TRD Calibration

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- Shuttle Preprocessor

Calibration and alignment variables, part 1

parameter	source	sim	rec	nr	size	total MB	update freq.
- position of supermodule (cm,deg)	survey	OK	OK	18x6	float	0.0004	year
- position of chamber (cm,deg)	analysis of 1e5 pp events	OK	OK	540x6	float	0.012	hour
- pad drift velocity factor	analysis of 1e8 pp events	OK	OK	1.2e6	ushort	2.3	year
- pad T0 (timebin)	analysis of 1e8 pp events	OK	OK	1.2e6	ushort	2.3	year
- pad gain factor	analysis of 1e8 pp events	OK	OK	1.2e6	ushort	2.3	year
- pad resp. funct. width (pad)	analysis of 1e8 pp events	OK	?	1.2e6	ushort	2.3	year
- chamber drift vel. (cm/timebin)	analysis of 1e5 pp events	OK	OK	540	float	0.0021	hour
- chamber drift T0 (timebin)	analysis of 1e5 pp events	OK	OK	540	float	0.0021	hour
- chamber gain	analysis of 1e5 pp events	OK	OK	540	float	0.0021	hour
- dedx histogram	offline analysis or sim.	--	OK	55	hist	0.052	year
- max timebin histograms	offline analysis or sim.	--	OK	55	hist	0.052	year
- clock frequency (MHz)	DCS Config DB	OK	OK	1	float	0	run
- number of timebins	DCS Config DB	OK	OK	1	int	0	run
- status byte of superm.	DCS Config DB	con	--	18	char	0	run
- status byte of chamber	DCS Config DB	OK	?	540	char	0.00051	run
- status byte of MCM	DCS Config DB	OK	?	6.7e4	char	0.064	run
- status byte of pad	DCS Config DB	OK	?	1.2e6	char	1.1	run
- FEE gain correction	DCS Config DB	--	--	1.2e6	ushort	2.3	run
- ADC thresholds	DCS Config DB	--	--	6.7e4	char	0.064	run

Calibration and alignment variables, part 2

parameter	source	sim	rec	nr	size	total MB	update freq.
- pretrigger information	DCS Archive DB	--	--	1024	char	0.001	run
- goofy: HV	DCS Archive DB	--	--	1	float	0	minute
- goofy: peak1 pos	DCS Archive DB	--	--	1	float	0	minute
- goofy: peak2 pos	DCS Archive DB	--	--	1	float	0	minute
- goofy: peak1 area	DCS Archive DB	--	--	1	float	0	minute
- goofy: peak2 area	DCS Archive DB	--	--	1	float	0	minute
- goofy: temp1	DCS Archive DB	--	--	1	float	0	minute
- goofy: temp2	DCS Archive DB	--	--	1	float	0	minute
- goofy: pressure	DCS Archive DB	--	--	1	float	0	minute
- goofy: velocity	DCS Archive DB	--	?	1	float	0	minute
- goofy: gain1	DCS Archive DB	--	--	1	float	0	minute
- goofy: gain2	DCS Archive DB	--	--	1	float	0	minute
- goofy: CO2	DCS Archive DB	--	--	1	float	0	minute
- goofy: N2	DCS Archive DB	--	--	1	float	0	minute
- environment temperature	DCS Archive DB	--	--	18x4	float	0.00027	minute
- chamber anode currents	DCS Archive DB	--	--	1080	float	0.0041	minute
- chamber drift currents	DCS Archive DB	--	--	1080	float	0.0041	minute
- chamber anode voltages	DCS Archive DB	--	--	1080	float	0.0041	minute
- chamber drift voltages	DCS Archive DB	--	--	1080	float	0.0041	minute
- low voltage voltage	DCS Archive DB	--	--	180	float	0.00069	minute
- low voltage current	DCS Archive DB	--	--	180	float	0.00069	minute
- atmospheric pressure	DCS Archive DB	--	--	1	float	0	minute
- luminosity	DCS Archive DB	--	--	1	float	0	minute
- magnetic field	DCS Archive DB	con	con	1	float	0	minute
- O2 content in gas	DCS Archive DB	--	--	1	float	0	minute
- chamber gas overpressure	DCS Archive DB	--	--	1	float	0	minute
total						12.8 MB	

Summary of calibration requirements

- Set of calibration parameters: 12.8MB
- Reference data:
  - Only for parameters 2 to 9
  - For detector calibration: 96MB
  - For pad calibration: $>$ 1.3GB
- calibration procedures in AliRoot to be done:
  - Pad Response Function in sim
  - status byte in sim and rec?
  - drift velocity monitoring (pressure, velocity)
    environment temperature in rec?
- Use cases: 2, 4 and 5.

Milestones table (partially)

New dataline: 15-Oct-06

New calibration Milestones (Alberto Colla)						
Milestones	provide list of milestones	14-Jul-06	DONE		14-Jul-06	
Requirements	revise size of calibration and reference data	3-Oct	0	0	3-Oct-06	
Offline	Calib parameters implemented in OCDB	31-Jul-06	DONE		31-Jul-06	
	Calib procedure implemented in AliRoot	31-Jul-06	DONE		31-Jul-06	with few exceptions in the reconstrcution part (status flag
	Provide name of contact for MC data quality control	1-Aug-06	DONE		1-Aug-06	Sylwester Radomski (S.Radomski@gsi.de)
	Provide data quality control macro. Check of occupancy.	31-Aug-06	LATE	LATE	31-Aug-06	http://www.physi.uni-heidelberg.de/~radomski/index.php
	Check memory consumption of reconstruction	31-Aug-06	LATE	LATE	31-Aug-06	
SHUTTLE	preprocessor algorithm implemented for use case 3	31-Aug-06	LATE	LATE	31-Aug-06	
	preprocessor algorithm implemented for use case 4	31-Aug-06	LATE	LATE	31-Aug-06	
Online	algorithm for DAQ implemented	30-Sep-06	0	0	30-Sep-06	
	algorithm for DCS implemented	30-Sep-06	0	0	30-Sep-06	
	algorithm benchmark by DAQ experts	30-Sep-06	0	0	30-Sep-06	
	algorithm benchmarked by DCS experts	30-Sep-06	0	0	30-Sep-06	

Summary of milesstones

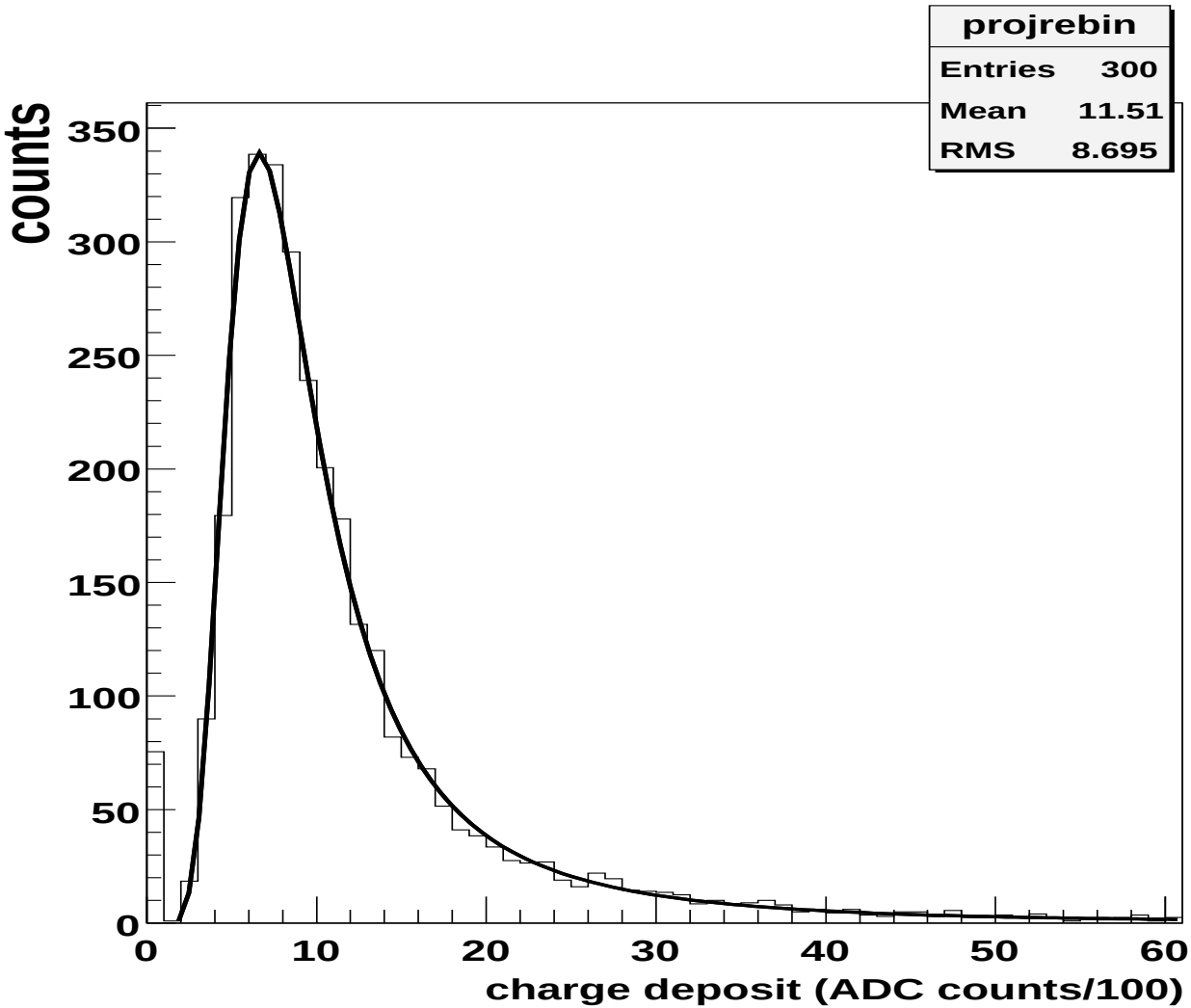
- New Calibration Milestones:
  - Offline: memory consumption of reconstruction: on going (15-Oct-06)
  - Shuttle: preprocessor algorithm DCS Archive DB: 15-Oct-06
- New Milestones on Raw Format:
  - Commissioning: 15-Oct-06
  - Hardware mapping: geometrical mapping: 15-Oct-06
  - Reconstruction: DONE
  - Simulation: Status: 31-Oct-06
  - Visualisation: 31-Oct-06
- New Alignment Milestones:
  - Geometry: DONE
  - Survey Data: 31-Oct-06
  - Sim/Rec: alignment procedures: central barrel alignment (TPC TRD) ??

Calibration strategies

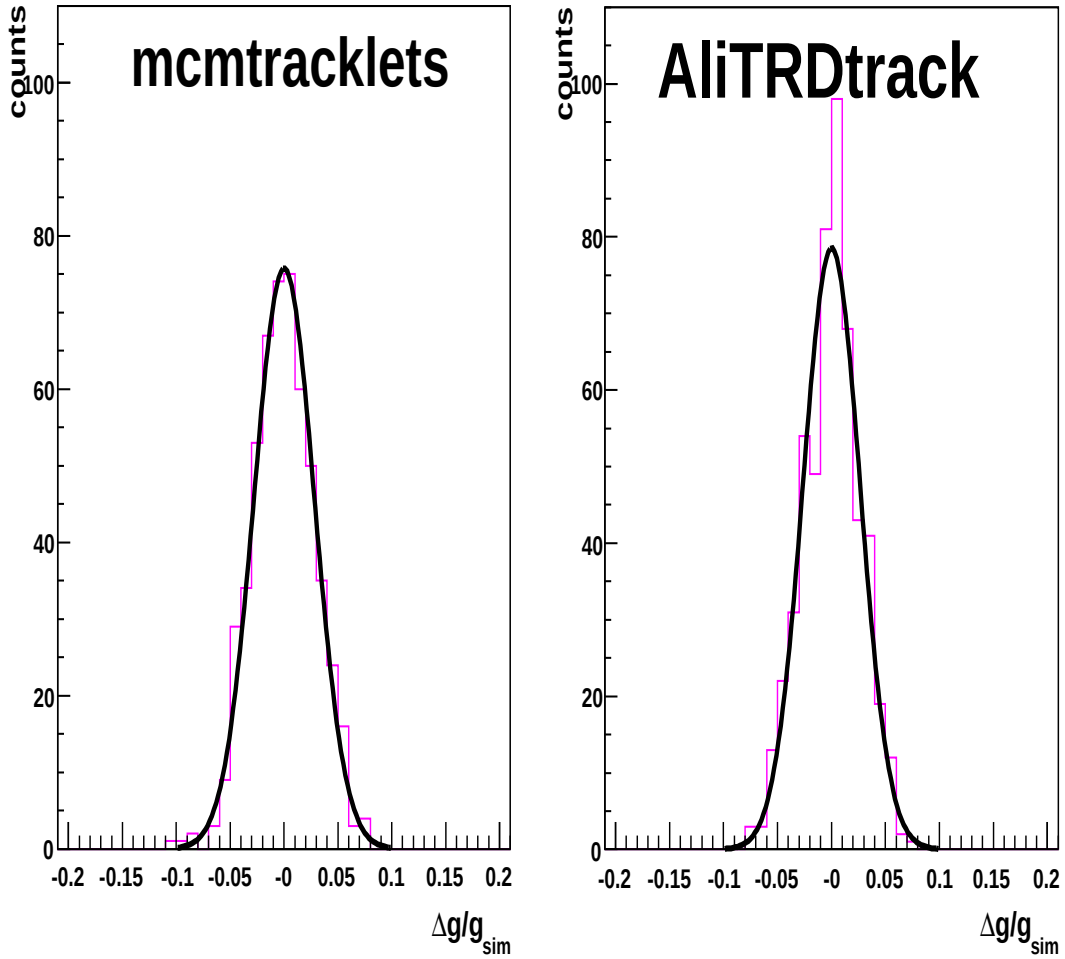
A class in AliRoot for the HLT parameters: AliTRDCalibra

- Generate the reference data
  - offline/online: mcm tracklets (how far can it be translated for the HLT?)
  - offline: during the back prolongation of the ESD tracks
  - precision: different levels of calibration possible
    (from per detector to per pad)
- Generate the calibration parameters:
  - fit methods on the reference data
  - can be runned at the HLT or at the SHUTTLE
- Populate the OCDB
  - produce the calibration objects from the set of calibration parameters

Calibration strategies: relative gain factor (reference data)



Calibration strategies: relative gain factor



Simulation:

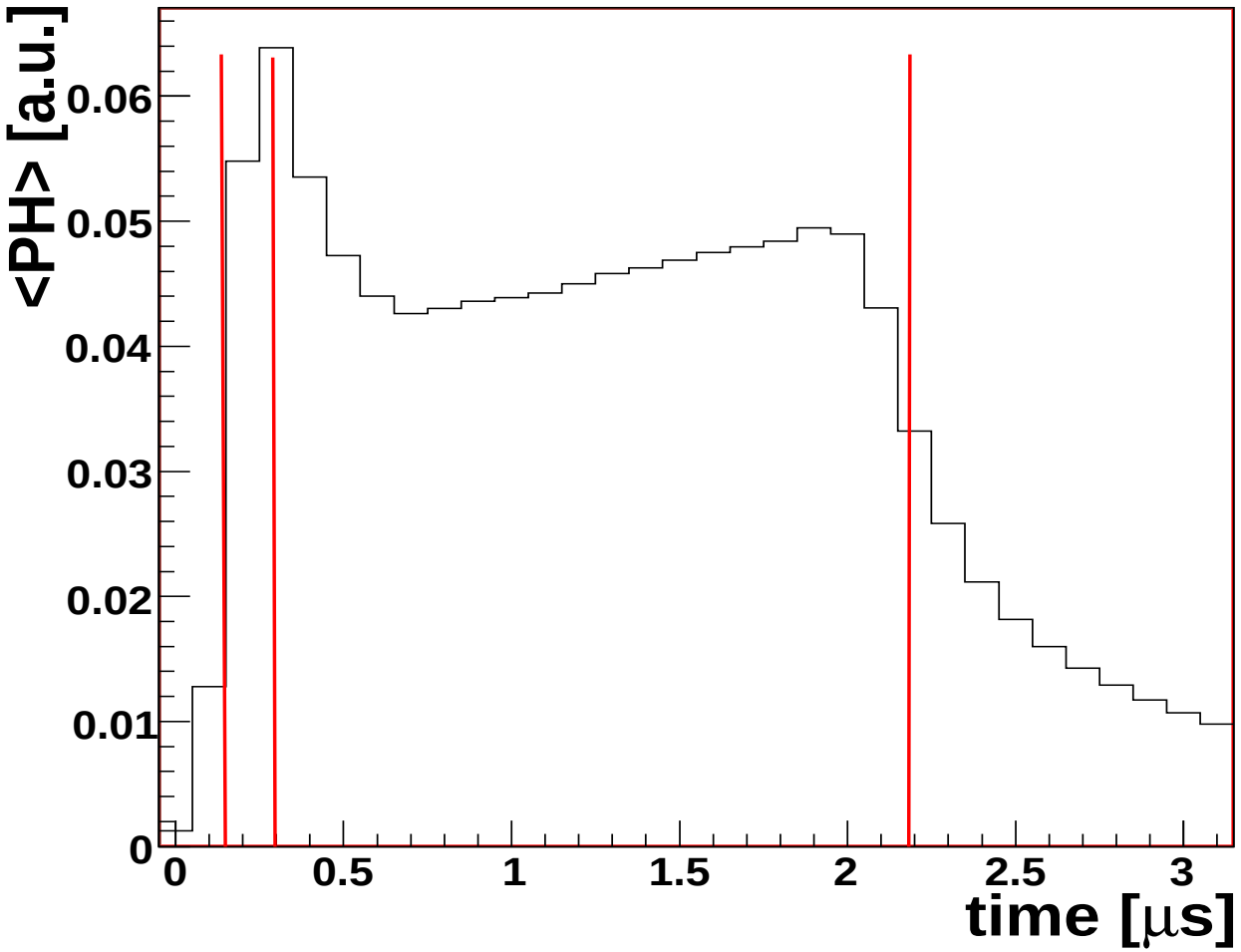
- π from the vertex 4 GeV

If calibration of tracks:

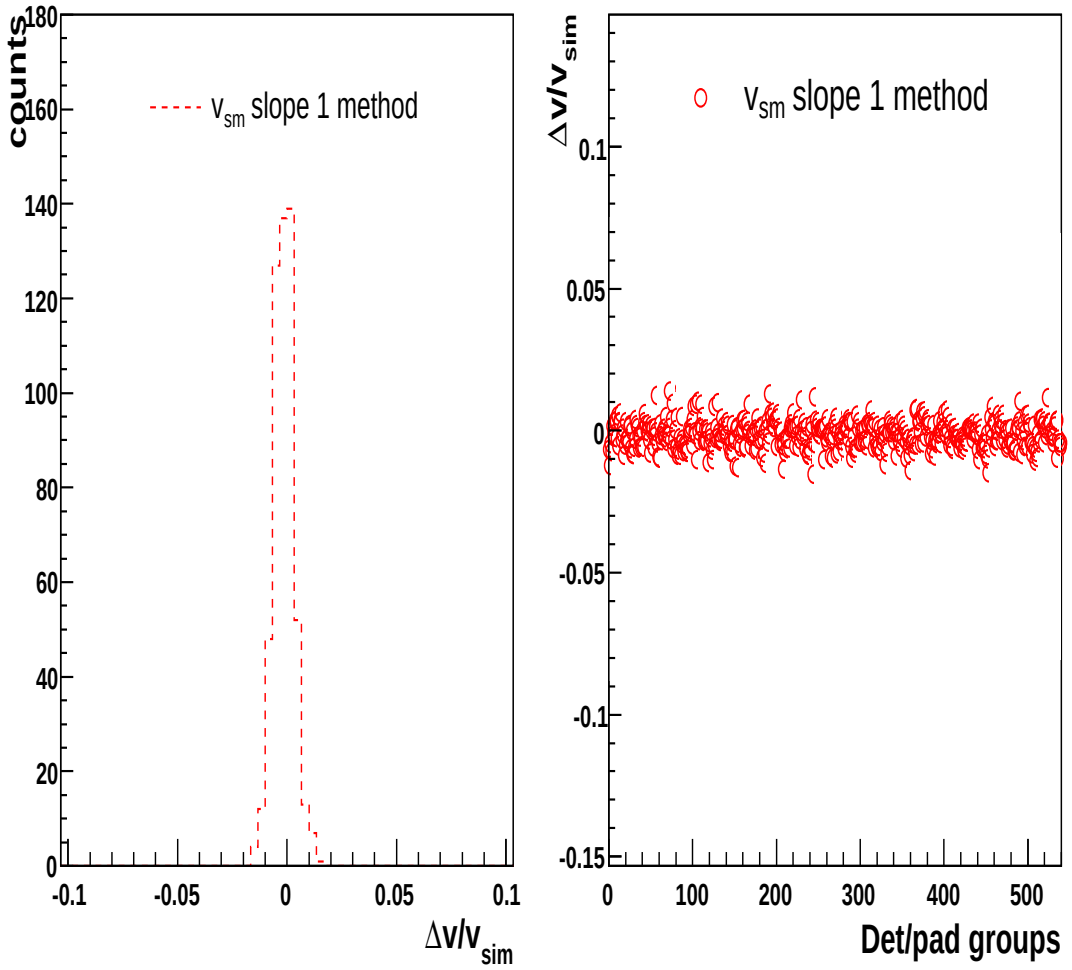
- Need the curvature of the track
- Only approximation with assumptions for mcm tracklets

σ_{mcm}=2.8% σ_{off}=2.6%

Calibration strategies: drift velocity (reference data)



Calibration strategies: drift velocity

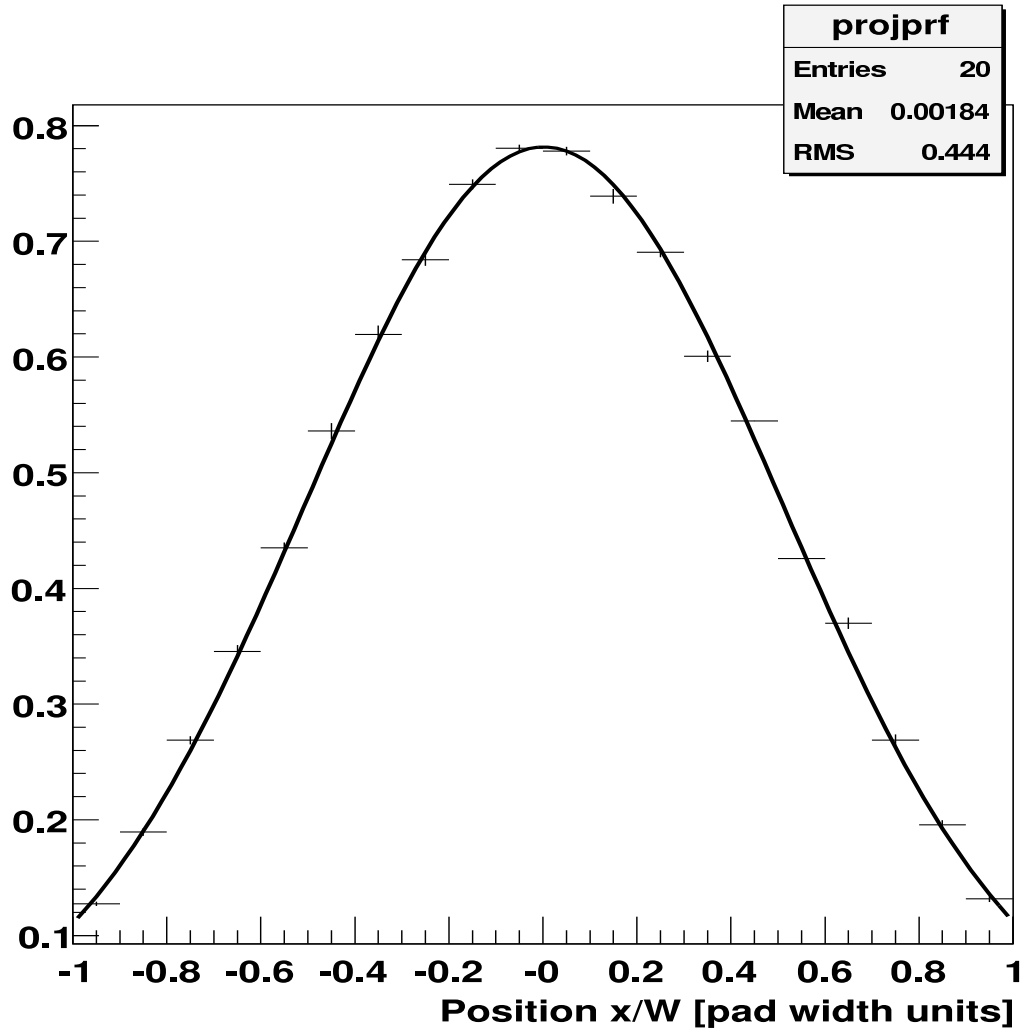


For drift velocity and time 0:

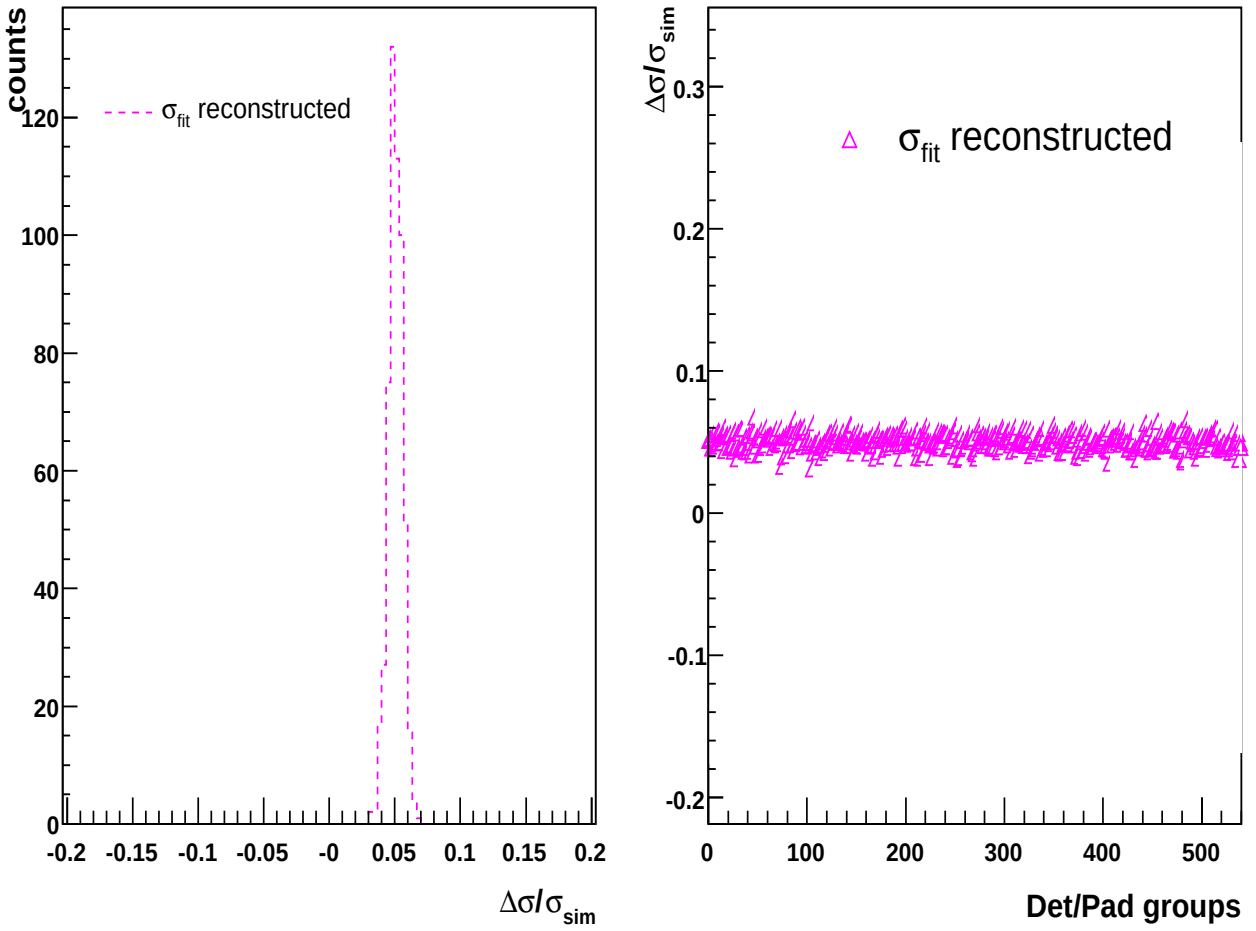
- Need enough time bins (22 (default) too small)!
- Need to change the trigger parameters for the mcm tracklets (from 2 to 22)
- relative time 0 calibration possible

perfect detectors and 26 time bins Offline

Calibration strategies: Pad Response Function (reference data)



Calibration Response: Pad Response Function



a shift of 5 % with comparaison to the value in the database

Summary of calibration strategies

mcm tracklets:

- See how far it can be translated for the HLT otherwise on raw data
- gain:
  correction from the track curvature only in the z direction assuming track coming from the vertex
- drift velocity:
  need to change the trigger parameters
- time 0:
  need to change the trigger parameters
- pad reponse function:
  shift to be understood

AliTRDtrack:

- gain:
  correction with the curvature of the track
- drift velocity:
  possible with enough time bins
- time 0:
  possible relative calibration
- pad response function:
  shift to be understood

Shuttle Preprocessor (HLT parameters)

- transfer of the reference data
  - in anycase (case 1)
  - only if enough statistics (algorithm at HLT) (case 2)

- fit of the reference data OR transfer of the calibration parameters
  - fit CPU time for detector calibrations: 16s

- Populate the OCDB if enough statistics

First simple prototype
(with fits) with reference data examples quasi ready