

Report on the LIME underground campaign

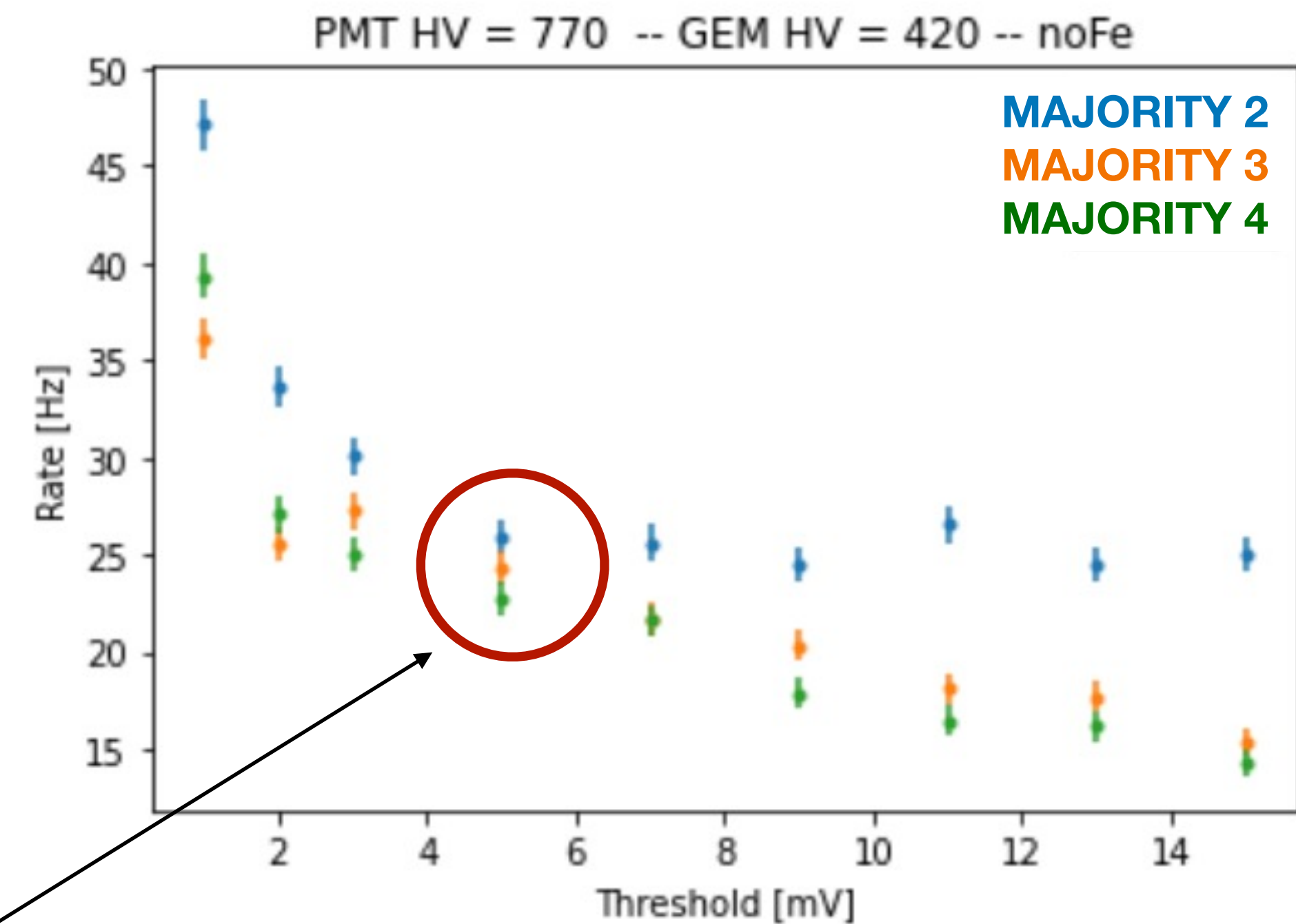
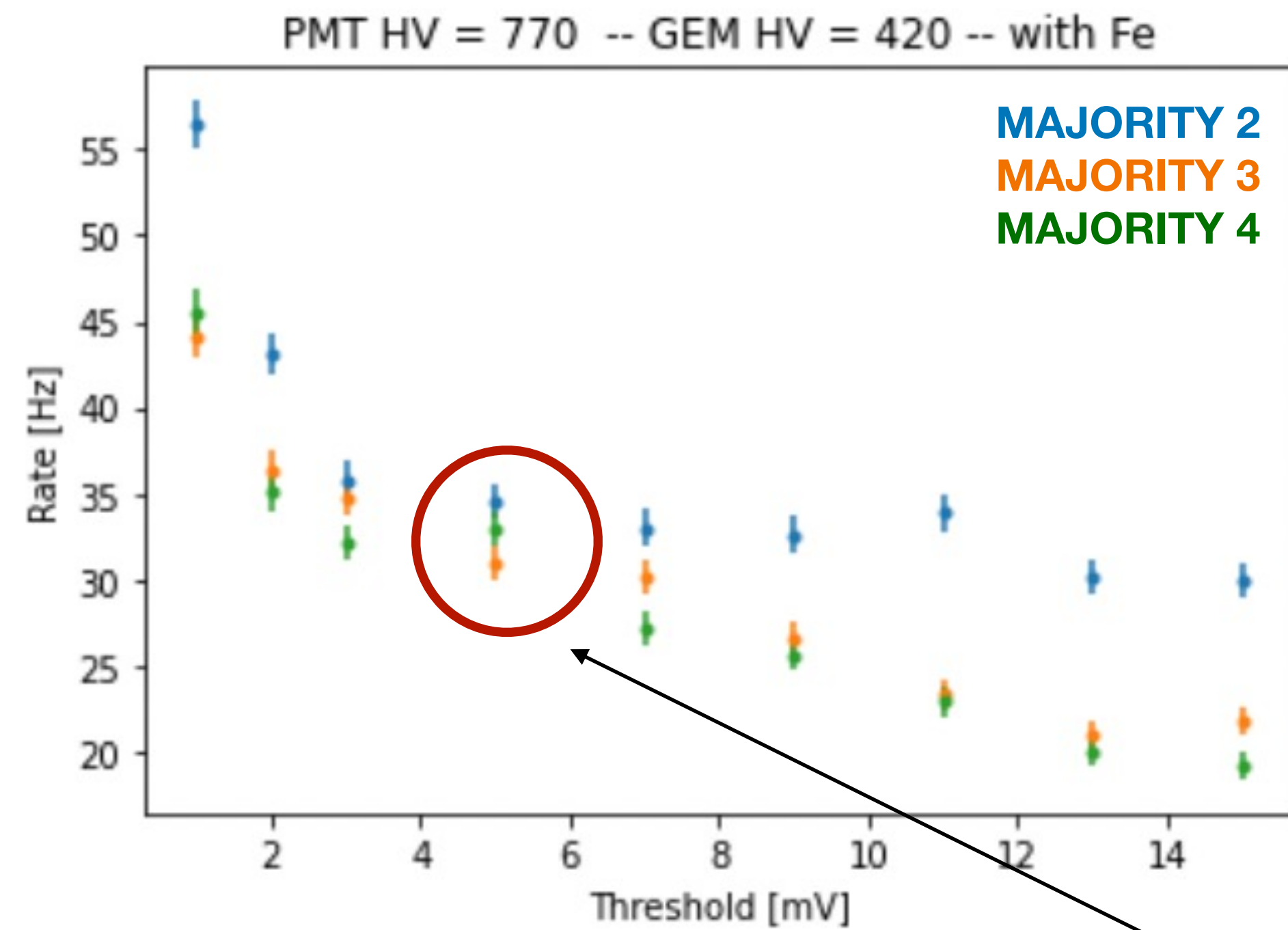
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24/11/2021

Data collected at LNGS

- Link to a more detailed description of the runs [here](#)
- We collected data with and without the ^{55}Fe source:
 - ⦿ Scan in VGEM1
 - ⦿ Scan in Z
 - ⦿ Scan in drift field
 - ⦿ Scan in PMT discrimination threshold (now @ 5mV)
 - ⦿ We generally acquired pictures with an exposure of 0.3 s
 - ⦿ Dedicated data taking with 0.1 ms pictures
 - ⦿ Long runs flushing the gas at 20 l/h, 3 l/h, and now 1 l/h
- Estimated number of “background-only” (no ^{55}Fe) pictures:
 - ⦿ $\sim 7.2 \times 10^4$ with 15mV PMT threshold
 - ⦿ $\sim 5.6 \times 10^4$ with 5mV PMT threshold

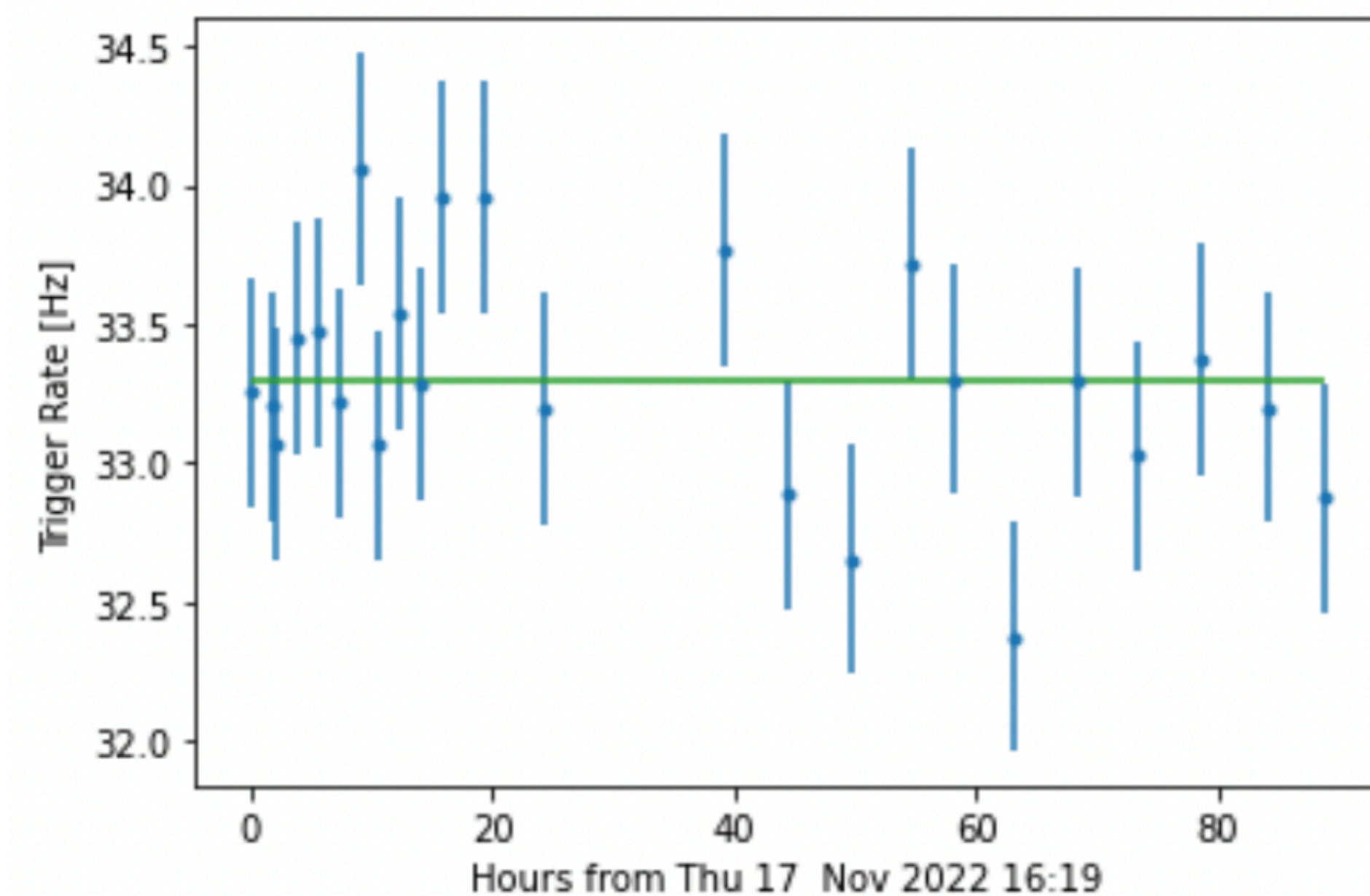
PMT discrimination threshold



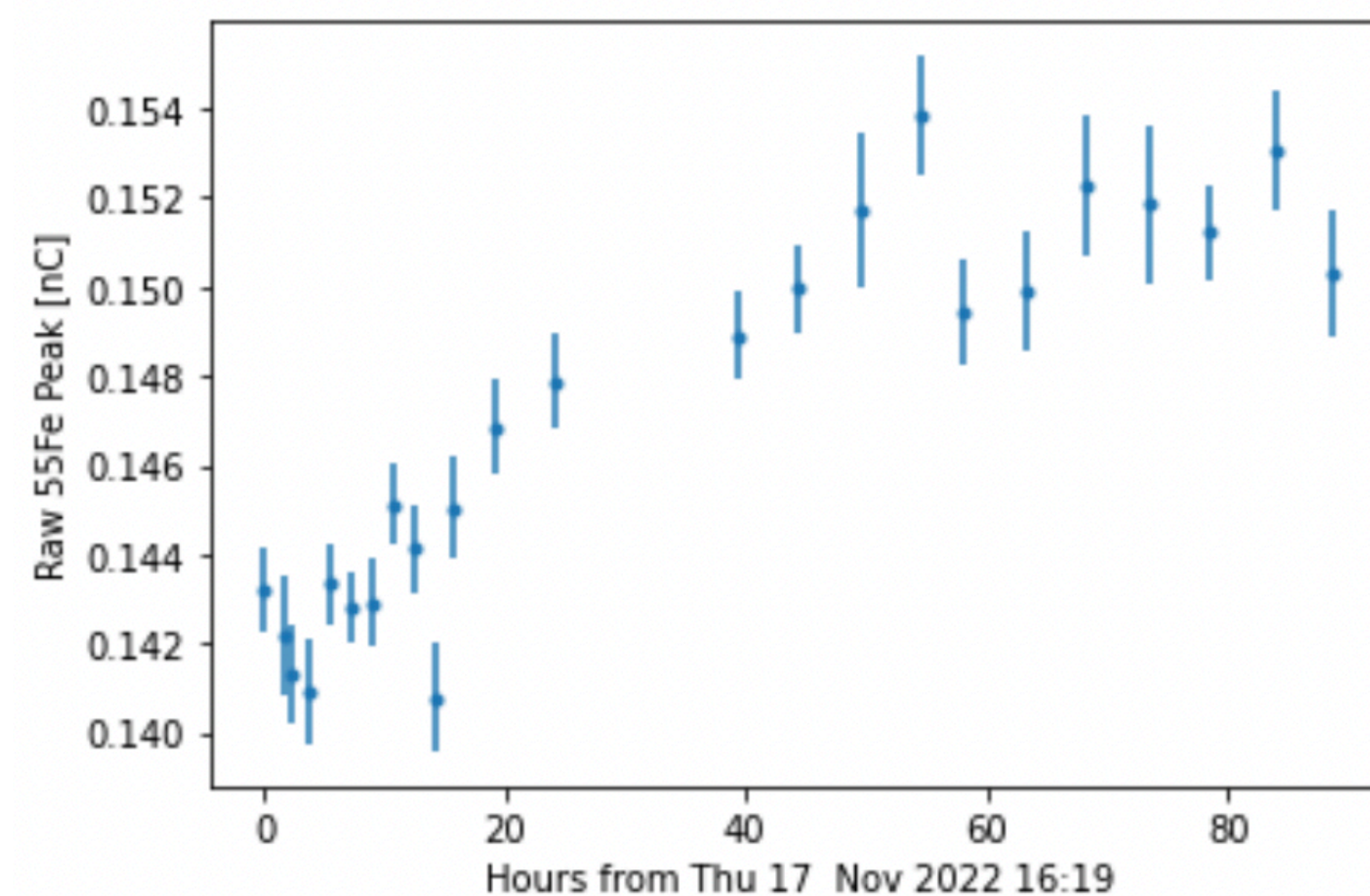
We decided to operate a 5mV, the lowest threshold value in which we are not sensitive to the PMT noise

Detector stability @ 3 l/h

Trigger rate

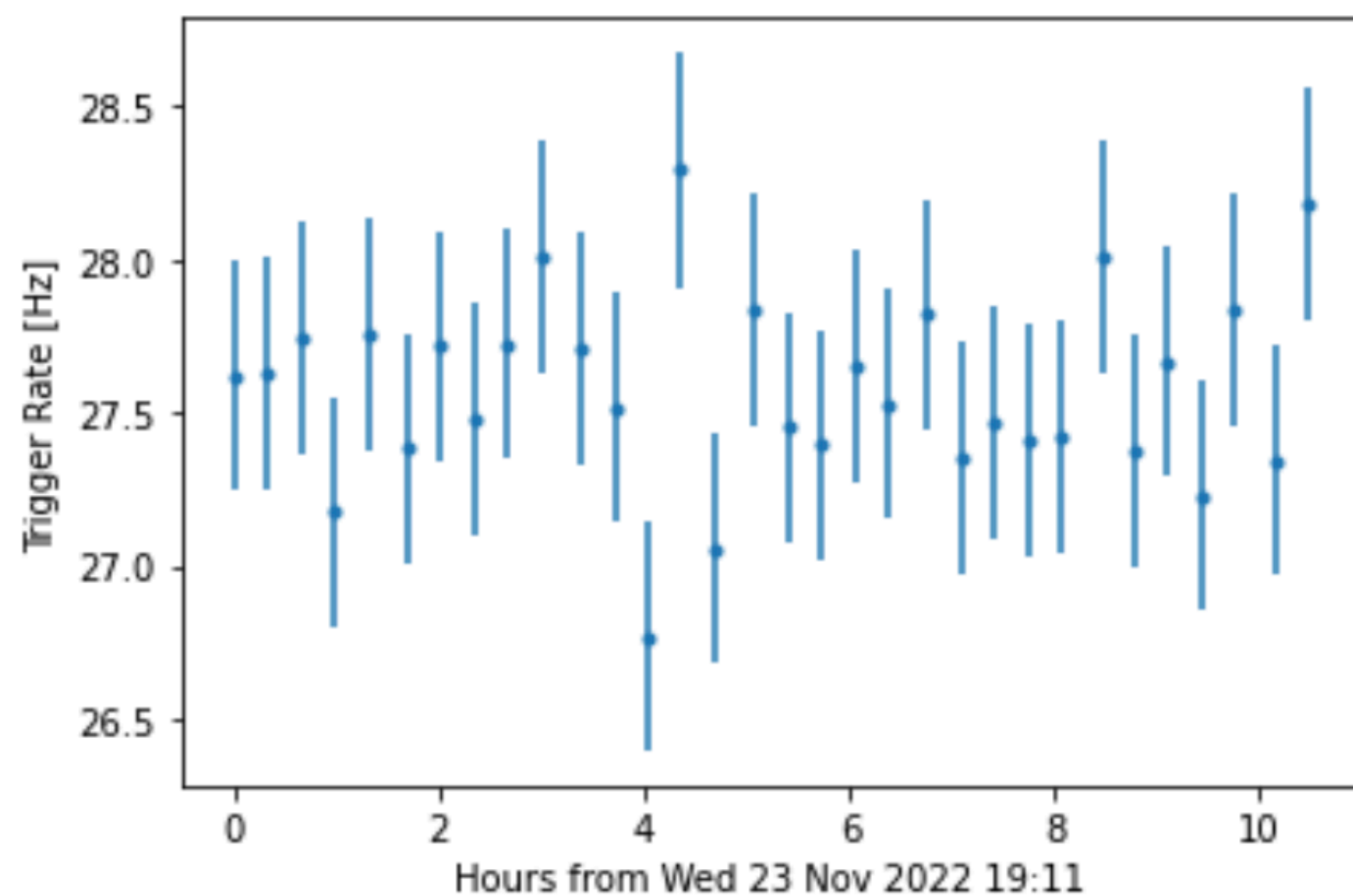


^{55}Fe peak light [sum of the charge of raw WFs]

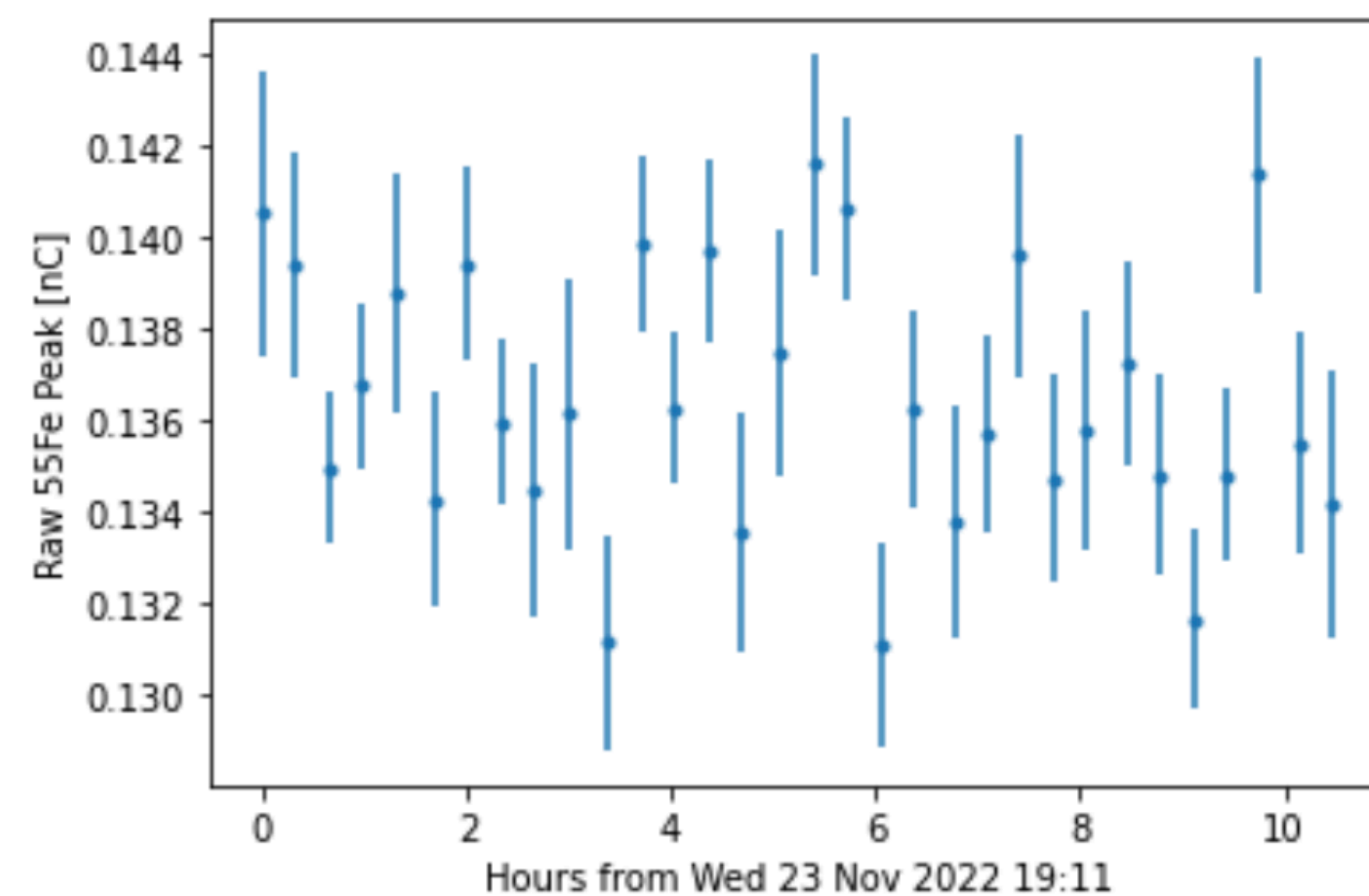


Detector stability after gas system operations

Trigger rate

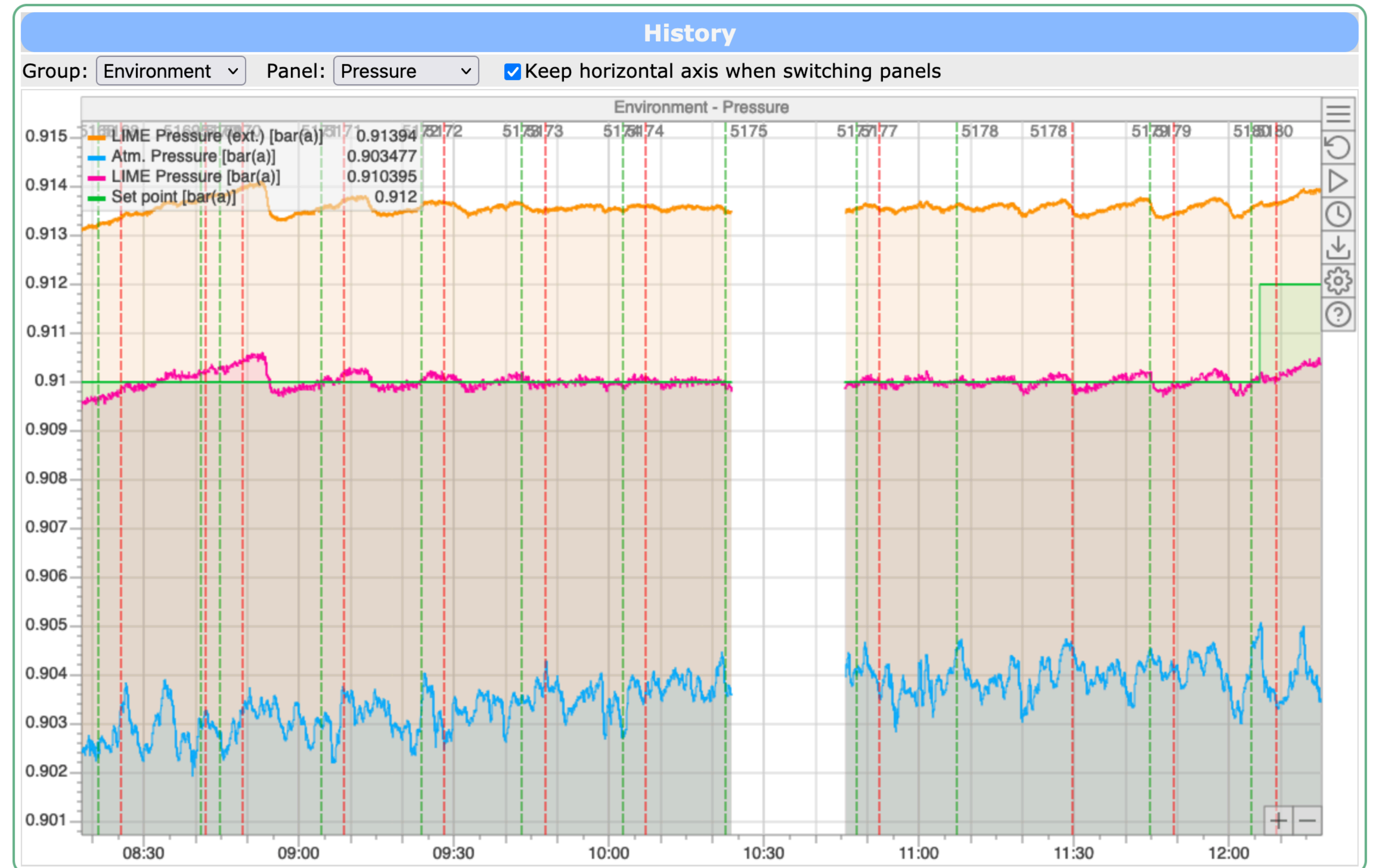


^{55}Fe peak light [sum of the charge of raw WFs]



Detector stability @ 1 l/h

- The detector is able to sustain the over-pressure even @1l/h



PMT analysis: towards a new python package

- I'm developing a python package to quick analyze the PMT data

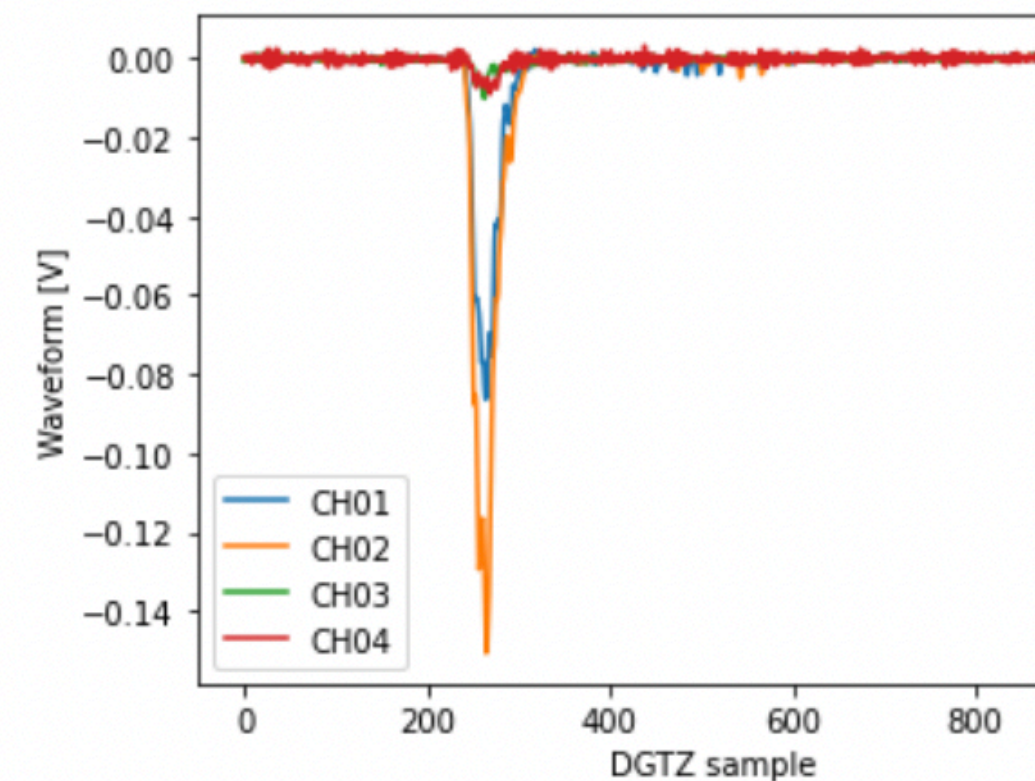
```
In [1]: import PMTreco as rec
import numpy as np
import matplotlib.pyplot as plt
```

```
In [2]: reco = rec.PMTreco([4505])

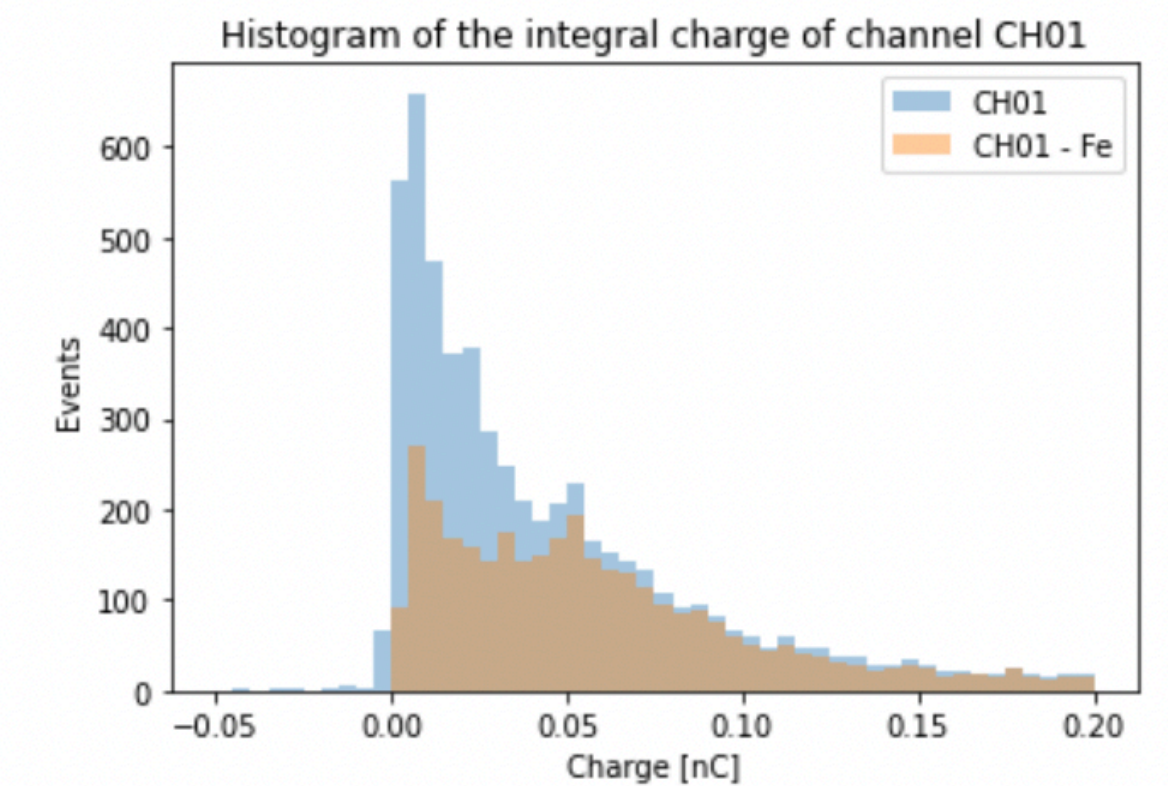
reco.ev_rate # in Hz
```

```
Out[2]: array([33.25559701])
```

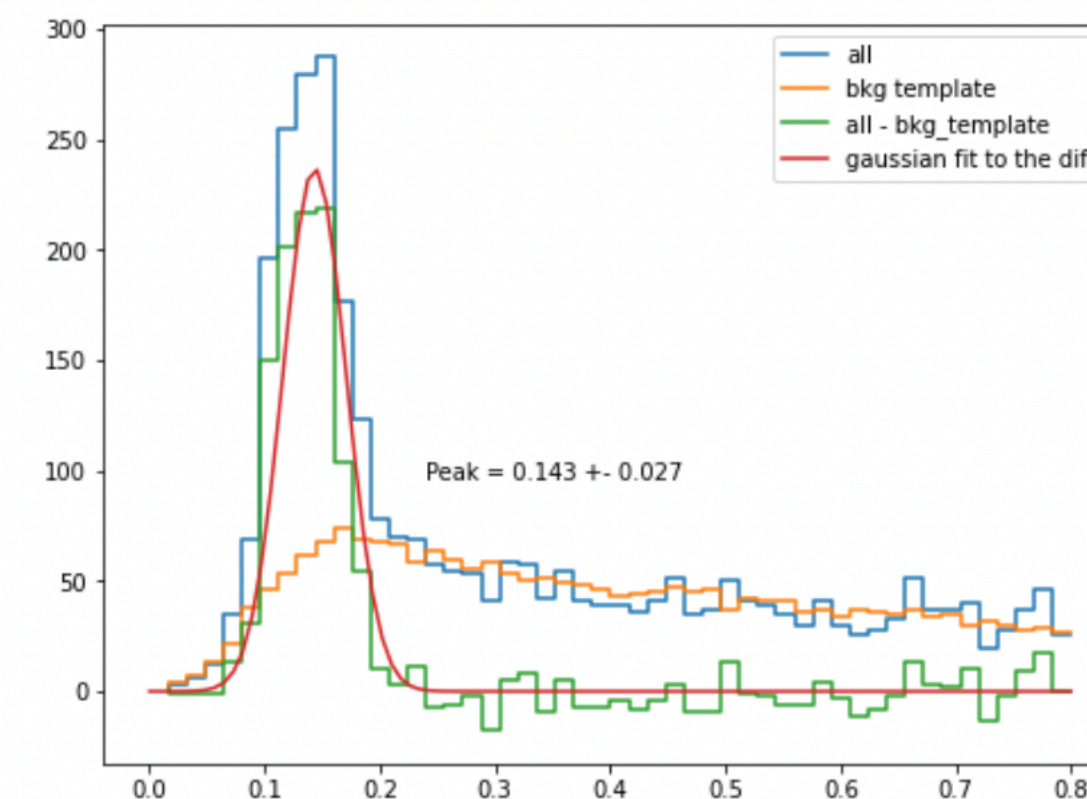
```
In [3]: reco.plot_single_WF(3, 4, channels = [1,2,3,4], run = 0)
```



```
In [4]: reco.plotIntegral(1, selection = 'Fe')
```

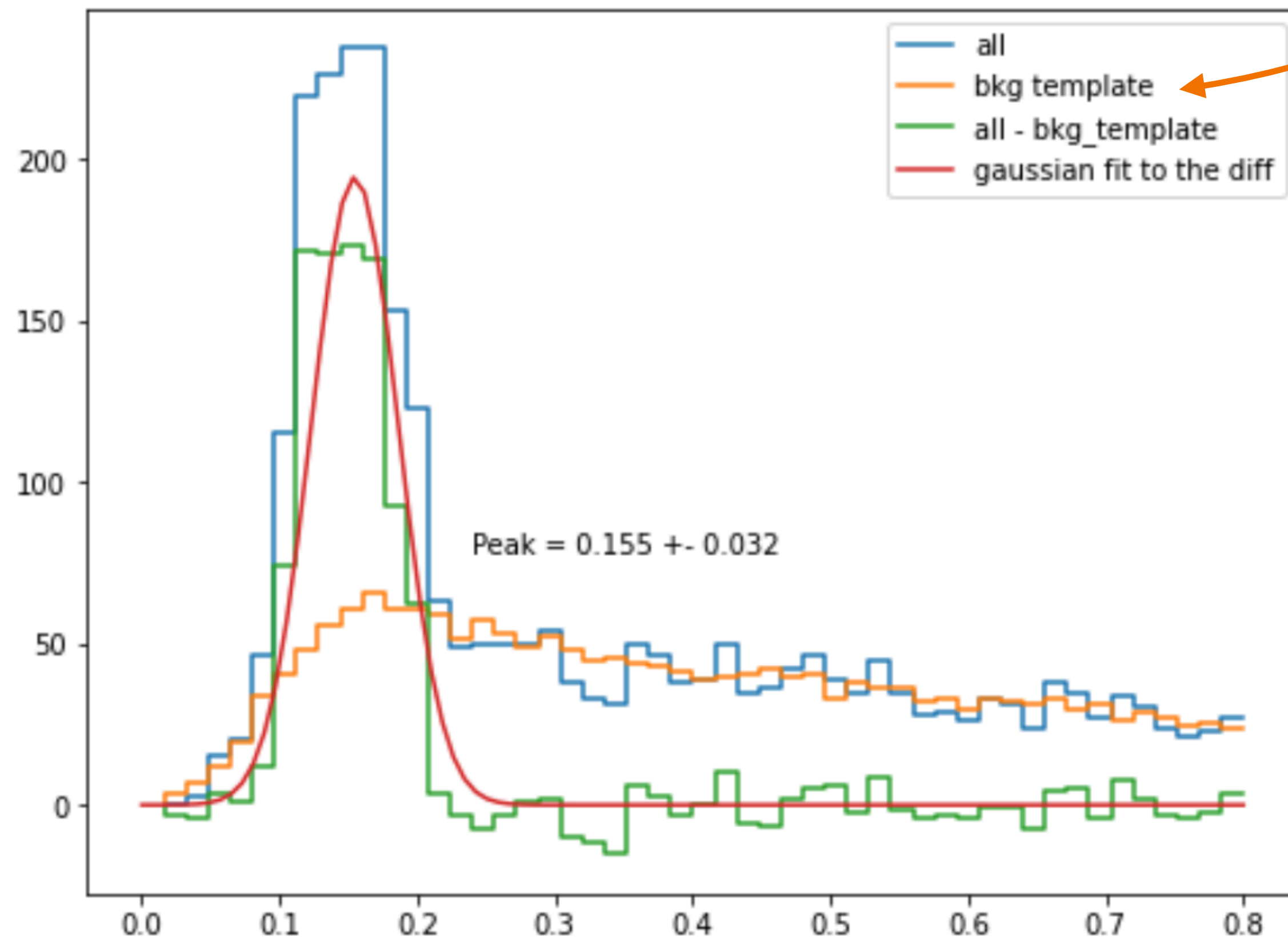


```
In [5]: mu, s_mu, resolution = reco.getFePeak(selection = 'Fe', bkgfile = './bkg_template_5mV.npy', plot = True)
```



PMT analysis: fast (and rough) reconstruction of the Fe peak

^{55}Fe peak light [sum of the charge of raw WFs]



Computed on a noFe dataset in the same conditions

- The peak cannot be gaussian:
 - ⦿ the 4 PMTs responds to light in different manners (see Francesco B.'s slides for more details)
 - ⦿ the light collected depends on the position of the spot with a R^{-4} scaling (R = distance between the spot and the single PMT)
- Conclusion: this is a fast but rough estimation

To do list

- Collect as much data as possible with and without the ^{55}Fe source before the installation of the first layer of shielding
- Monitor the gas system
- Next week shifts doodle [here](#)
- If you want, enter in our new Discord server!! Link [here](#)