Pre-shower
and
muon system

Update

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Outline and Introduction

- Cluster analysis performed on merged ntuples (CALO + GEM)
  - Mu/Ele selection with local vs ancillaries criteria
- Simulation of electrons in different lead thicknesses (Geant)
- Plans

- No alignment with ancillaries yet
- No matching of GEM clusters with particle info provided by the ancillary
  - Not feasible with electrons in any case but we will do it for muons

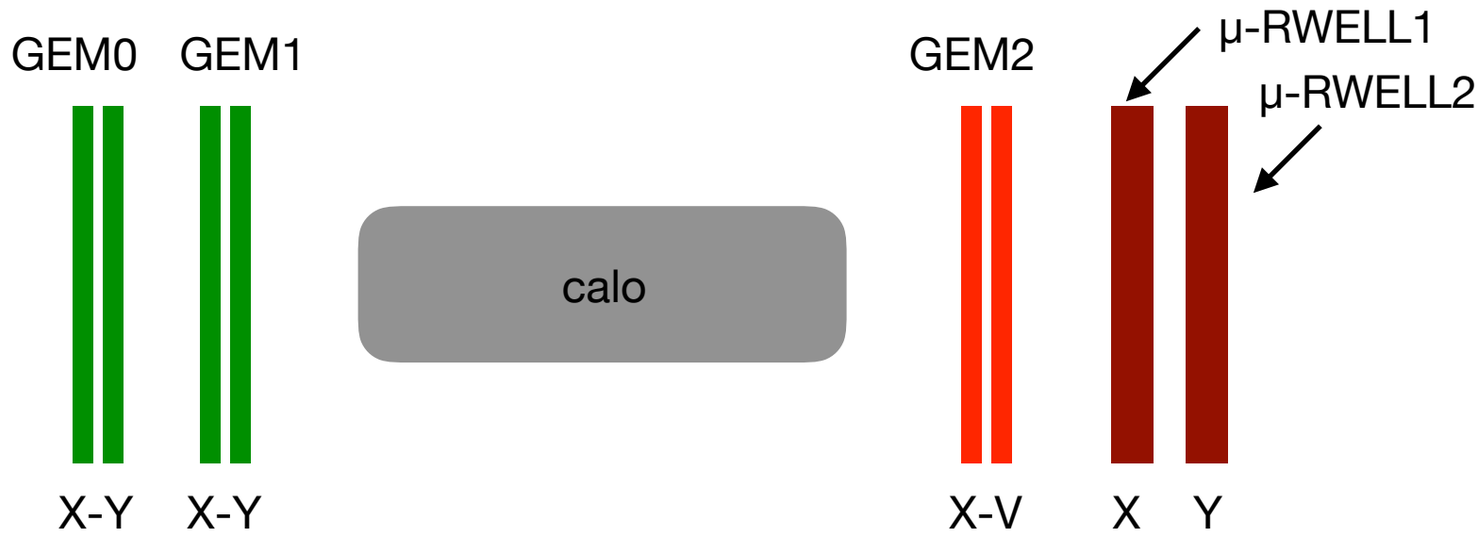
Clusters analysis

- Lead thickness scan with electron beam
- Muon / Electron beam with no additional lead
  - 5 mm lead always in front of all pre-shower and muon system detectors
- Runs used:
  - 51 (calo #12688): MUON 40 GeV - Pb: 0 mm (+ 5 mm) = ~ 1.0 X_0
  - 71 (calo #12709): ELECTRON 20 GeV - Pb: 0 mm (+ 5 mm) = ~ 1.0 X_0
  - 66 (calo #12705): ELECTRON 20 GeV - Pb: 3 mm (+ 5 mm) = ~ 1.5 X_0
  - 65 (calo #12704): ELECTRON 20 GeV - Pb: 6 mm (+ 5 mm) = ~ 2.0 X_0
  - 64 (calo #12703): ELECTRON 20 GeV - Pb: 10 mm (+ 5 mm) = ~ 2.5 X_0

Muon / Electron selection

Local muon/electron selection

- Muon selection:
  - pre-shower: ≥ 2 layers
  - muon-system: ≥ 3 layers
- Electron selection:
  - pre-shower: ≥ 2 layers
  - muon-system: NO layers



Ancillaries muon/electron selection

- Muon selection:

(adc_preshower - adc_ped_mean_preshower) < 20 &&
(adc_muon - adc_ped_mean_muon) > 10

- Electron selection:

(adc_preshower - adc_ped_mean_preshower) > 30 &&
(adc_muon - adc_ped_mean_muon) < 8

From Samuel

Ancillary Selection:

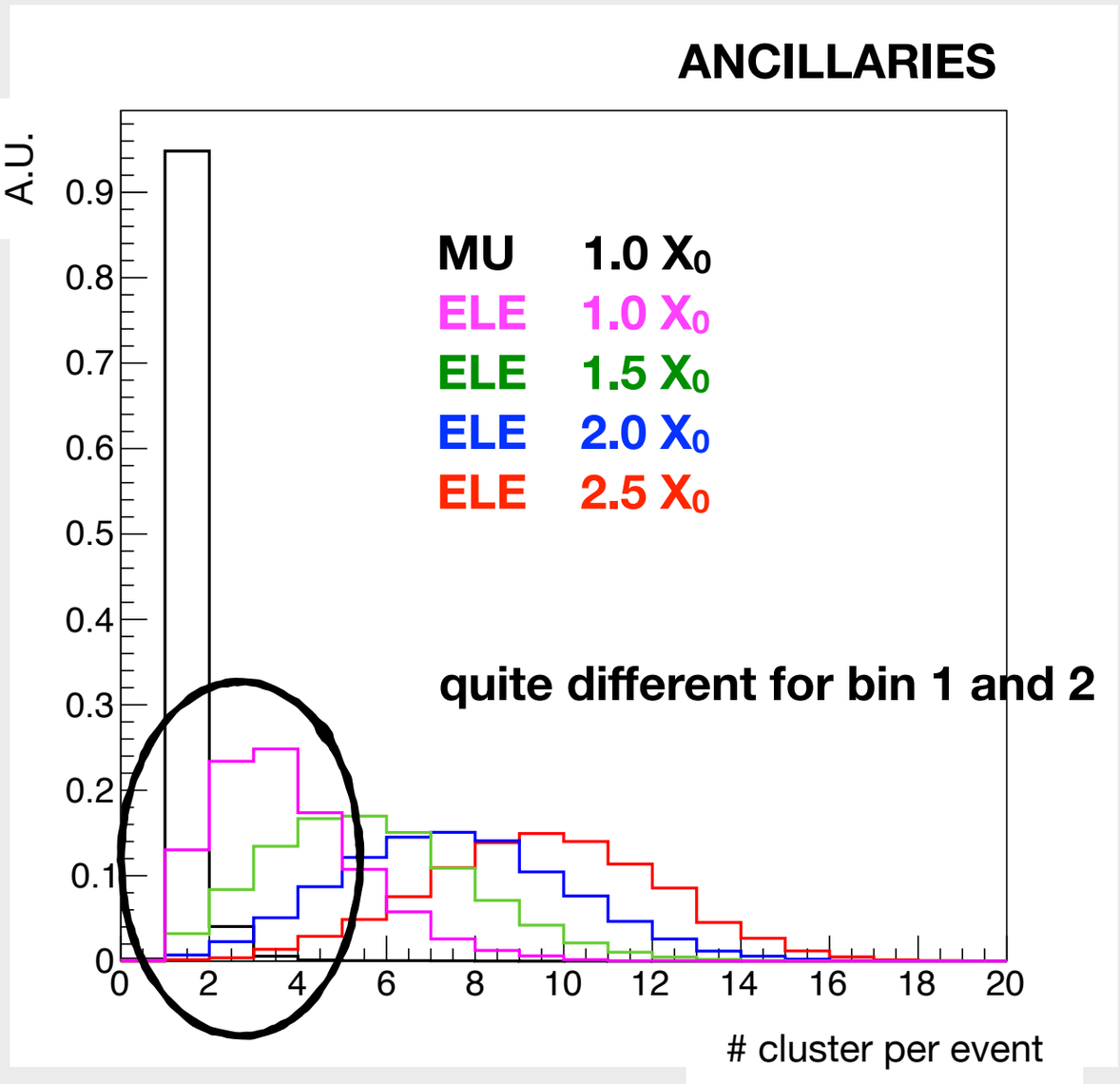
	preshower	muon ADC
electron	> 30	< 8
muon	< 20	> 10
hadron	< 20	< 5

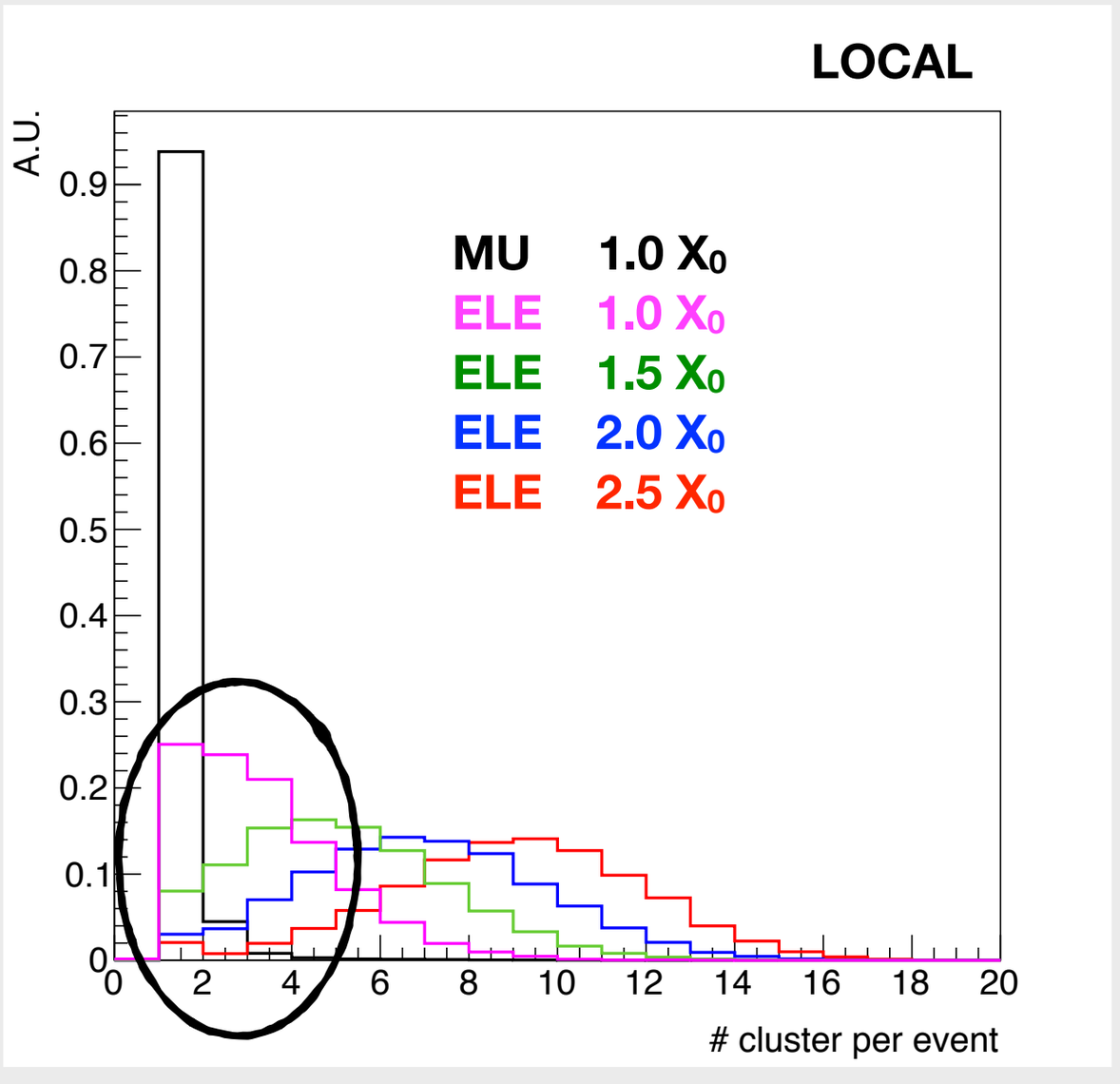
Table of events

	Ancillaries selection			Local selection		
	# events	**# mu**	**# ele**	**# events**	**# mu**	**# ele**
Run 51 MU 0 Pb	43213	27398	3163	43094	35480	6398
Run 64 ELE 10 mm Pb	15031	40	11082	14861	90	14655
Run 65 ELE 6 mm Pb	15103	38	11195	14919	94	14729
Run 66 ELE 3 mm Pb	14995	30	10958	14783	75	14605
Run 71 ELE 0 mm Pb	14995	41	10973	14810	83	14544

Number of clusters

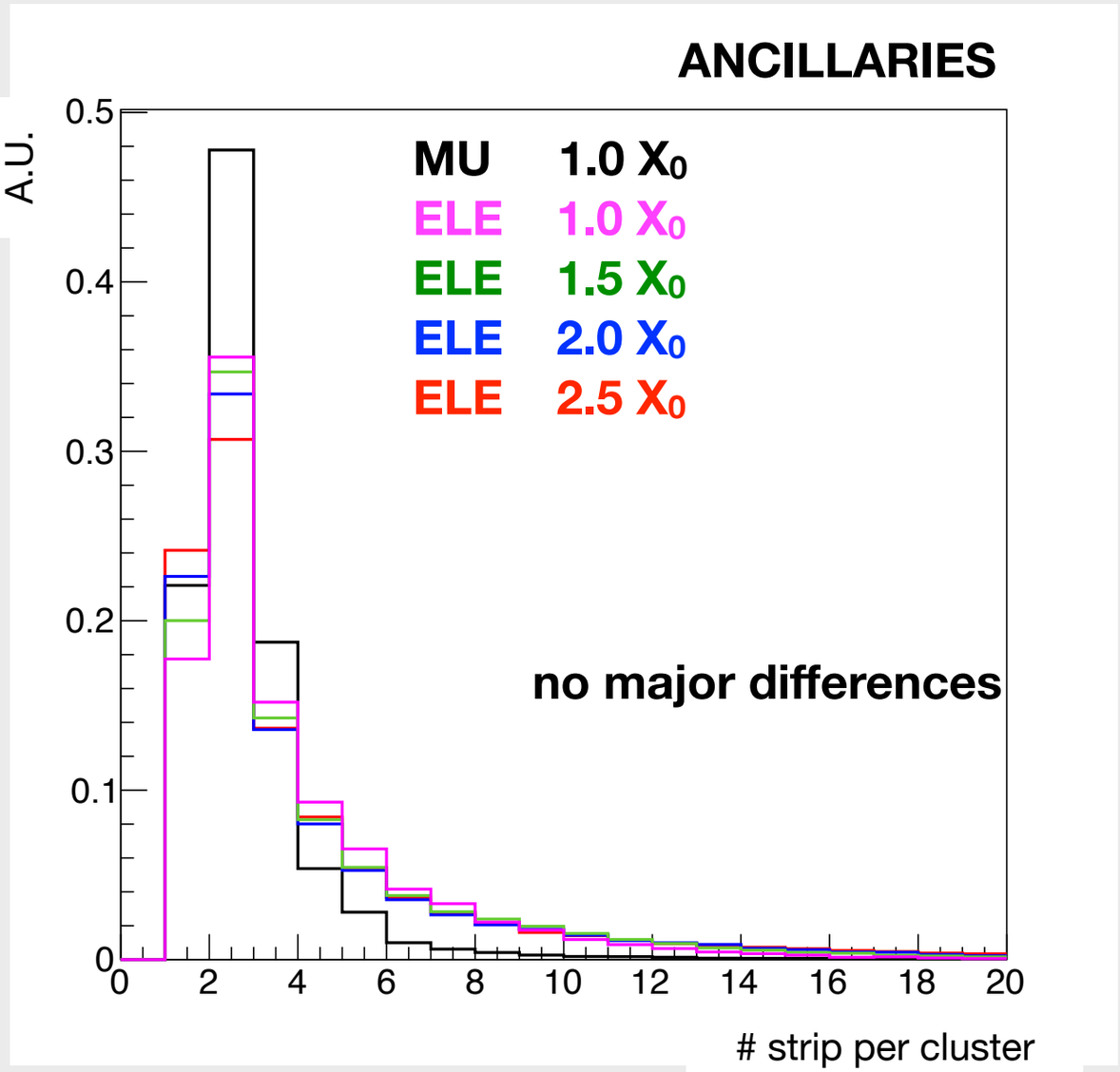
- Comparison between ANCILLARIES and LOCAL selection
- GEM 1 x (pre-shower)

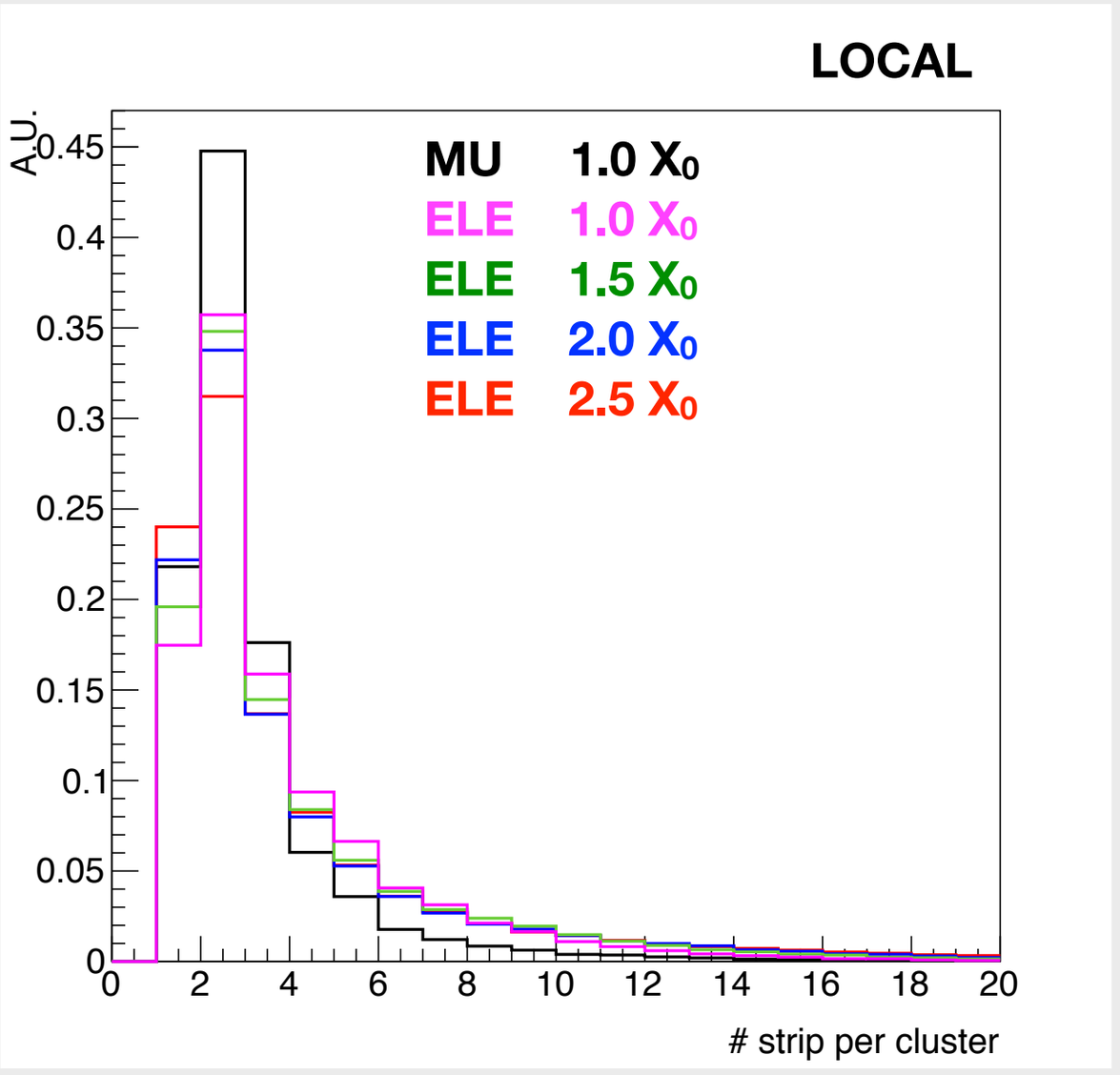




Cluster-size

- Comparison between ANCILLARIES and LOCAL selection
- GEM 1 x (pre-shower)





Plans (1)

- Alignment of pre-shower and muon system wrt ancillaries
- Tracking of muons → efficiency measurement
- Repeat the study on the cluster/strip charge on MERGED ntuples
- Implement new checks on saturated strips

- **NEED:**

GemHit_q in MERGED ntuples (+ info to use ancillaries selection)

if code on the DREAM PC is updated with those 2 info, we can produce ntuples by ourselves

Comparison 1 - 0 dead strip

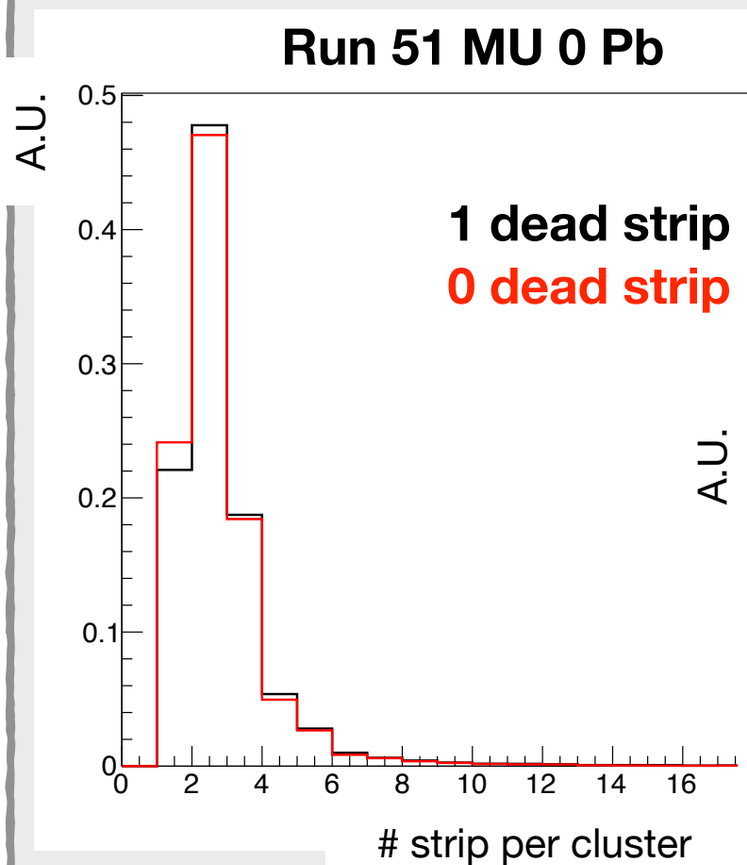
FROM SLIDES PRESENTED IN COMO

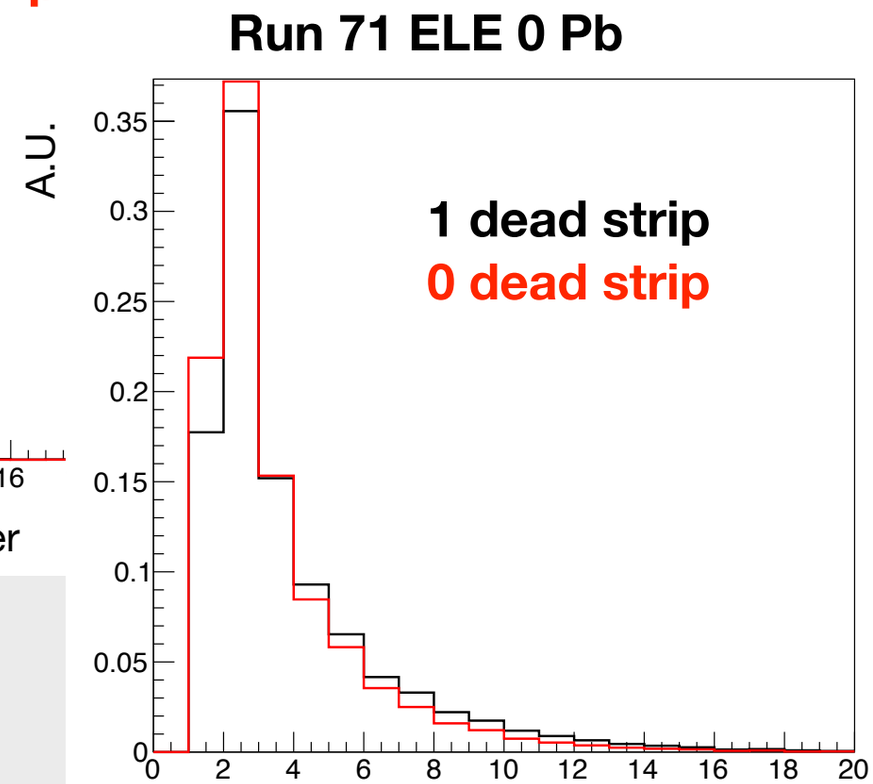
- In the clustering algorithm, default is **A**
  - one dead strip allowed inside a cluster
- Tested option with no dead strips (**B**)
- No major differences seen

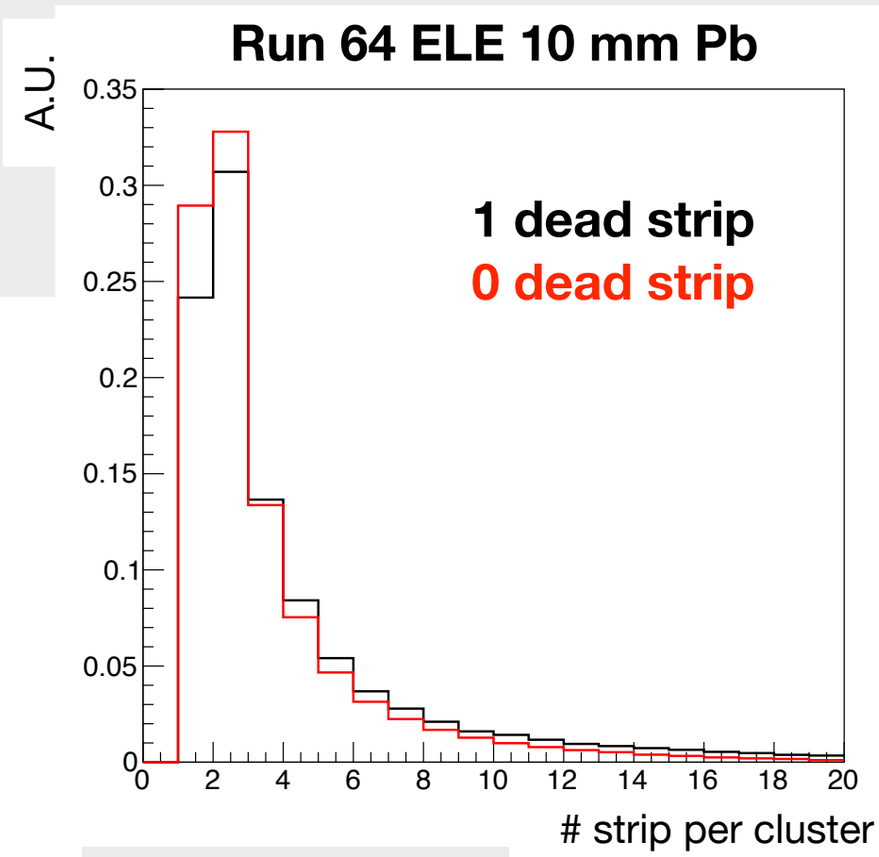
- **We tested again the 0 dead strip option with the new mu/ele selection**

Cluster-size

- Comparison between 1 and 0 dead strip clustering algo
- GEM 1 x (pre-shower)



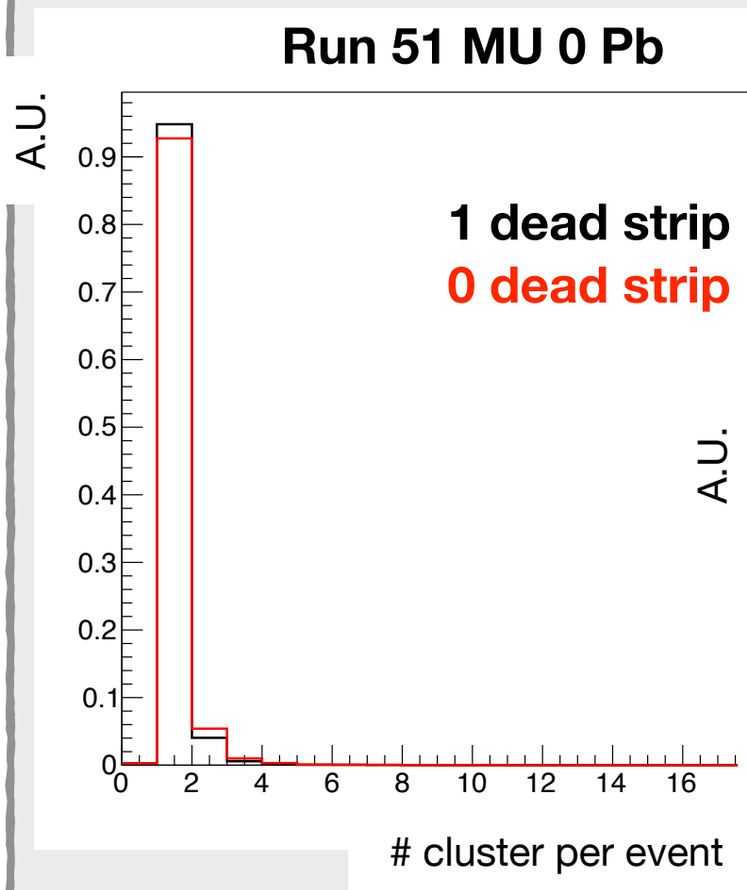


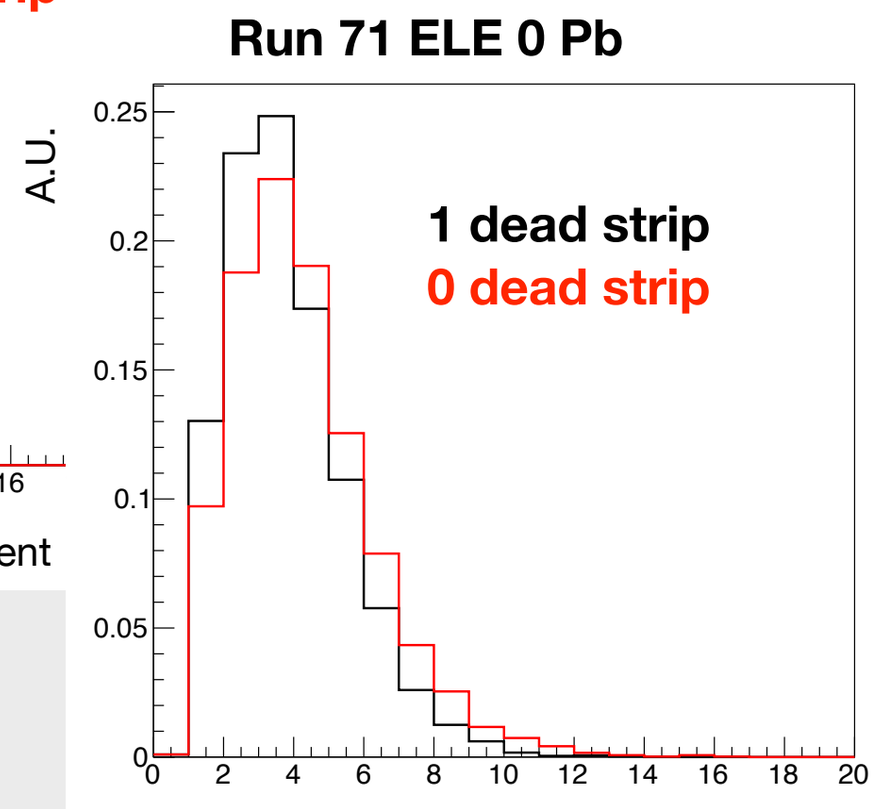


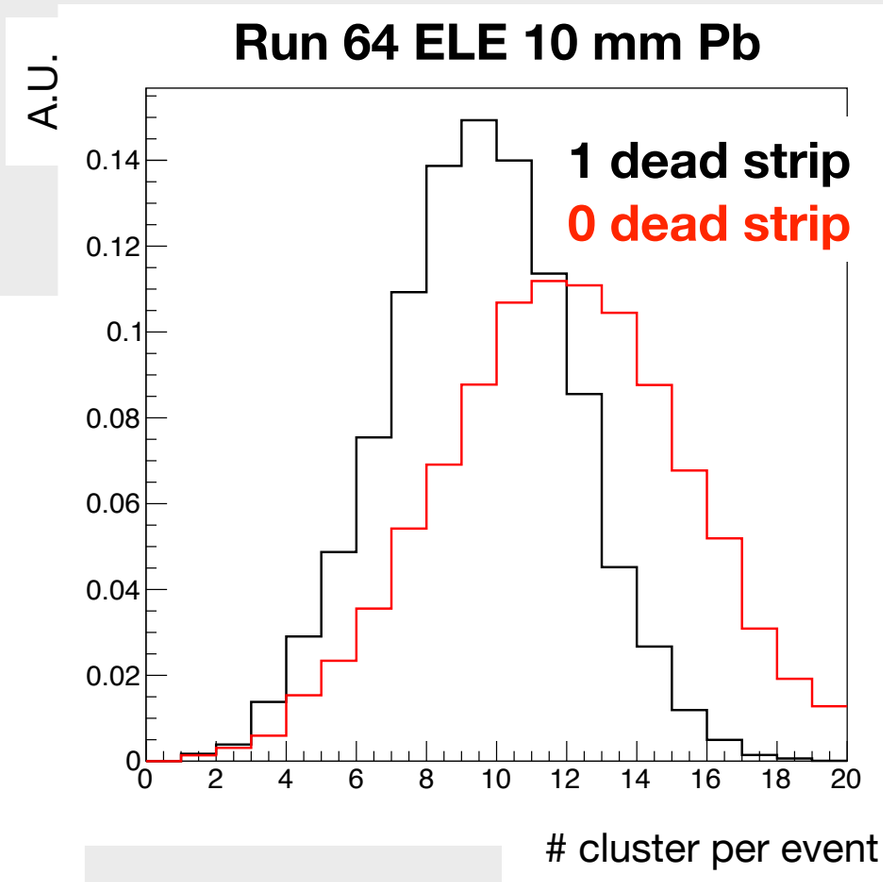
no major differences

Number of clusters

- Comparison between 1 and 0 dead strip clustering algo
- GEM 1 x (pre-shower)







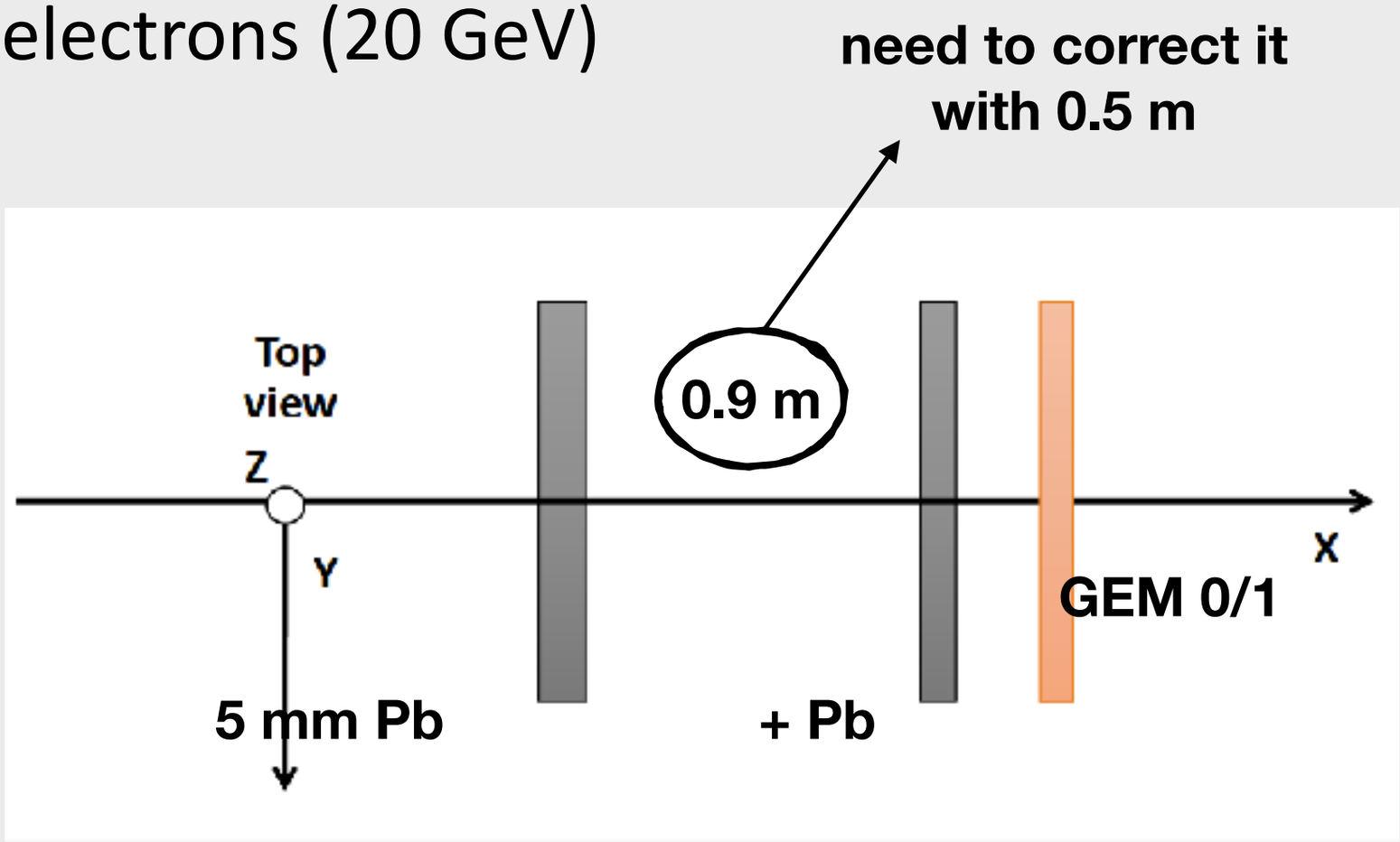
BIG difference between the two algorithms

Plans (2)

- From now on we will perform all studies using both algorithms
- Aim is to count how many particles we detect using combined information from number of clusters in the 0/1 dead strip scenarios and the cluster charge

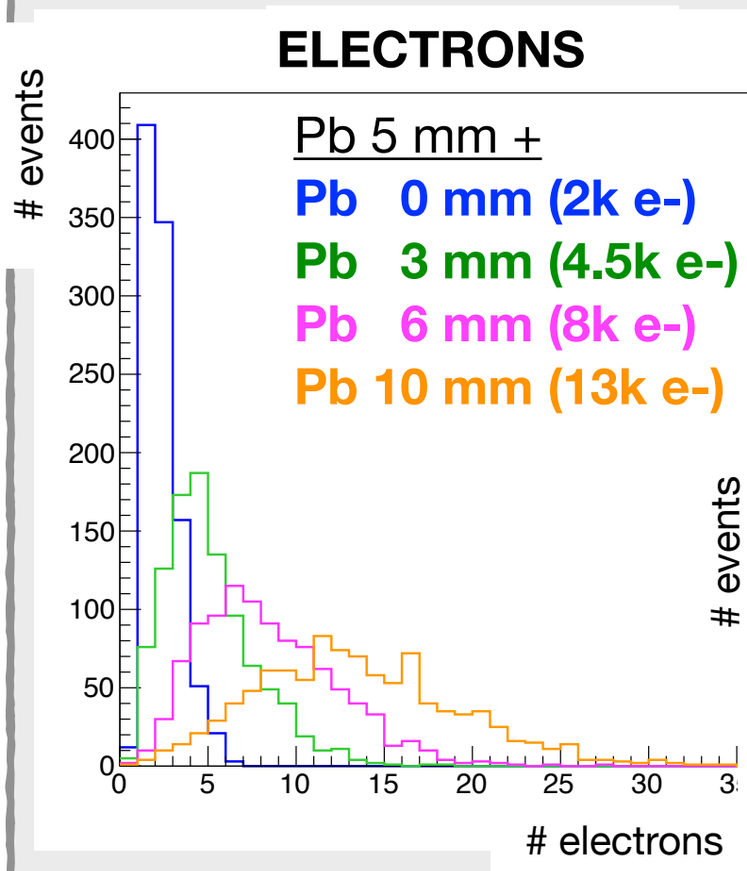
First attempt with simulation

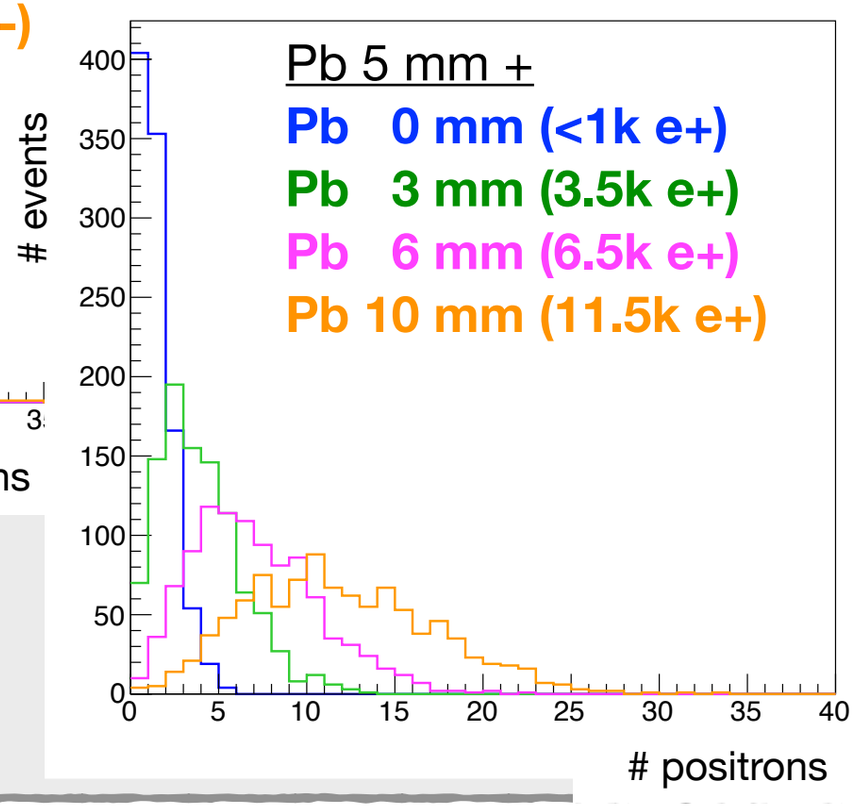
- Want to see the effect of different lead thicknesses on electron beam
- Asked some help from colleague in Bologna, need to learn how to use GEANT
- Simulated 1000 electrons (20 GeV)

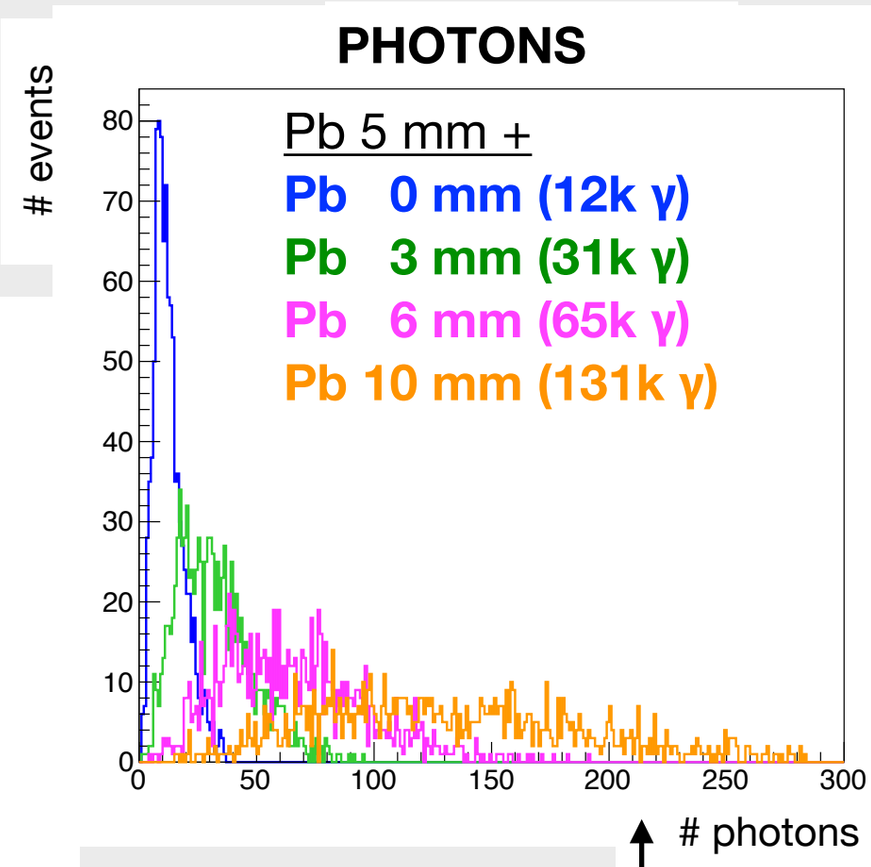


First attempt with simulation

- Number of ele +/- and photons per event
- After second lead thickness







different scale!

Plans (3)

- Repeat the simulation using the proper distance between the 2 lead thicknesses
- Propagate particles to the surface of the pre-shower
- Try to use this information to check what we detect/see with pre-shower

Plans - summary

- Alignment of pre-shower and muon system wrt ancillaries
- Tracking of muons → proper efficiency measurement
- Study cluster/strip charge on MERGED ntuples
- **NEED: GemHit_q in MERGED ntuples (+ info to use ancillaries selection)**

if code on the DREAM PC is updated with those 2 info, we can produce ntuples by ourselves

- Use both 1 and 0 dead strip scenarios to study cluster properties
- Repeat Geant simulation using the proper distance between the 2 lead thicknesses
- Propagate particles to the surface of the pre-shower to use this information to check what we detect/see with pre-shower