NP04 PDS
data taking planning

IV CURVES

11th april 2024

Anna Balboni
Anna Scanu
Laura Pérez-Molina
Renan de Aguiar

TASK LIST

NP04 PDS data taking plan

- IV curves code optimization ..... 🟠
  - Debugging and improving the output and the fits' performance
- IV curves data organization ..... ✅
  - Moved to `/eos/experiment/neutplatform/protodune/experiments/ProtoDUNE-II/PDS_Commissioning/ivcurves`
- Vbd computation and json file ..... 🟠
  - `10.73.137.1xx_map.json` saved for each IV curve with `Vbd_per_AFE`, `OV`, `Vbd_trim`
- Volts vs dac curves for bias voltage .... 🟠
- Dead channel map ..... 🟠
  - First histogram to check the data available for each channel
- Script to program bias from .json file ..... 🔴
- Comparison of NP04 IV curves with lab ones measurements ..... 🔴
- Code to repository ..... ✅
  - Located in DUNE/PDS repository (iv_analysis.py script)
- Vbd versus temperature ..... 🟠
  - First steps collecting all the analysed data + plot vs time

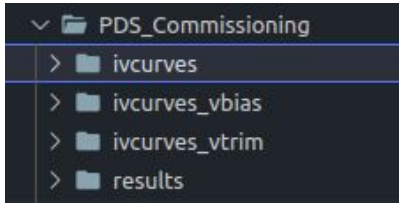
Organization

- **CODE TO REPOSITORY**

(run inside DAQ environment)
git clone https://github.com/DUNE/PDS.git
cd PDS/scripts
python iv_analysis.py > /eos_path/.../Apr-09-2024-run00/log.txt

- **OUTPUT DATA FOLDER**

/eos/experiment/neutplatform/protodune/experiments/ProtoDUNE-II



→ **ivcurves**: over V_{bias} & V_{trim} (14^{th} Mar - 11^{th} Apr)
→ **ivcurves_vbias**: over V_{bias} (7^{th} Mar - 14^{th} Mar)
→ **ivcurves_vtrim**: over V_{trim} (29^{th} Feb - 7^{th} Mar)
→ **results**: plots with results

- *.root files
- *_map.json
- breakdown_output.txt
- log.txt
- quality_checks.pdf

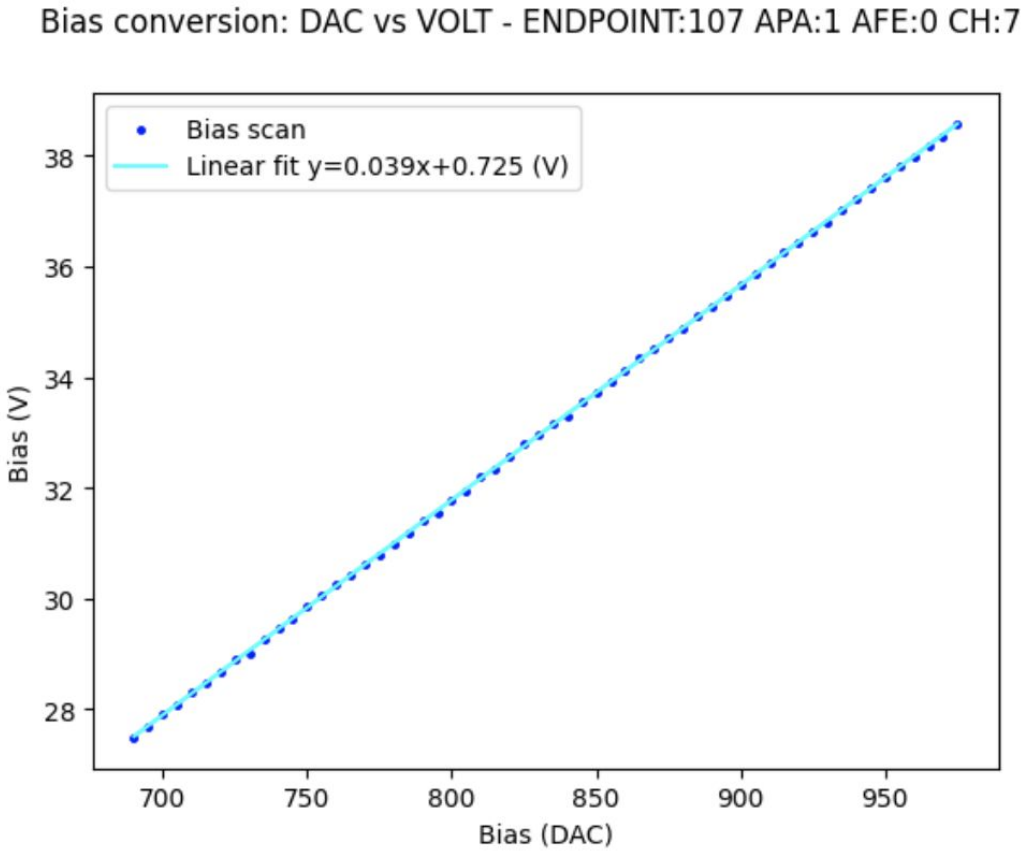
Organization

- Corrected few bugs
- Working towards a simple output for the V_{bd} vs T analysis
- Need to convert time to T using slow control

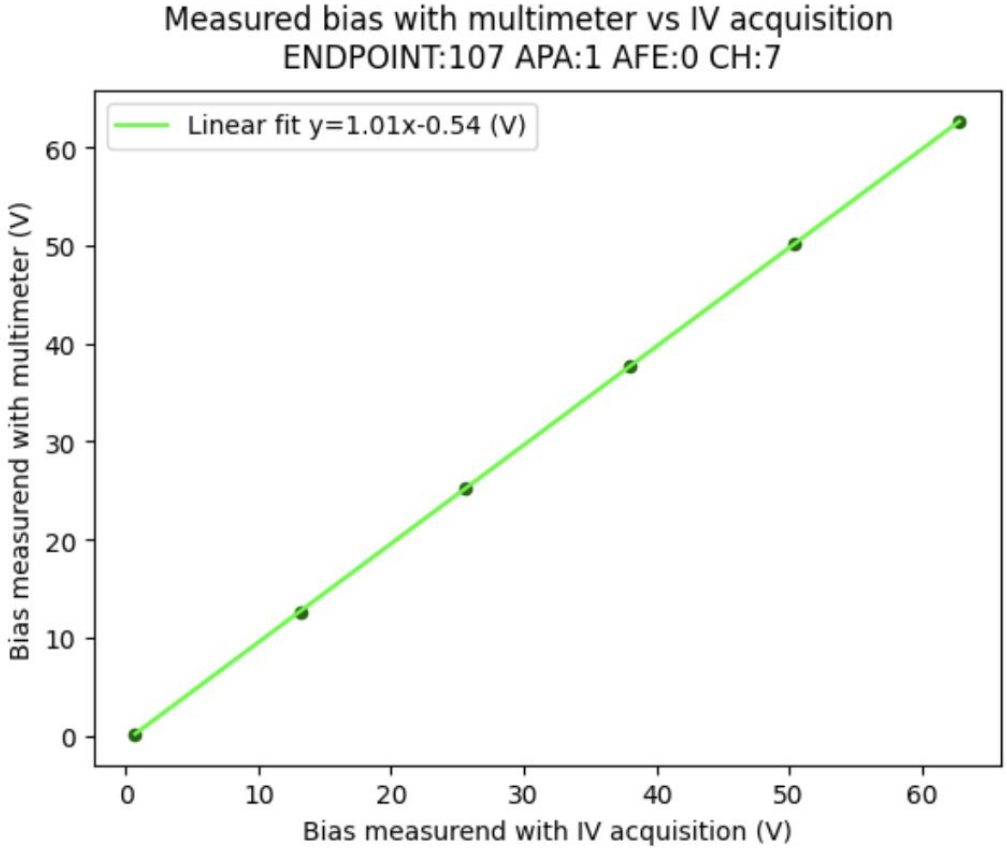
V_{bd} conversion from DAC to V

- We observe V_{bd} higher than expected values
- Observed values around +5 V
- Trying to understand this discrepancy, working to calibrate the DAC counts to V

DAC - Volt conversion: BIAS



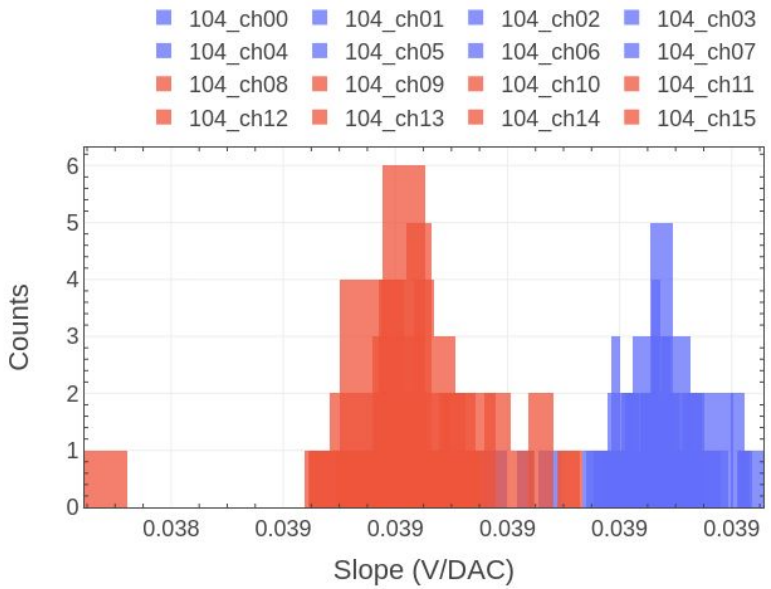
Voltage-voltage comparison (DAPHNE vs multimeter)

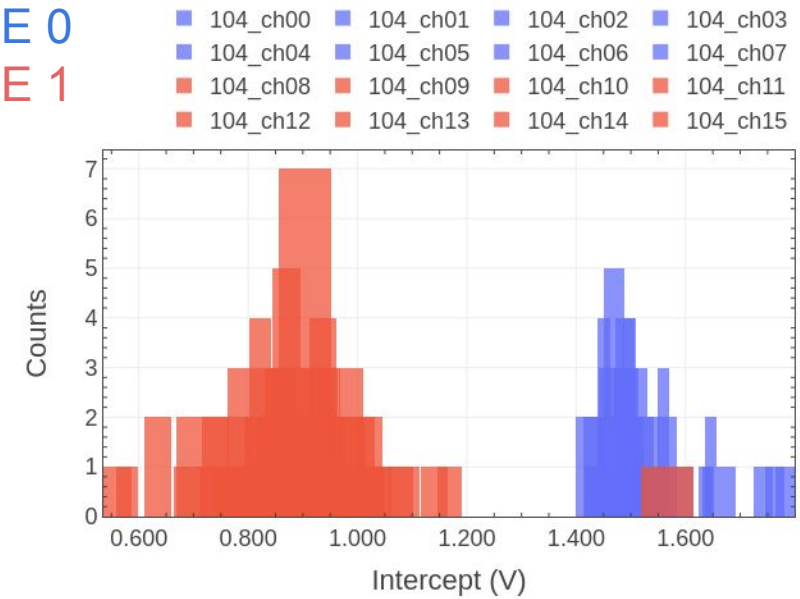


Linear fit values of V vs DAC using Bias (IP: 104)

AFE 0

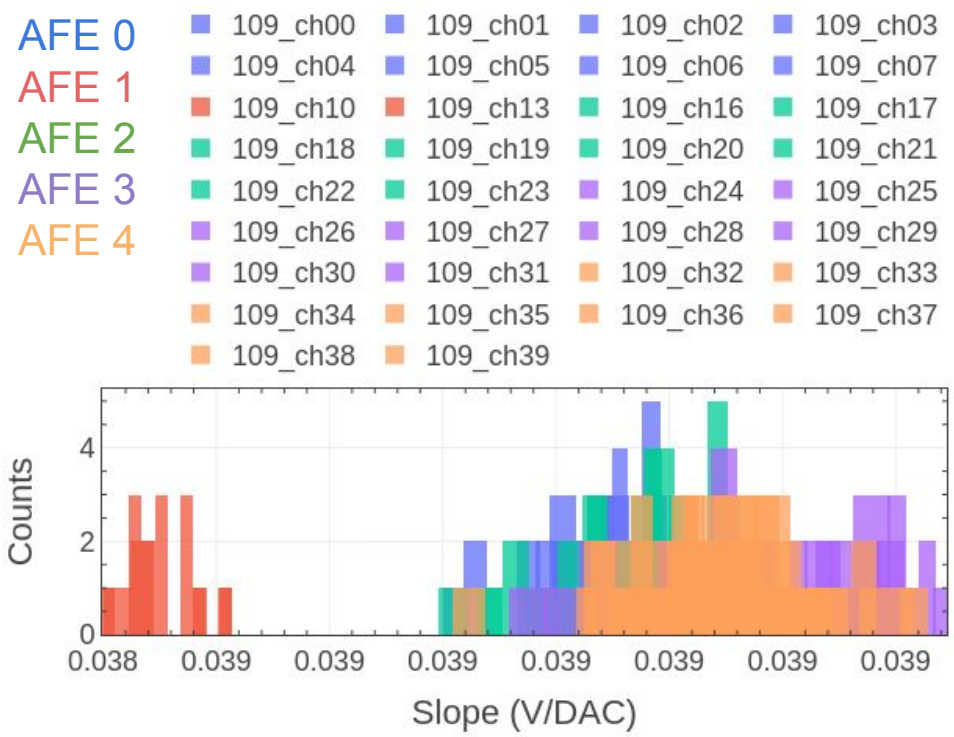
AFE 1

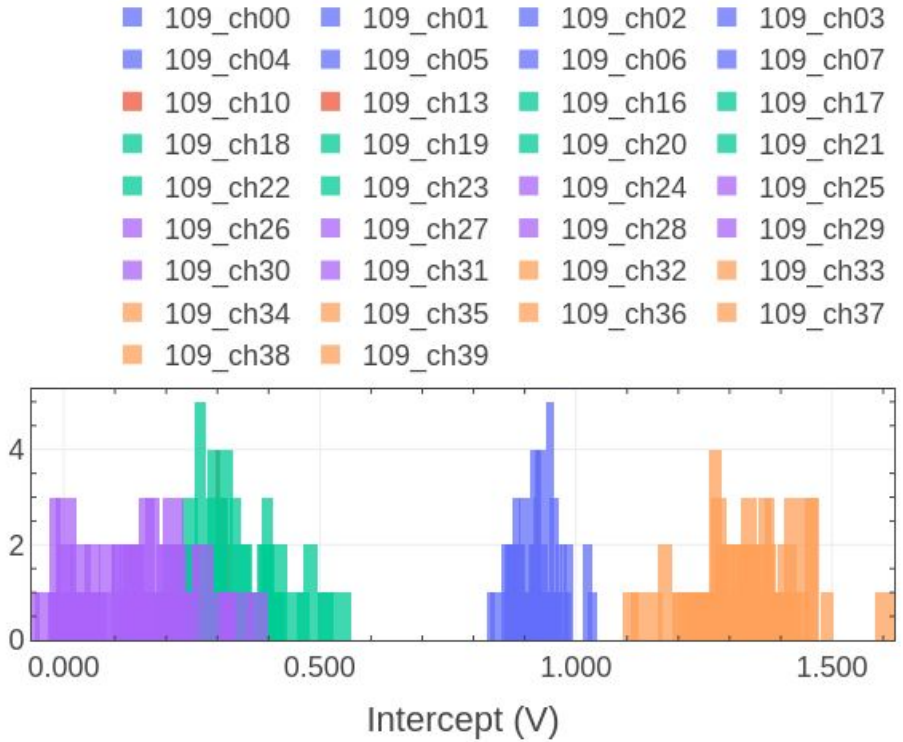




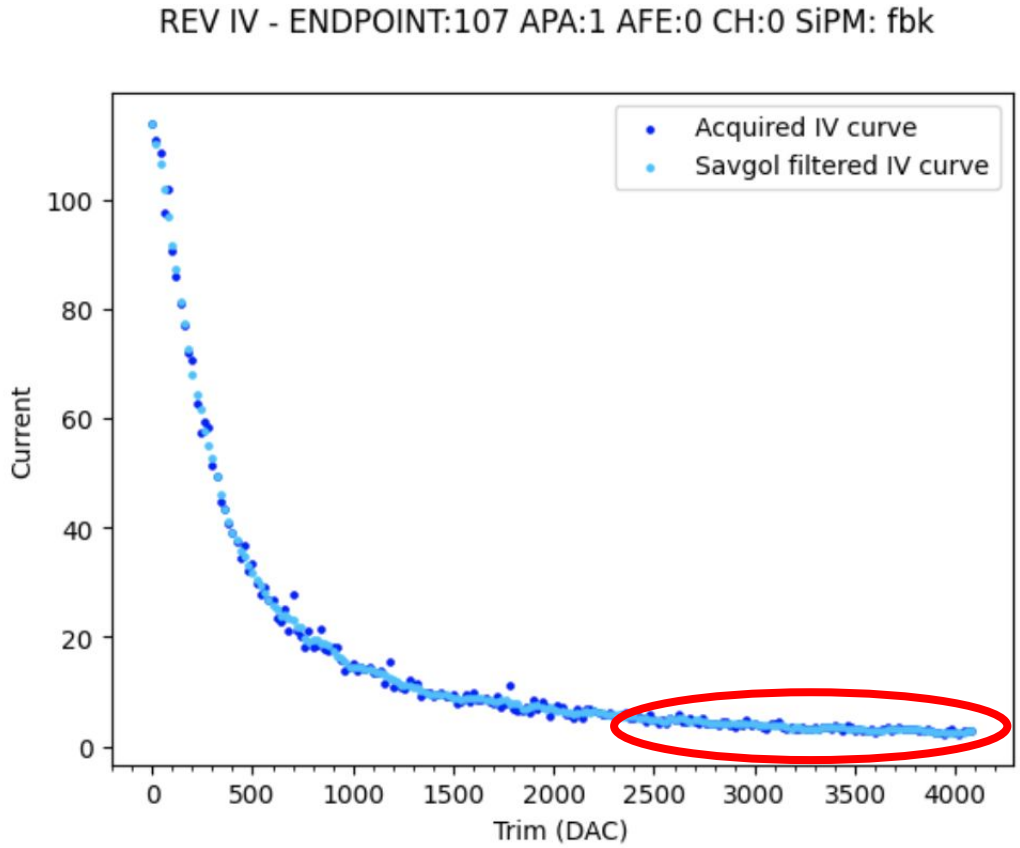
Linear fit values of V vs DAC using Bias (IP: 109)

AFE 0
AFE 1
AFE 2
AFE 3
AFE 4





ENDPOINT 107 - noise problem



Current is never lower than 2 mV

⬇️

Noisy channel

⬇️

Vbd is hard to be determined

V_{bd} computation and json file

Output from iv_analysis.py gives a *_map.json for each end-point with the V_{bd} computed with both fits and the averaged (suggested) value.


```
{"apa": 1,
"fbk": [0, 1, 2, 3, 4, 5, 6, 7],
"hpk": [8, 9, 10, 11, 12, 13, 14, 15],
"fbk_value": 1060,
"hpk_value": 1560,
"Vbd_per_AFE": [946.25, 1372.5],
"Overvoltage": [75.57268016512126, 67.49634065686702],
"FBK_Vbd_trim": [498.0607801439446, 743.1285751459079, 305.9967112752274, 781.9799259163103,
293.1263805685769, 302.1162747168664, 285.8873496807448, 395.1923759082806],
"HPK_Vbd_trim": [1315.0011241755608, 900.062407261619, 1322.2926490344516,
1378.5511306855765, 864.5304233641641, 1358.9195448734456, 0.0, 1309.6469822618294],
"run": "Apr-09-2024_1155"}
```