

AMS Software Review ACC Analysis

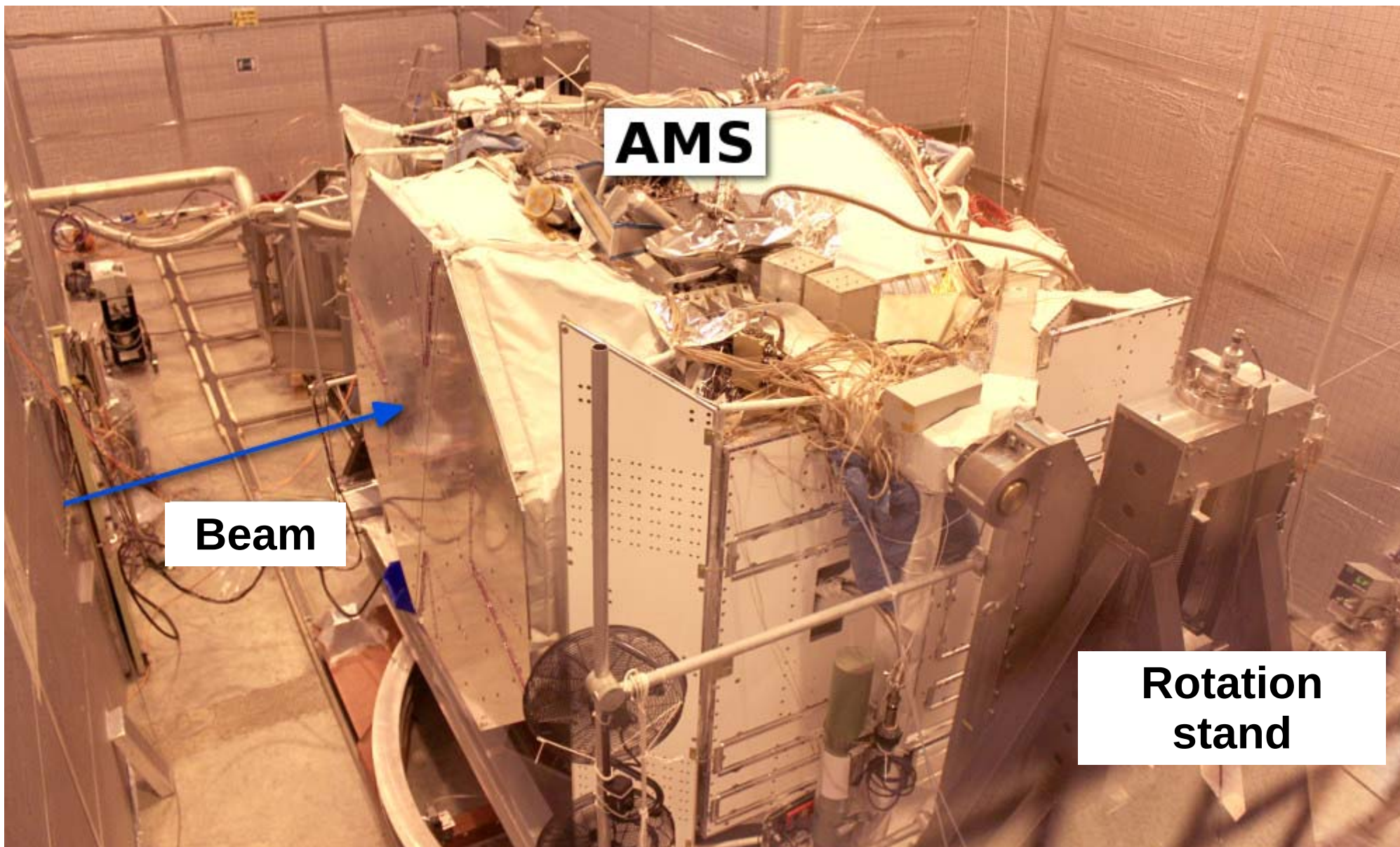


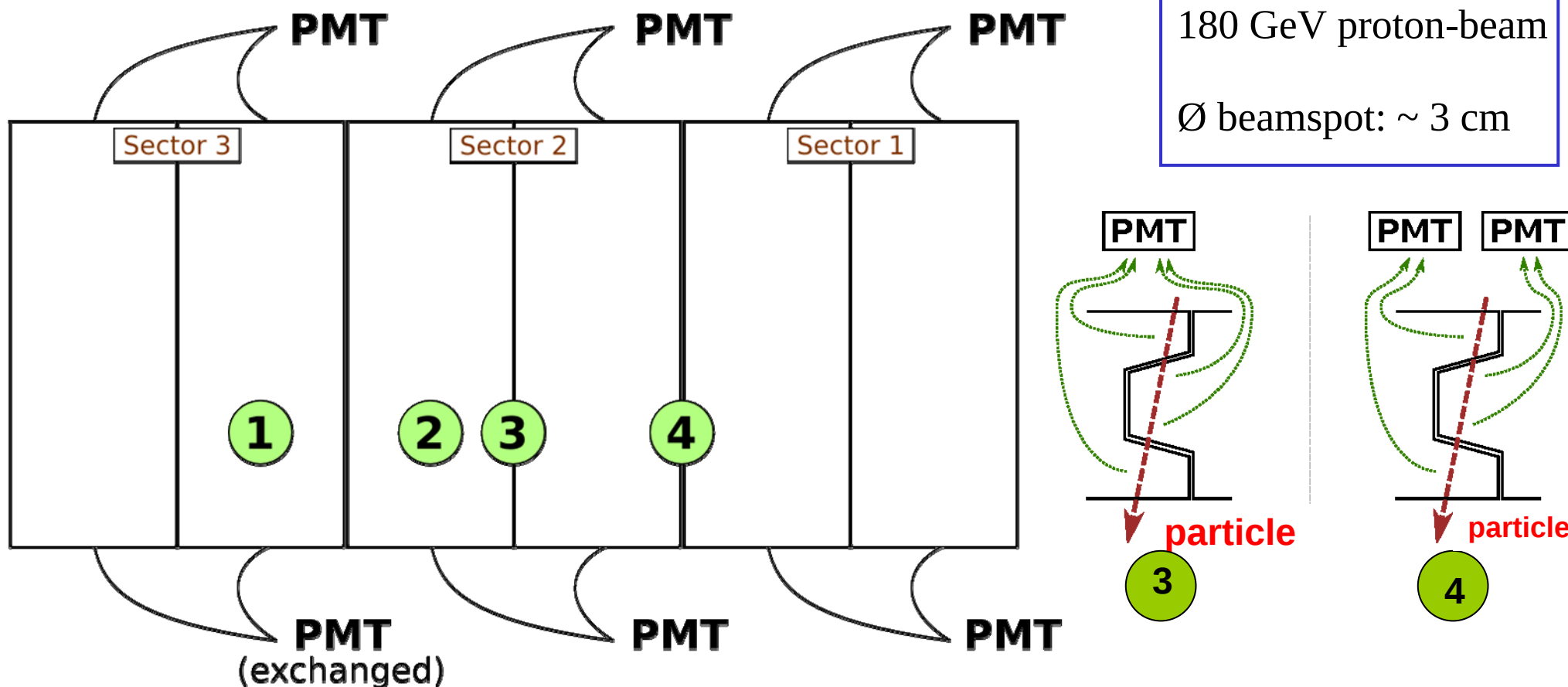
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I. Phys. Institute B,
KSC, 31st January 2011

RWTHAACHEN
UNIVERSITY



2010 August Testbeam → ACC Inefficiency Studies



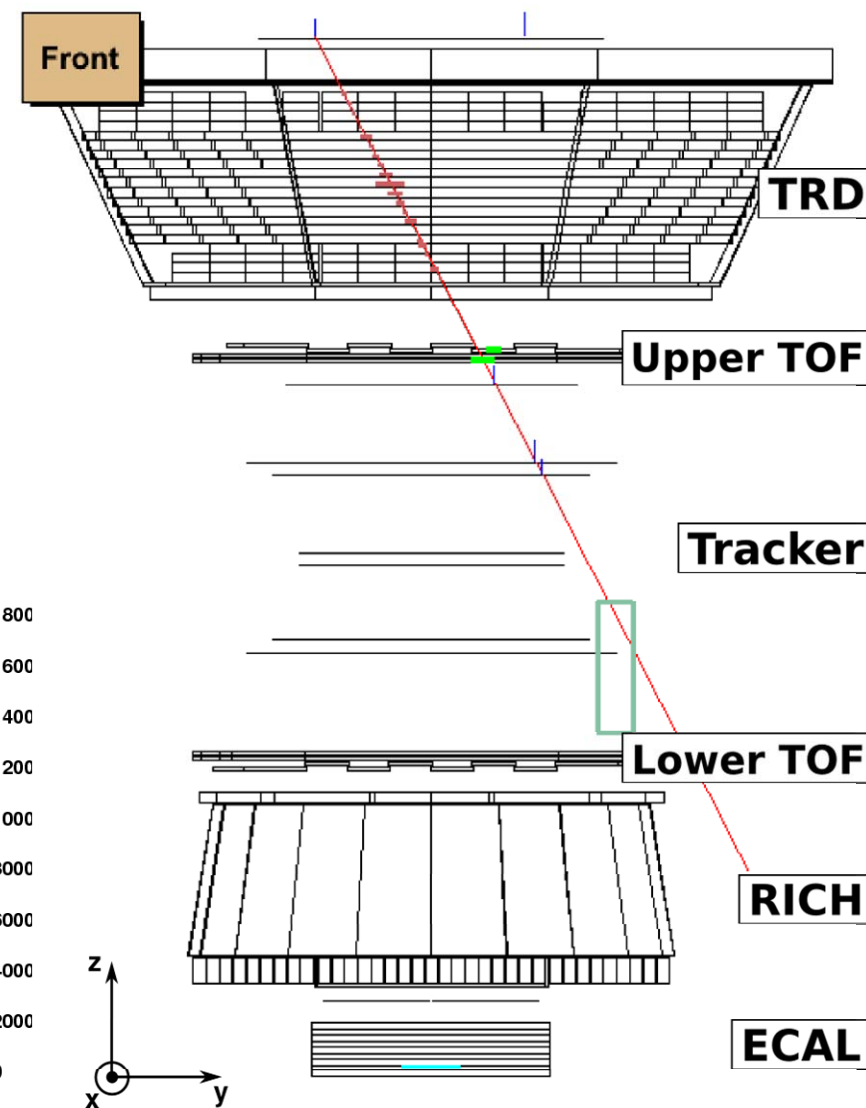
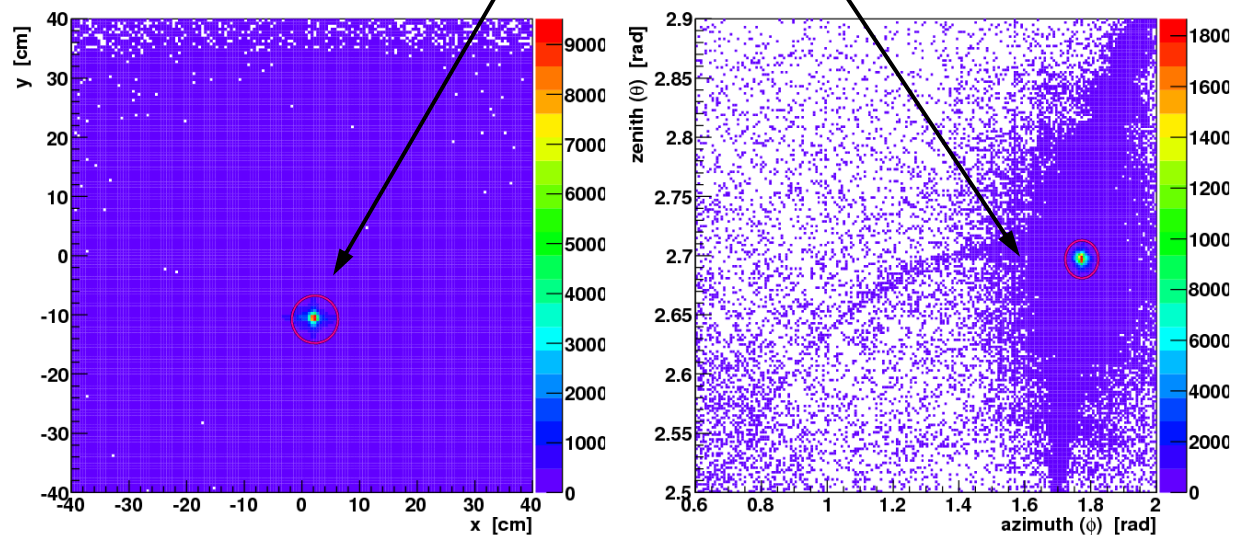


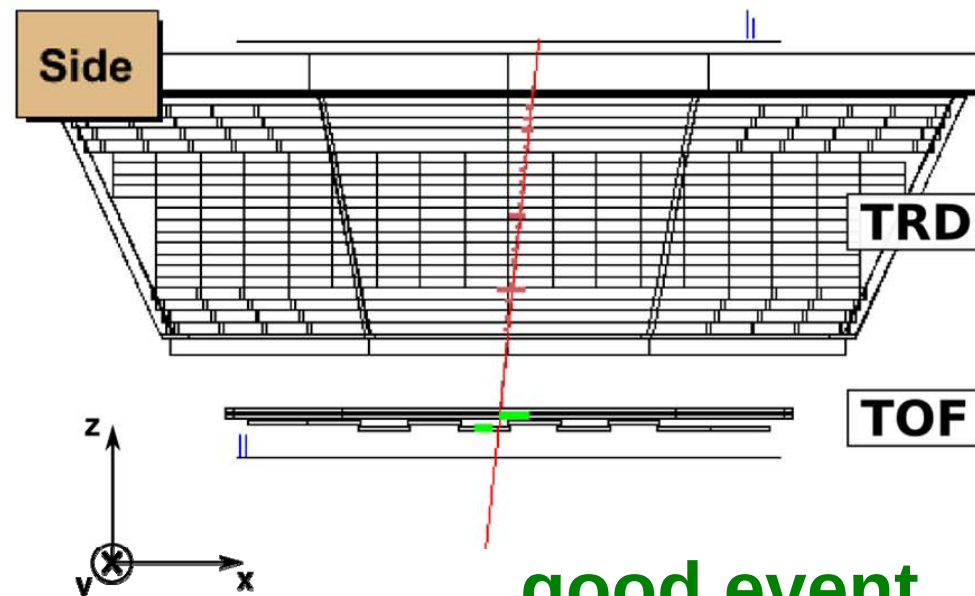
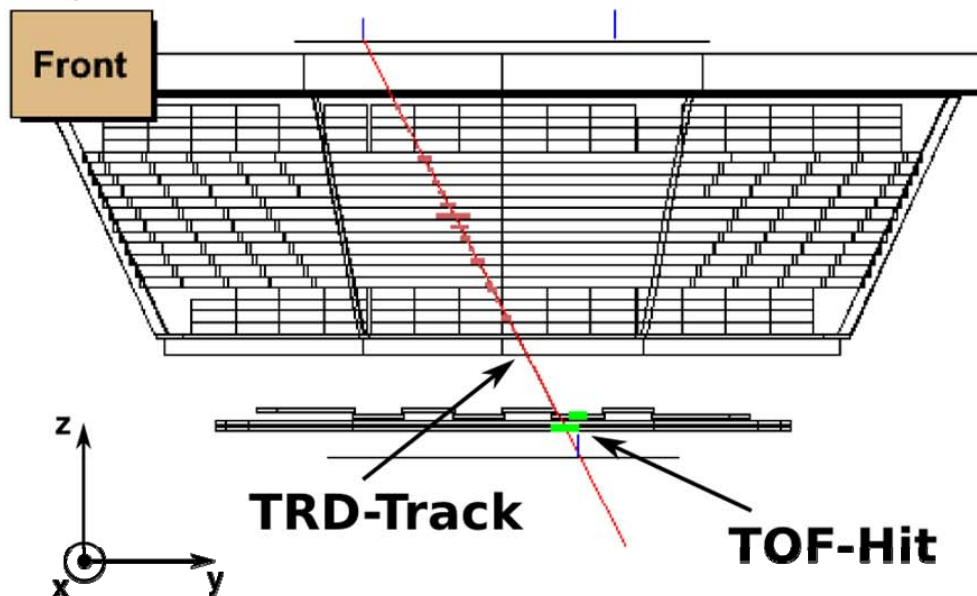
4 positions for ACC-test

- | | |
|--|---|
| (1) panel (8mm thickness), exchanged PMT | (3) slit region (2x4mm thickness), shared PMT |
| (2) panel (8mm thickness), original PMT | (4) slit region (2x4mm thickness), separate PMT |

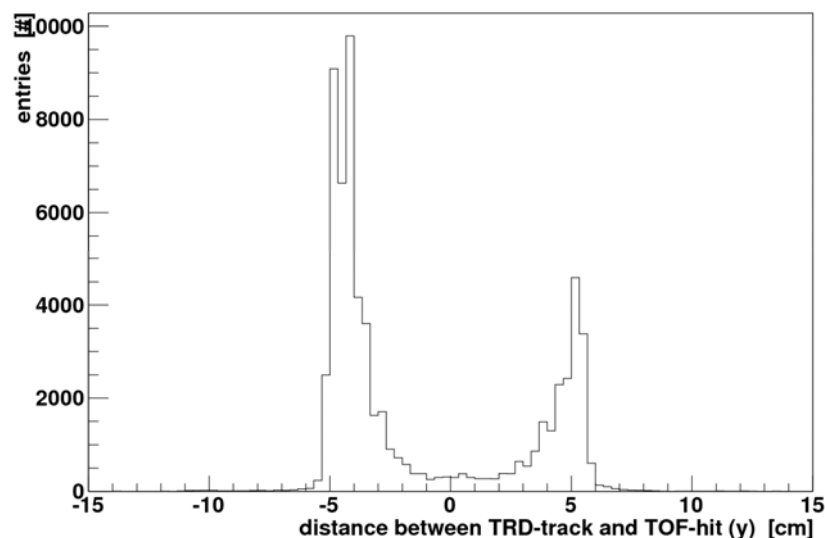
Requirements:

- Trigger from Upper TOF
- Single reconstructed TRD-Track
- TRD-Track matching beam config.
- matching TOF-hit positions

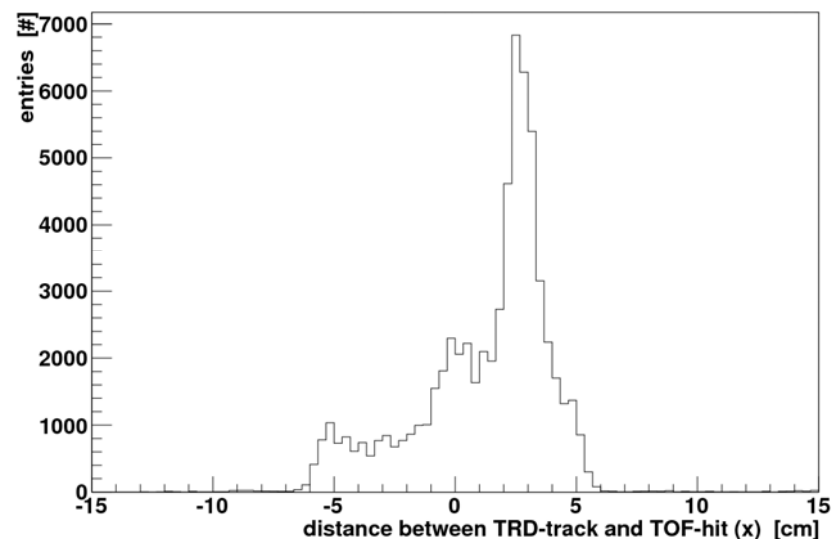




distance TOF-hit to TRD-track (y)



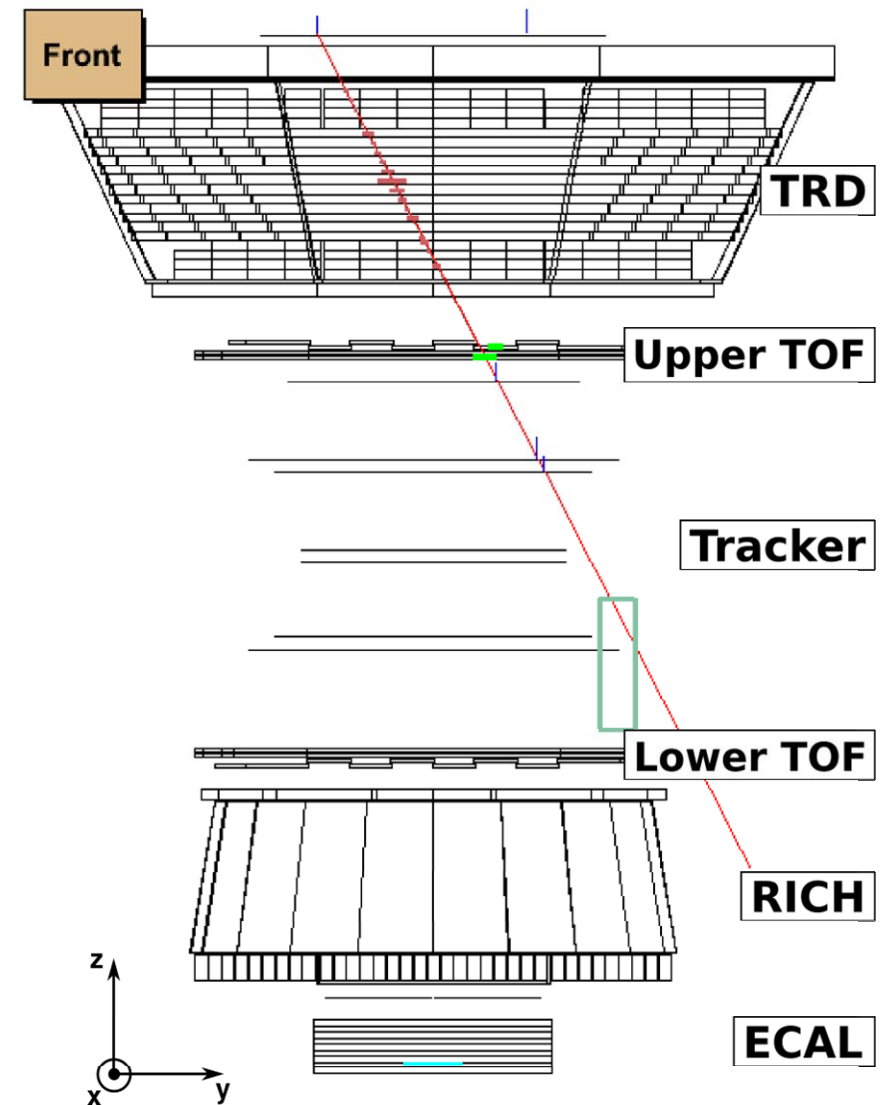
distance TOF-hit to TRD-track (x)



TRD track – center of TOF panel

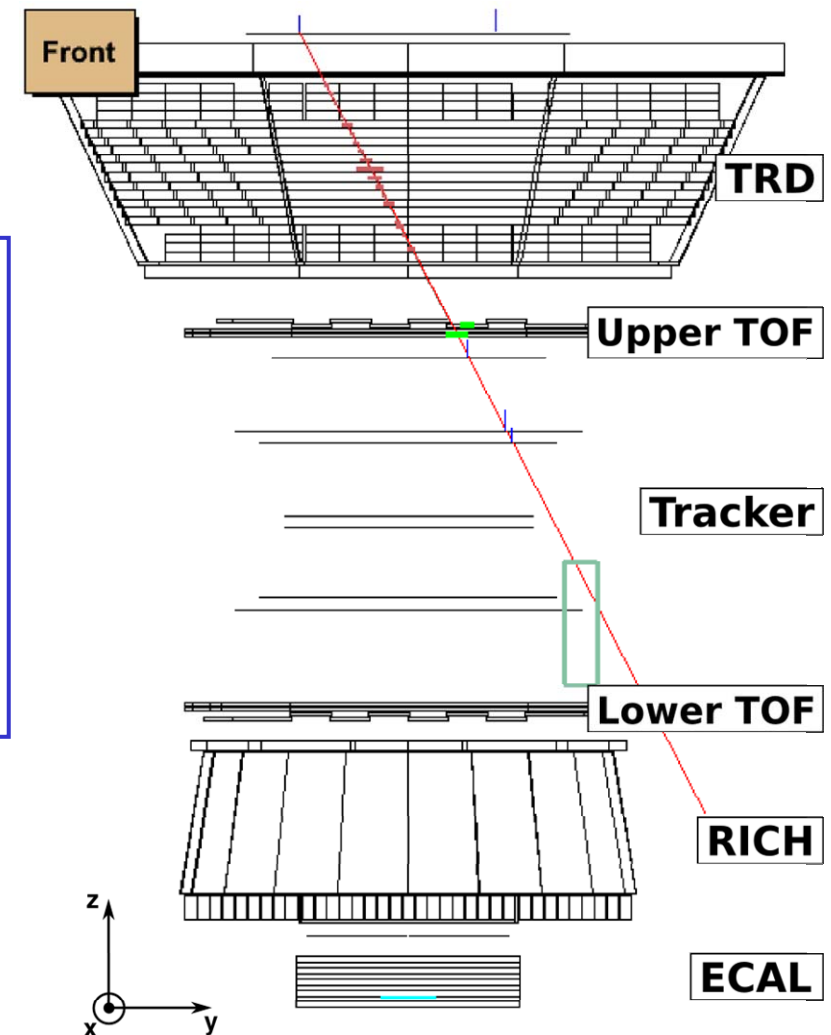
Requirements:

- Trigger from Upper TOF
- Single reconstructed TRD-Track
- TRD-Track matching beam config.
- matching TOF-hit positions

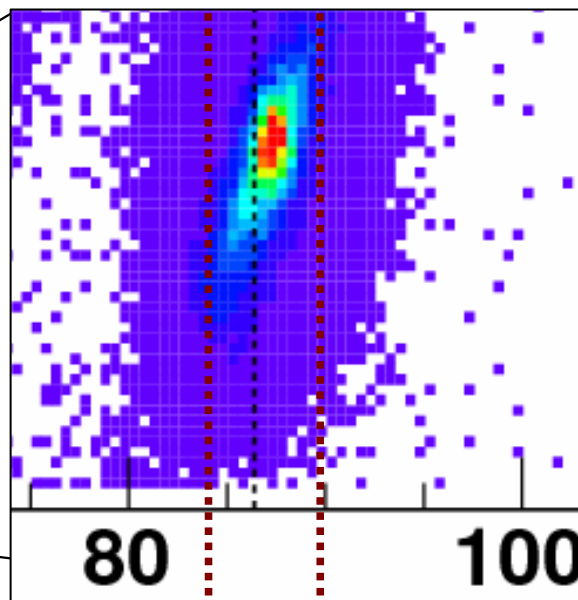
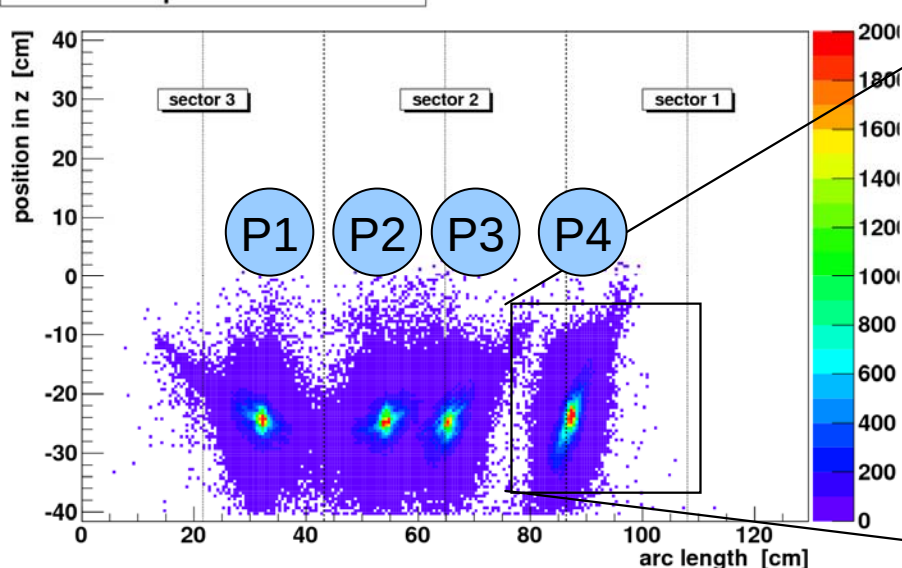


Requirements:

- Trigger from Upper TOF	7.661.060
- Single reconstructed TRD-Track	5.310.522
- TRD-Track matching beam config.	2.994.861
- TRD-Track matching beam config.	705.926
- matching TOF-hit positions	528.643



Position of predicted ACC-hits



Missed Events

Panel (8 mm thickness) (P1, P2):

0 out of 259,245 $\rightarrow I < 1.16 \cdot 10^{-5}$

Slit region (2x4mm thickness),

shared PMT (P3):

0 out of 125,010 $\rightarrow I < 2.40 \cdot 10^{-5}$

Slit region (2x4mm thickness),

different PMT (P4):

1 out of 144,268 $\rightarrow I < 4.00 \cdot 10^{-5}$

$\sim 6\text{cm}$

8mm panel region: $\sim 73\%$
slit region: $\sim 27\%$

ACC inefficiency:

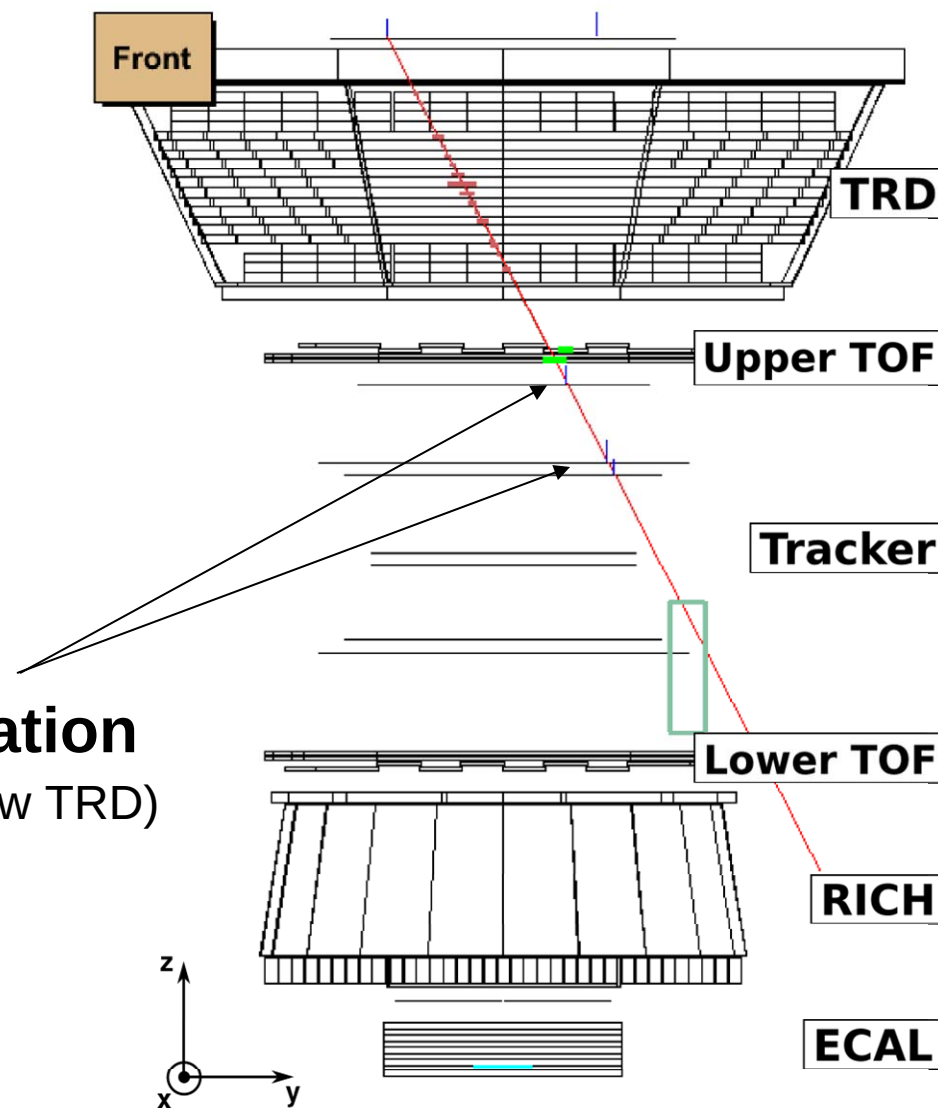
$I < 6.00 \cdot 10^{-6}$ (@ 95% CL)

requirement: $I_{\text{design}} < 10^{-4}$

Requirements:

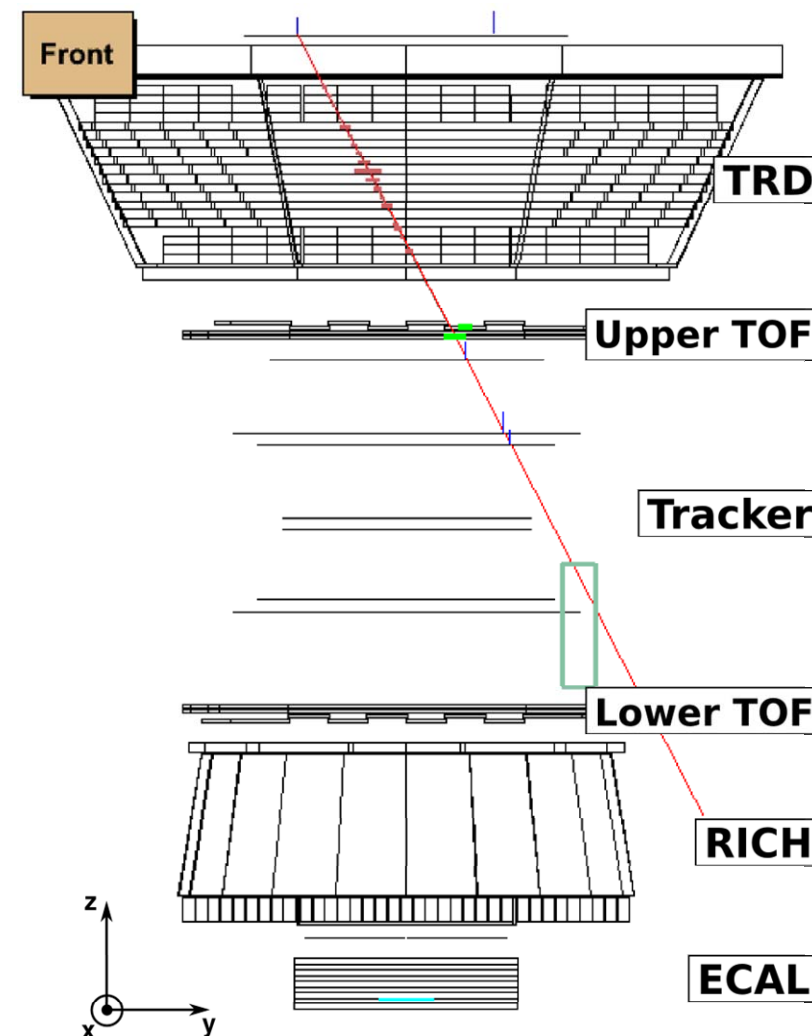
- Trigger from Upper TOF
- Single reconstructed TRD-Track
- TRD-Track matching beam config.
- matching TOF-hit positions
- *Tracker information*

Tracker information (3 Tracker-layers below TRD)



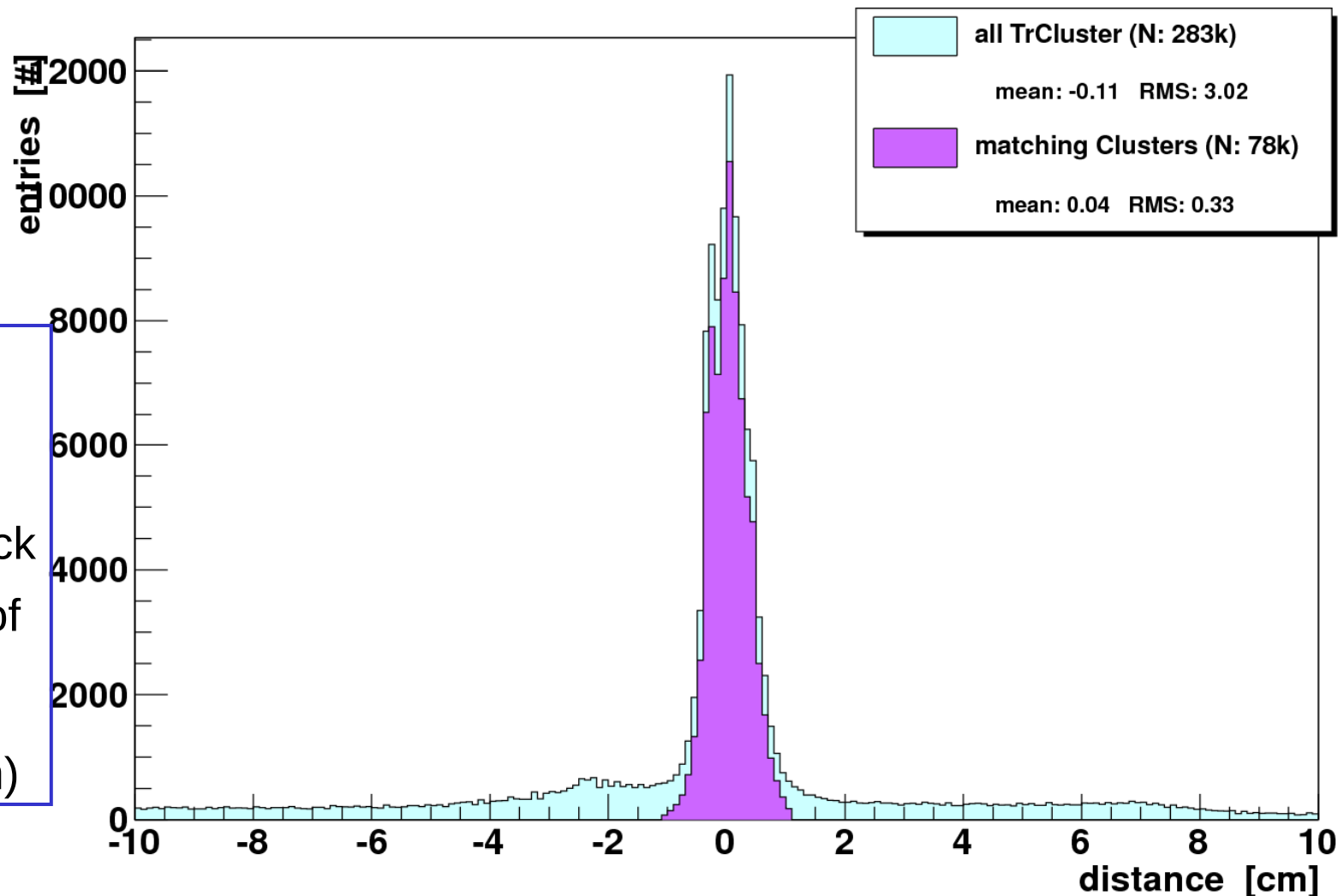
Requirements:

- Trigger from Upper TOF	7661060
- Single reconstructed TRD-Track	5310522
- TRD-Track matching beam config.	2994861
- matching TOF-hit positions	705926
- min. 2 matching TrCluster-hits on first 3 layers below TRD	528643
- linear fit / check for χ^2	415966
- track predicts ACC-hit	324826
	322884



→ **322,884 events** after all cuts

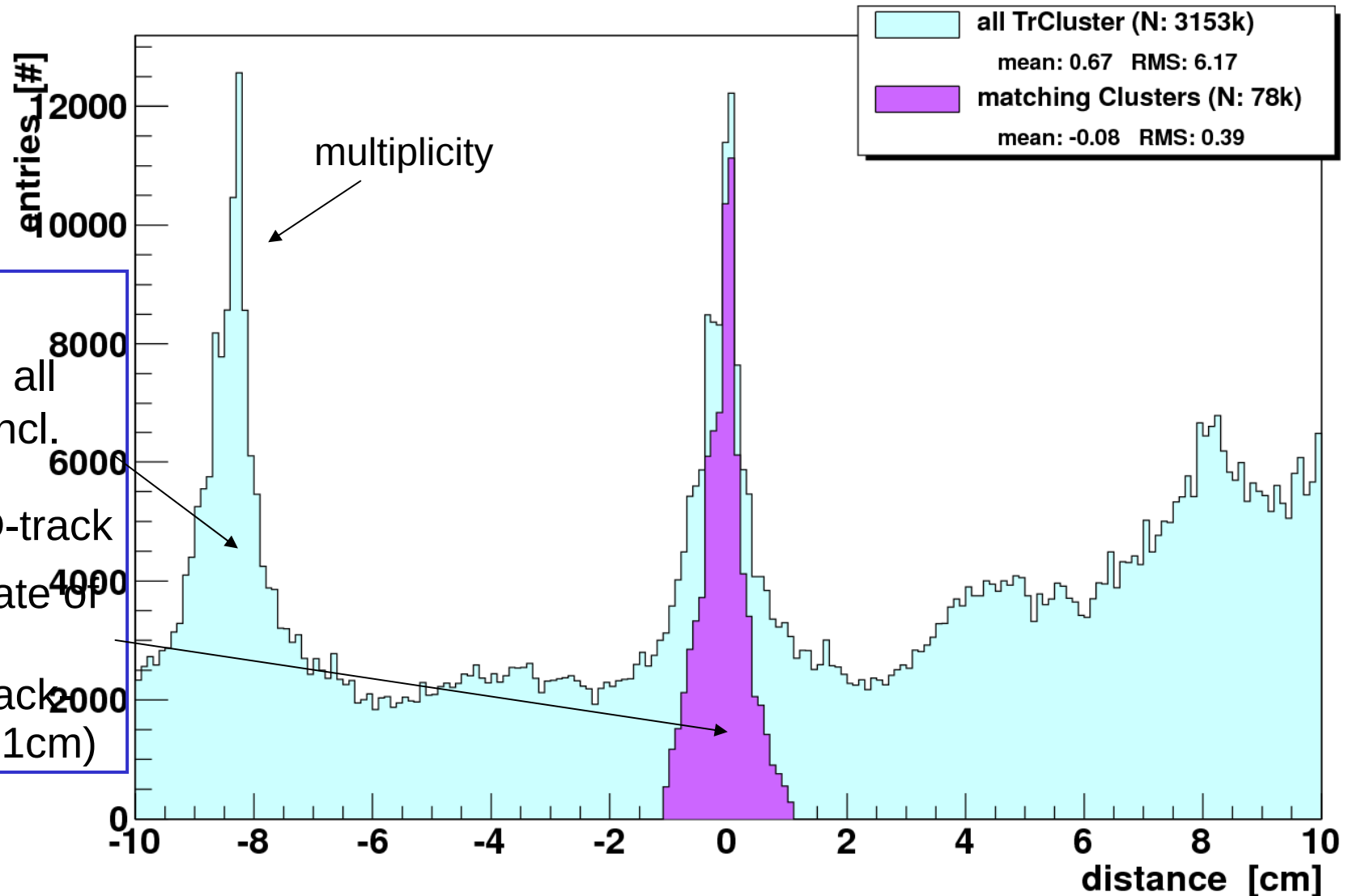
Distance in y from Tracker-Hit to TRD-Track (layer 2)



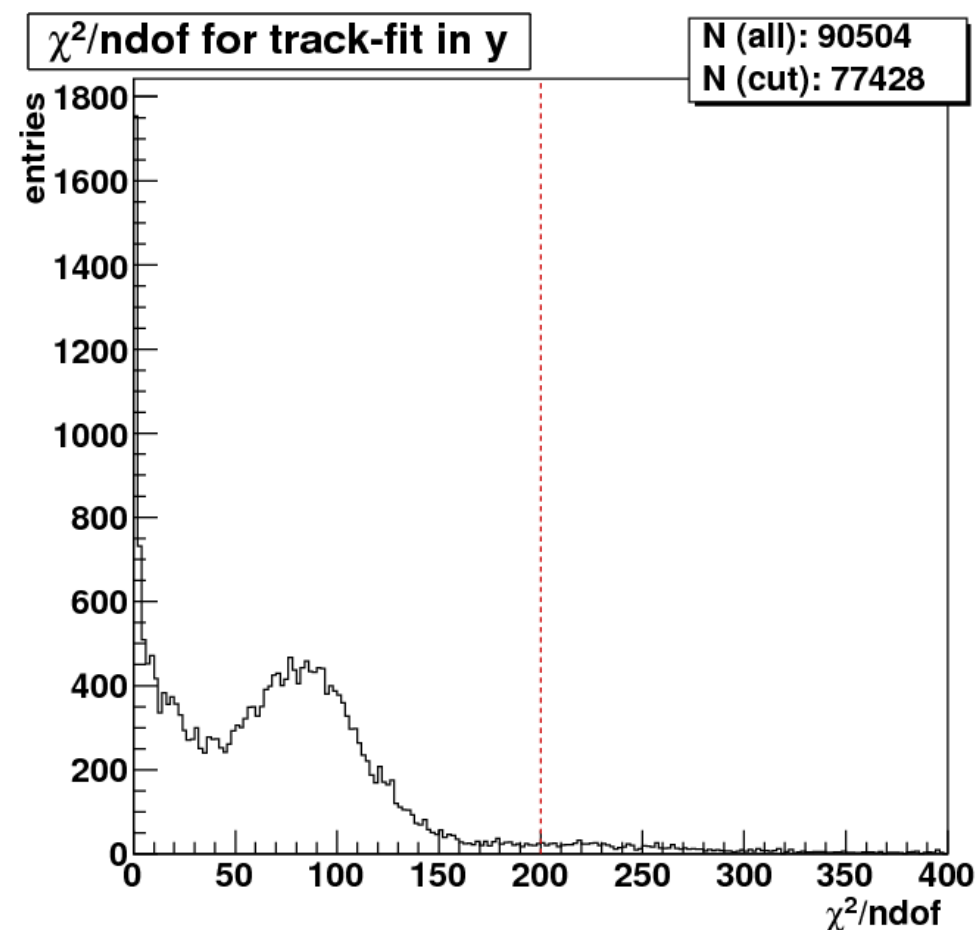
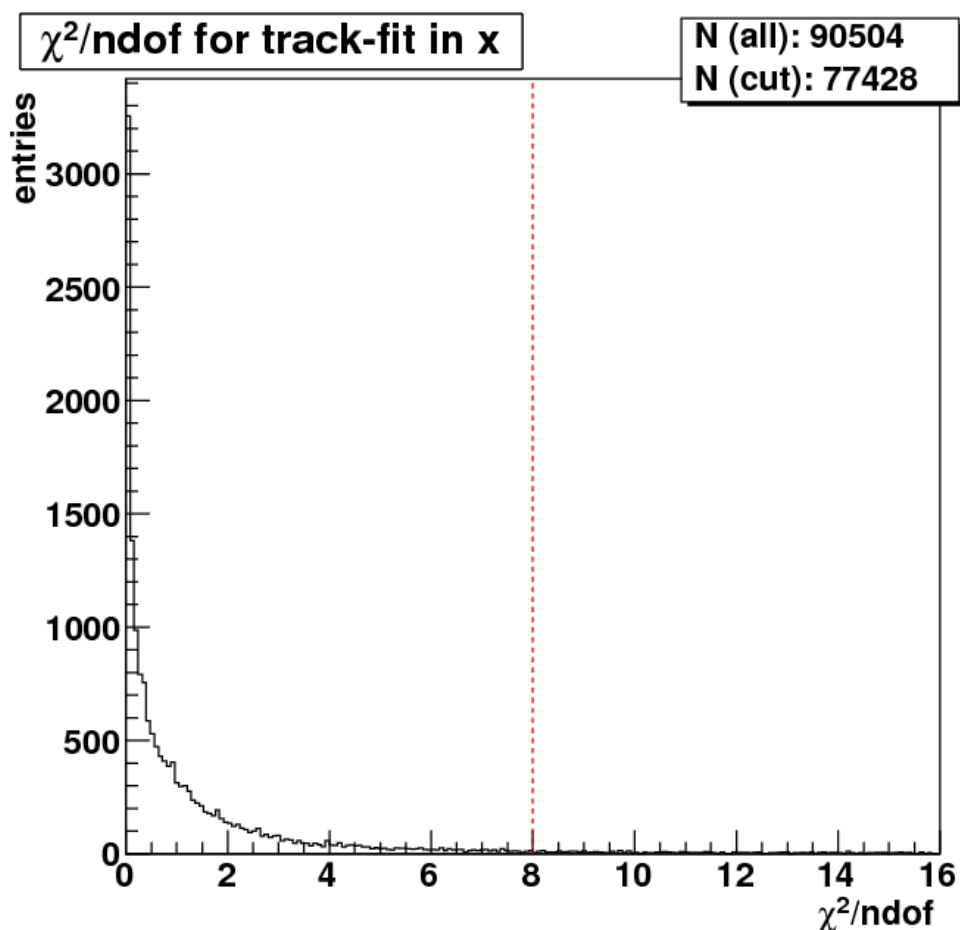
TrCluster:

- distance from all Cluster-hits to extrapol. TRD-track
- x & y coordinate of nearest hit is within TRD-track-uncertainty ($\sim 1\text{cm}$)

Distance in x from Tracker-Hit to TRD-Track (layer 2)

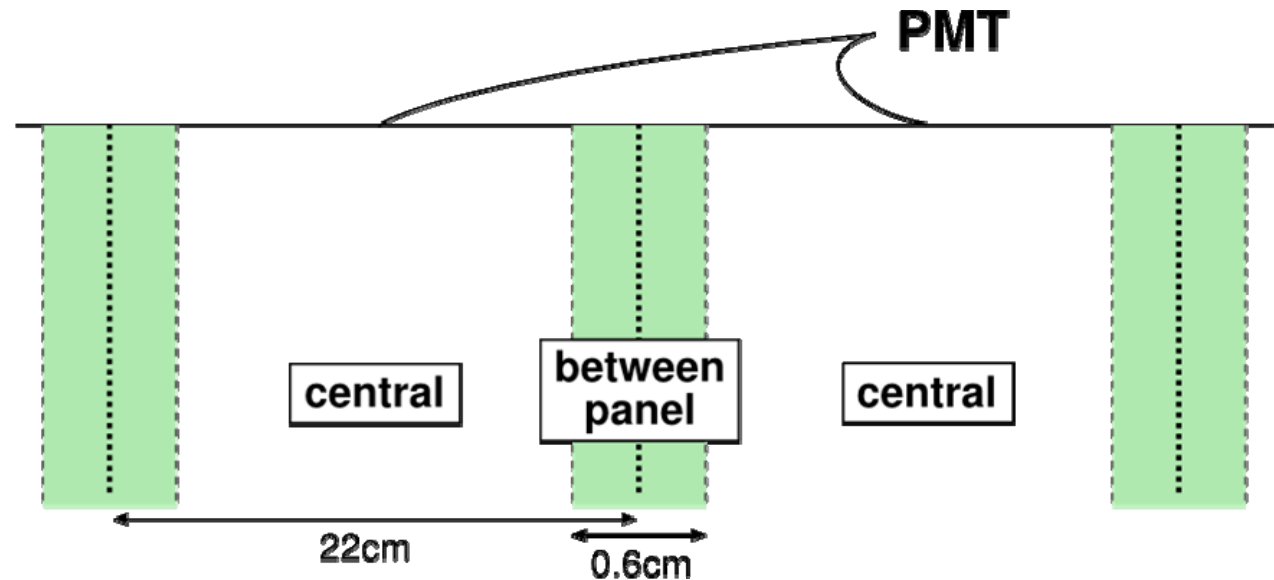


- min. 2 matching hits on 3 Tracker-layers below TRD
- fit linear Track through points, not including bending in y-direction
- check for χ^2



Dimensions

panel width: 22 cm
 beamspot Ø: 3 cm
 Slit region (nut & spring)
 width of slit region
 between panel: 0.6 cm



Missed Events and Inefficiency

Panel (8 mm thickness):

1 out of 304,022 $\rightarrow I < 1.90 \cdot 10^{-5}$

Slit region (2x4mm thickness), shared PMT:

0 out of 9,450 $\rightarrow I < 3.17 \cdot 10^{-4}$

Slit region (2x4 mm thickness), different PMT:

0 out of 9,412 $\rightarrow I < 3.18 \cdot 10^{-4}$

Dimensions

panel width: 22 cm
 beamspot $\varnothing$: 3 cm
 Slit region (nut & spring)
 width of slit region
 between panel: 0.6 cm

Inefficiencies

Panel (8 mm thickness):

$$I < 1.90 \cdot 10^{-5}$$

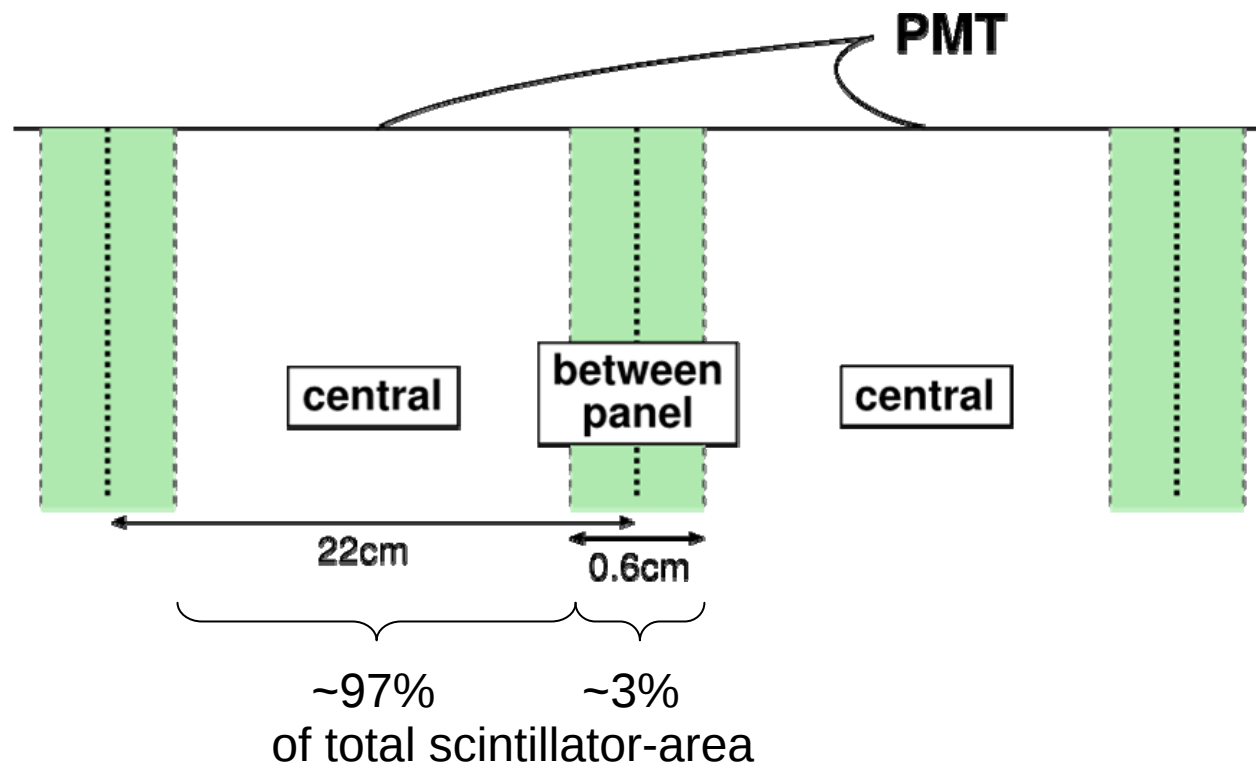
Slit region (2x4mm thickness),
 shared PMT:

$$I < 3.17 \cdot 10^{-4}$$

Slit region (2x4mm thickness),
 different PMT:

$$I < 3.18 \cdot 10^{-4}$$

single inefficiencies
 weighted corresponding to area

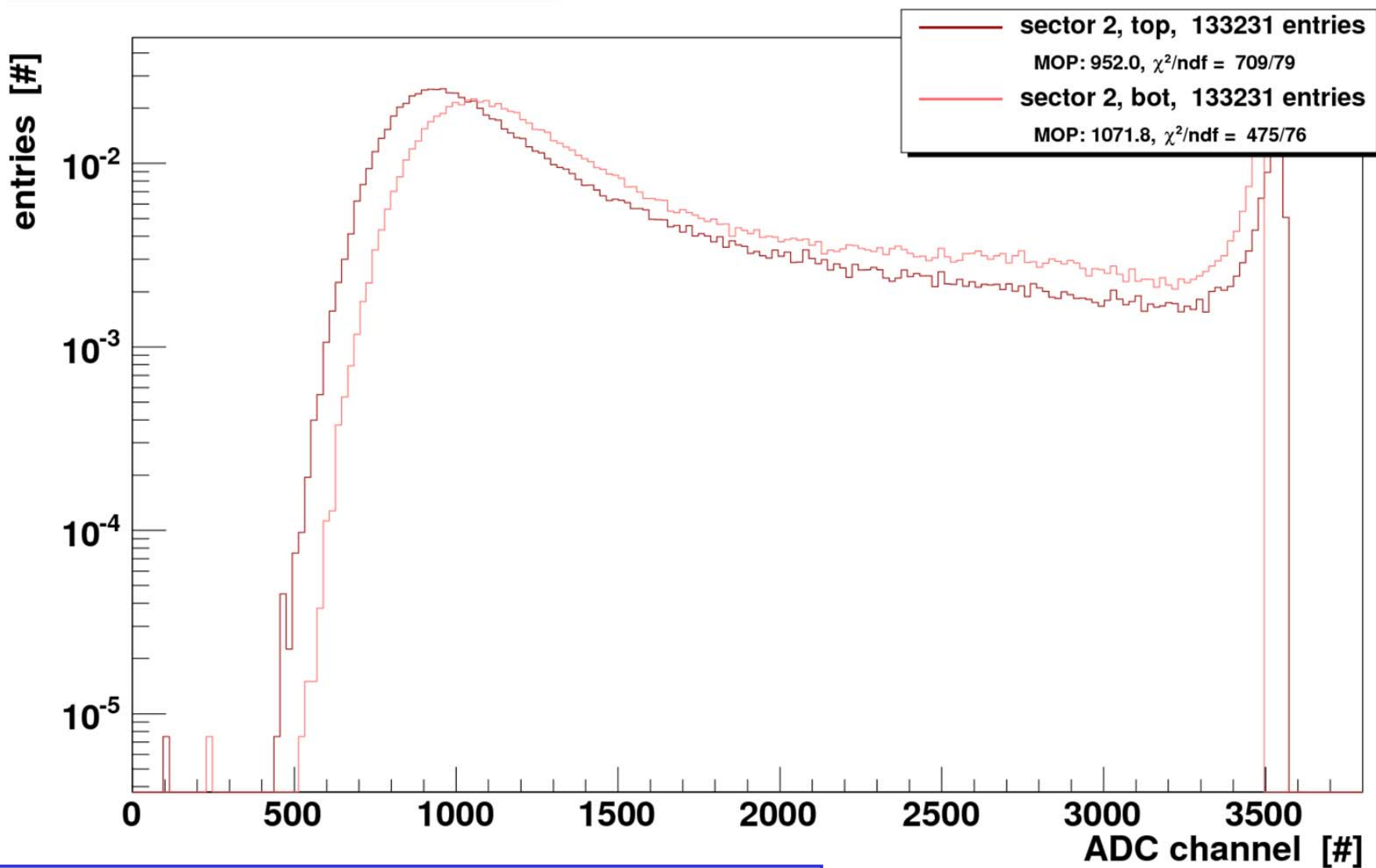


ACC Inefficiency:

$$I < 1.89 \cdot 10^{-5} \text{ (@ 95\% CL)}$$

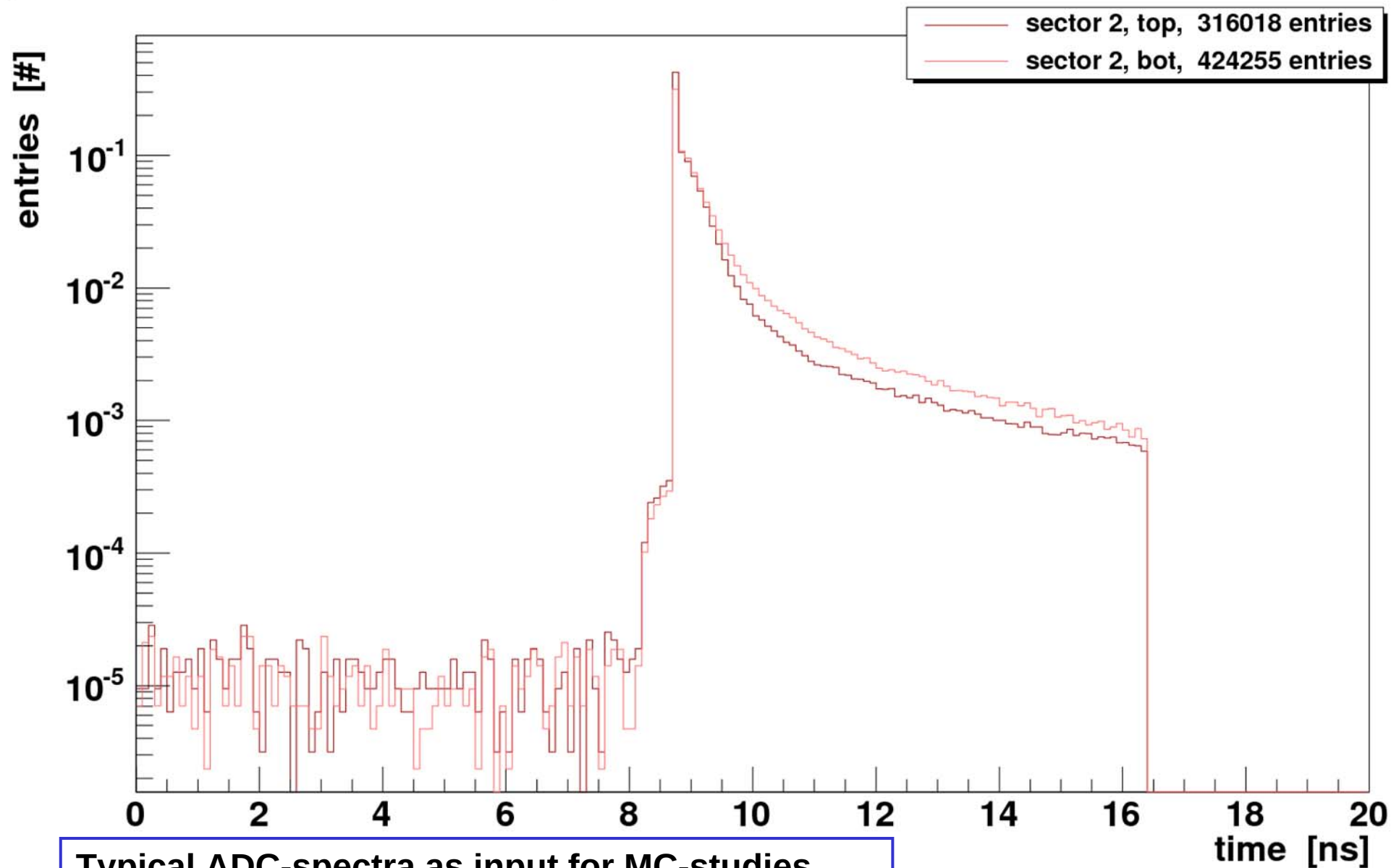
requirement: $I_{\text{design}} < 10^{-4}$

ADC-spectrum (sector 2)



Typical ADC-spectra as input for MC-studies

TDC-spectrum (sector 2)



Typical ADC-spectra as input for MC-studies