

# Simulation status

Edgar Sánchez García (CIEMAT)

[edgar.sanchez@ciemat.es](mailto:edgar.sanchez@ciemat.es)

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# Solder paste Cu pipe

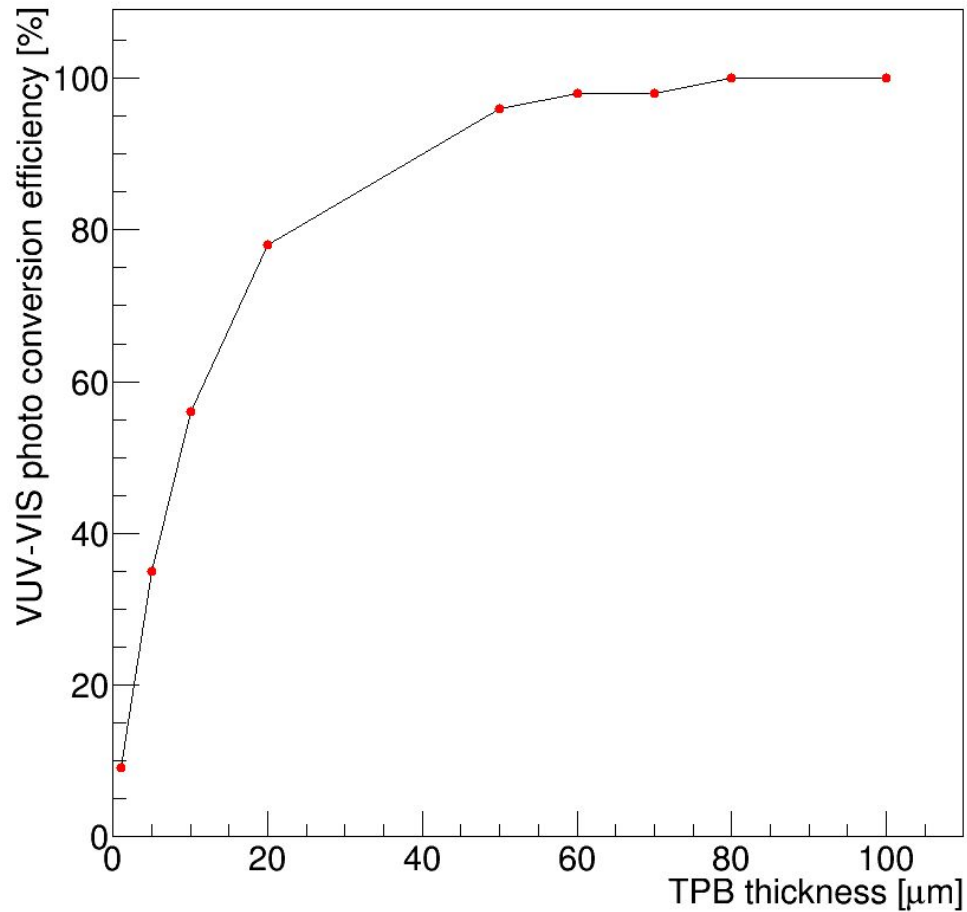
- 1 g of solder paste assumed. Placed at 20 cm from top cap.

Isotope	Radioimpurity [mBq/kg]	Events ROI [evt/week]	Events ROI && untagged [evt/week]
$^{238}\text{U}$	12	32	2
$^{232}\text{Th}$	4	7	0
$^{40}\text{K}$	1236	150	24
<b>Total</b>	---	182	26

- The contamination levels are rough estimations (based in DS-20K database).
- The amount of solder paste necessary is estimated too.
- Large contribution comes from the  $^{40}\text{K}$  (40 ppb).

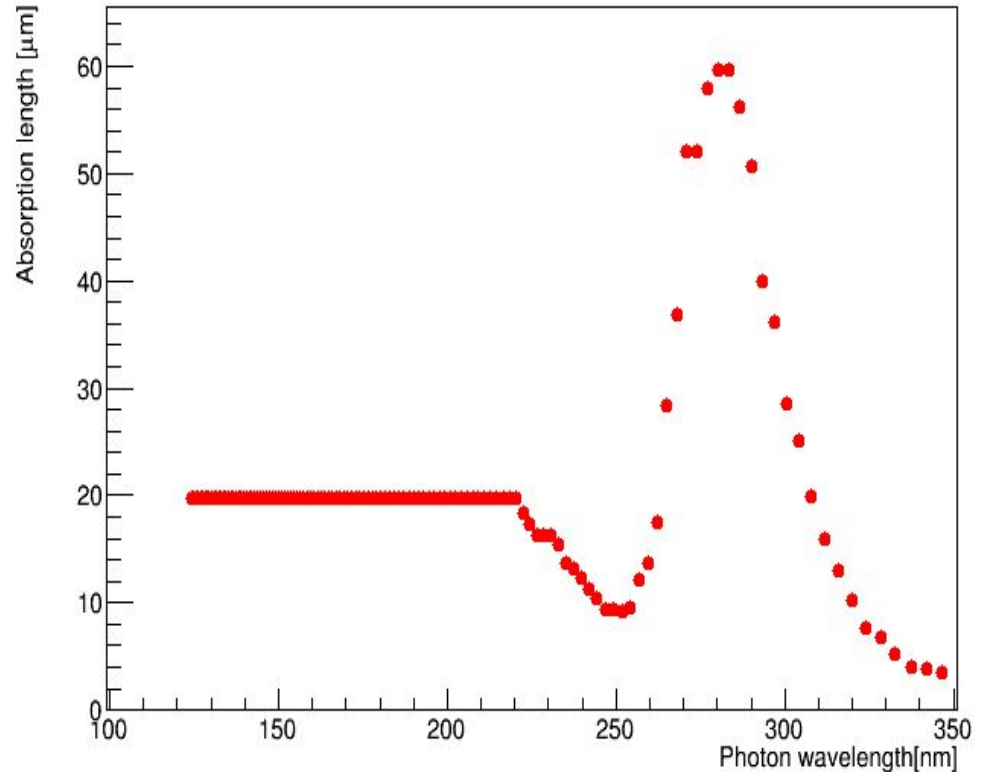
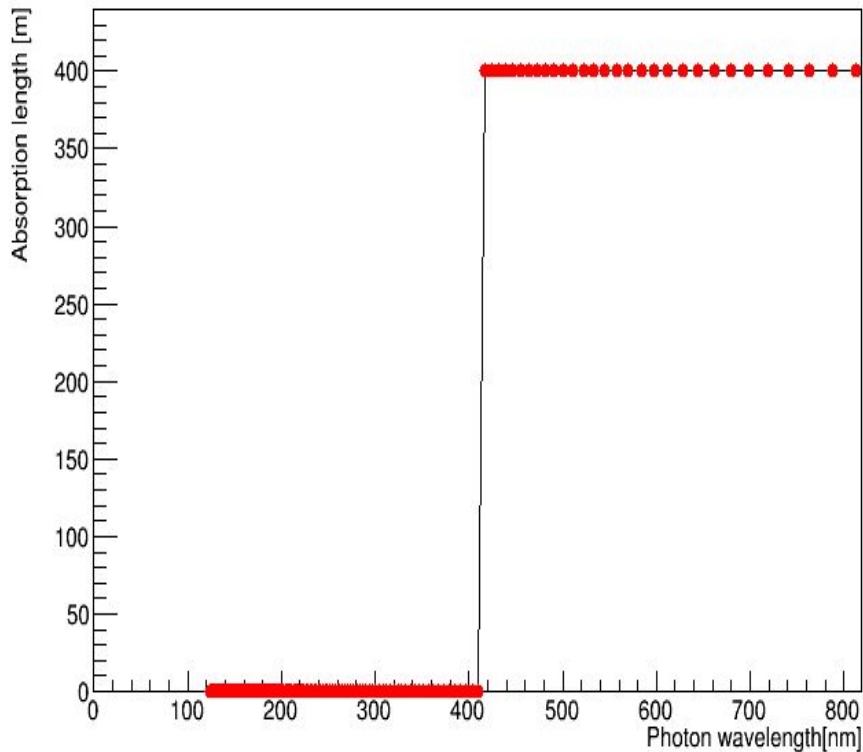
# TPB thickness

- $^{39}\text{Ar}$  simulation with different TPB thickness from 100  $\mu\text{m}$  to 1  $\mu\text{m}$ .
- The conversion efficiency from VUV to VIS decreases under 60  $\mu\text{m}$ .



# TPB thickness

- G4DS TPB absorption length for photons.
- 20  $\mu\text{m}$  for VUV-photons.
- Efficiency of emission  $\rightarrow 1$       Number of photons produced  $\rightarrow 1$
- Time  $\rightarrow 1.5$  ns



# External background production

- Massive production of  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$   $\gamma$ -events without lead belt using cluster. Single phase ArDM geometry implemented.
- 
- Generator: cylinder 7 m total height and 1.5 m radius.

## Monitoring of the simulation jobs in EULER

Last update: Wed Feb 13 10:32:58 CET 2019

user	jobs		files	
	running	queued	fil	root
Pablo	0	0	0	0
Vicente	0	0	8	2741
Edgar	31	30	496	712
Roberto	0	0	8	2797
Total	31	30	512	6250

RN	events ×		× 1e6	%	jobs					files	
	requested	done	ArDM	fraction	requested	queued	running	done	%	fil	root
K	30000000600.0	6309220160.0	1276226409.0	21.03	600	440	40	120	20.00	80	80
U	432000008640.0	28767920608.0	5960304766.0	6.66	8640	8032	120	488	5.65	256	5906
Th	79200001584.0	18870790440.0	3877728959.0	23.83	1584	1144	88	352	22.22	176	264
Total	541200010824	53947931208	11114260134	9.97	10824	9616	248	960	8.87	512	6250

[Full list of jobs](#)

# Modification to internal design

		Old design	Design proposed by Marcin
Inner cylinder→	Internal diameter	71 mm	76.2 mm
	External diameter	84.2 mm	93.3 mm
	Thickness	6.6 mm	8.5 mm
	Collection efficiency	2.7 %	2.4 %

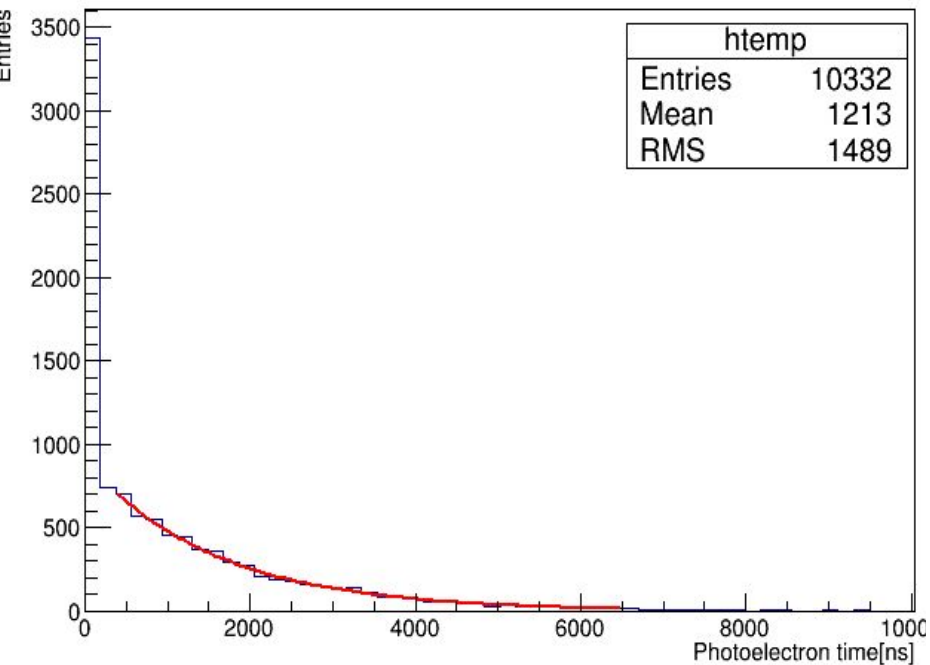
- Good collection uniformity with Z and R in both designs.
- With the new design the volume is a 6 % larger.
- From the point of view of simulation it is a reasonable design.

# Electronic simulation

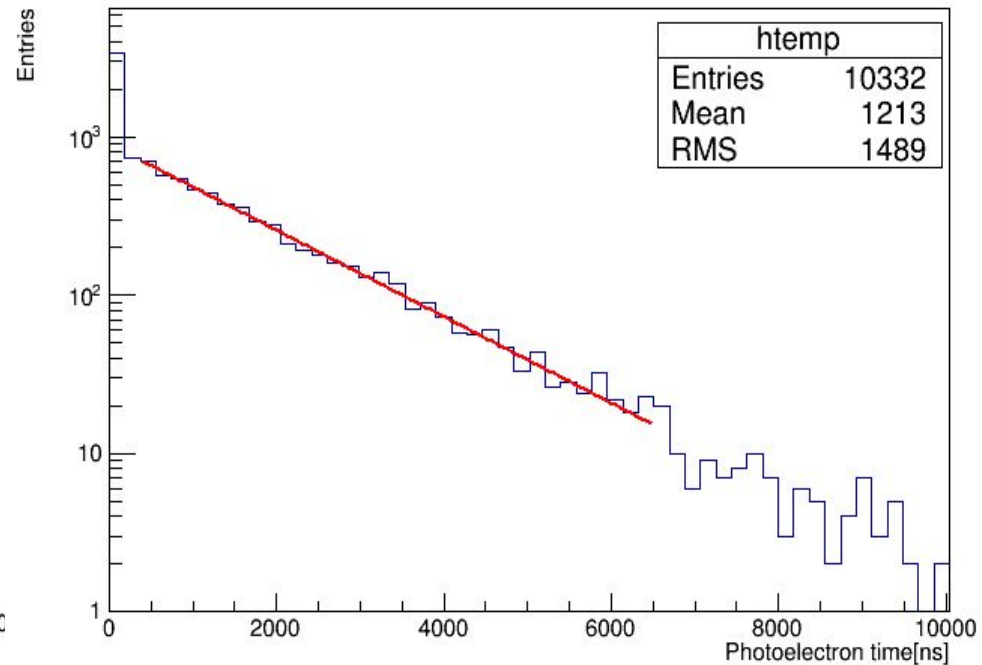
- $\beta$  events with different energy generated.
- From the light simulation:

$$T_{\text{slow}} \sim 1559 \text{ ns} \quad F_{90} \sim 0.29$$

pe\_time {Entry\$<10 && ph\_time>0}

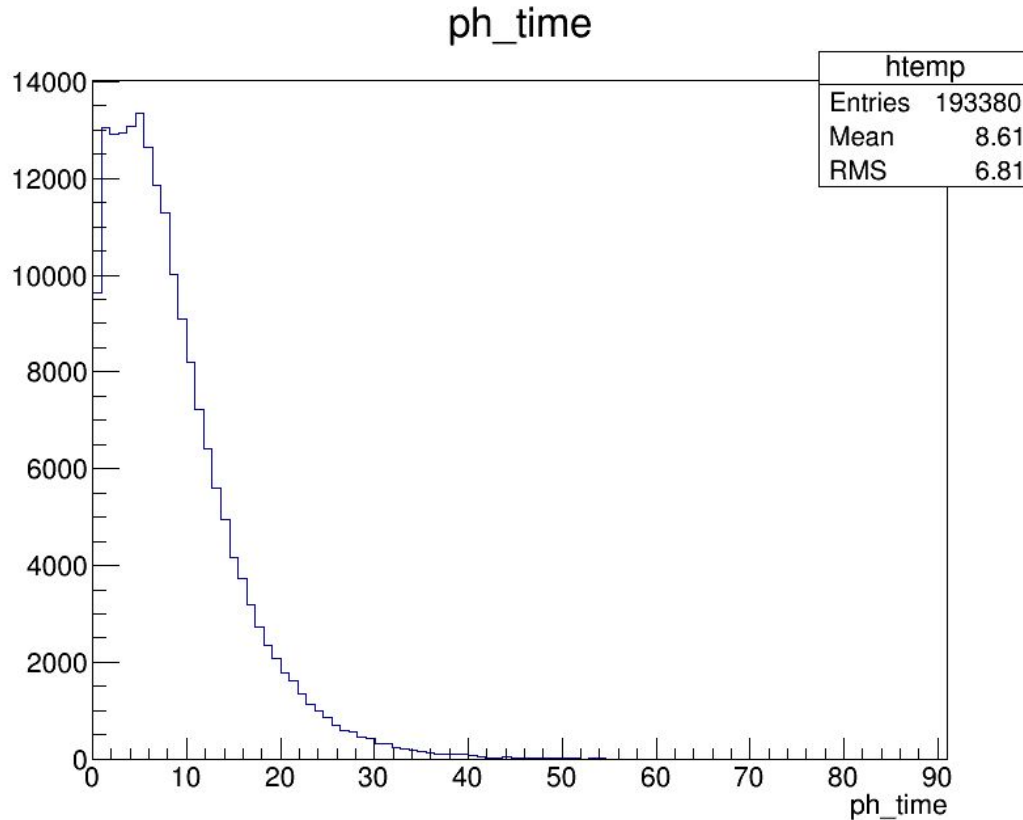


pe\_time {Entry\$<10 && ph\_time>0}



# Electronic simulation

- 5 MeV  $\alpha$  events with different energy generated.



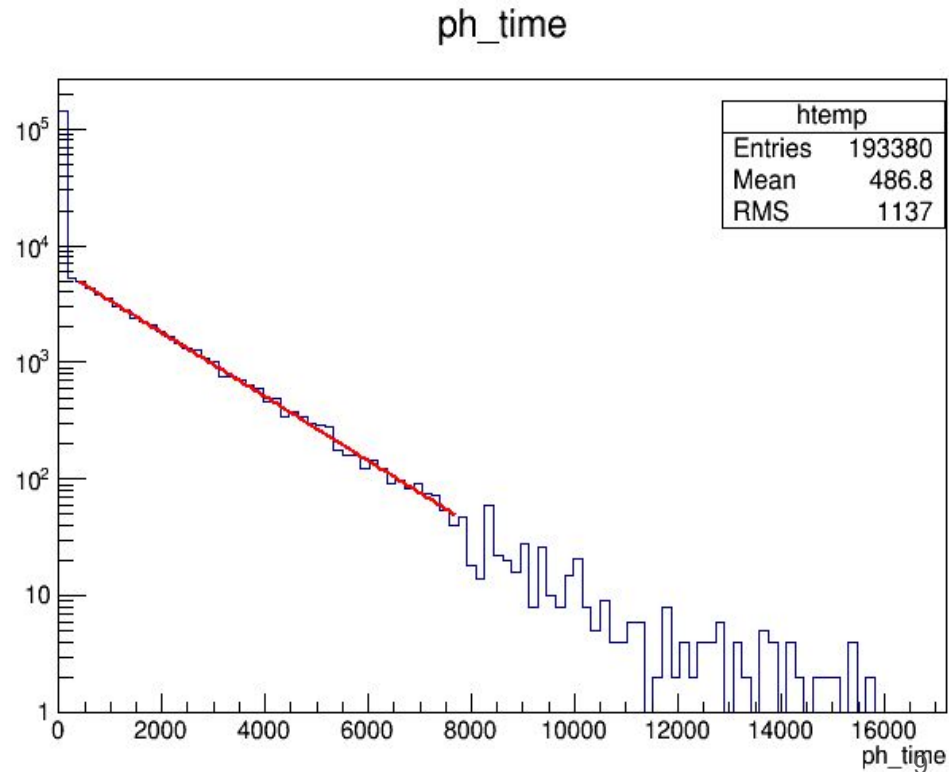
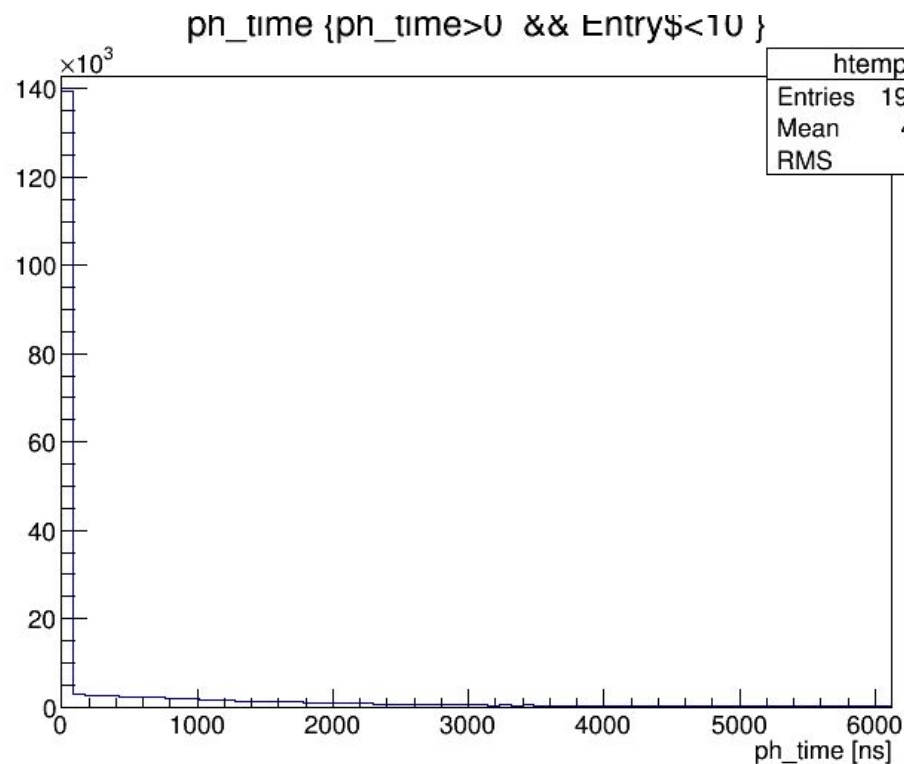
- Triplet to single ratio and quenching factor are not working well for  $\alpha$  events in G4DS.



# Electronic simulation

- For the moment triplet to single ratio changed to constant value 0.7
- We need to look in detail for a more realistic ratio and some quenching factor references.
- From the light simulation:

$$\tau_{\text{slow}} \sim 1587 \text{ ns} \quad F_{90} \sim 0.71$$



# Electronic simulation

- Channel identification included for DArT in order to have inputs compatibles with the electronic MC.
- PDE cut applied in simulation with a flat random distribution between 0 and 1 (PDE <0.4).
- Config file with default parameters (we need to change the DAQ).

```
[base]
#seed = 1234
ev_max = 200

[ds20k]
n_channels = 2

[daq]
eff = 0.9
jitter = 20e-9
gate = 5e-6
pre = 1e-6
sampling = 125e6
snr = 5
baseline = 80
bits = 12

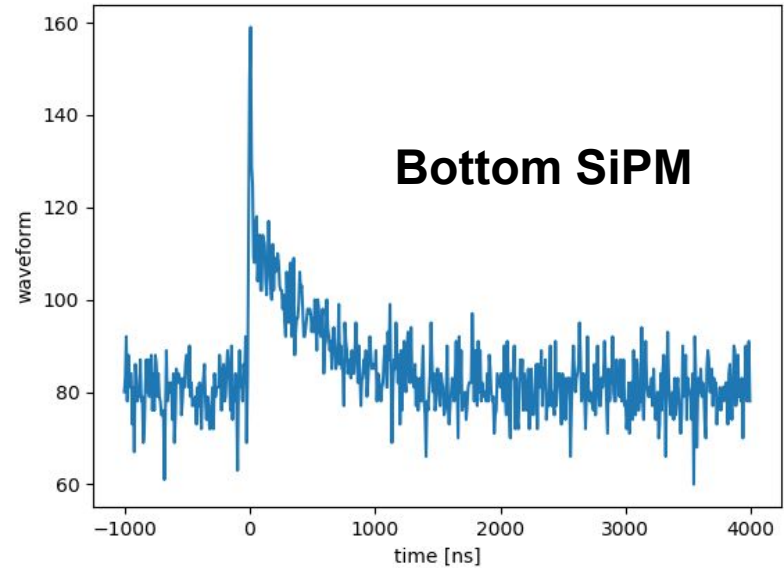
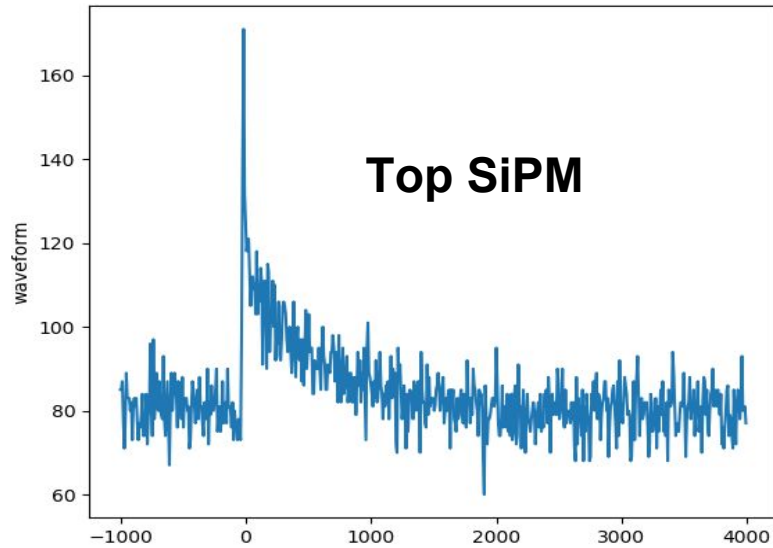
[sipm]
spread = 0.08
dcr = 200
ap-tau = 3e-6
# these are probabilities and not mean values
ap = 0.15
dict = 0.2
phct = 0

[arma]
# gain is the height of the single p.e. signal in ADC channels (amplitude, not charge)
gain = 80
tau = 540e-9
sigma = 8e-9
# scale is the probability of the SiPM slow component (charge ratio, not amplitude ratio)
scale = 0.94

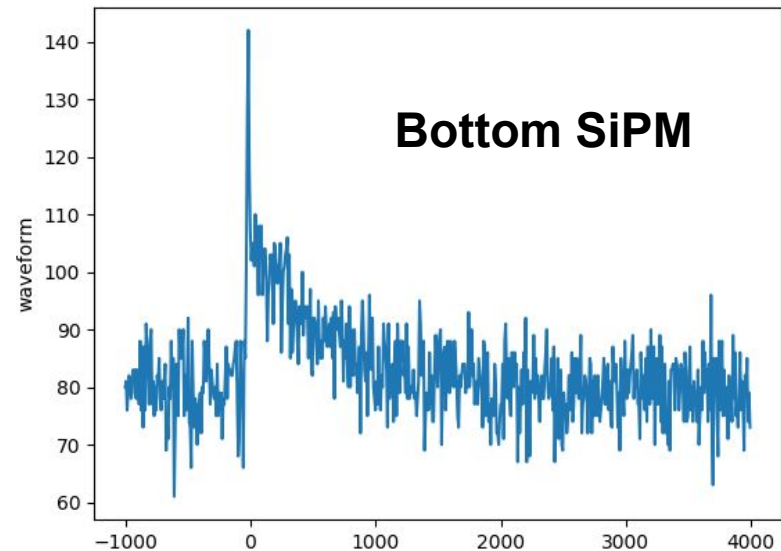
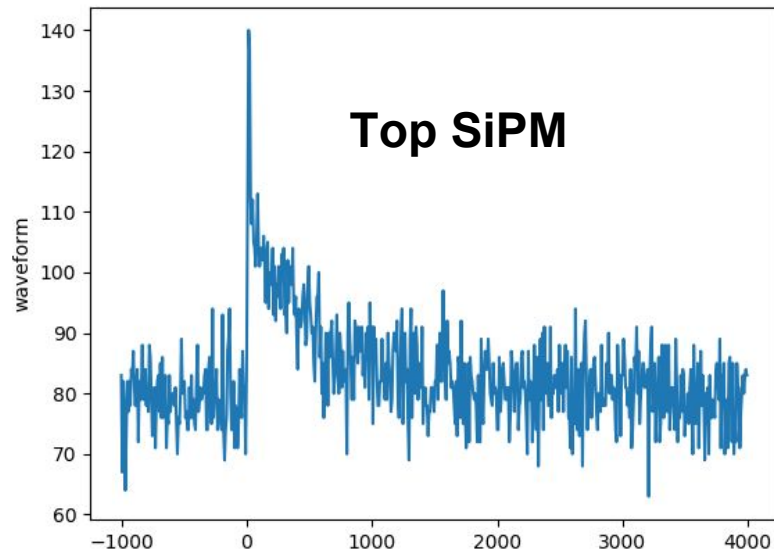
[reco]
baseline_from = -1e-6
baseline_to = -20e-9
t0_cumfrac = 0.20
fprompt_from = -1e-6
fprompt_to = 90e-9
# for the moment, integration is performed over the full gate
```

# Electronic simulation

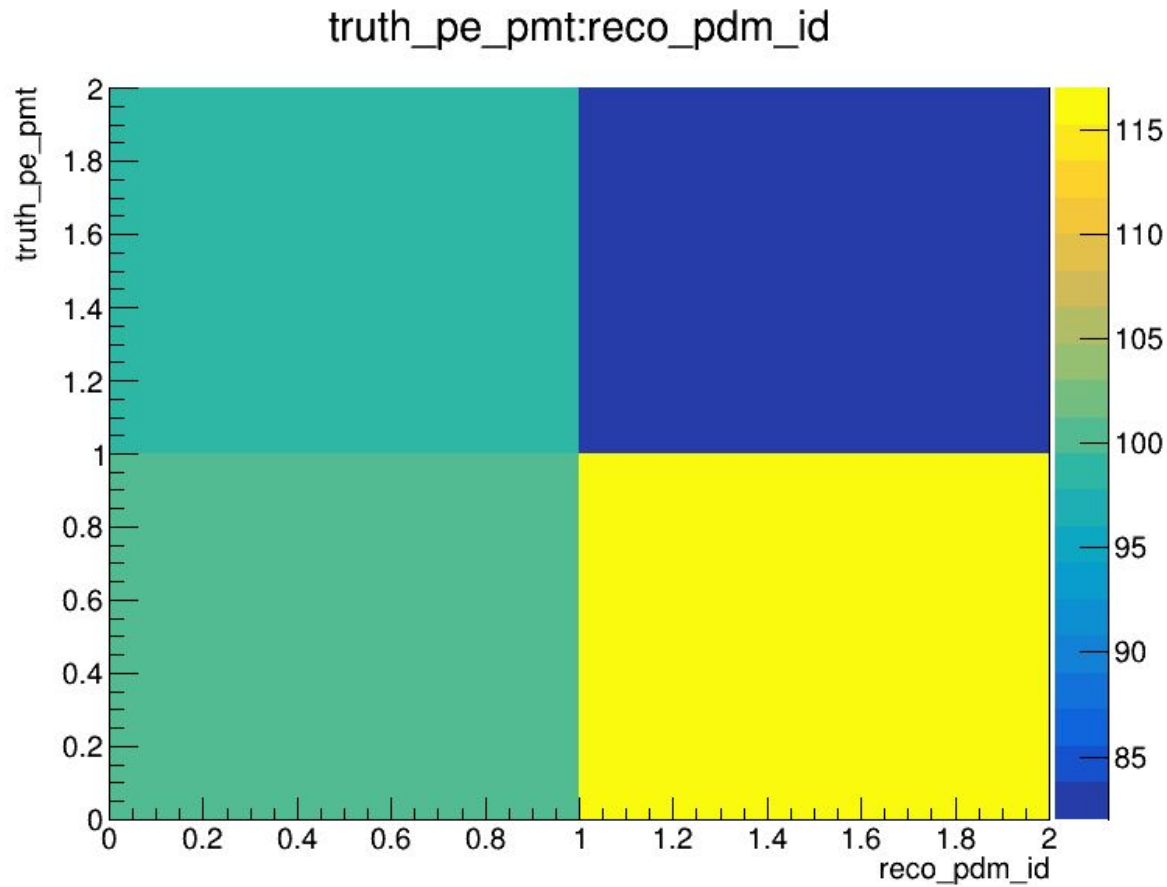
- 200 keV  $\alpha$  event with SNR 15 and baseline 80



- 2000 keV  $\beta$  event with SNR 15 and baseline 80

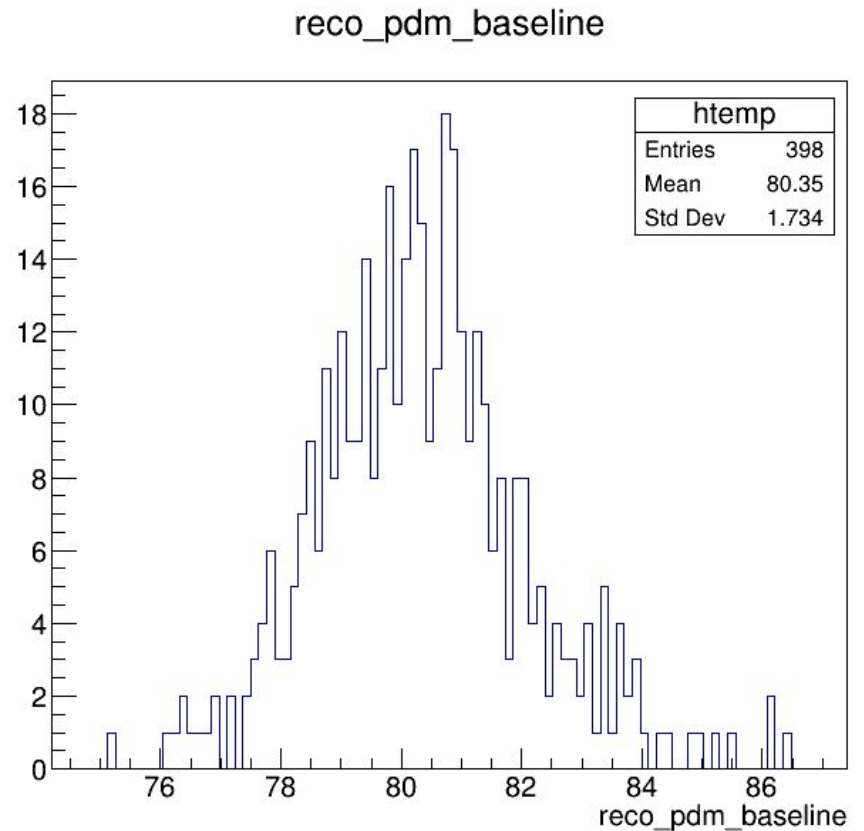
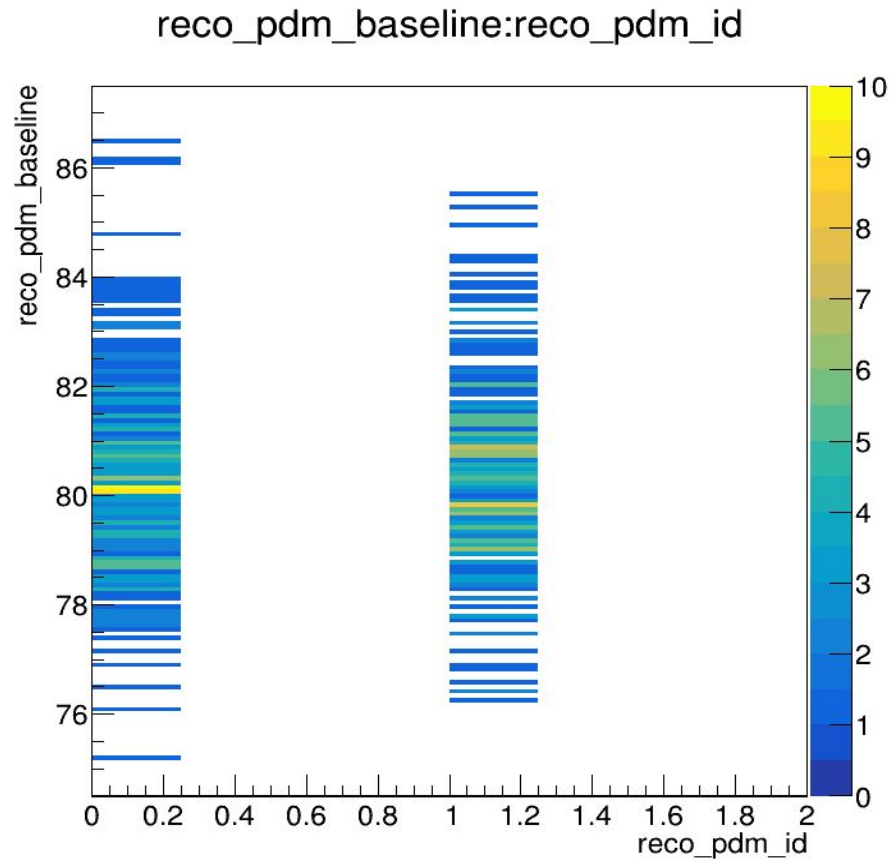


# Electronic simulation



- Truth channel ID vs Reconstructed ID. There are a lot of bad identified events.

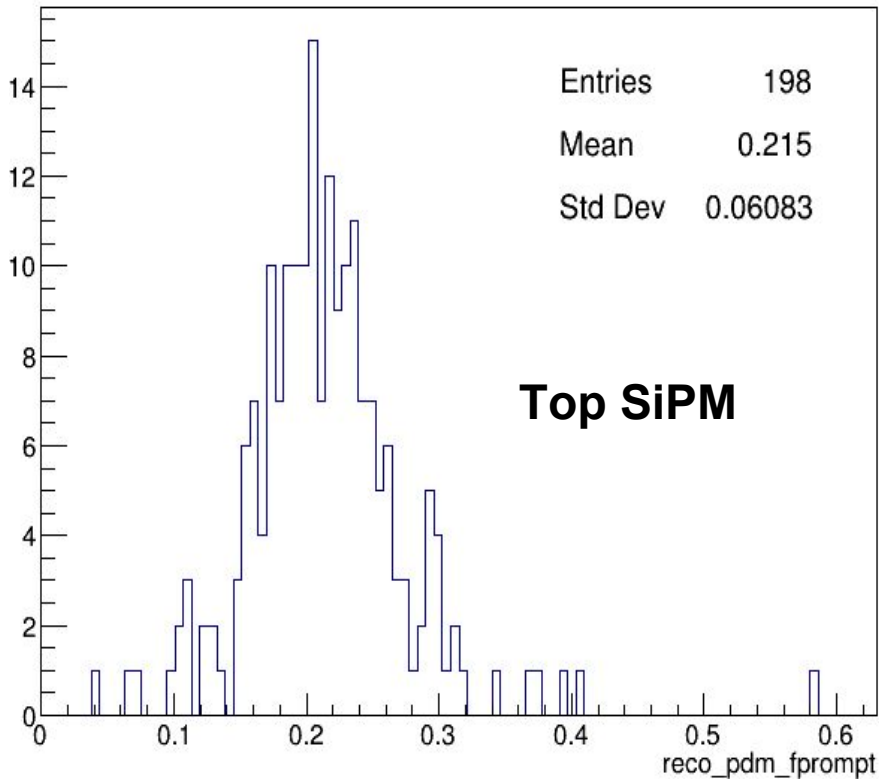
# Electronic simulation



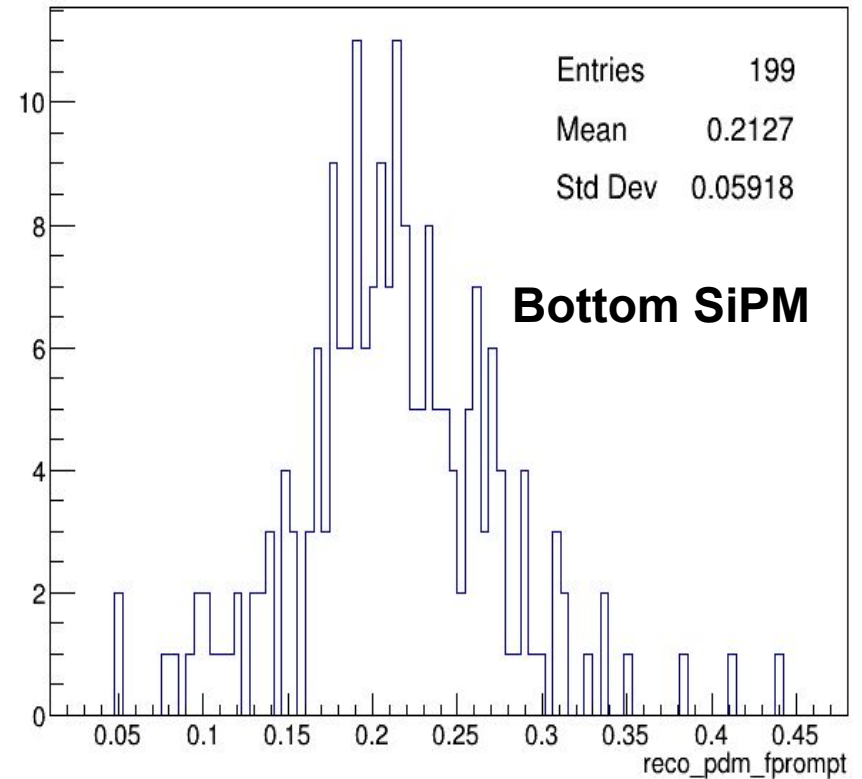
- Baseline around 80. It is consistent in both channels.

# Electronic simulation

reco\_pdm\_fprompt {reco\_pdm\_id == 0}



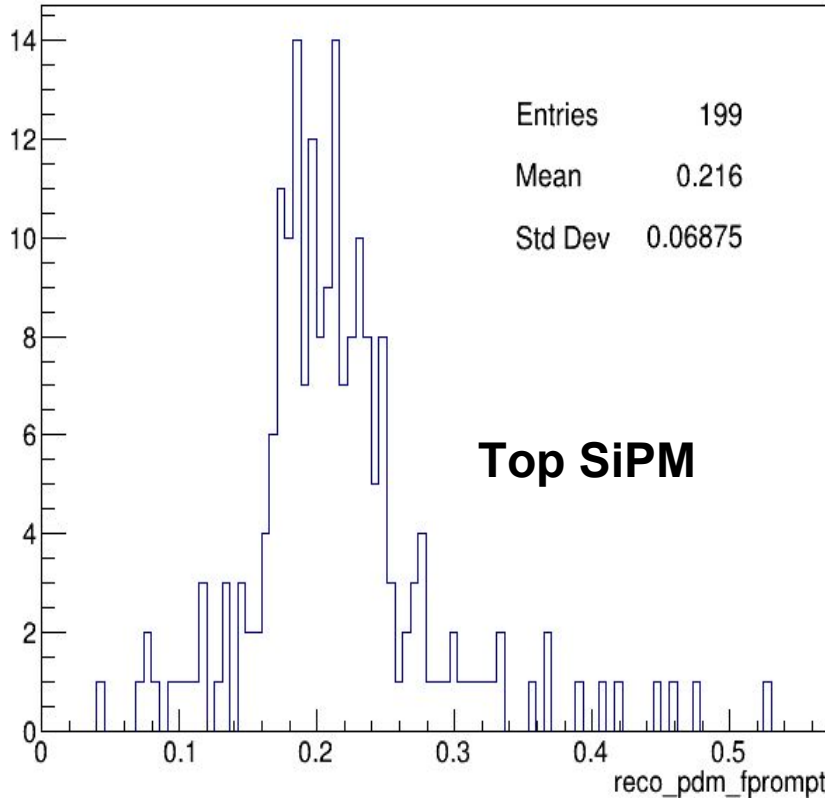
reco\_pdm\_fprompt {reco\_pdm\_id == 1}



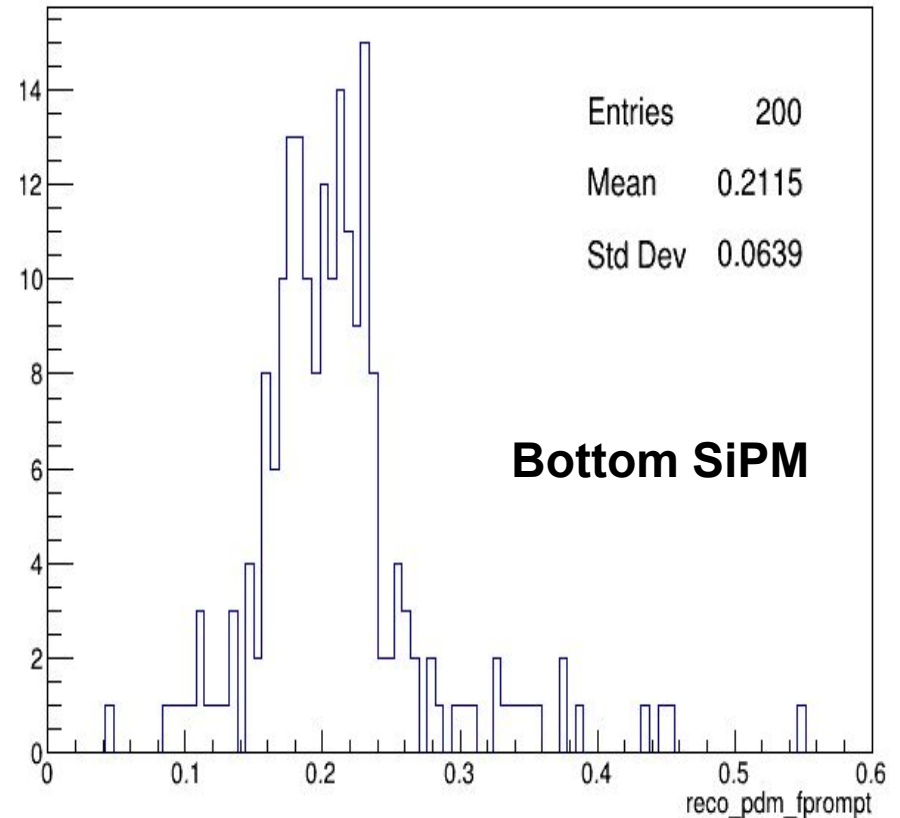
- 2000 keV  $\beta$  event with SNR 15 and baseline 80
- It can be consistent with the 0.29 of the light simulation.

# Electronic simulation

reco\_pdm\_fprompt {reco\_pdm\_id == 0}



reco\_pdm\_fprompt {reco\_pdm\_id == 1}



- 200 keV  $\alpha$  event with SNR 15 and baseline 80
- It is inconsistent with the 0.7 that we expect.
- I need to check if the code is working right or if we need to modify the input.