determination

Event Determination Algorithm



Event rate	2 MHz	20 MHz
T0 candidates	1.73	1.55
MC mached	0.935	0.93
Missed events	0.065	.07
Ghost t0 candidates	0.8	0.66

t0 distribution for correctly identified events



- 2 MHz
- T0 determination
 - $\sigma < 1$ ns
- Double peak structure
 - Slightly different timestamp distribution of Barrel TOF and FTOF

Event determination

- Implemented in Pandaroot
 - Development brunch
 - → trunk within 2 weeks
 - Can be used for event and timebased simulation
- QA macros
 - Pandaroot/macros/qa/eventDet

Online reconstruction and filtering

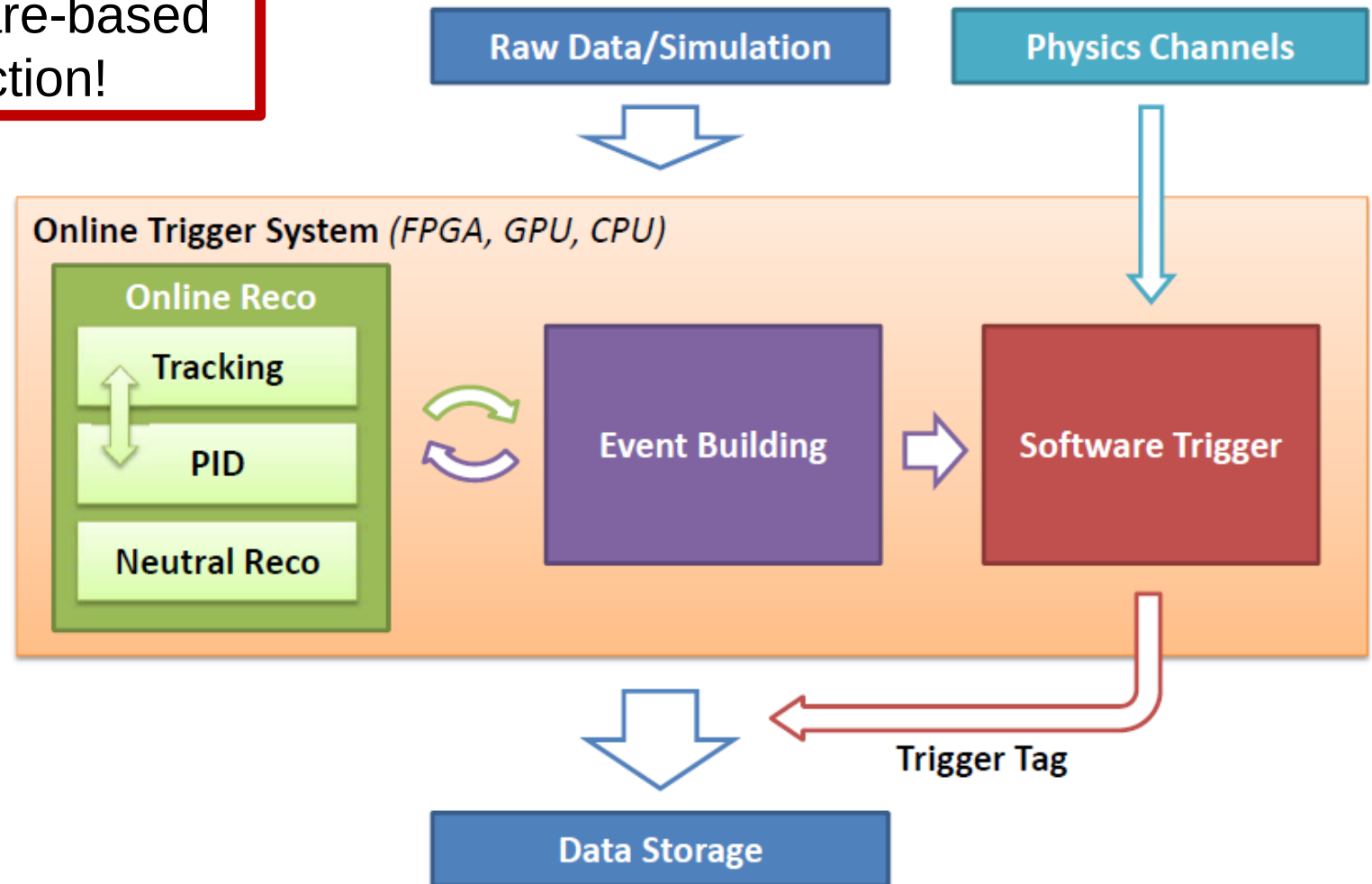
- moved to Uppsala for 6 month
 - Karin Schönning, Michael Papenbrock,
Walter Ikegami Andersson, Jenny
Regina
 - 1.2.2017 – 1.8.2017



UPPSALA
UNIVERSITET

Online reconstruction and filtering

PANDA will be the first experiment using an entirely software-based data selection!

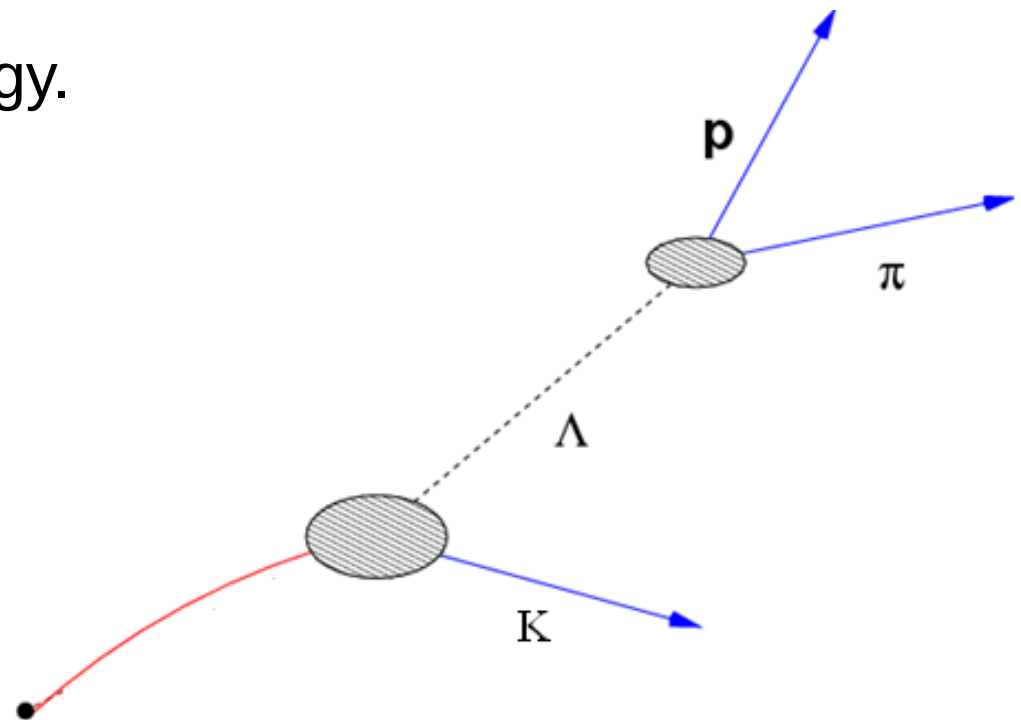




Challenges in hyperon reconstruction

Weak decays \rightarrow displaced vertices

- Tracks do not come from the interaction point
- Many hyperons leave no trace in innermost detectors *i.e.* the MVD.
- Complicated event topology.

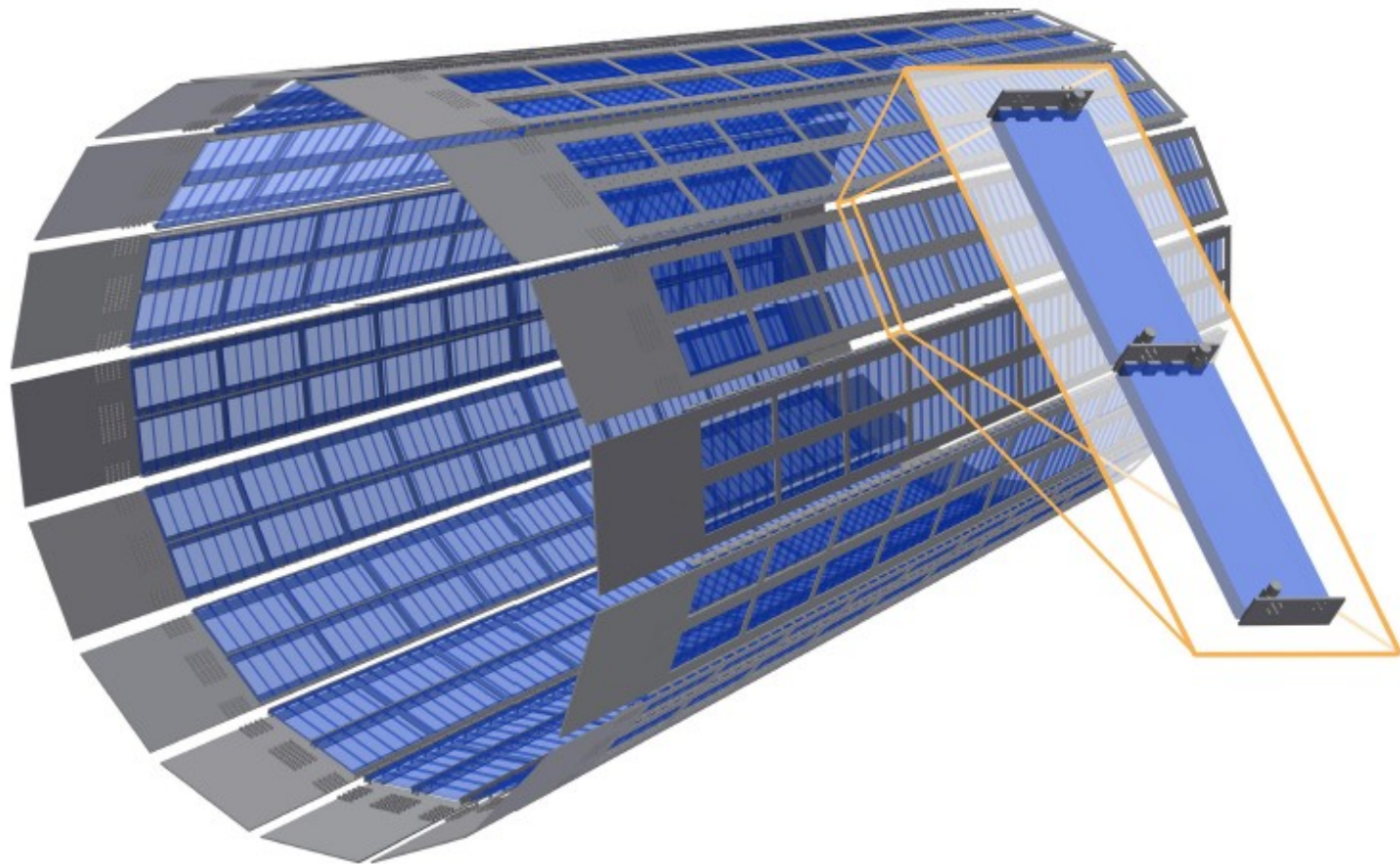




UPPSALA
UNIVERSITET

Possibilities with a Barrel TOF Detector

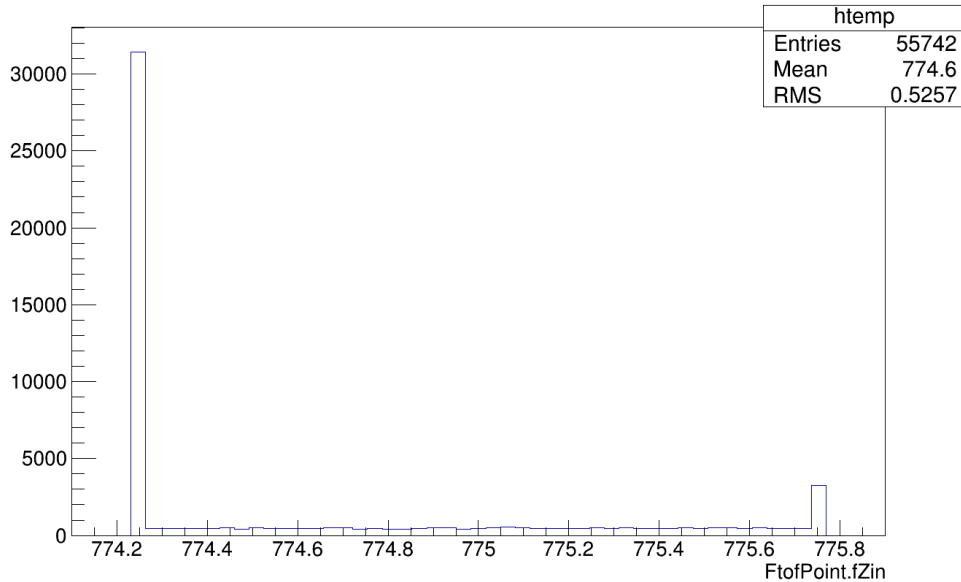
- Enables a flexible and dynamic event building
- Precise t_0 determination
- PID



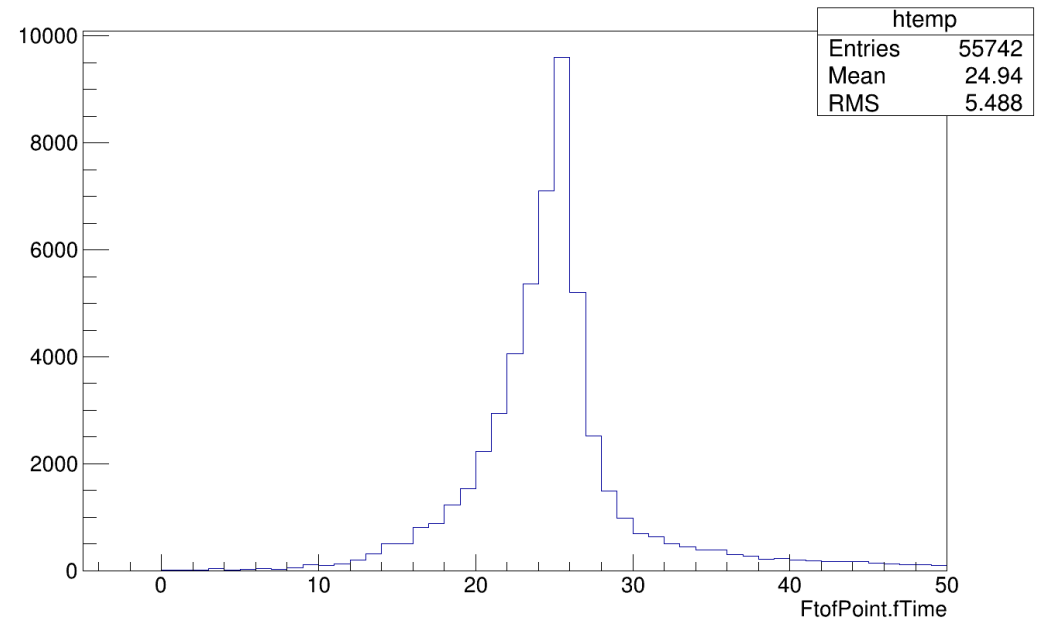
First simulation studies

- Event determination (t_0) for hyperons
 - Event generator is not working properly → wrong time informations

FtofPoint.fZin



FtofPoint.fTime



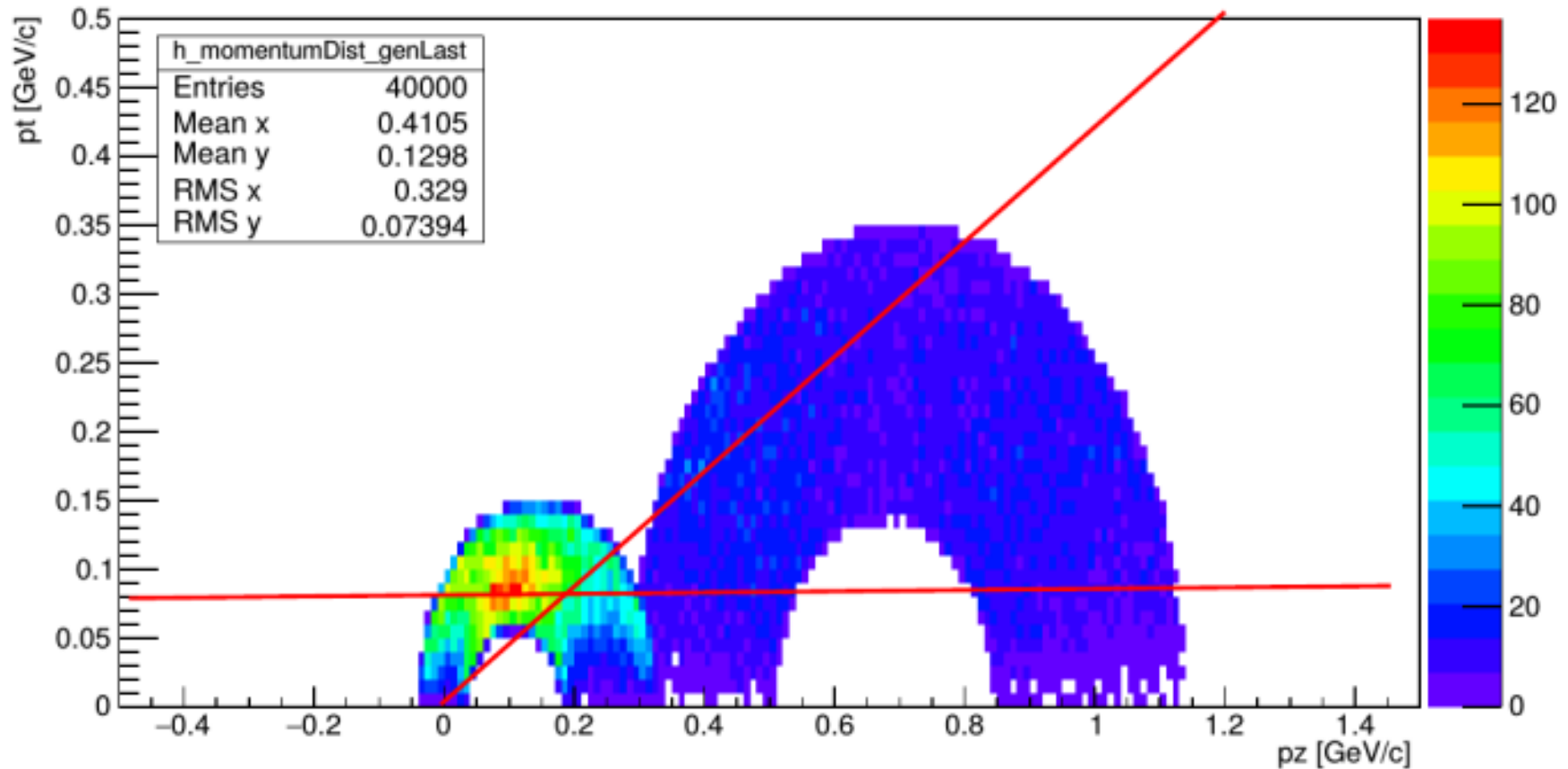
- Event based simulation
- Primary momentum
 - 15 GeV/c
- 7.7 m tracklength
- Minimum time of flight → ~26 ns
- => time information for displaced vertex is wrong in Pandaroot!

First simulation studies

- Event determination (t_0) for hyperons
 - Event generator is not working properly → wrong time informations
 - Simulations studies of the momentum distribution
 - $P\bar{p} \rightarrow l\bar{l} \rightarrow p\pi \dots$
 -

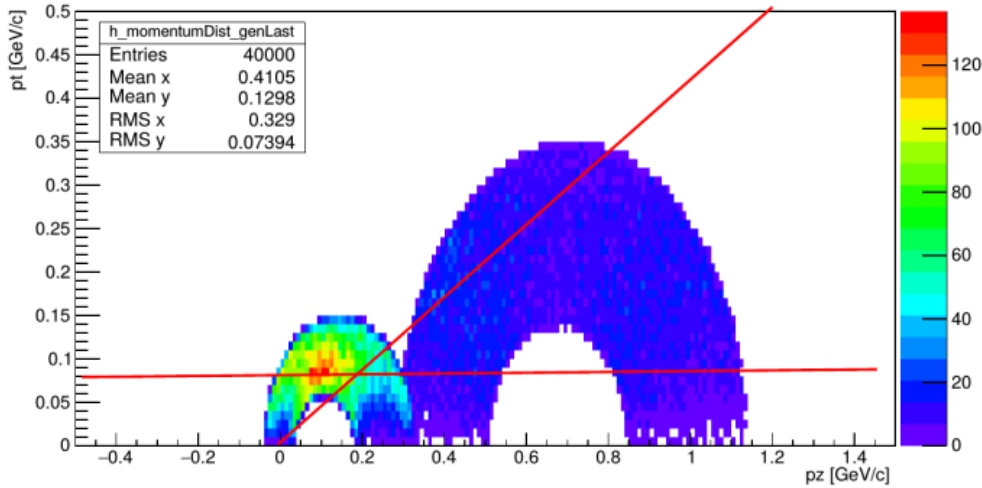
- 1.64 GeV/c

momentum distribution of generatorLast particles

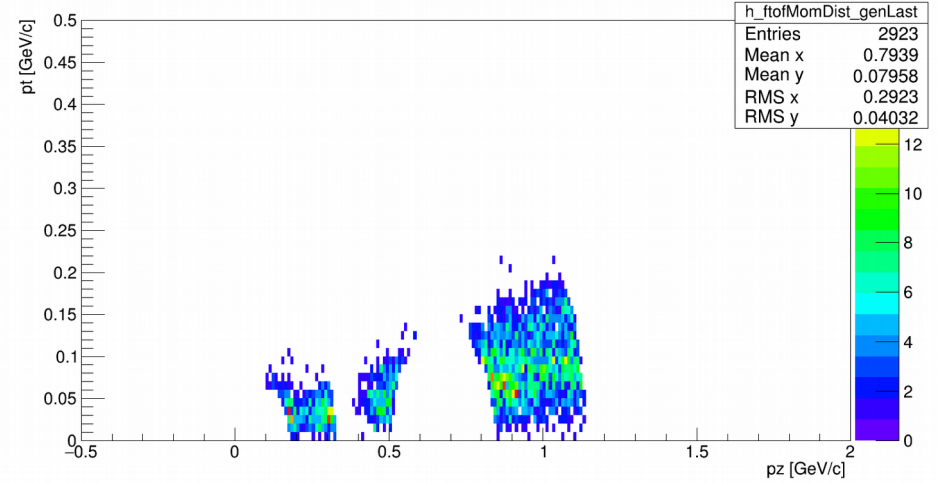


- 1.64 GeV/c

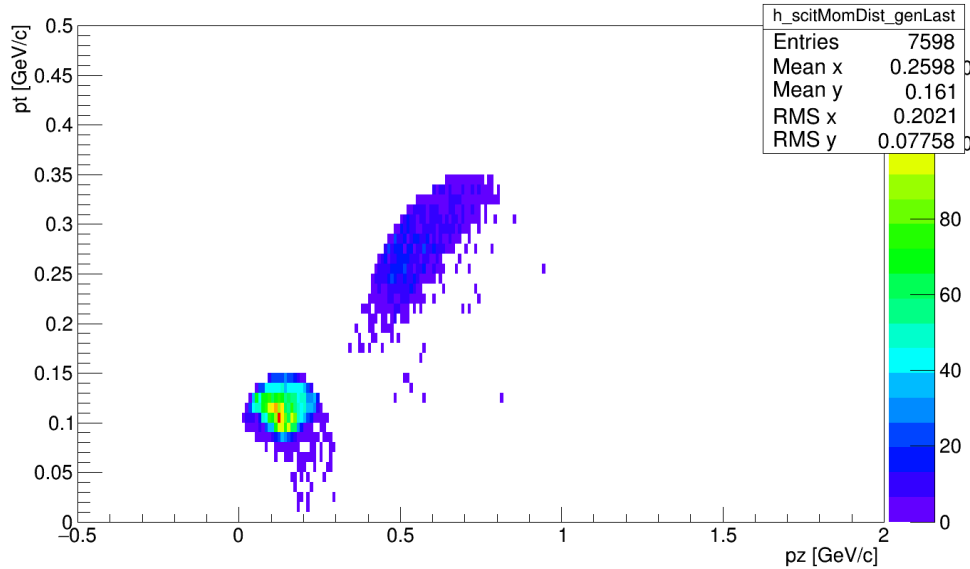
momentum distribution of generatorLast particles



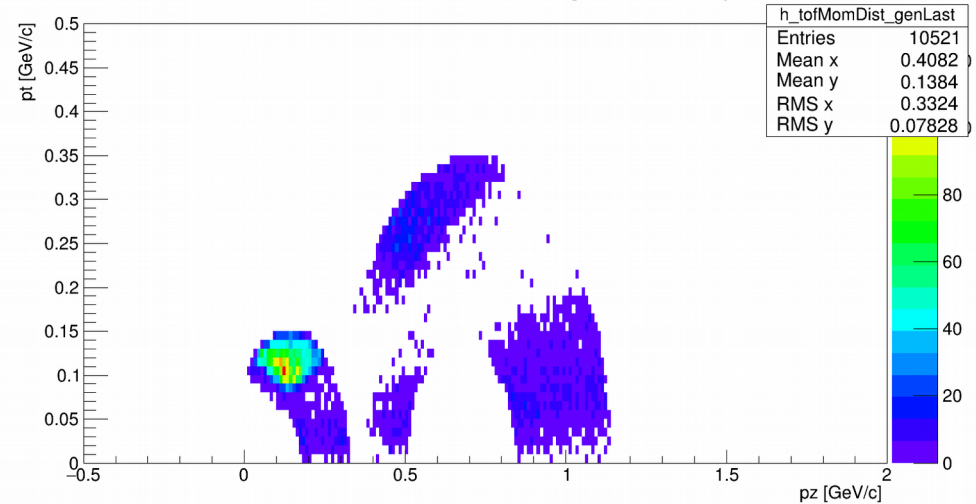
FTOF momentum distribution of generatorLast particles



SciTil momentum distribution of generatorLast particles

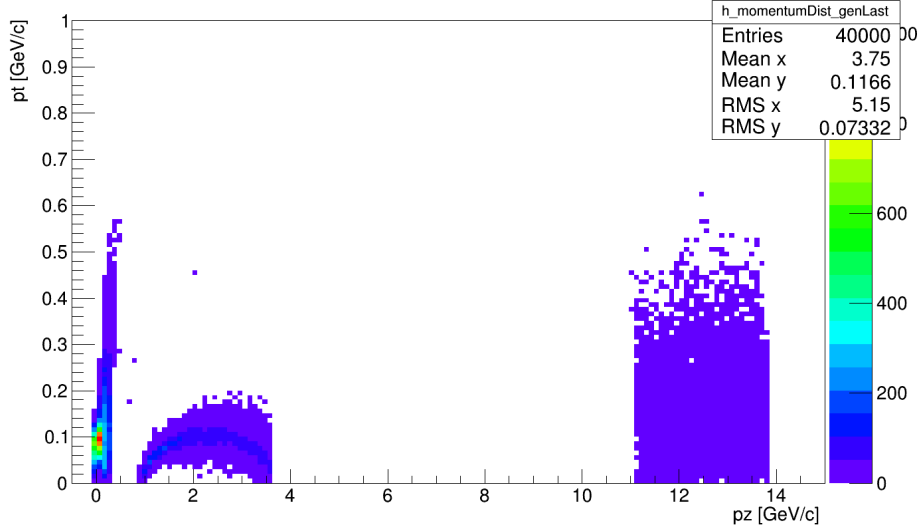


ToF Counter momentum distribution of generatorLast particles

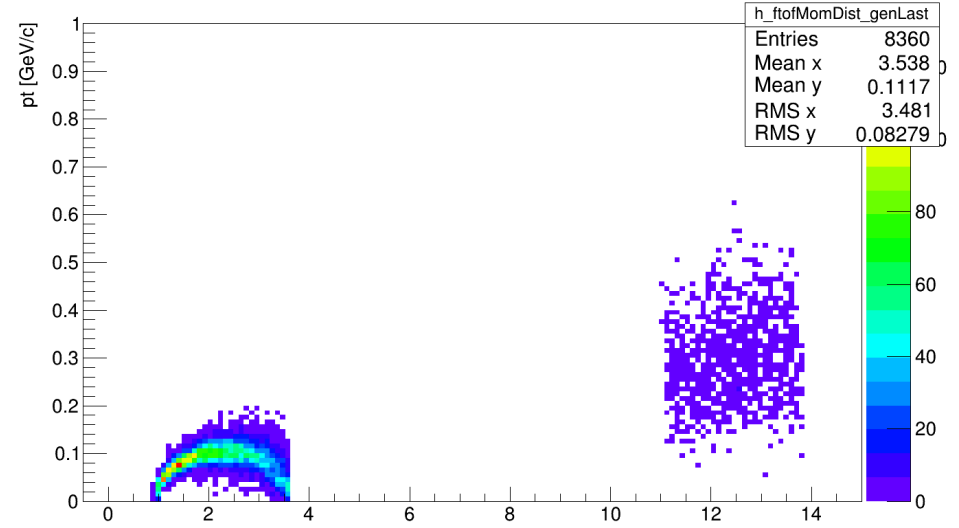


- 15 GeV/c

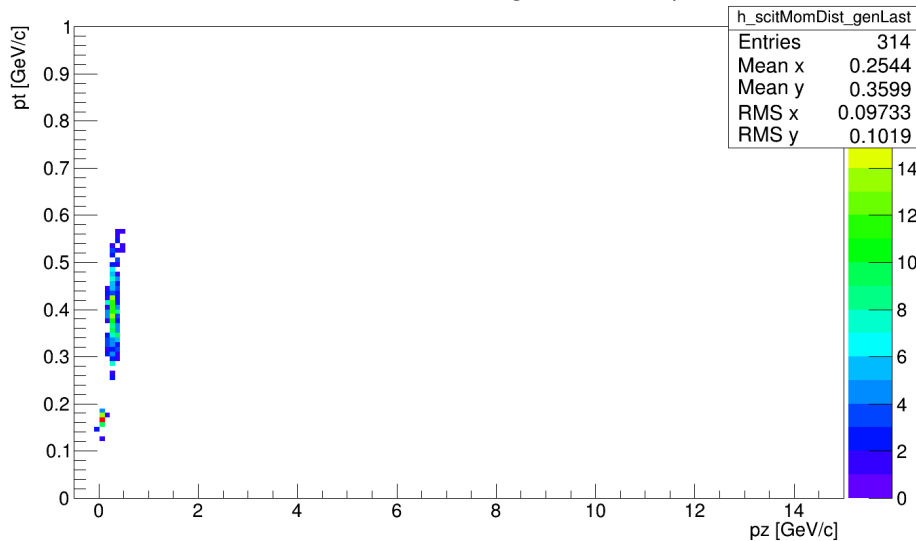
momentum distribution of generatorLast particles



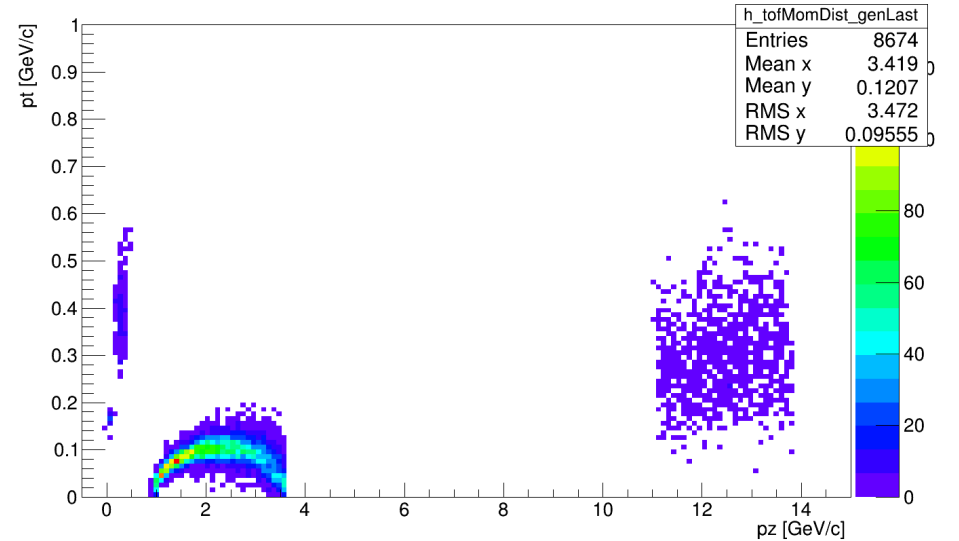
FTOF momentum distribution of generatorLast particles



SciTil momentum distribution of generatorLast particles



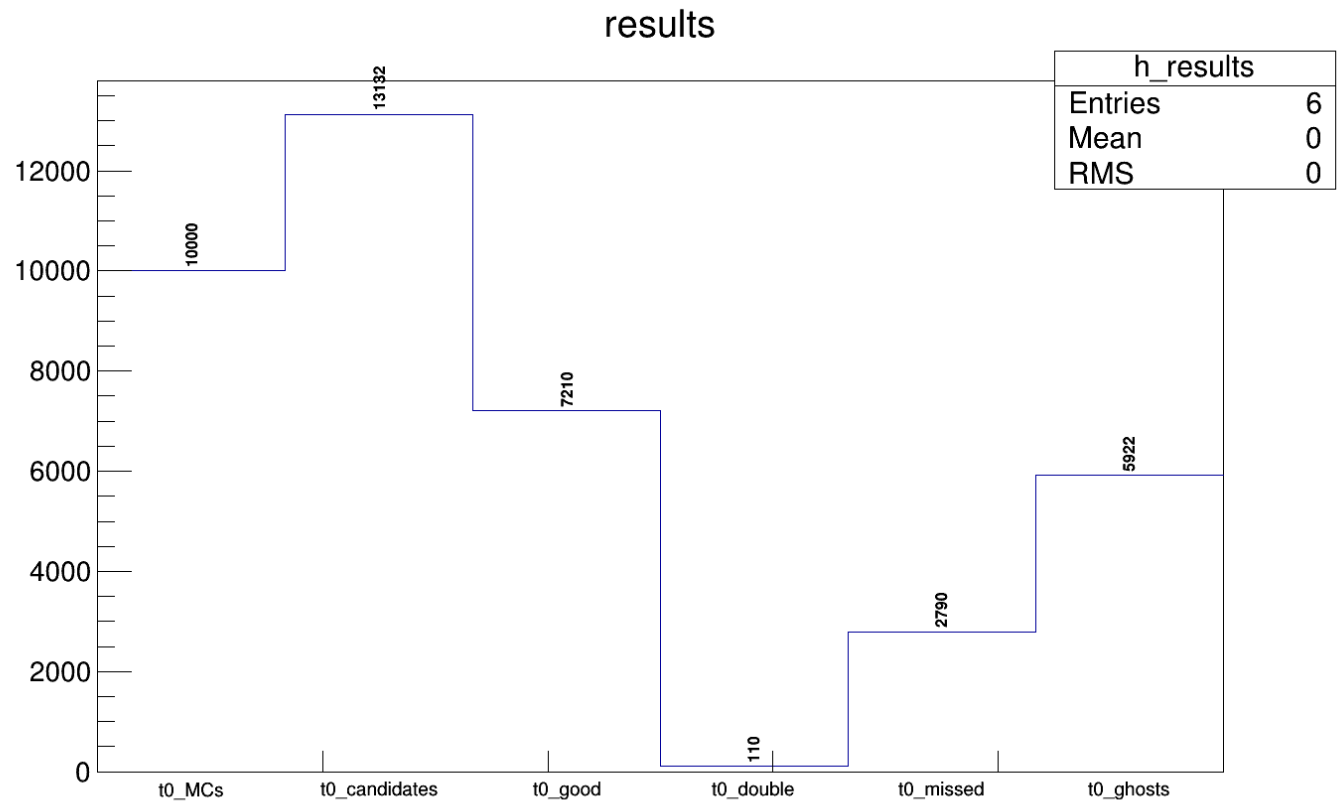
ToF Counter momentum distribution of generatorLast particles



First simulation studies

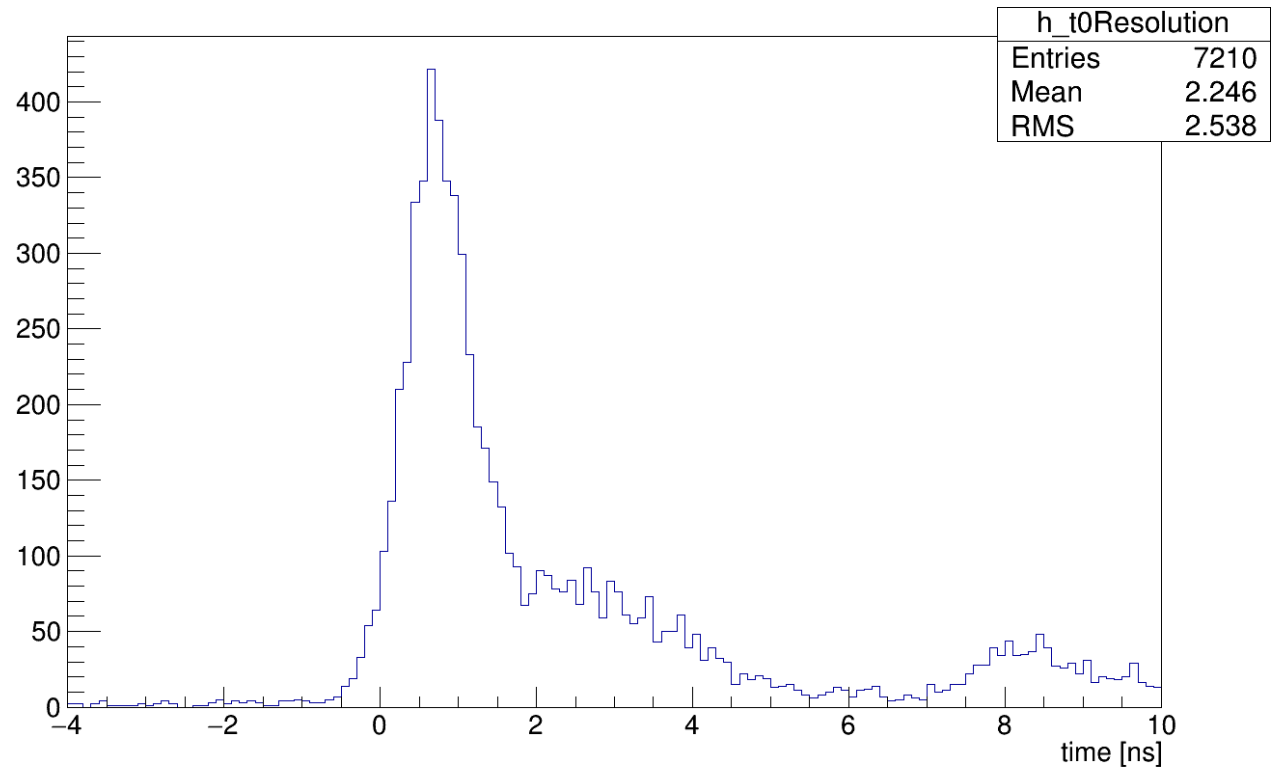
- Event determination (t_0) for hyperons
 - Event generator is not working properly → wrong time informations
 - Simulations studies of the momentum distribution
 - $\bar{p} p \rightarrow \bar{l} l \rightarrow p \pi \dots$
 - How many events are reconstructible
 - How many of these give at least one direct hit in a TOF counter

- Time based simulation
 - Event Generator
 - Pbap \rightarrow llbar
 - Llbar \rightarrow p +pi
 - 2 MHz average event rate
- Primary momentum
 - 1.64 GeV/c



- Time based simulation
 - Event Generator
 - $Pbap \rightarrow l\bar{l}bar$
 - $Llbar \rightarrow p + \pi$
 - 2 MHz average event rate
- Primary momentum
 - 1.64 GeV/c

t0 Resolution



Outlook

- Support of online/ timebased event building and tracking in spring 2018 release
- Online reconstruction and filtering
 - Fix the event generator / time information

Thank you for your attention