

Diamond target calibration

F. Oliva on behalf of Lecce PADME group

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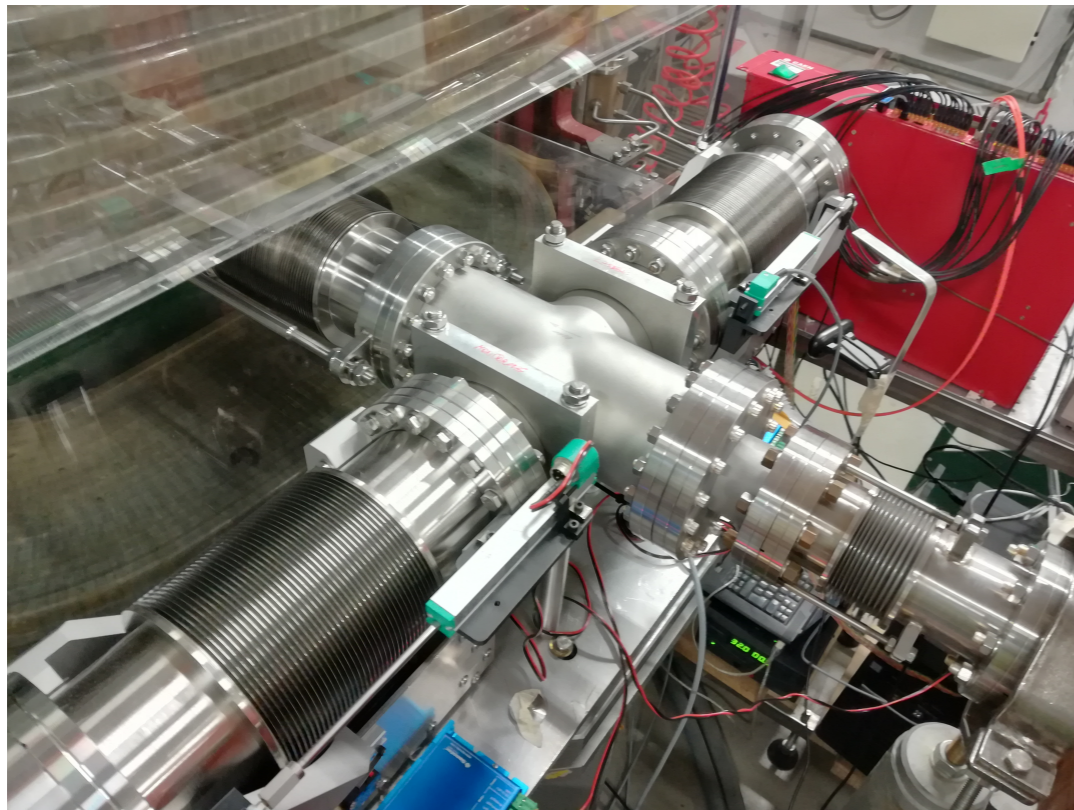
**PADME general meeting
8-9 Jan 2019**



Data samples

Calibration 19 December 2018

Diamond target, Fitpix and Timepix



4 different multiplicity

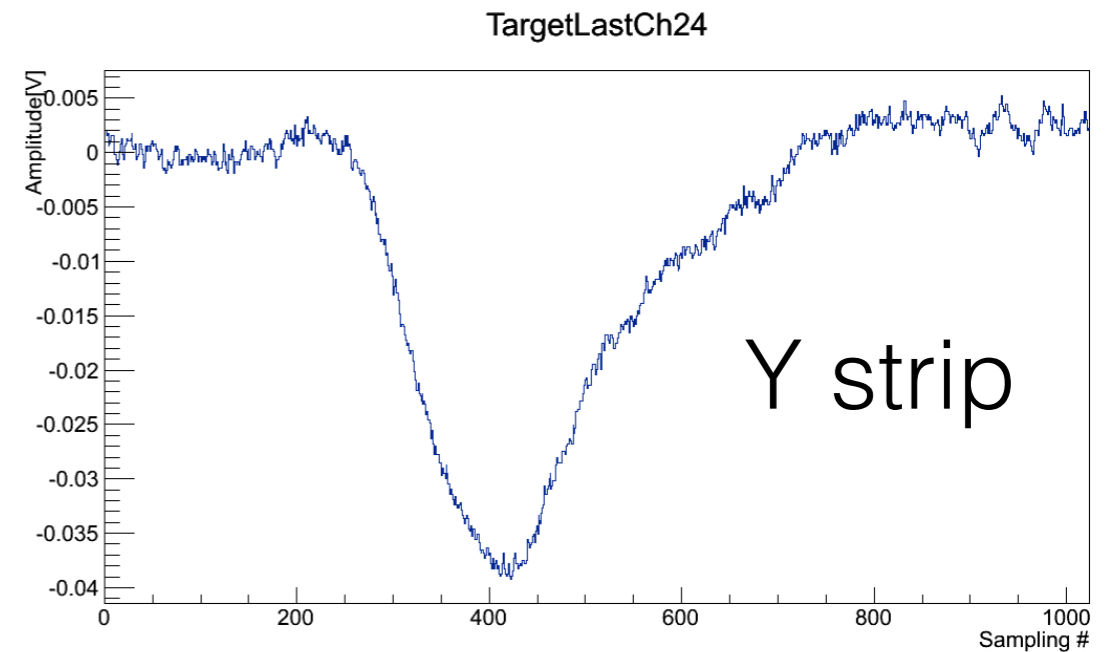
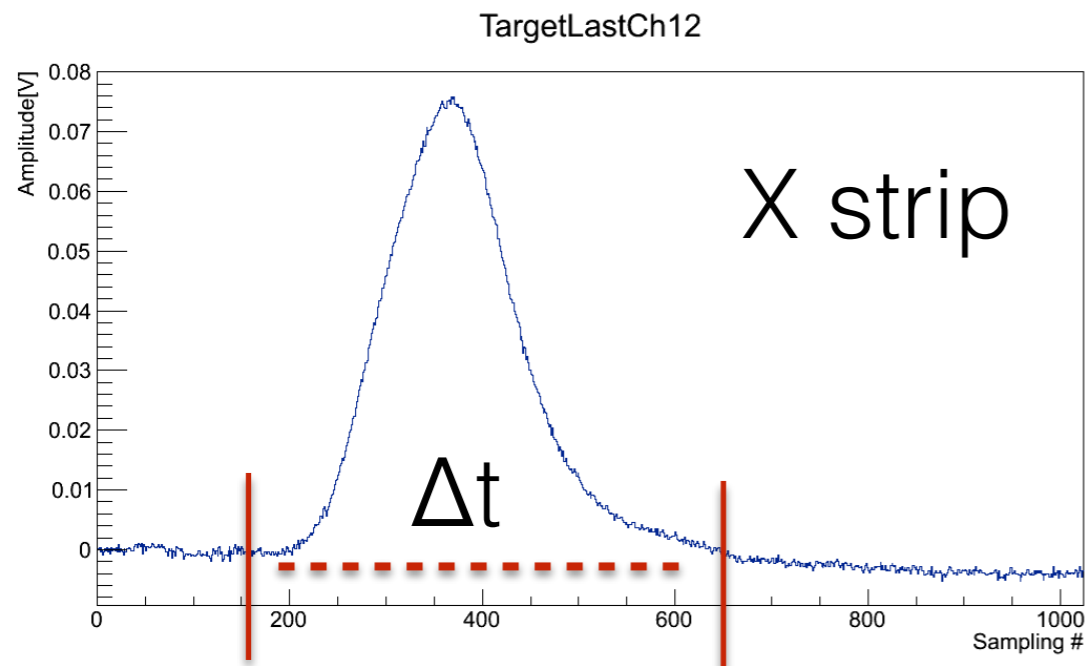
5000	run_0000000_20181219_182922
10000	run_0000000_20181219_184326
15000	run_0000000_20181219_190104
20000	run_0000000_20181219_191731

Be careful!

SATURATION of FitPix
for POT < 15000

Thanks to Claudio Di Giulio for BTF setup and FitPix root-ple

Raw collected charge



Integral of the signal for $150 \text{ ns} < \Delta t < 650 \text{ ns}$

HV X strips = -250 V

HV Ystrips=ground

Collected charge from each strip

$$Q_{\text{COLL}} = \int \frac{V dt}{R} \quad \text{with } R = 50 \Omega$$

Equalized (or relatively calibrated) charge

It's important to obtain the gain **G** of each charge amplifier of the electronics

$$Q = \int \frac{V dt}{R} \frac{1}{G}$$

G=gain

How to?

Injection of charge to each channel using a pulser to study the output of the amplifiers

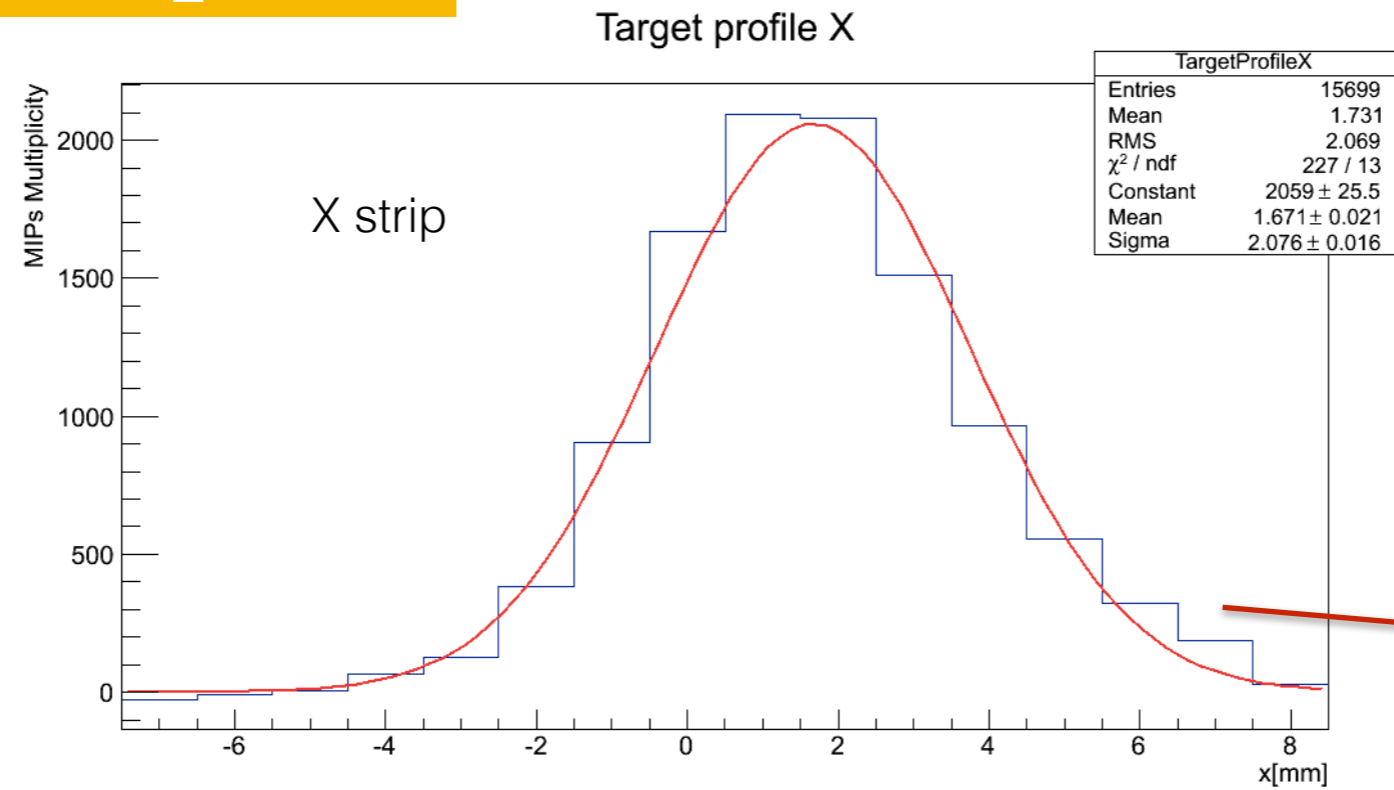
Calibration done in vacuum with only one board.
The other one didn't respond (known problem)

Another calibration is needed (as soon as possible)
to understand better

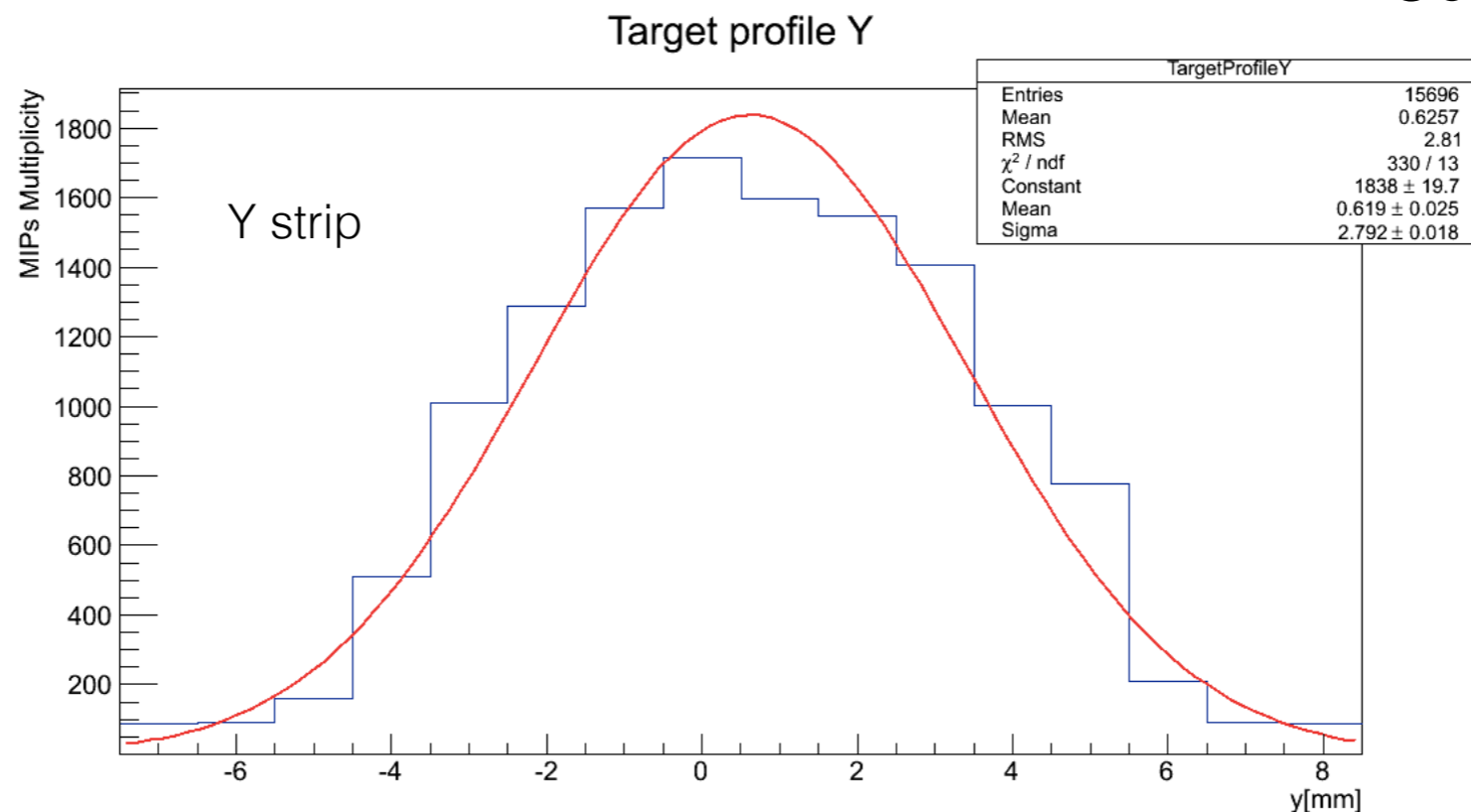
Before phase II?

Cumulative Beam profiles

run_0000000_20181219_184326

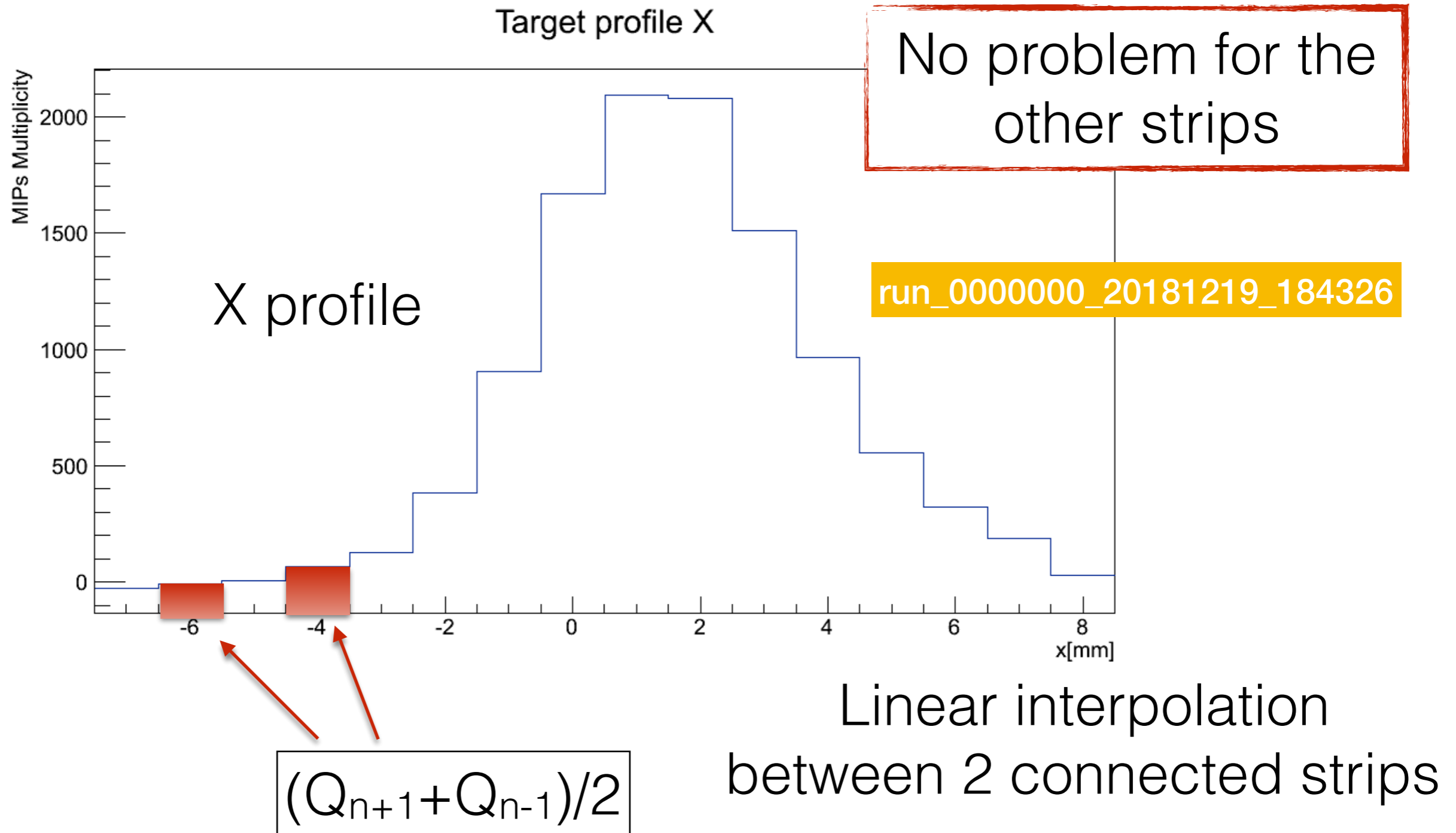


Coverage of the target
 $\sim 100\%$



Dead strips charge assignment

Dead Strips: X3, X5



Multiplicity/strip from nominal CCD

$$N_{\text{particles}} \sim \frac{Q[\text{fC}] * 6250[\text{e}^-/\text{fC}]}{36[\text{e}^-/\mu\text{m}] * \text{CCD}[\mu\text{m}]}$$

Multiplicity calculated with **CCD** ~ 10 μm

(multiplicity given
by BTF staff using FitPix)

same as the 50 μm thick prototype?

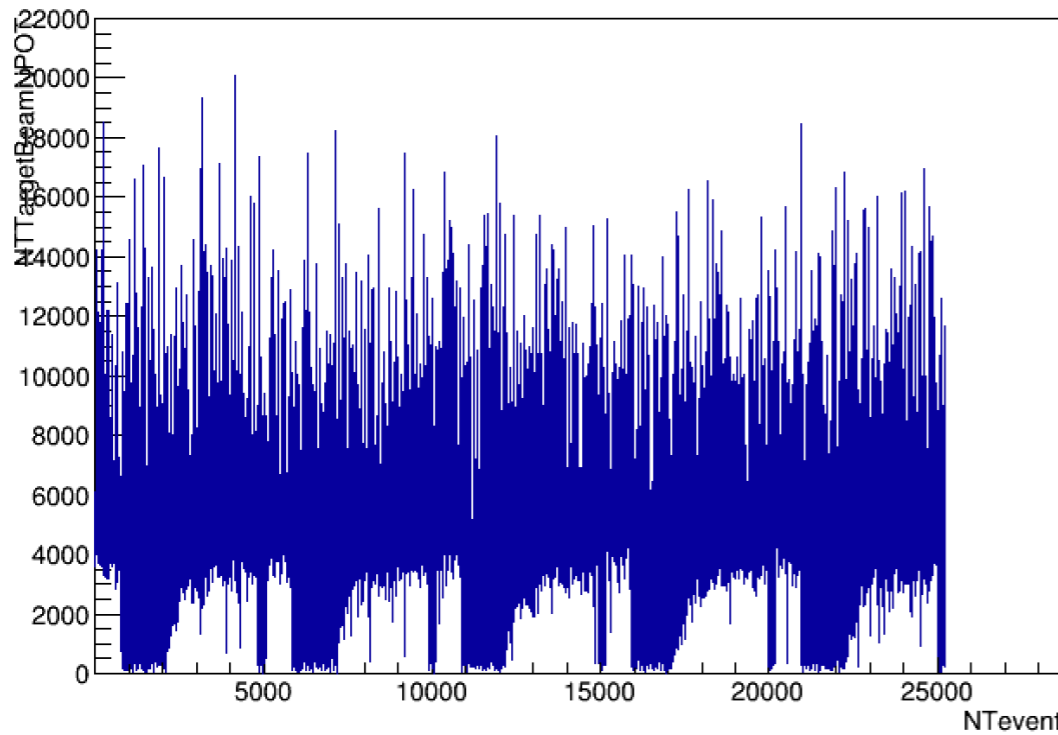
We expected a **CCD** ~ 20 μm
for 100 μm detector

Possible explanation: bad quality diamond detector

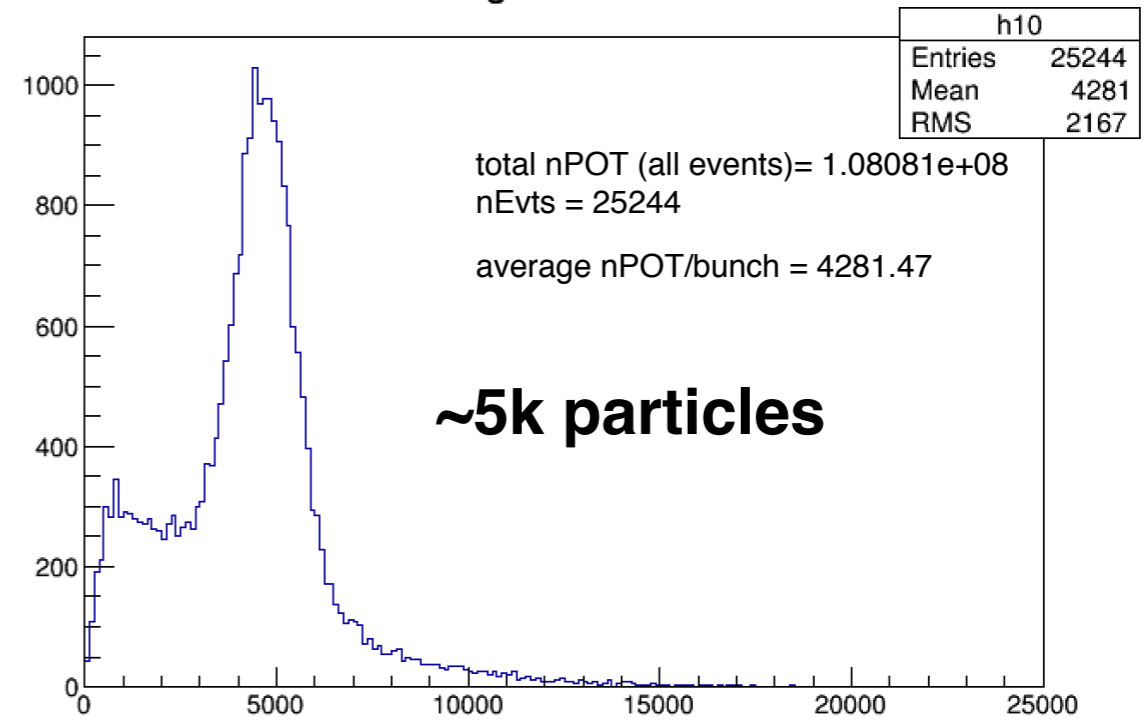
Total Target multiplicity from Reco

run_000000_20181219_182922

NTTargetBeamNPOT:NTevent

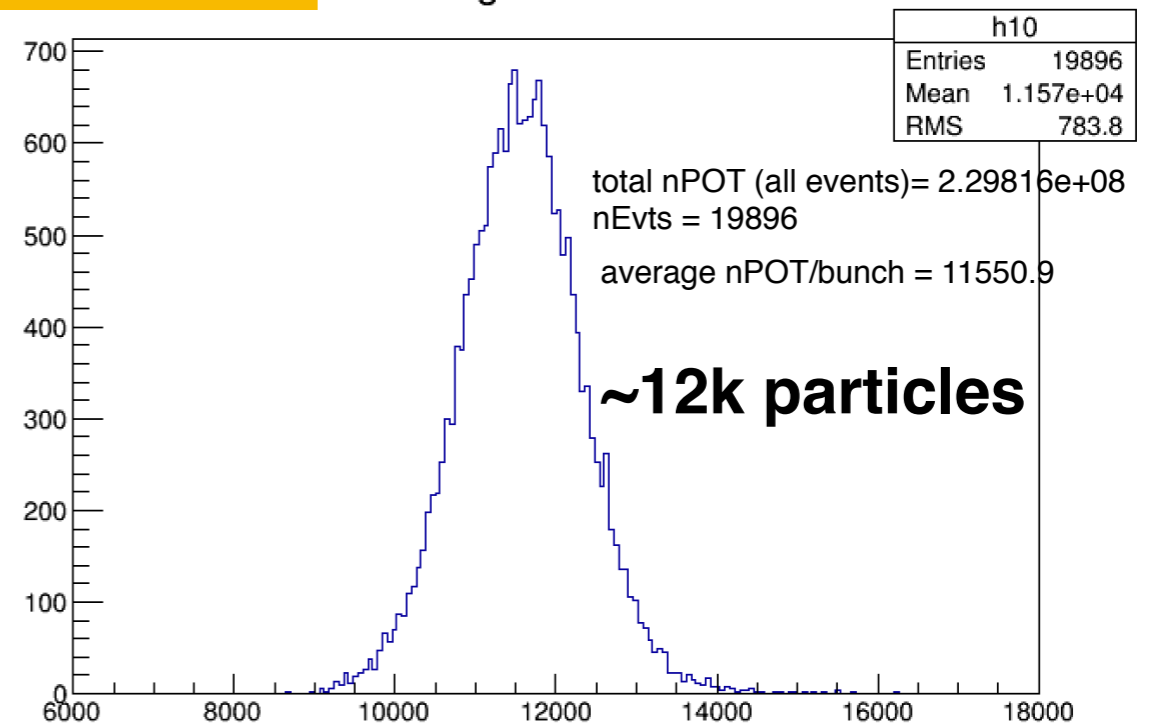
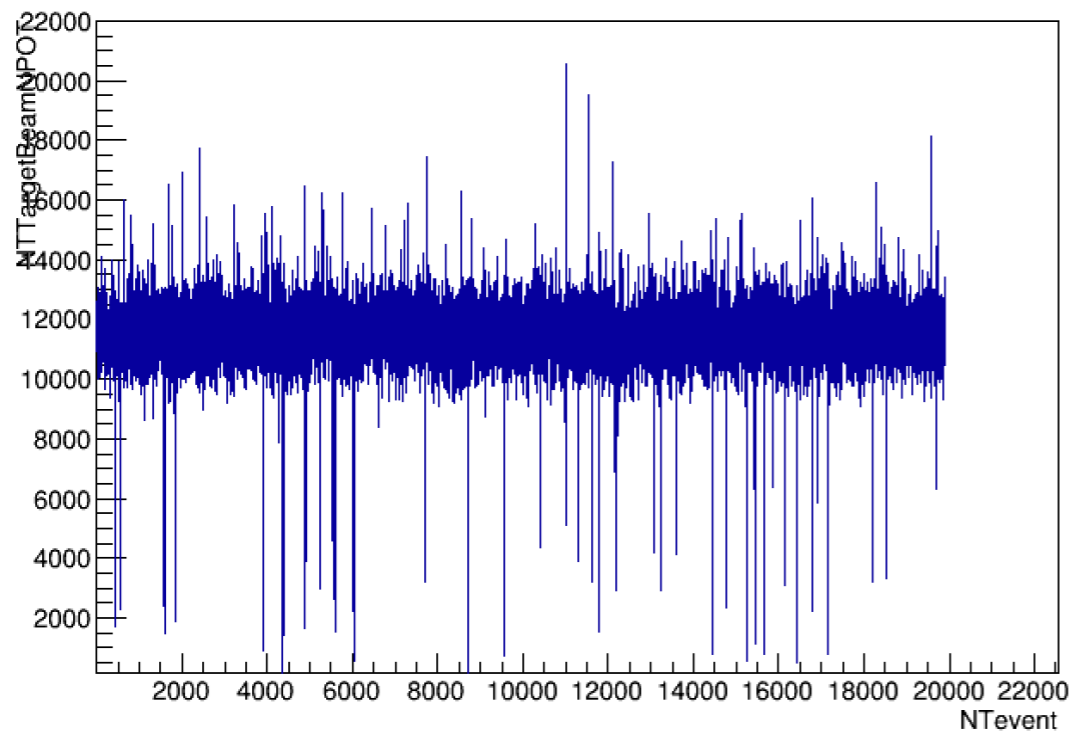


NTTargetBeamNPOT

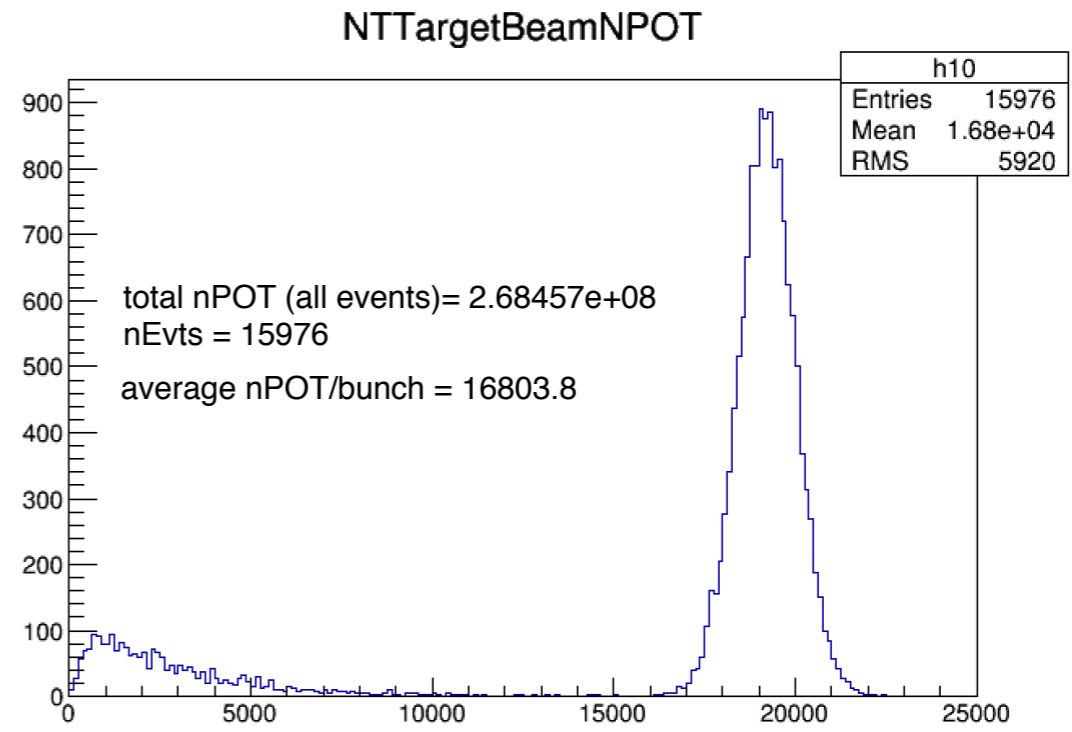
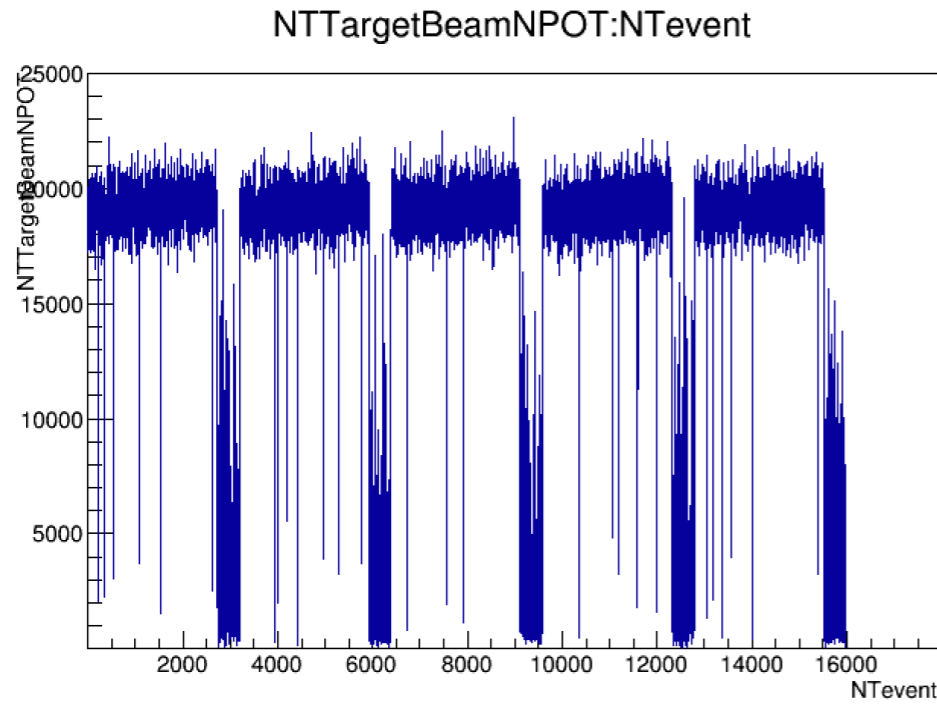


run_000000_20181219_184326

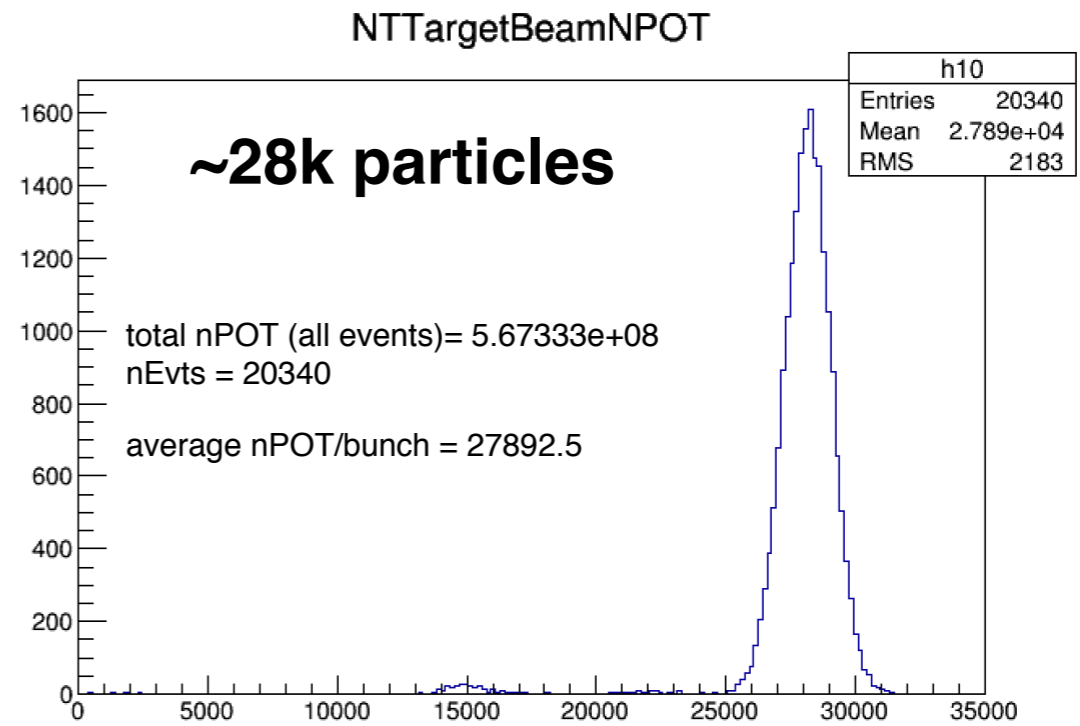
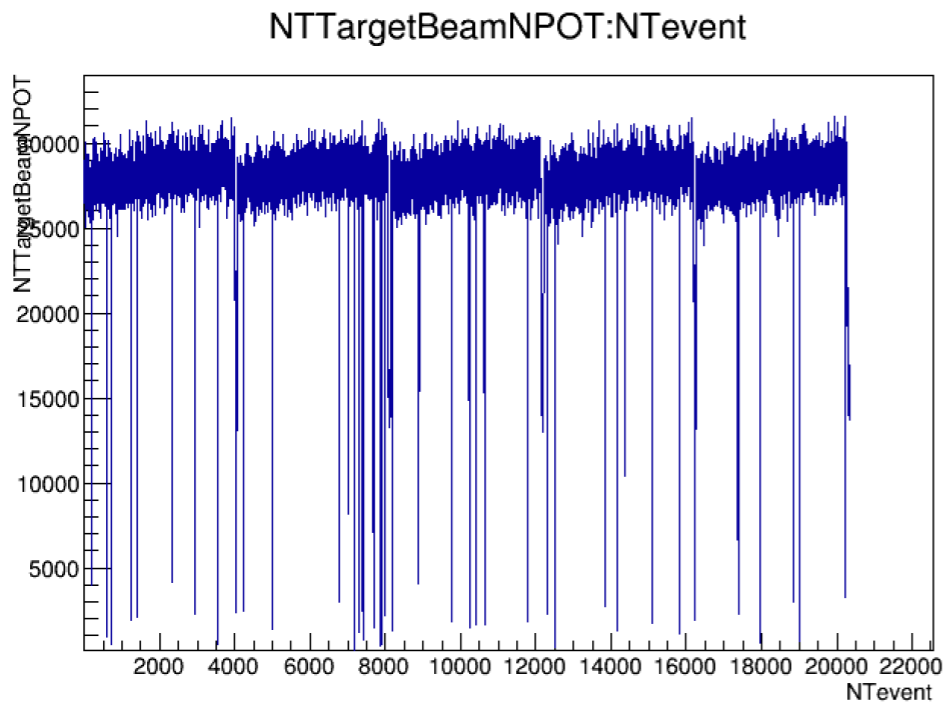
NTTargetBeamNPOT



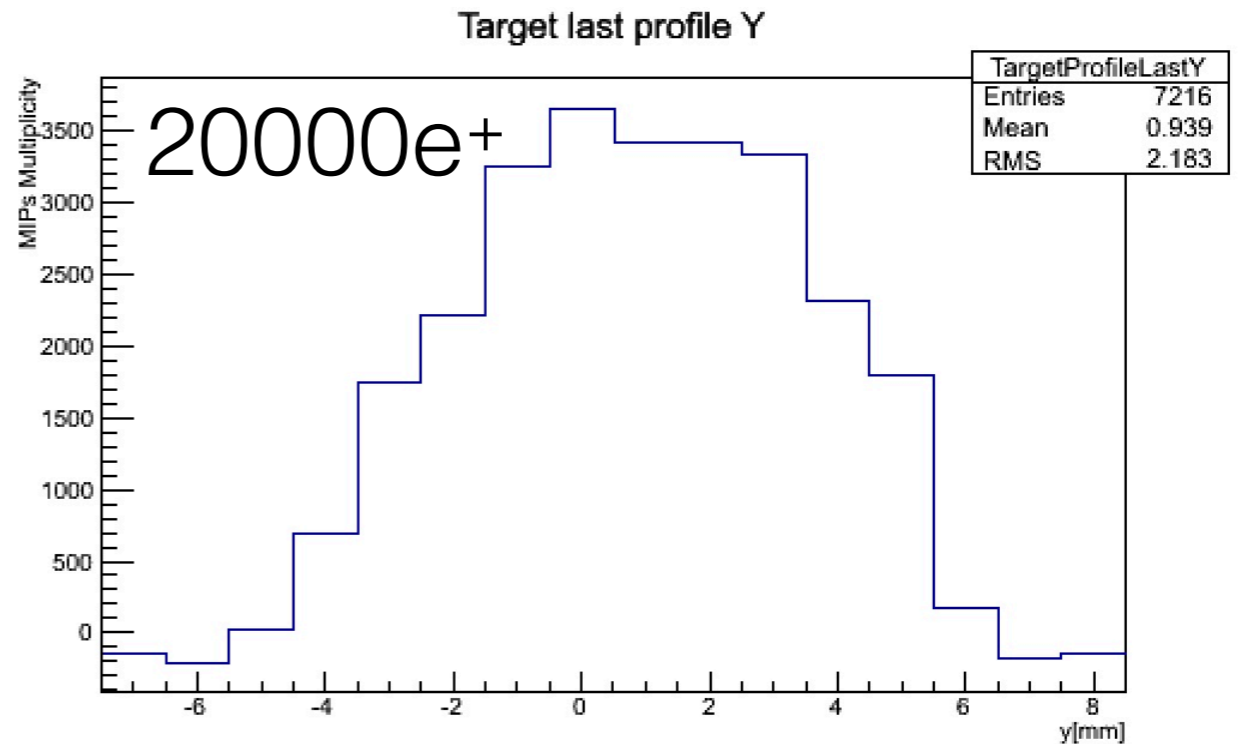
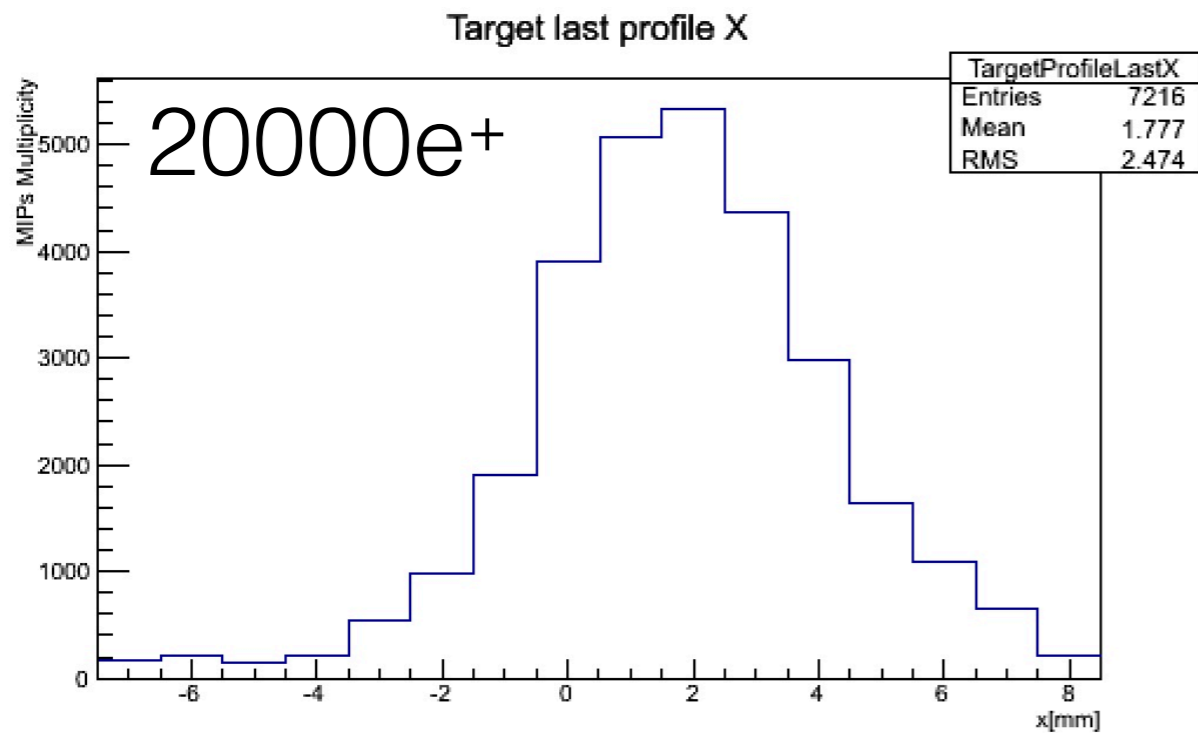
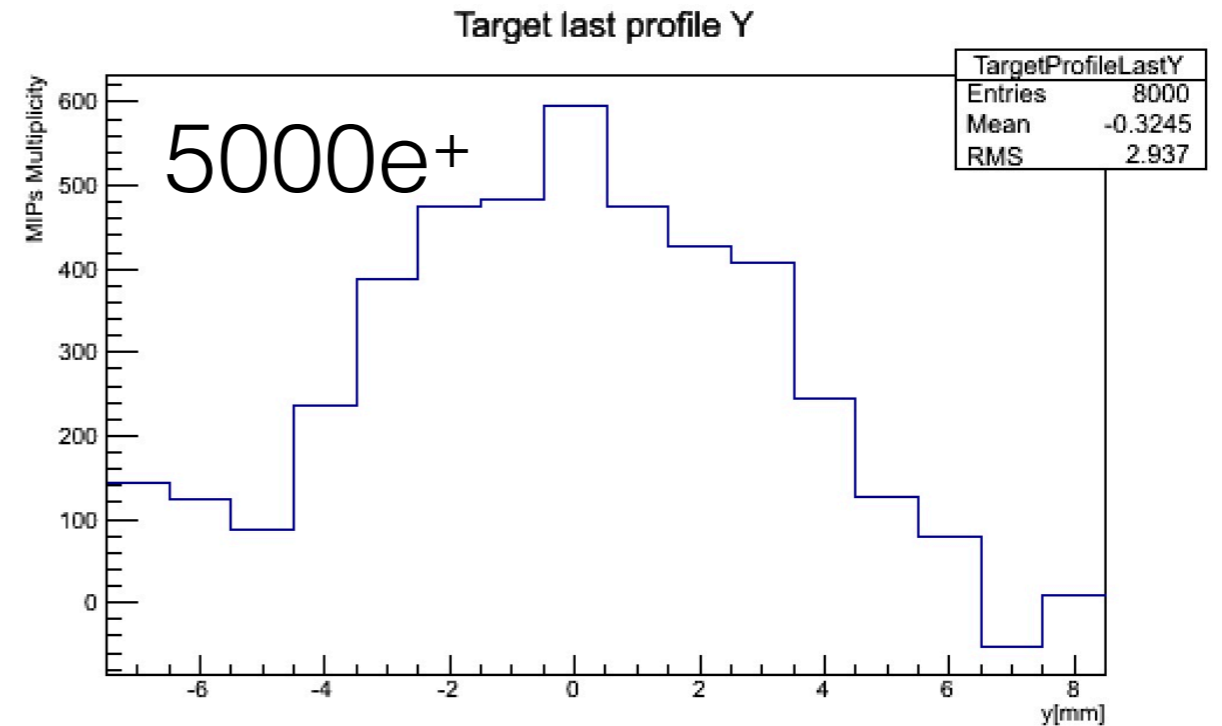
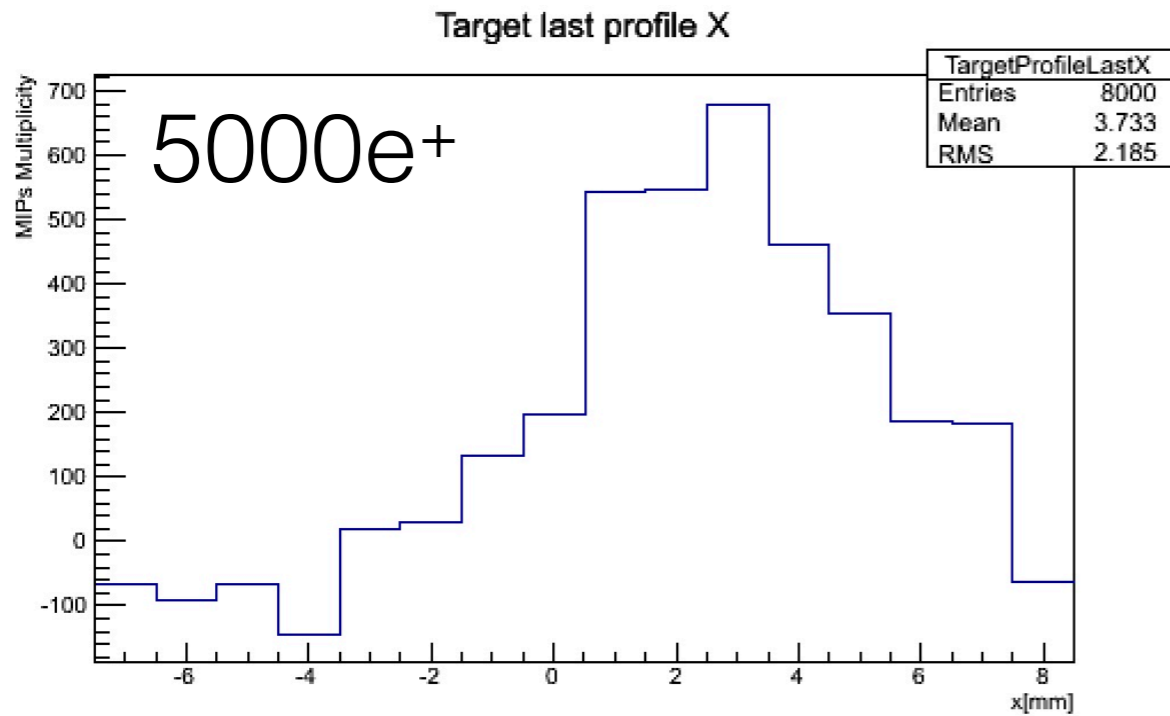
run_000000_20181219_190104



run_000000_20181219_191731

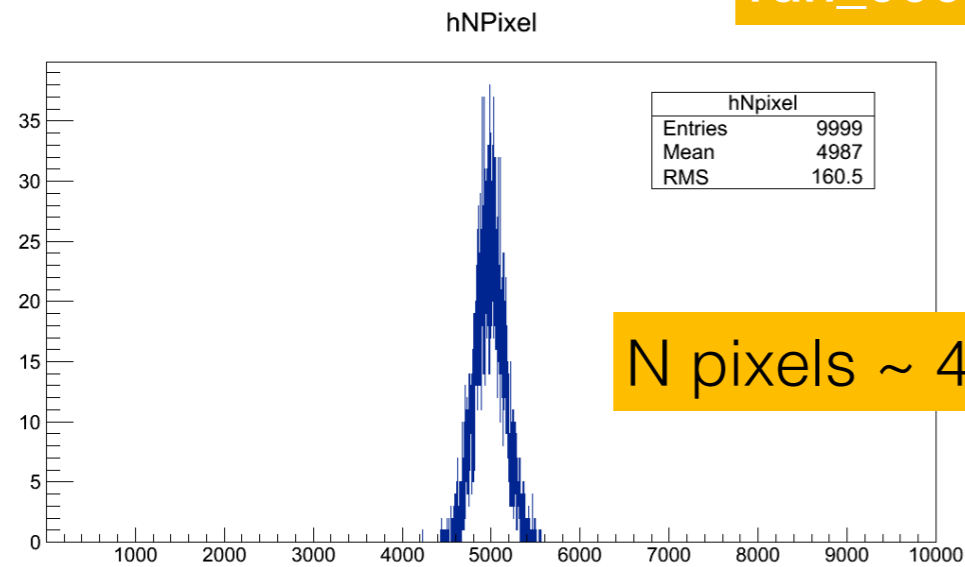


Single bunch beam profiles

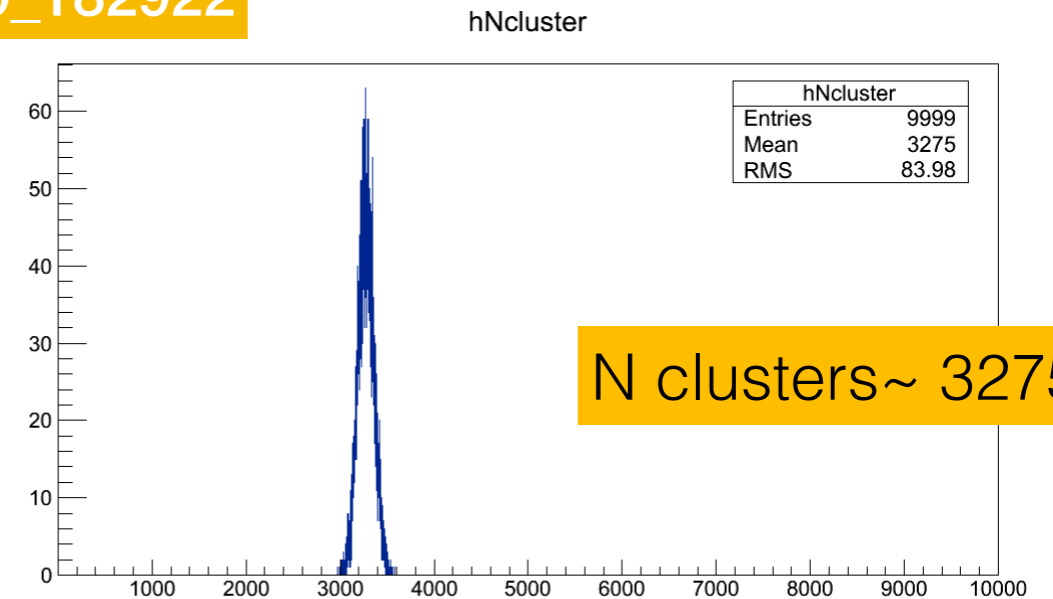


Total multiplicity from FitPix

run_0000000_20181219_182922

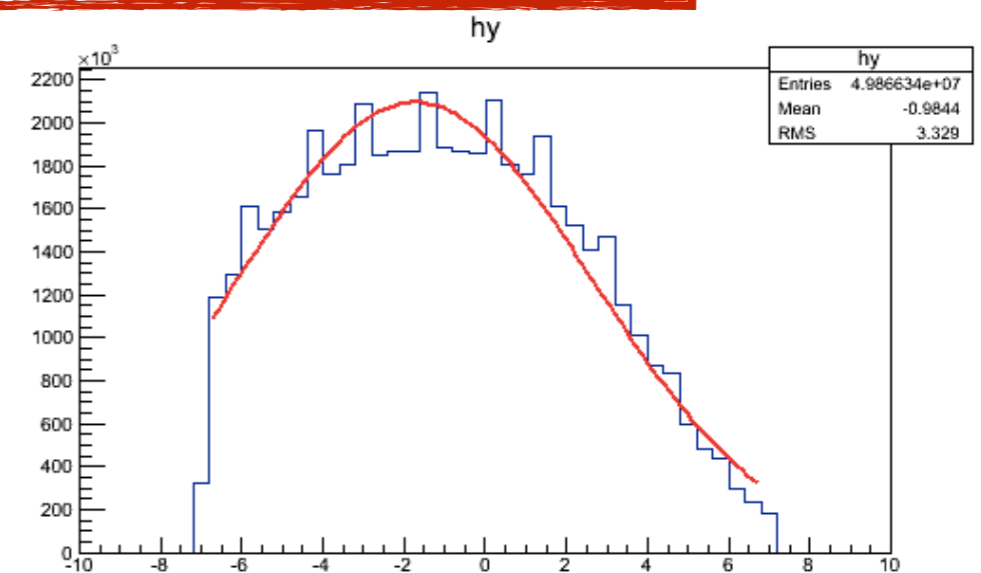
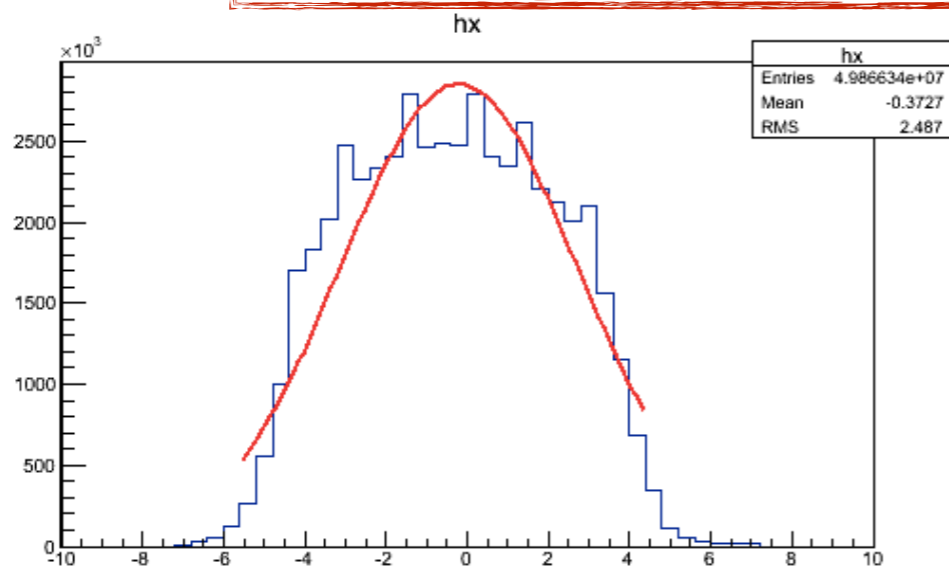


N pixels ~ 4987



N clusters ~ 3275

How to estimate the coverage of FitPix?



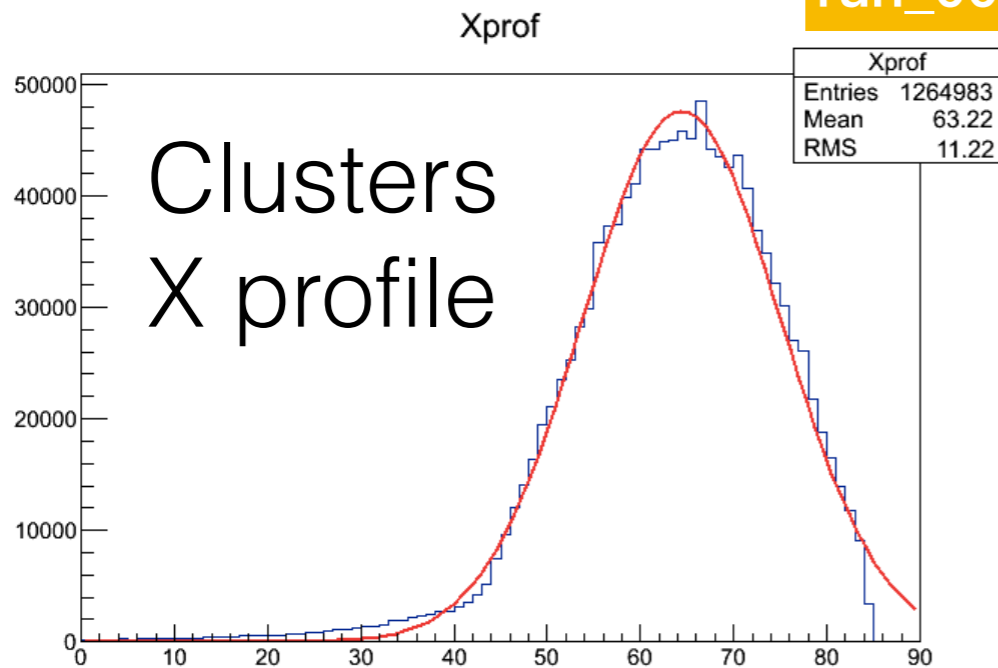
Coverage of FitPix 90% →

Npixels ~ 5540
Nclusters ~ 3638

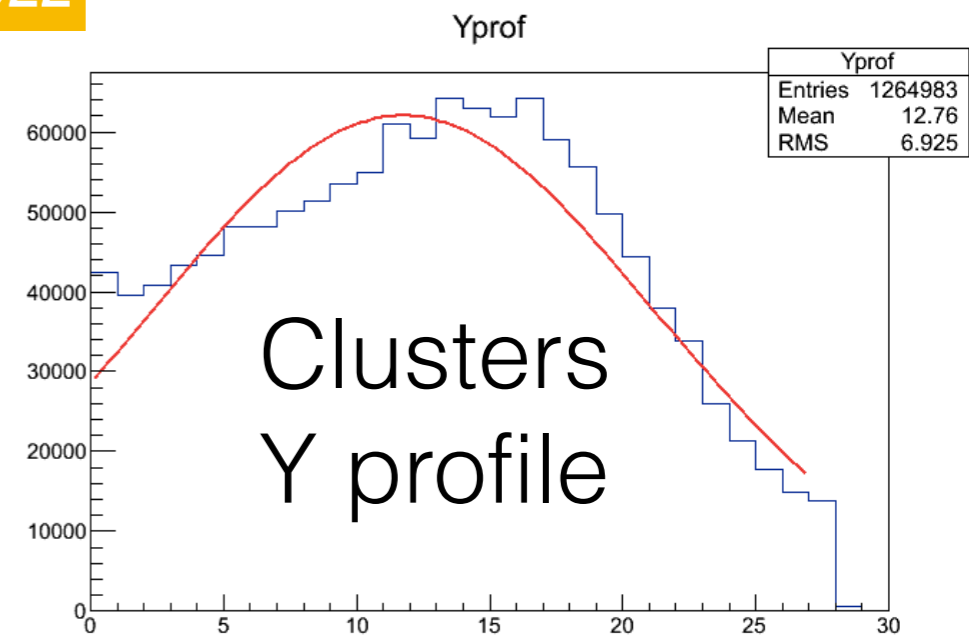
Total multiplicity from TimePix3

How to estimate the coverage of TPix?

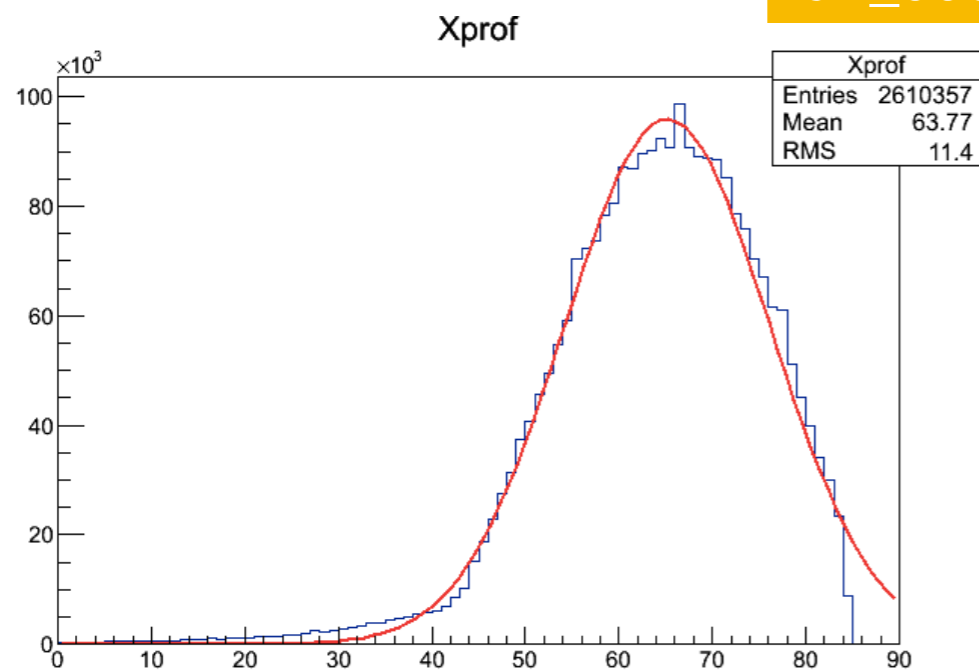
run_000000_20181219_182922



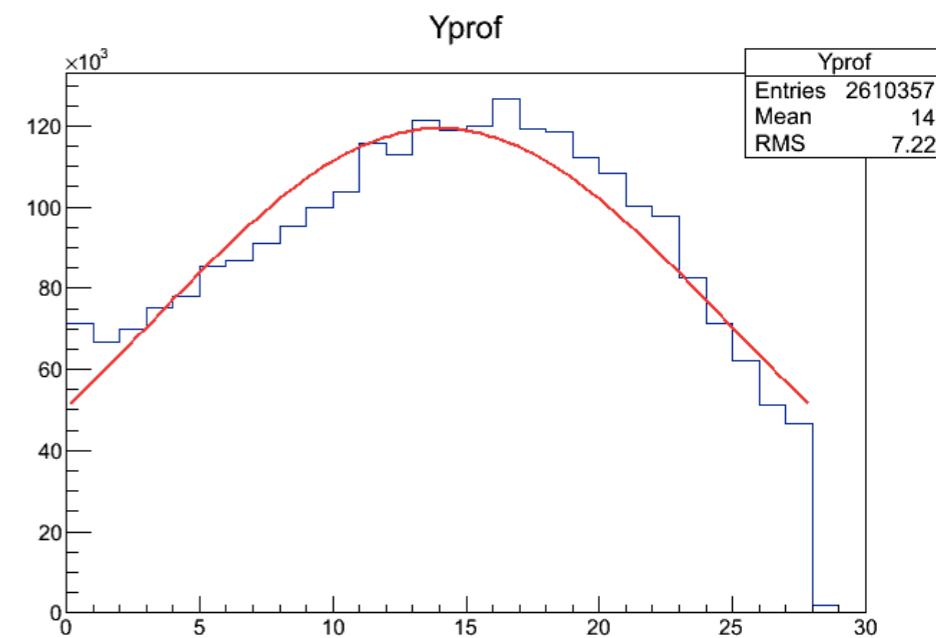
5k particles
Pixels 5752
Clusters 2591



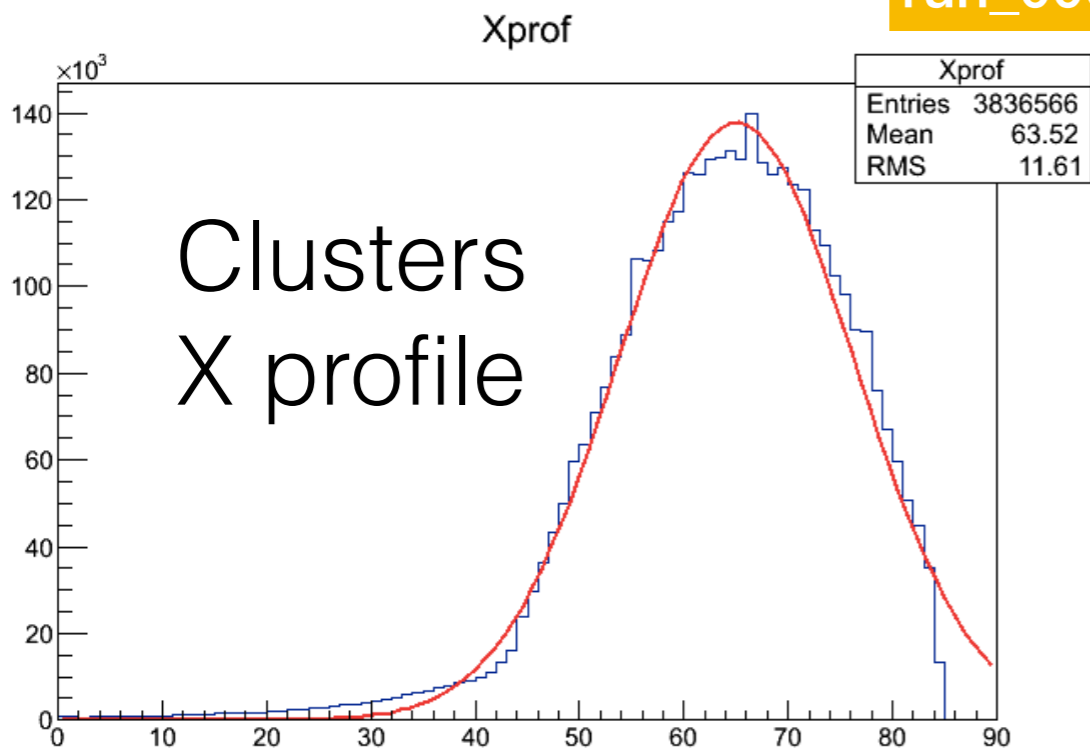
run_000000_20181219_184326



10k particles
Pixels 12474
Clusters 5305



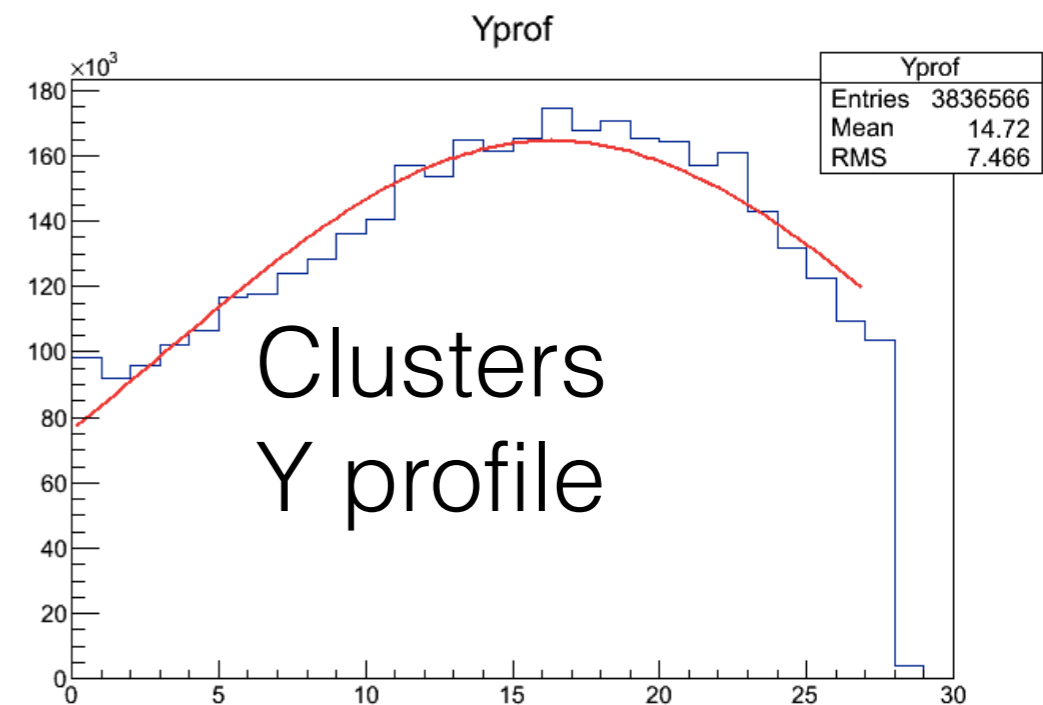
run_000000_20181219_190104



Clusters
X profile

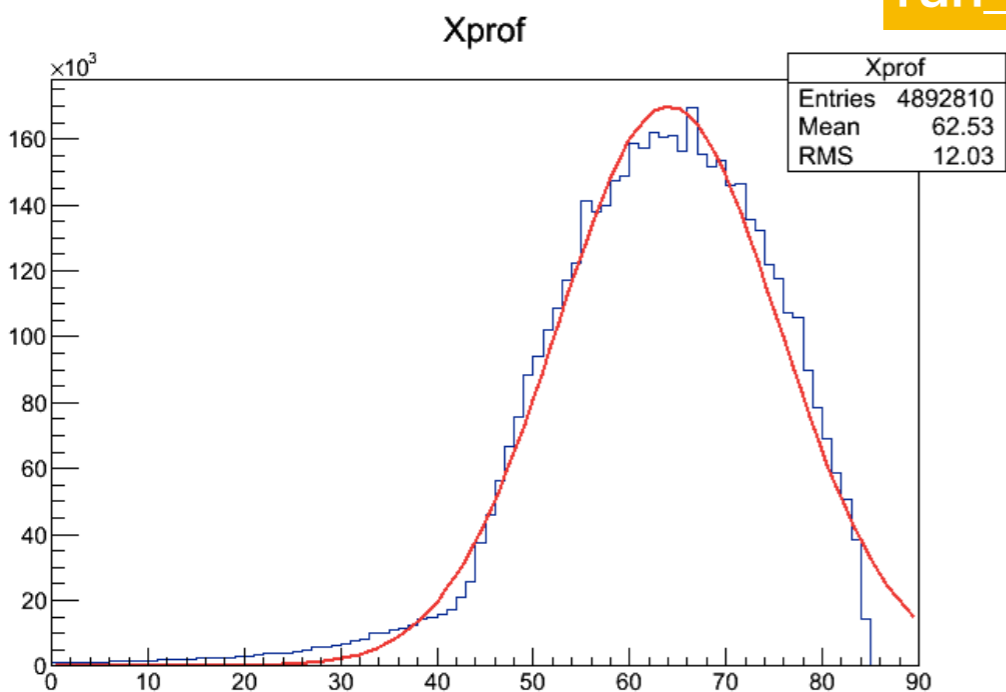
15k particles

Pixels 19400
Clusters 7760



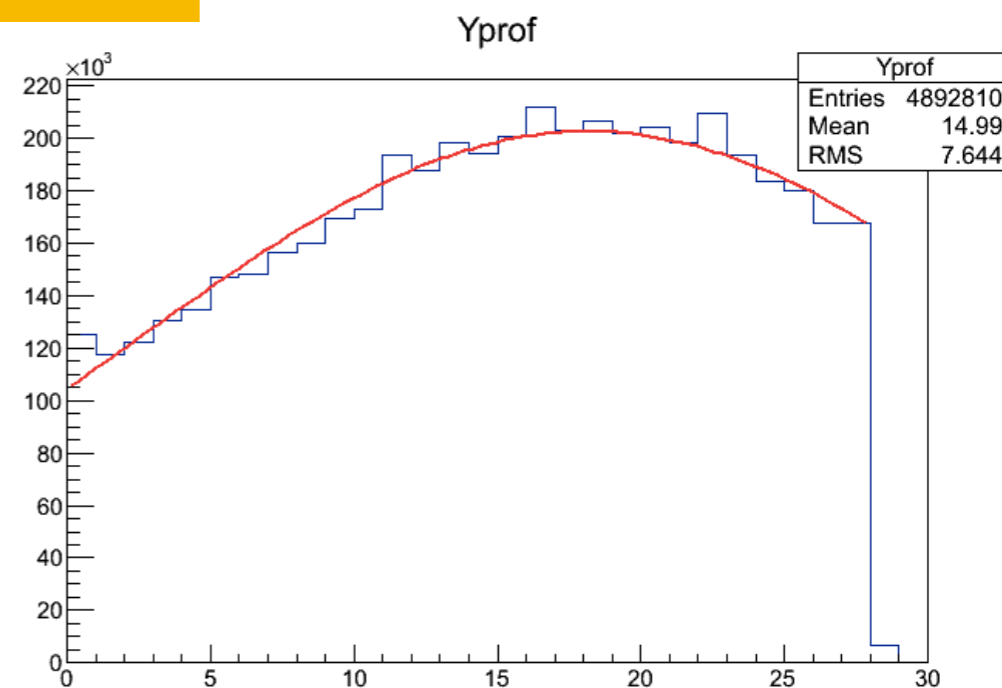
Clusters
Y profile

run_000000_20181219_191731



20k particles

Pixels 26498
Clusters 9920



$$\text{Multiplicity from pixels} = \frac{\text{Number of pixels}}{\text{Geometrical acceptance}}$$

$$\text{Multiplicity from clusters} = \frac{\text{Number of clusters}}{\text{Geometrical acceptance}}$$

For TPix and TimePix, to compare with target multiplicity

Bunch multiplicity

Nominal	Target from reco	TimePix3					FitPix			
		From pixel counting	From cluster counting	Mean CS	Acc	Time Pix3/Target	From pixel counting	From cluster counting	* Mean CS	Acc
5000	5000	7015	3160	2.22	0.82	0.63	5540	3638	1.5	0.9
10000	11570	16200	6890	2.35	0.77	0.59	11290	5870	1.5	0.9
15000	19000	28125	11250	2.50	0.69	0.59	17000	11200	1.5	0.9
20000	28000	43440	16270	2.67	0.61	0.58	22280	15160	1.5	0.9

cluster counting/POT on target

CCD=16.9 μm

* supposing same value of 5k for 10k, 15k and 20k

First

CONCLUSIONS

- The calibration with TPix and FitPix is very preliminary;
- the beam shape could be strong source of systematic errors and could be reduced with dedicated run.



BACKUP SLIDES

FitPix 450 particles

