

vPDU setting:
Analysis finding & gridd stuff
15/04/2024

Angus, Conner, Elisabeth, Daria

vPDU analysis (preliminary)

Data: vPDU3 (Edinburgh/Warsaw), vPDU6 (Edinburgh)

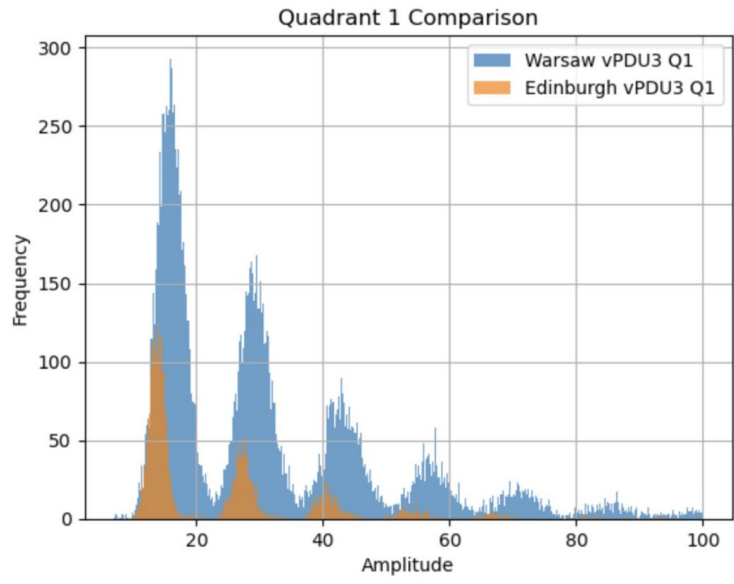
Passport version: [DEVbranch](#)

Note: vPDU3 LV supply 2.2 V/ vDPU6 2.08 V

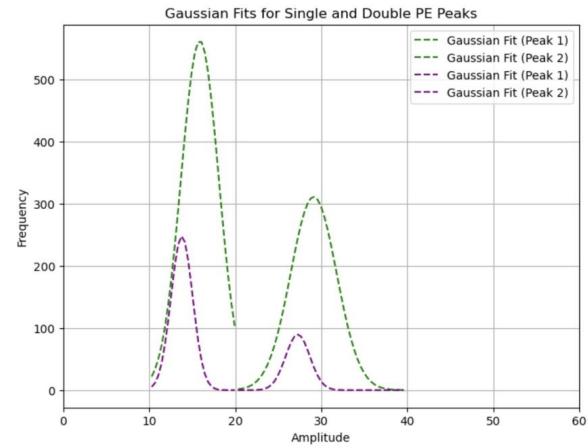
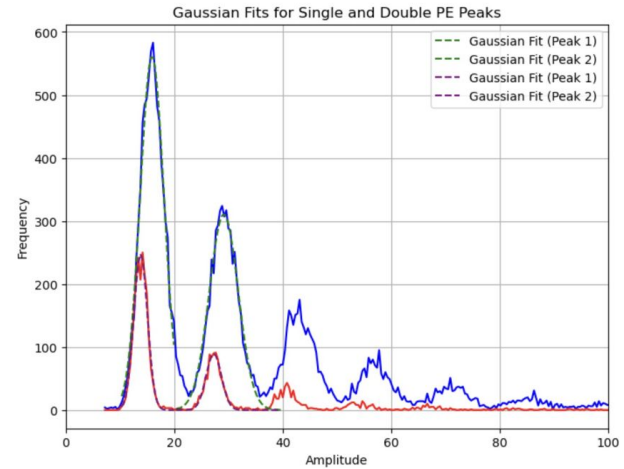
Summary of measurement:

https://docs.google.com/spreadsheets/d/1PcC9QyrPxJzhuWC0BKJSJjbt3x8tI0j_8s70YjKozCg/edit?usp=sharing

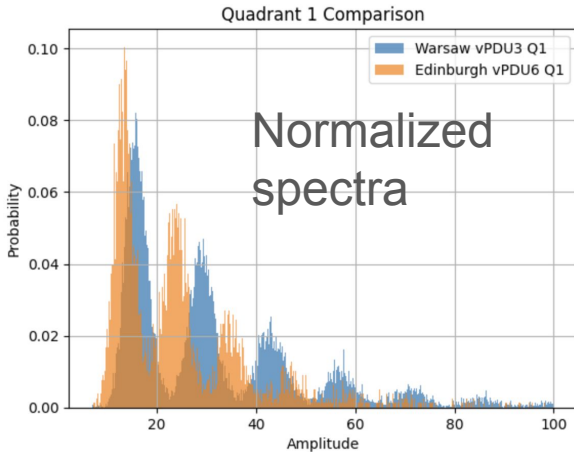
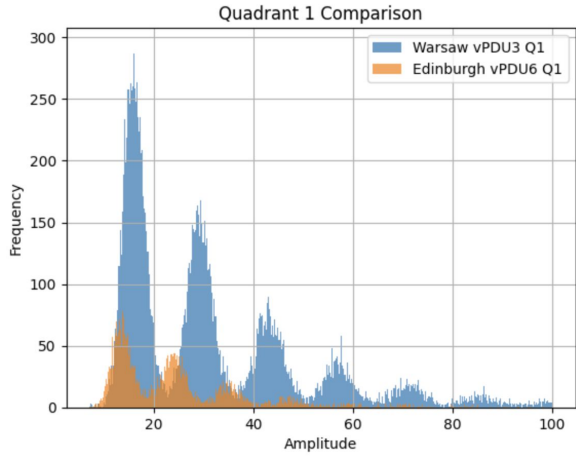
vPDU analysis (preliminary)



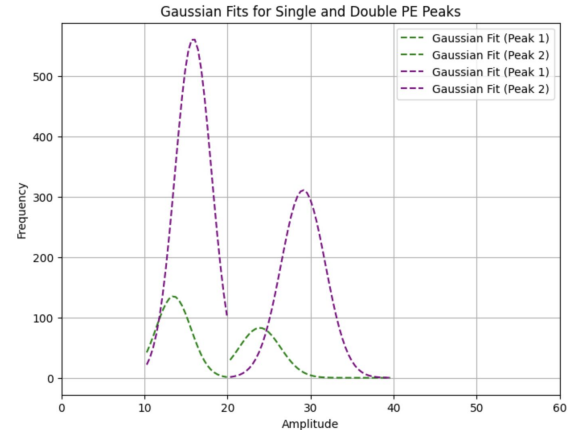
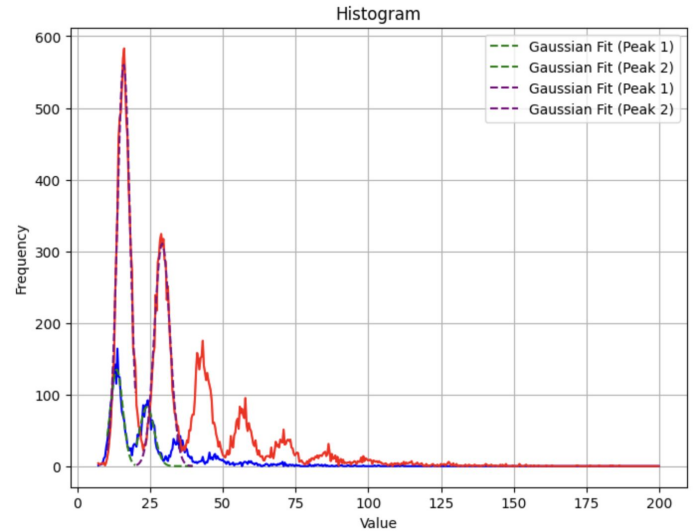
Note: different bias voltage and different laser setting/trigger



vPDU analysis (preliminary)



Shift depend on different LV supply (same in single tile)



What next?

Warsaw data is moving to the grid (Elisabeth)

Few checking on passport and get full passport values (Angus, Daria)

Checking IV curve to compute V_{db} using second derivative fit and uniform data taking at same bias -> 7VoV

Writing documentation: <https://foswiki.web.cern.ch/DarkSideUK/Private/VPDUTest> (all)

Request: check resolution

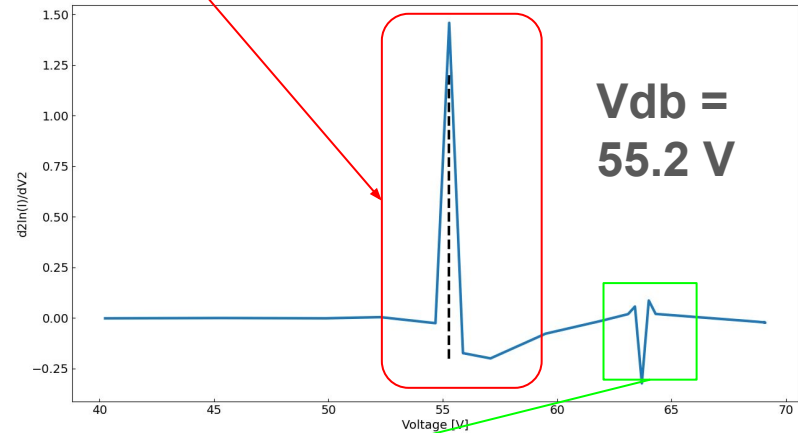
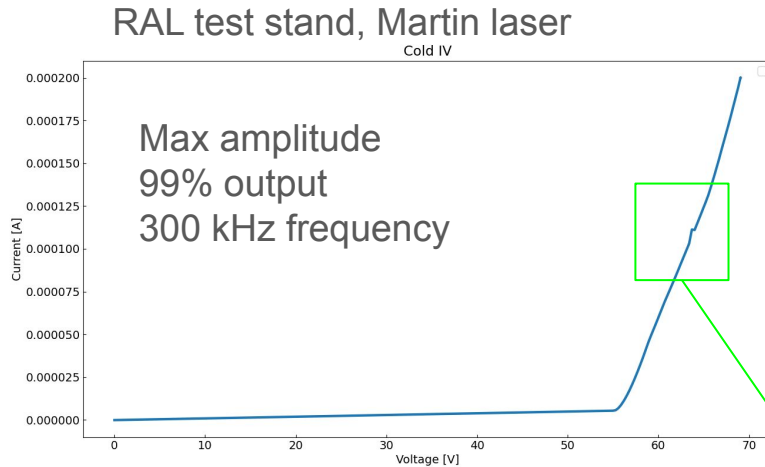
vPDU setting:
Analysis finding
25/03/2024

Angus, Conner, Elisabeth, Daria

IV analysis: second derivative fit

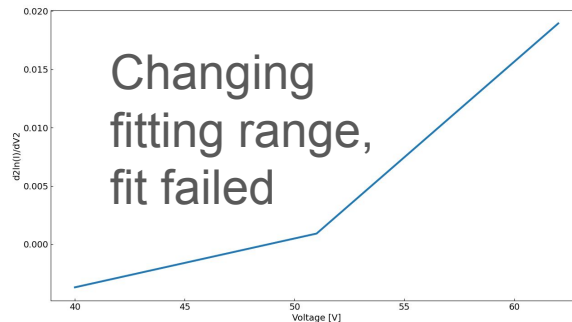
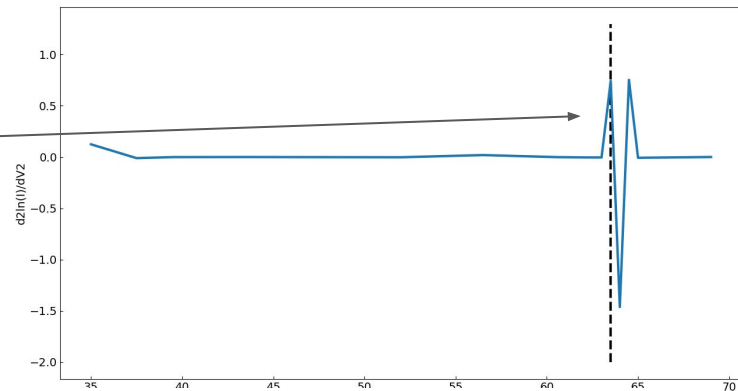
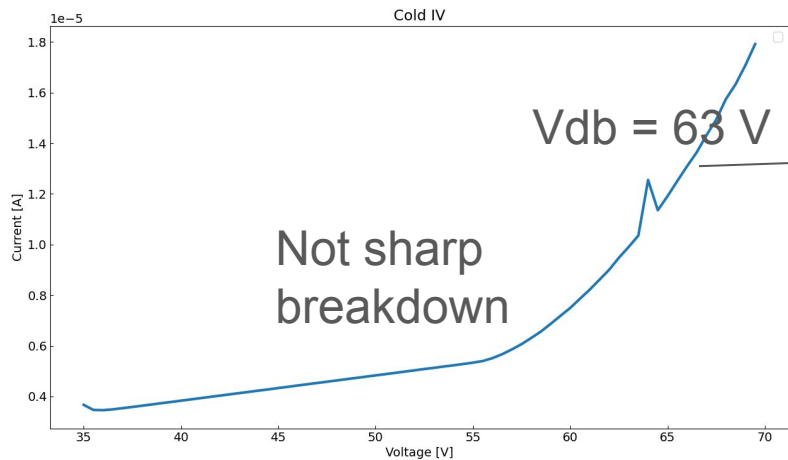
IV fitting procedure recently update with second derivative fit

Requirement: need enough light to see a sharp background -> **second derivative fit is finding highest rate of change in gradient**

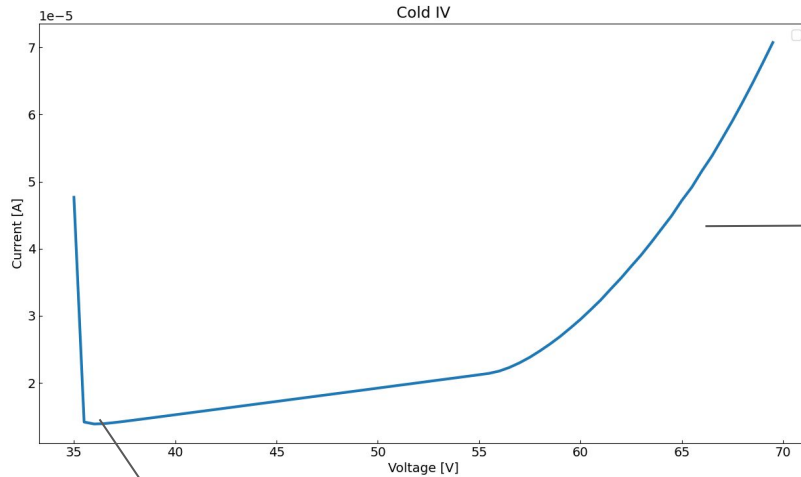


Bump around 10 μA not affect the fit

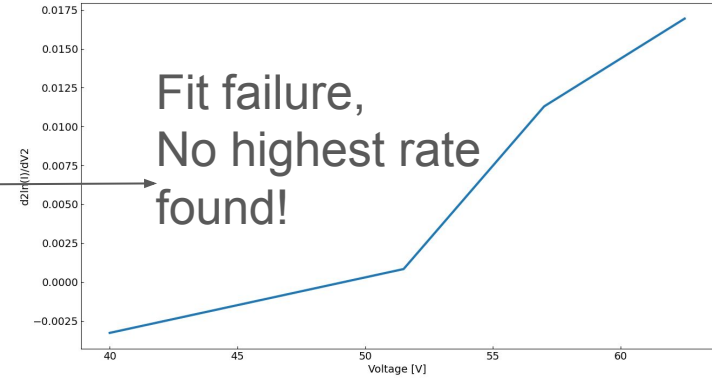
IV curve single tile: Edinburgh



IV quadrant: Edinburgh



Suggestion: I think that IV can start from 40V as is done for warm test



Need to check Warsaw data too, probably same problem looking to the IVs

Data analysis: Edinburgh vs Warsaw

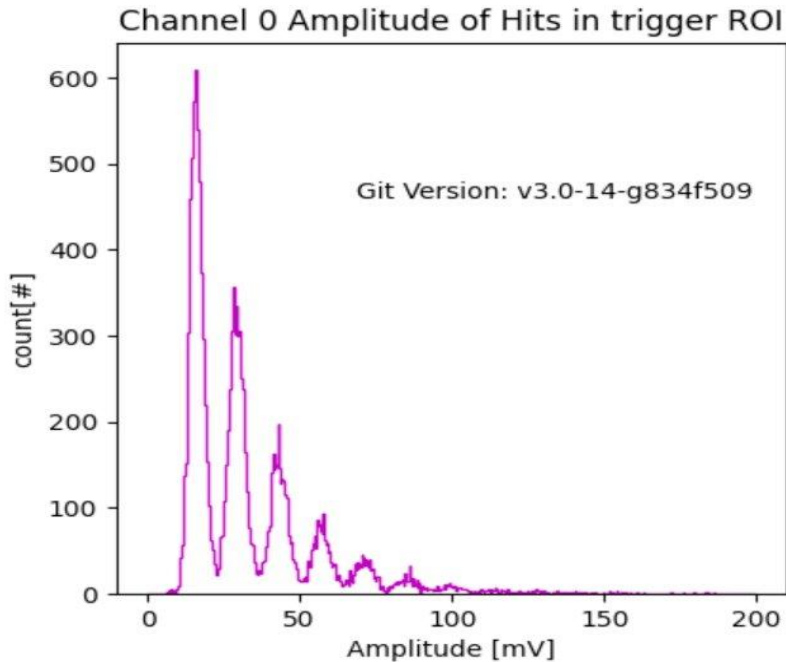
- Data taking
 - Different number of events
 - Different light-source settings
 - Different bias (still using first derivative fit or not enough light condition)
 - Taking different datasets (quadrants, tiles)
- Logging
 - Different test information logged at each location with different formats, some information missing
- Upload
 - Warsaw waiting for grid access, at the moment data is shared by email attachment
 - Some Edinburgh data is on the grid, not-standardised naming

Proposal:

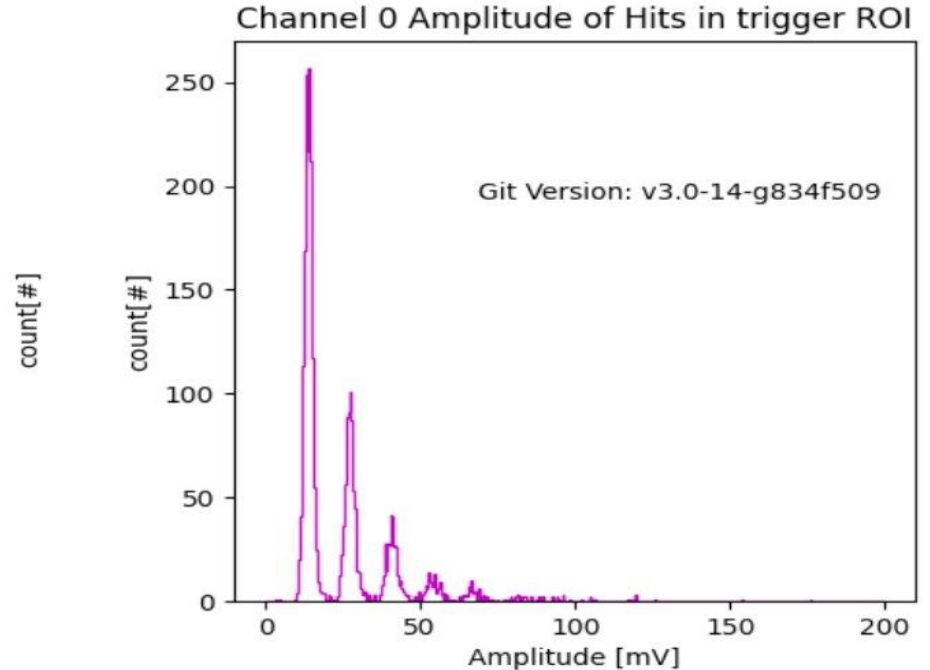
- Data taking
 - Bias: 7 VoV -> Vdb need to be estimate with second derivative fitting - Warsaw revising their method, Edinburgh optimize light condition for IV
 - Number of WF: checking passport results and then merge in a common number of WF acquired - **agree provisionally**
 - Light conditions: Warsaw will send selection of results to compare to Edinburgh data, once other variables are fixed (aiming for similar 1PE and 2PE occupancy)
- Logging
 - Data recording:
https://docs.google.com/spreadsheets/d/1PcC9QyrPxJzhuWC0BKJSJjbt3x8tl0j_8s70YjKozCg/edit?usp=sharing
 - Adding all info on the twiki page: <https://foswiki.web.cern.ch/DarkSideUK/Private/VPDUTest>
- Upload
 - Agree standard format and file structure when Warsaw gets access
 - Automate upload in both locations

Looking at the data → latest passport version

Warsaw, vPDU3, all quadrants, all tiles

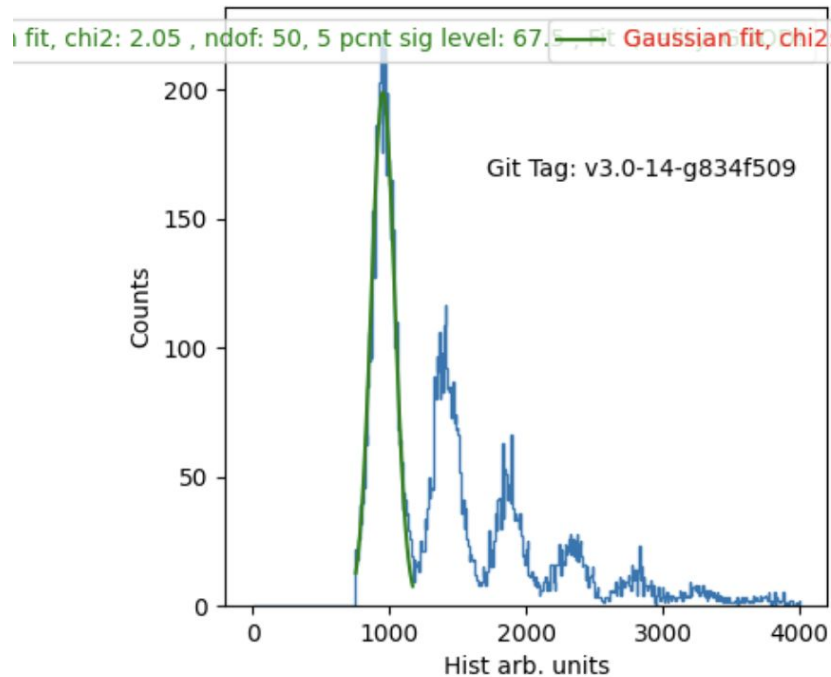


Edinburgh, vPDU2, quadrant 0, tile 0

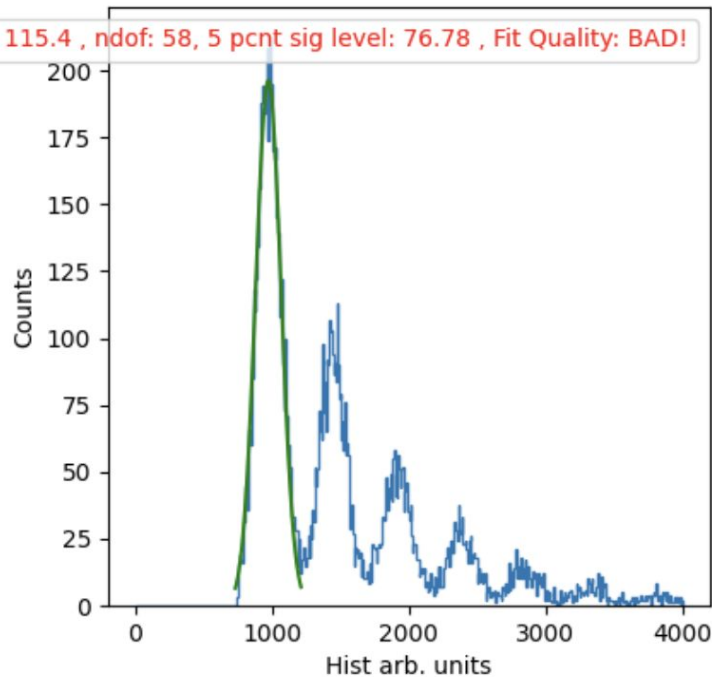


Looking at the data → latest passport version

Warsaw, vPDU3, Q1, all tiles



Warsaw, vPDU3, Q2, all tiles



Data acquisition: planning

Which set of measurement to qualify a vDPU?

- IV curve -> per tile and per quadrant (1 V step up 50V and 0.2 V after 50V) ->35 - 70 V range cold, warm: 35 - 75V (100 uA current limit)
- Noise acquisition at 40 V -> per quadrant (go back single tile in case of problem) :
 - Edinburgh/Warsaw: 500k per WF, 100 WF
- SPE calibration at 7 VoV
 - 5 runs: 1 tile per quadrant across all quadrant and 1 run for all quadrant on/all tiles on
 - Edinburgh: 4k sample per WF, 15% pre-trigger , 40k WFs, Martin laser setting: 200 Hz (try explore 1 kHz)
 - Warsaw: need to change to 15% pre-trigger (now at 50%), LED setting: 10 kHz
 - Note:external sinc-out trigger

vPDU setting: Testing and reconstruction

Angus, Conner, Elisabeth, Daria

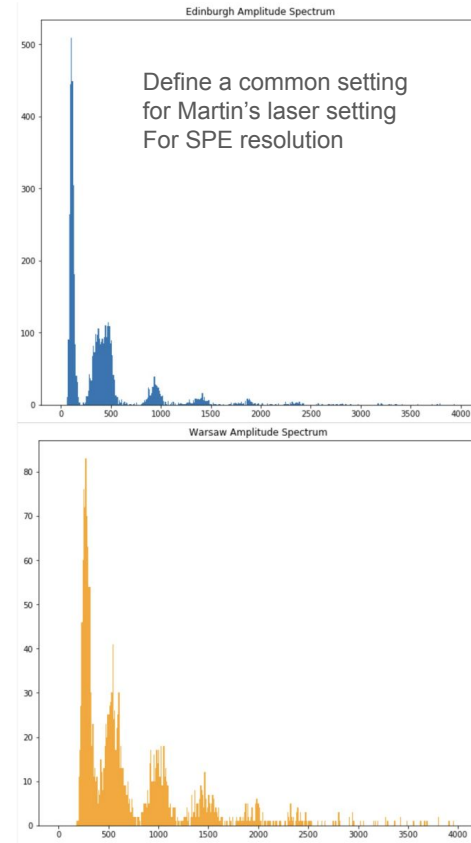
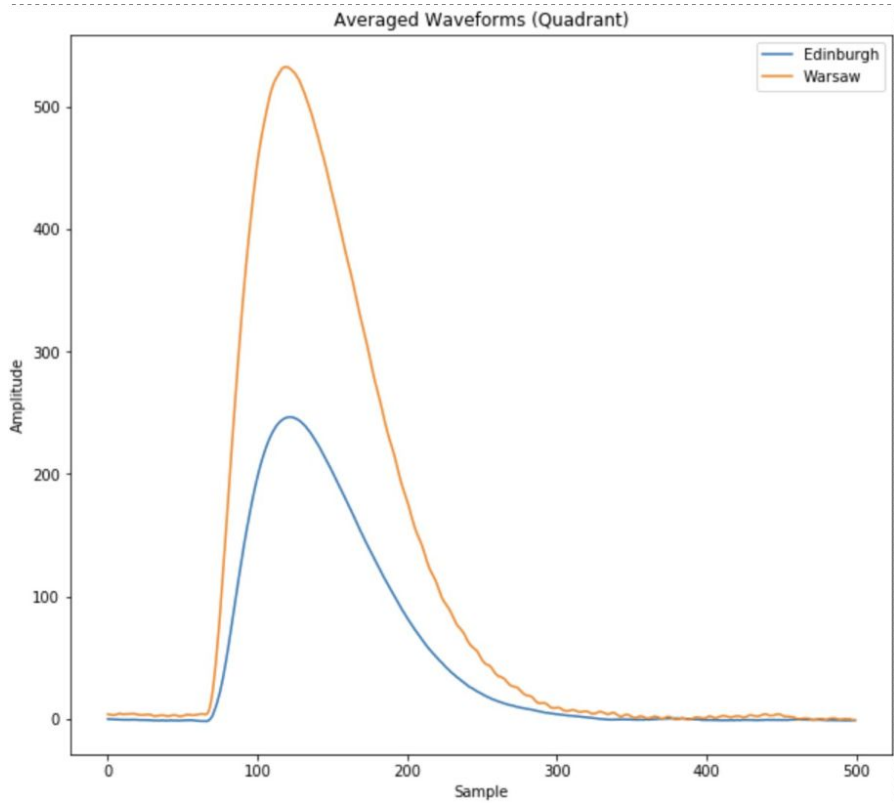
Reco: confi.ini

Conf.ini to reconstruct the raw
WF (frozen version soon on the
gridd)

```
1 [base]
2 nevents = -1
3
4 [daq]
5 data_format = NAsup2
6 n_channels = 4
7 sampling = 125e6
8 bits = 16
9
10 [reco]
11 bl_to = 300
12
13 [roi]
14 n_trigs=200 # number of events to determine the trigger position
15
16 [arma]
17 tau = 400e-9
18
19 [pdm_reco]
20 reconstructed_as = asic # asic, feb
21 downsample_by = 1 # rebin / downsample the waveform (1 means no change)
22 polarity = 0 # polarity of the waveform (1 for positive peaks, -1 for negative peaks, (0 will automatically give +1 for
23 baseline_to = 3600e-9 #3360e-9 # time from the beginning of the wf from which the baseline will be evaluated (in sec)
24 running_gate = 120e-9 # period of time for the running mean (in sec)
25 threshold_in_rms = 5 # at how many rms does the peak start
26 min_time_between_peaks = 250e-9 # merge the peaks with this time between them (in sec)
27 extended_time_for_integral = 500e-9 # additional time to be added to the identified peak at the end (in sec)
28 add_left_time_for_integral = 200e-9 # additional time to be added to the identified peak at the beginning (in sec)
29 roi_left = 200e-9 #500e-9 #200e-9 # region of interest left width (in sec)
30 roi_right = 270e-9 #1400e-9 #2000e-9 #2100e-9 # region of interest right width (in sec)
31
```

https://gitlab.in2p3.fr/darkside/veto_passport/-/tree/vPDUdev/vPDUPassport?ref_type=heads

vPDU analysis: findings



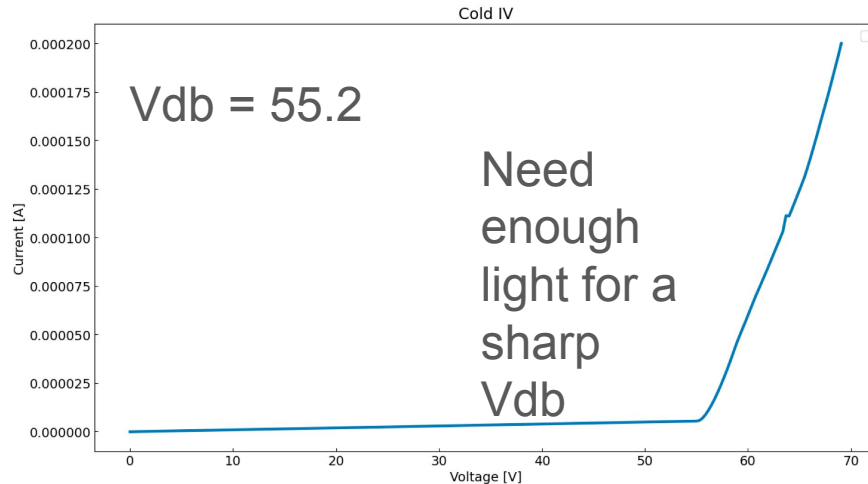
More coming->
redo analysis
with fixing
confi.ini

Define a common setting
for Martin's laser setting
For SPE resolution

IV curve example

Test of Martin's laser in the new RAL test stand

IV setting: pulse generator frequency at 300 kHz, laser at maximum amplitude, 99% output (for SPE using 0.5% output and 5kHz)



NOTE:
Cannot used same setting for SPE data taking!

vPDU passport status

Everything is still in the development branch:

https://gitlab.in2p3.fr/darkside/veto_passport/-/tree/vPDUdev/vPDUPassport?ref_type=heads

What next:

- Merge all optimization in the deV branch (Conner, **DONE**)
- Test it (Angus, **ongoing**)
- Move on master and froze on the grid

Grid

Example scripts:

https://gitlab.in2p3.fr/darkside/veto_passport/-/tree/el_grid_dev/GridTools

Note: not easy to tidy up after uploads, get in touch with Elizabeth before first upload

Plan: run automated reconstruction and vPDU passport analysis

Volunteers welcome!

More info on the twiki soon!

File catalogue structure:
/vo.northgrid.ac.uk/darkside/veto/

- vtile_cold_test/raw/vPDUx/...
- vtile_cold_test/reconstructed/vPDUx/...
- vpdu_cold_test/raw/vPDUx/site/...
- vpdu_cold_test/reconstructed/vPDUx/site/...

Future plan

After define the best setting and testing all workflow analysis, suggest to have a PDU manual:

- Setting data acquisition for midas, laser, ecc...
- Uploading file
- Data analysis
- Uploading passport on DB

Example here (vtile testing):

<https://docs.google.com/document/d/1RseMTZNXZIIzzxLM930wJQdMKaIPndJt4KchRnRG3ik/edit?usp=sharing>

Database update

PaoloF, Daria

Database update: workflow

Please update DB before shipping!

1. **Assembly and warm test sites:**

- a. Add the vPDU map on the DB https://gitlab.in2p3.fr/darkside/productiondb_software/-/tree/master/examples_python/submit_vpdu
- b. Set vTiles as *integrated* using location gui: `ds20k_veto_location_gui`
- c. Add warm tests on the DB https://gitlab.in2p3.fr/darkside/productiondb_software/-/tree/master/examples_python/submit_vpdu_test
- d. Set the status of vPDU as *bagged* before shipping to a cold test site

2. **Cold test sites:**

- a. Set a *received* when received the vPDU: `ds20k_veto_location_gui`
- b. Set as *unbagged* when you start the test
- c. Set as *bagged* when you complete the test and the vPDU is bagged
- d. Update vPDU passport on DB https://gitlab.in2p3.fr/darkside/productiondb_software/-/tree/master/examples_python/submit_vpdu_cold_test

Current locations:
vPD2/3 -> Liverpool
vPDU4 -> to be reworked Manchester
vPDU5/6-> Edinburgh

Radiopurity

Responsibles

Front-end electronics
population on PCB
@Birmingham



SIPMs mounting
@Liverpool/STFC interconnect



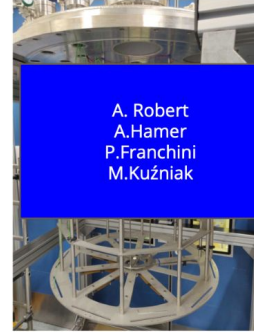
Tile test @Oxford/STFC
interconnect



vPDU integration + warm test
@Manchester/Warmick



vPDU cold test @Liverpool,
@Edinburgh, @Lancaster +
ASTROCENT (Poland)



Please be in contact with me
or material WP for any
concern about protocols
Share any measurement
about dust or clean room
qualification

Useful link

Radio-purity control are integrated in vDPU document:

https://docs.google.com/document/d/1YseTVpHCY_fhqOh_4F9Zlu18ypMpMJhrvyd9rKadX44/edit?usp=sharing

Warm test: pag.168 -175 (under review, Vicente+Daria)

Bagging procedure: pag 176 ([bags model here](#))

Cold test: 182 (under review, Vicente+Daria)

Clean room environment check

Please update the dust measurement here:

<https://docs.google.com/spreadsheets/d/15n33JDgYFmkUVLC-ghx0QGWdAtvYMGfDDtcAlufp1MQ/edit?usp=sharing>

(check that your clean room is consistent with ISO7 clean room)

Arrange Rad7 measurement (to be done before assembly/testing IV vPDU):

Manchester -> Warmick -> Edi -> Lancaster (clean tend in place?) -> Liv (already measurement in the past)

What about ASTROCENT?

vPDU storage ?