

Ongoing activities for PNS for PDS calibration run

Ajib Paudel (On behalf of PNS for PDS group)

PNS runs:

All the run numbers and details are filled in the google spreadsheet by Sam

https://docs.google.com/spreadsheets/d/1UbbC-N2yJ7k_QW4HT-eM1Flrzd2dG26-IBIFAHH8Ew/edit#gid=1222608845

Quick Summary table made by Vitaliy:

Run No	Configuration	Trigger	Length
25036	TPC+PDS	4Hz	5h
25050	TPC+PDS	4Hz	5h
25068	TPC+PDS	4Hz	4h
25071	TPC+PDS	4Hz	3h
25080	PDS	40Hz	4h

24034

PDS+TPC

4 Hz

<30 min

Analysis frameworks:

PDS: DAQ produces hdf5 files which has information from PDS and CRP readouts

(for PDS data):

→ Sam decoded the hdf5 files into Python .npz files, which are available in lxplus machines.

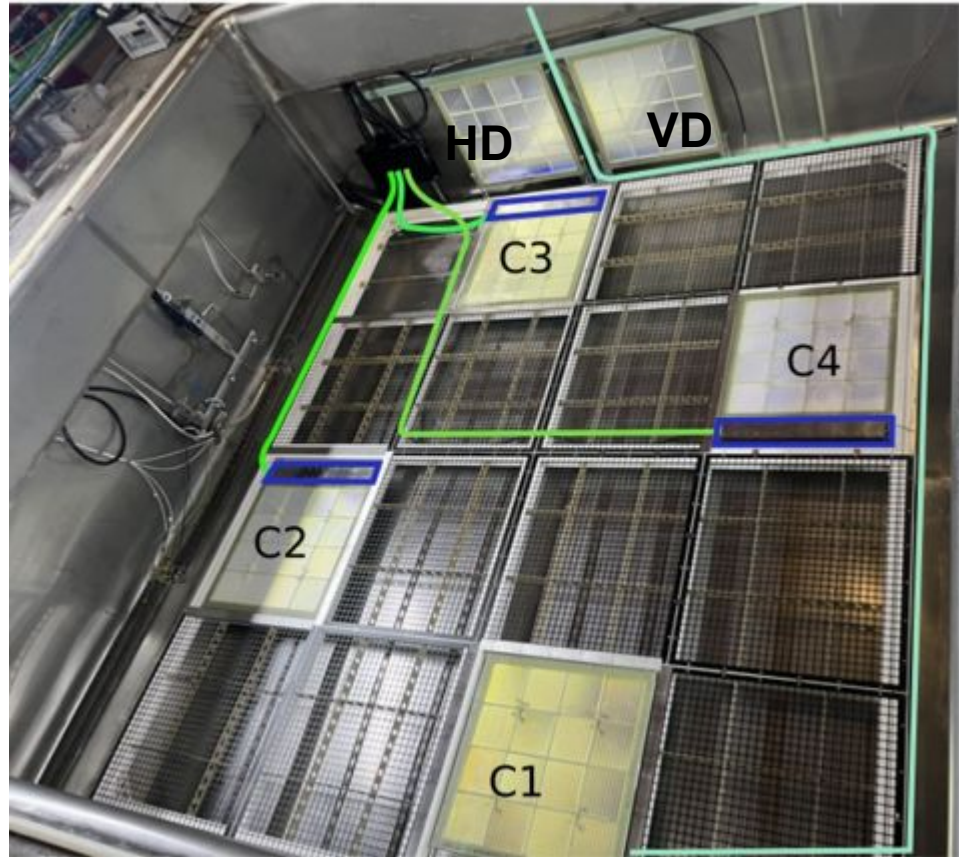
→ Laura Zambelli has developed lardon framework (python based framework to analyze LAr experiment), and kindly provided us examples and instructions to access the information from hdf5 file.

→ LArSoft decoder (from Jake) now working with correct channel map; using the decoded files I dump waveforms from all DAPHNE channels into a root file using LArSoft analyzer code.

(for CRP data)

→Lardon framework from Laura, Wei has been looking into the hits using the framework

→LArSoft, I have written a LArSoft script to get the CRP information. Currently, I have only hit information; working to expand the code to include more details.



HD

VD

C3

C4

C2

C1

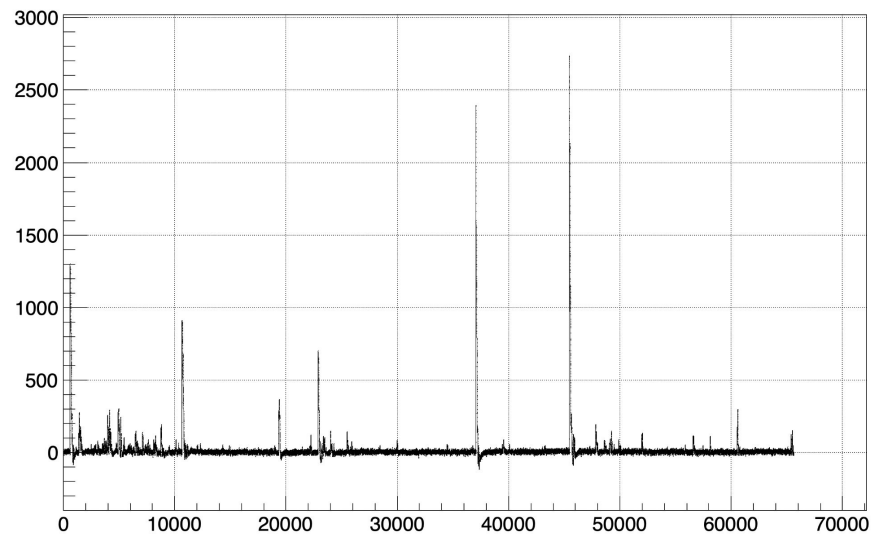
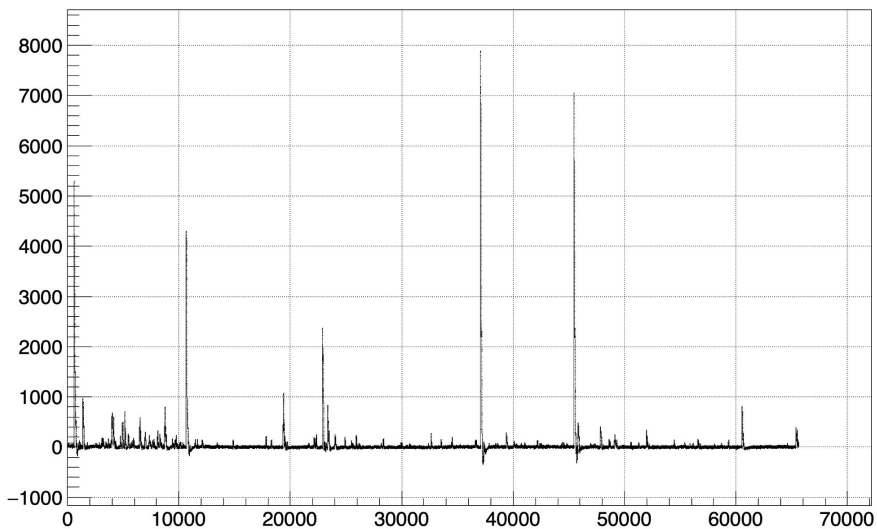
← PNS

Looking at PDS waveforms from each channel:

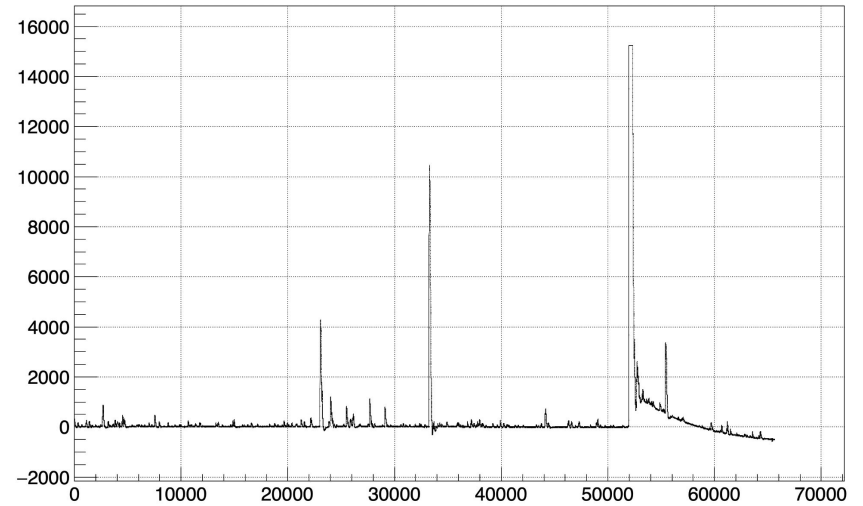
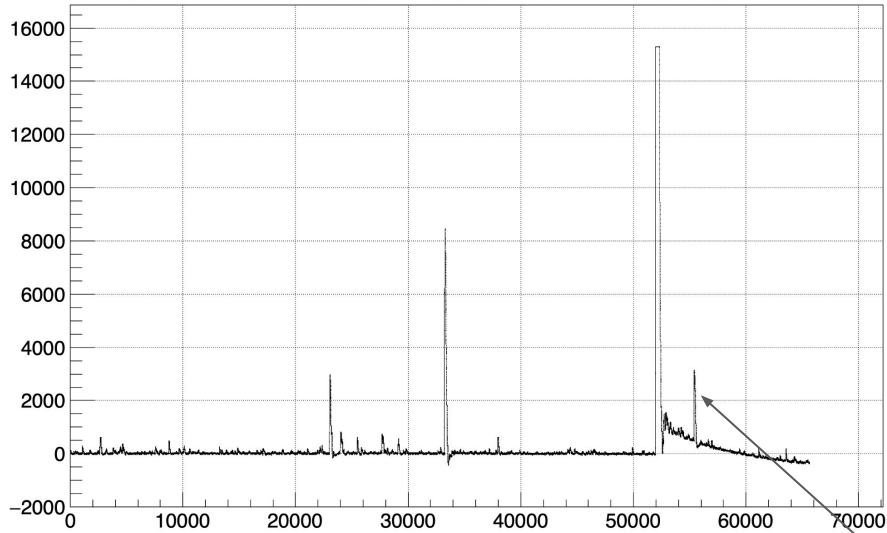
Channel 40

C4 → closest to PNS

Channel 47

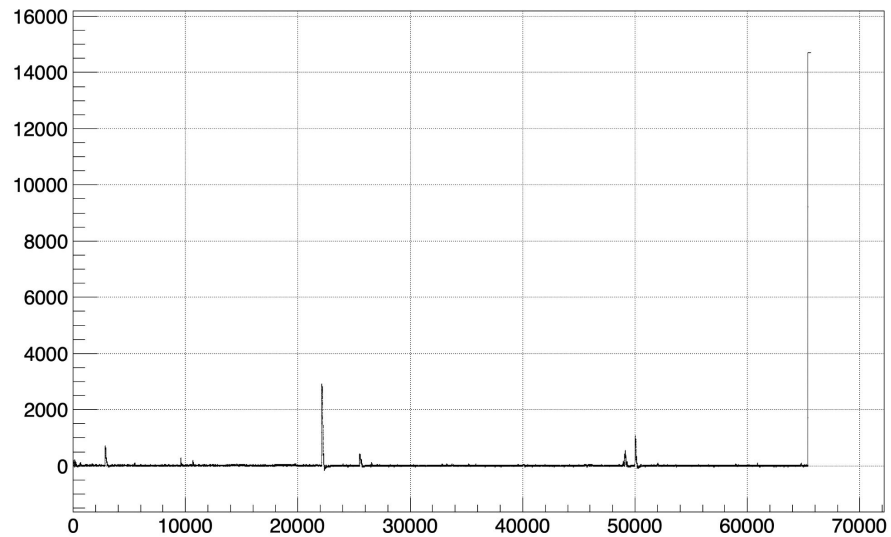
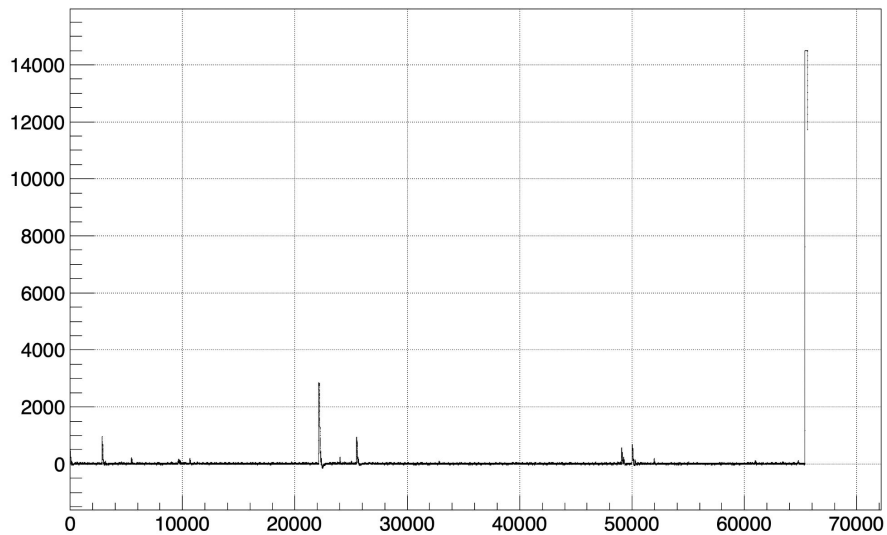


C1 (ch 0, 7) → Second closest to PNS

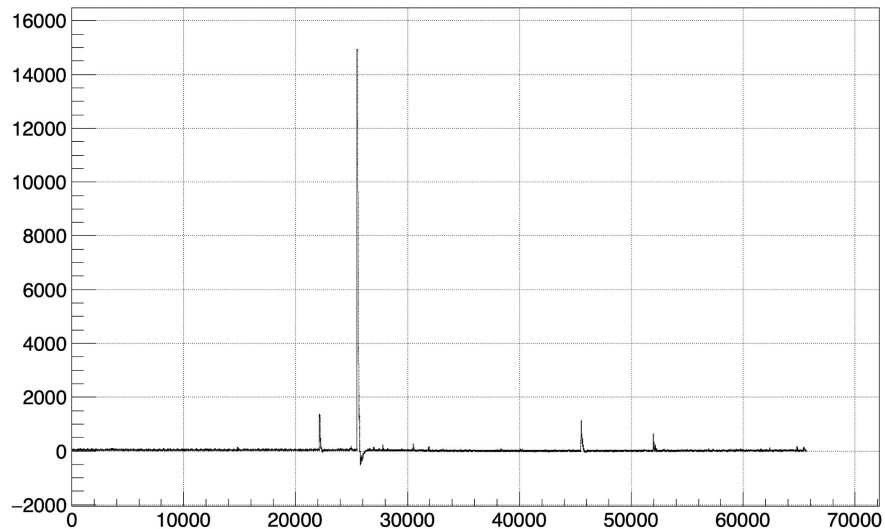
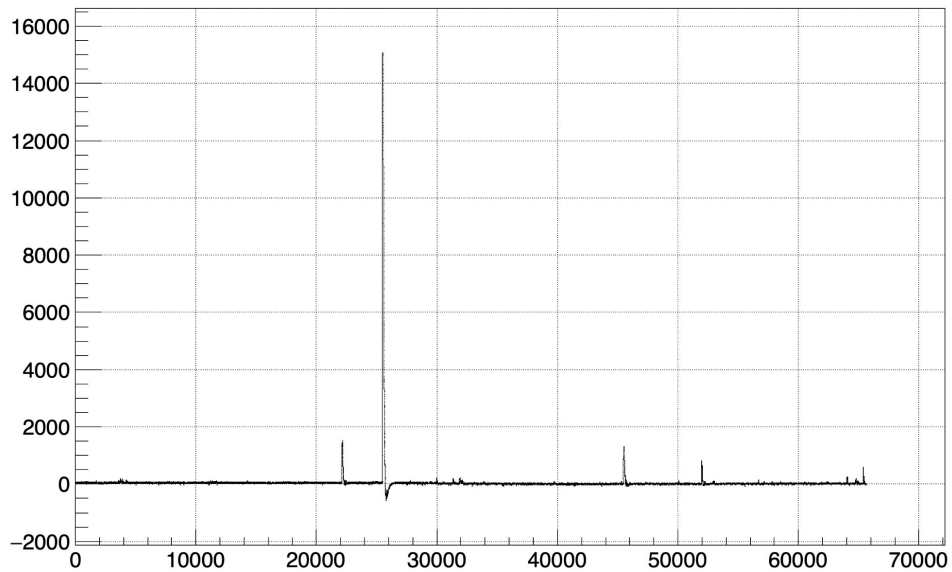


Possibly a Michel electron candidate

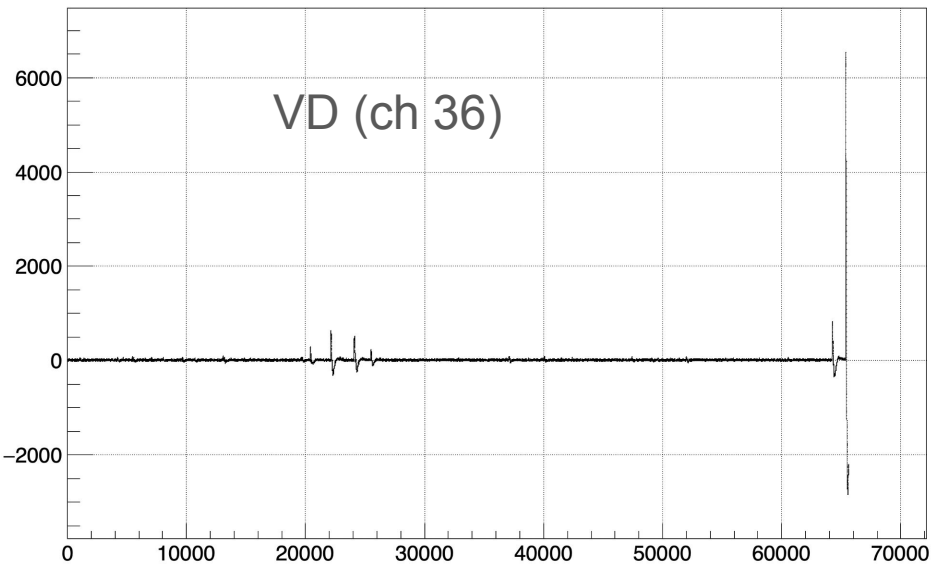
C3 Channel 20-27



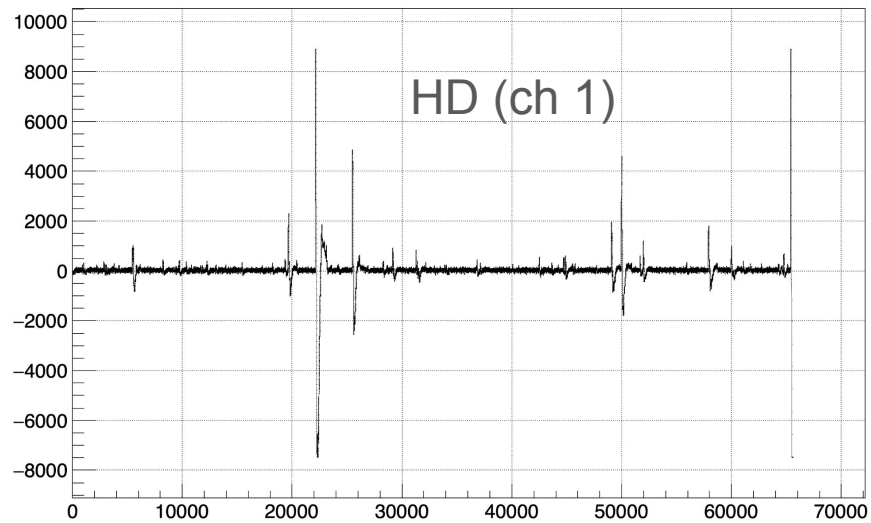
C2, Channel 10-17



VD (ch 36)

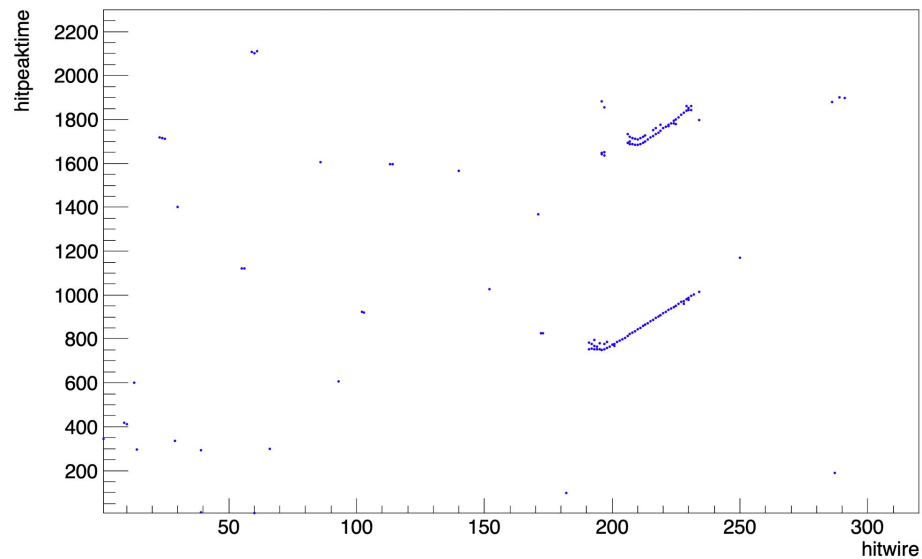


HD (ch 1)



CRP hits for the same event:

hitpeaktime:hitwire {hitplane==2}

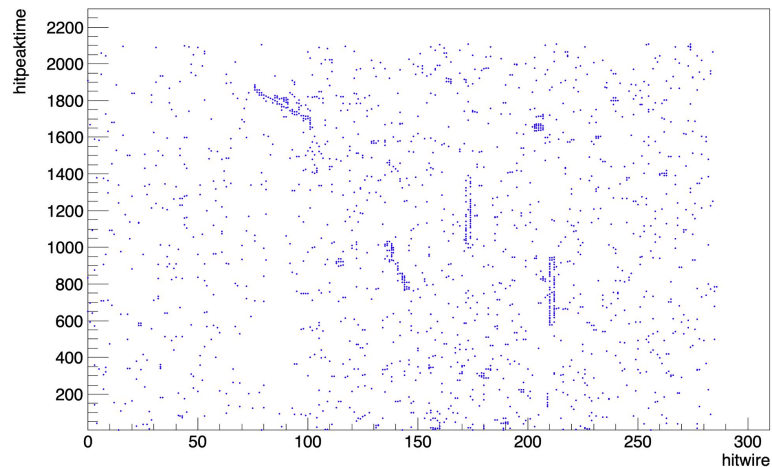


Collection plane

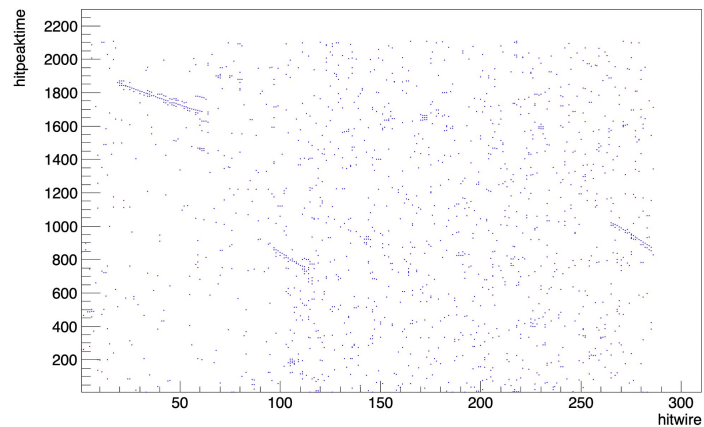
Induction channels looks noisier, more investigation ongoing to understand it.

induction planes

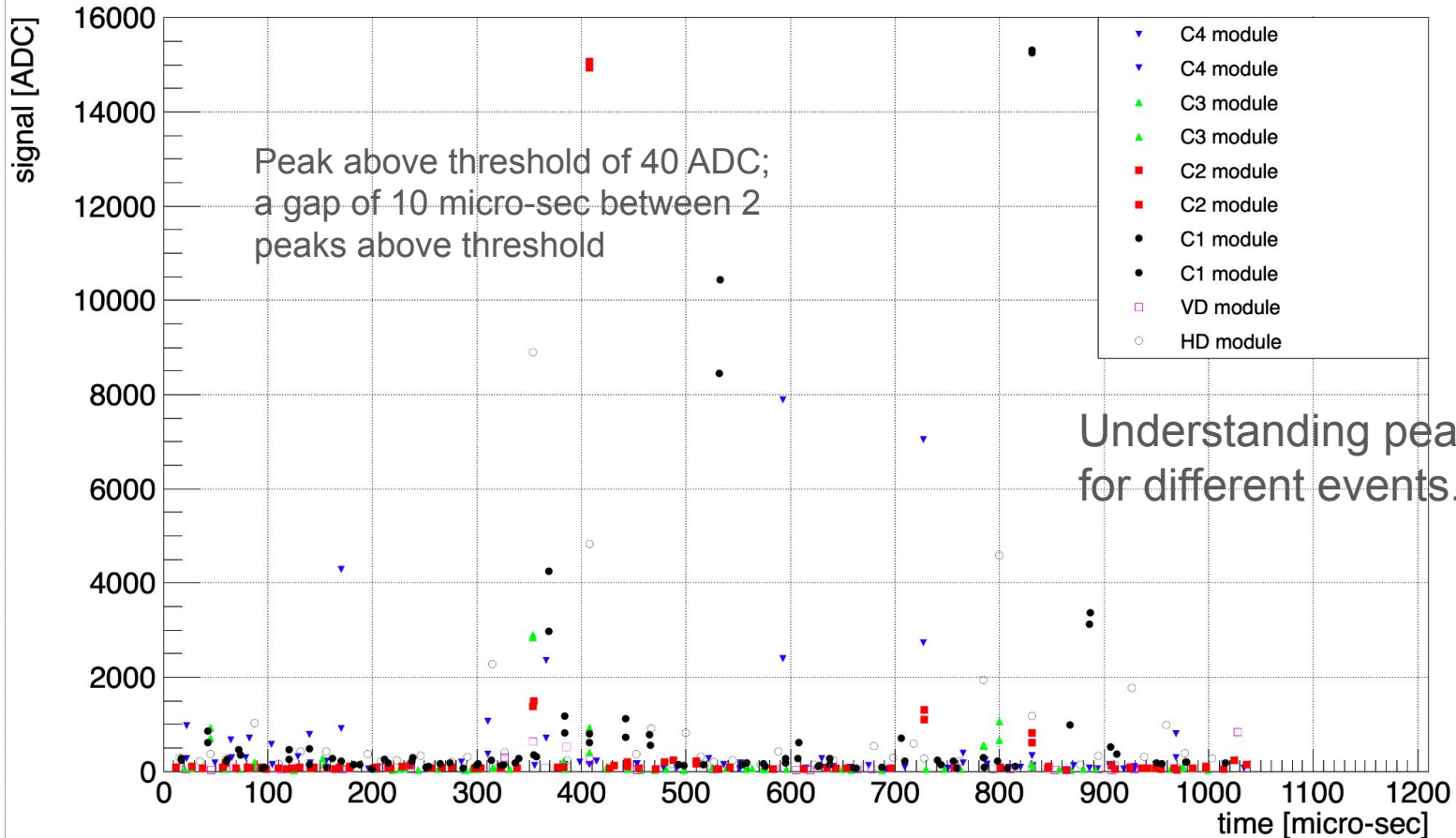
hitpeaktime:hitwire {hitplane==0}



hitpeaktime:hitwire {hitplane==1}



time vs peak values



Summary:

→ Looking at PNS data using LArSoft and Lardon tools

→ FLUKA and Geant4 simulation ongoing

→ Data gives an opportunity to study low energy physics in LArTPC and developing tools for PDS+CRP matching

Goals: Identifying neutron capture signals

Understanding calorimetric energy reconstruction in the few MeV scale

→ The studies will be challenging, more so because the shape of the waveforms have undershoot and deconvolution will be needed for Light yield measurement.

→ At the moment we are doing full photon simulation at the truth level and counting the photons reaching hitting the detectors. It is desirable to have a more realistic simulation of the waveforms similar to that observed in data and comparison of simulation and data.