WEEKLY ANALYSIS UPDATE

09 Dec 2024

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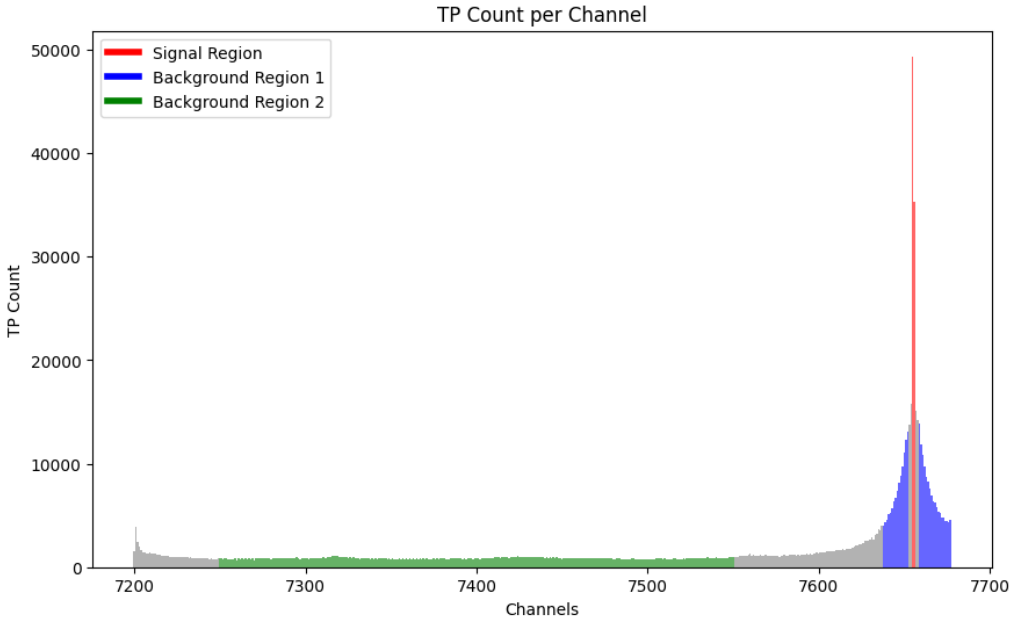
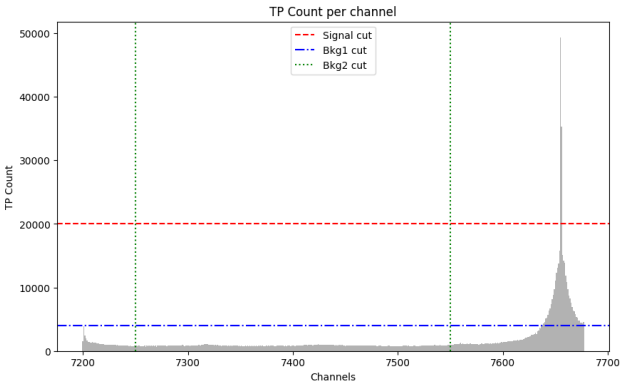
Updates of the week

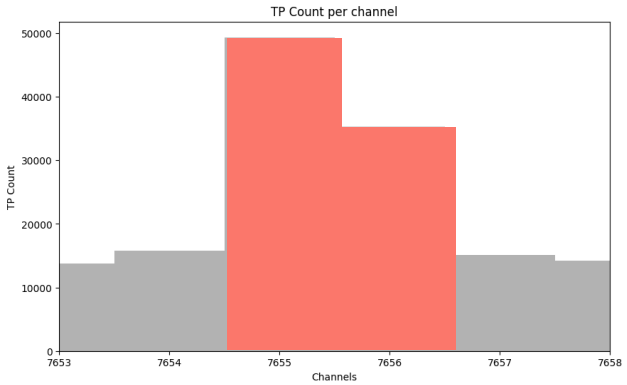
1. TP stream files for APA 2 channels for run 026482
2. Statistics from TPstream files are significantly high
3. Set of Background TPs:
    1. Clustering to remove data from cosmics
    2. Zoom in on Bismuth active region
4. Plotting ADC value histogram for signal (Bismuth) and background region
5. To get only Bismuth TPs: Subtraction of the expected background TPs in the signal region to estimate only Bismuth TPs

TP Count per Channel

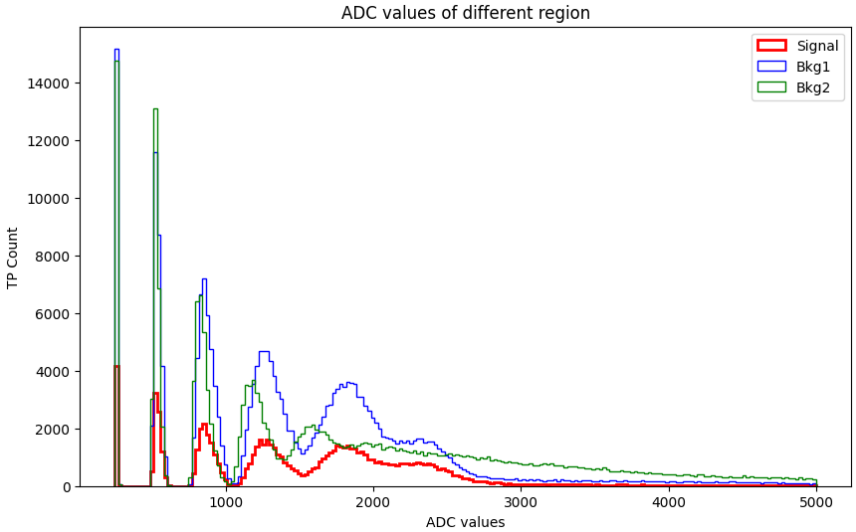
- Datafile: Three tpstream.hdf5 datafiles from run 26482
- Data read using *justintime* package only from APA 2 collection channels
- Collection TPs that are recorded before being passed to Trigger
- Selection:
  - Signal selection: TP count > 20000
  - Background selection:
    - Region 1: TP count > 4000
    - Region 2: Visible flat region



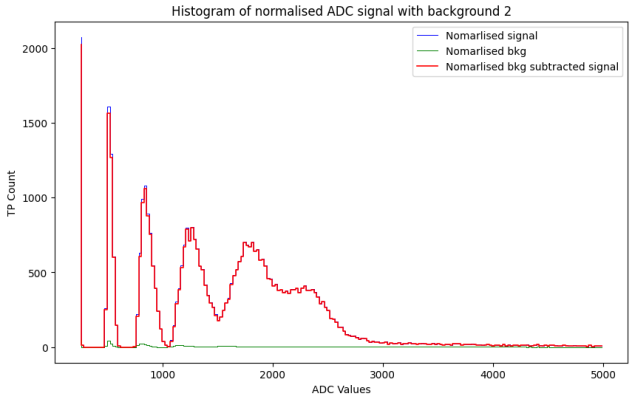


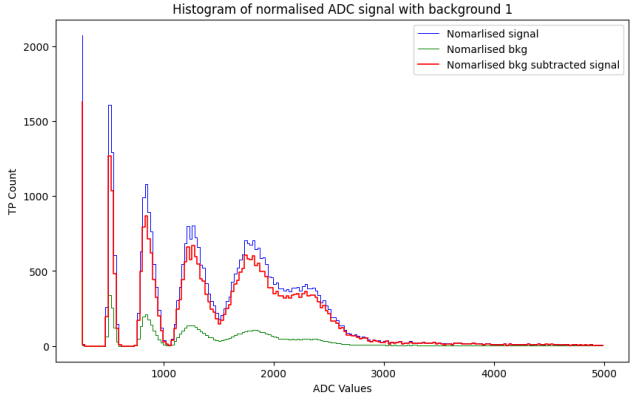


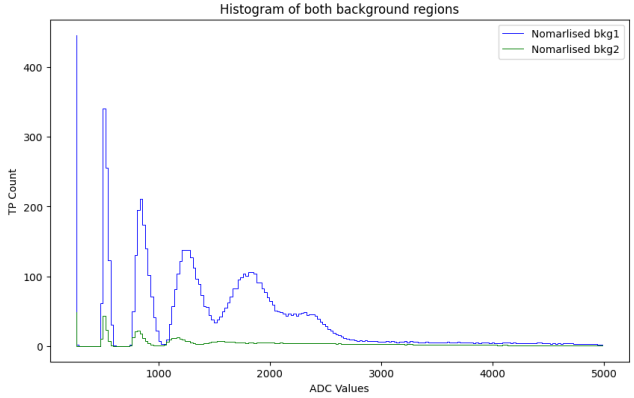
TP ADC Histogram



- Bin-width = 25
- Normalisation by channel number
- Channel numbers:
  - Signal: 2
  - Background 1: 34
  - Background 2: 300



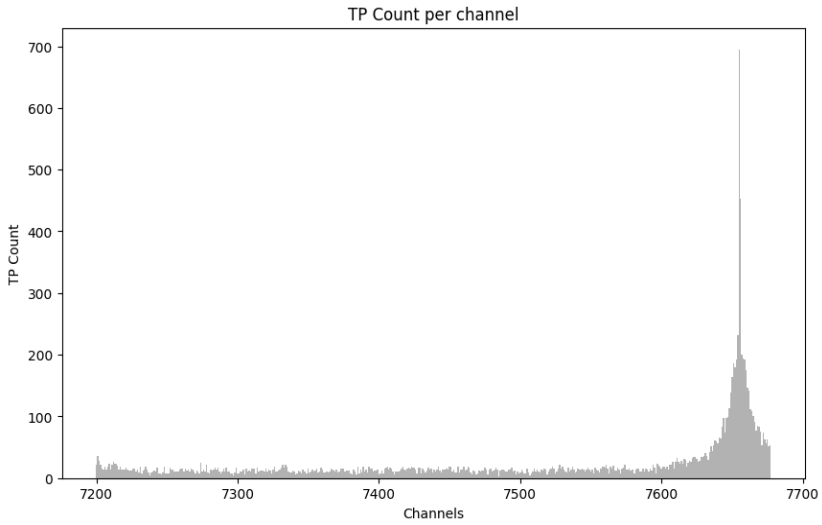


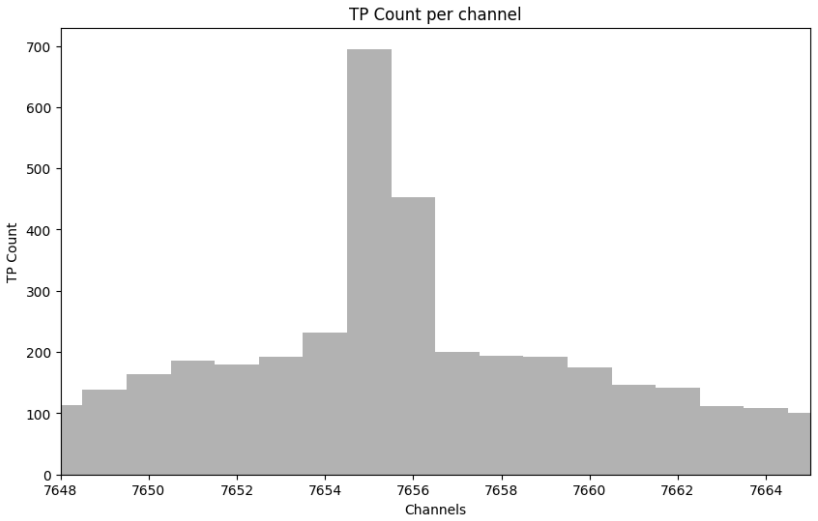


THANK YOU!

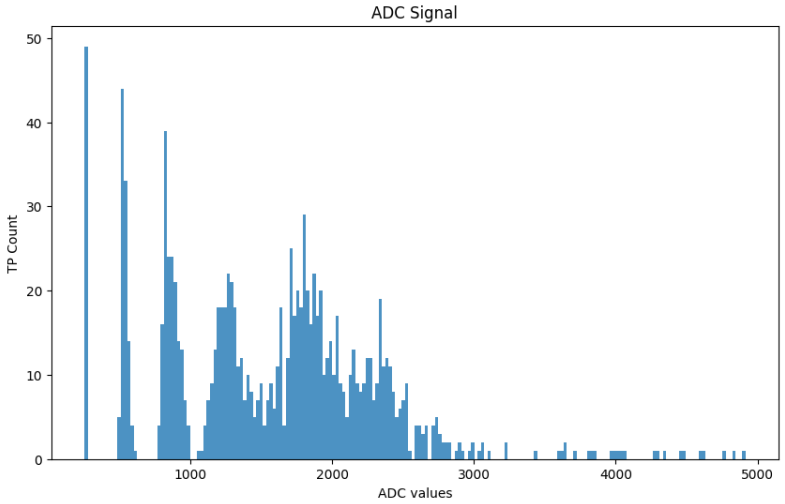
TP Count per Channel

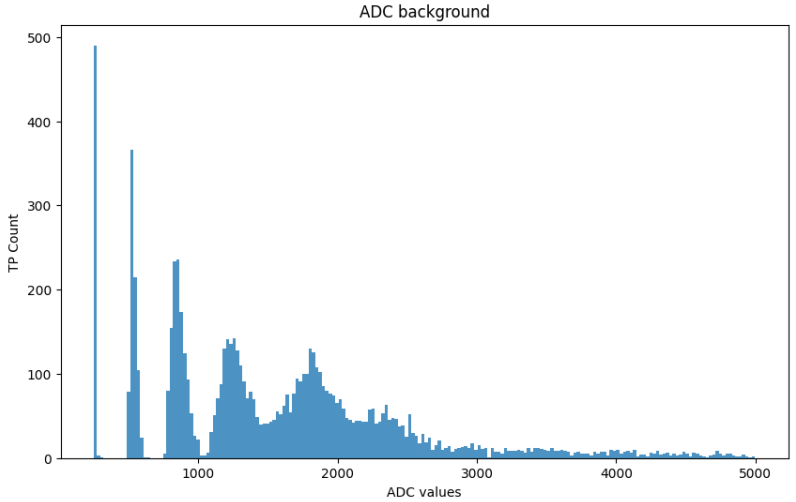
- Datafile: 10 sub-runs of run number 26482 off beam data
- Data read using *justintime* package only from APA 2 collection channels
- Emulated Collection TPs using *TPGSandbox* with Simple Threshold (=250) algorithm
- Selection:
  - Signal TPs from channel 7655 and 7656 (from visual inspection)
  - Channels with TP count > 100 are removed from rest to get Background





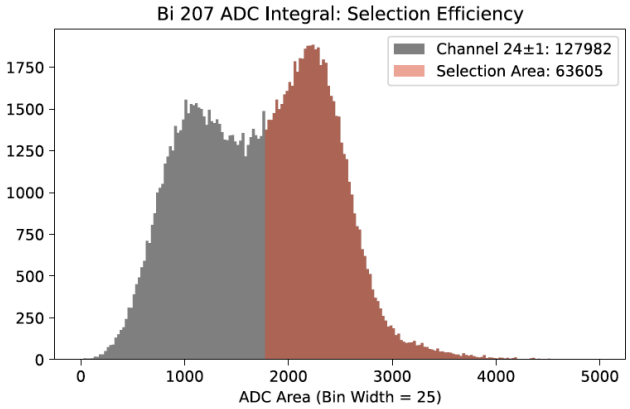
TP ADC Histogram





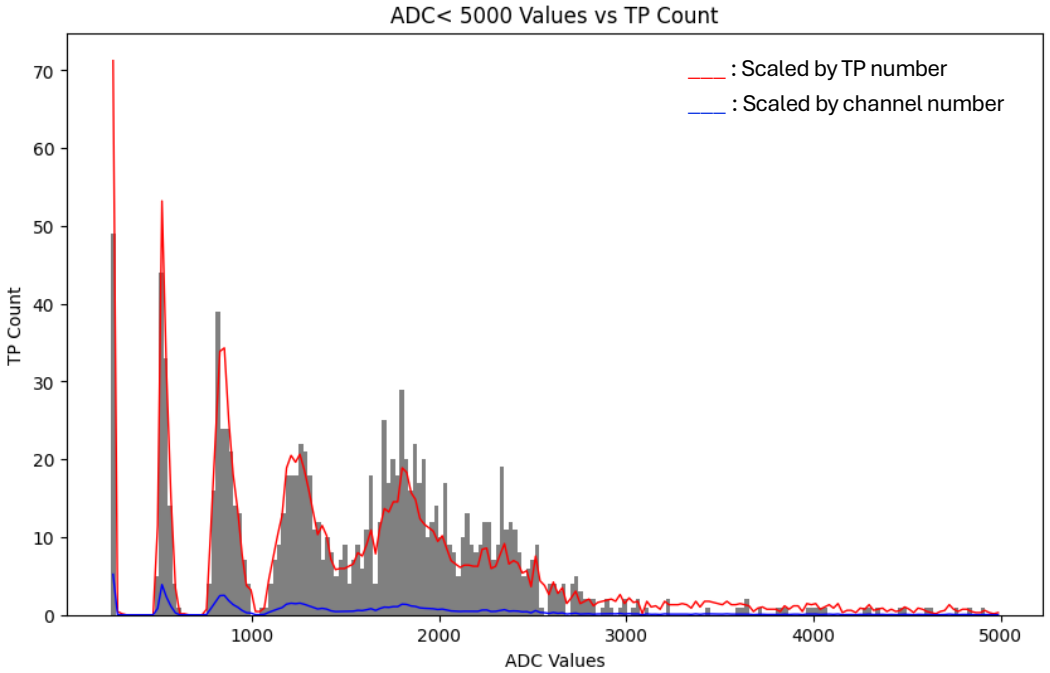
Bins = 200 to match Alex's plot

- ADC integral distribution of TPs from Signal (left) and Background (right)
- TP numbers after selection:
  - For signal: 1148
  - For background: 7895

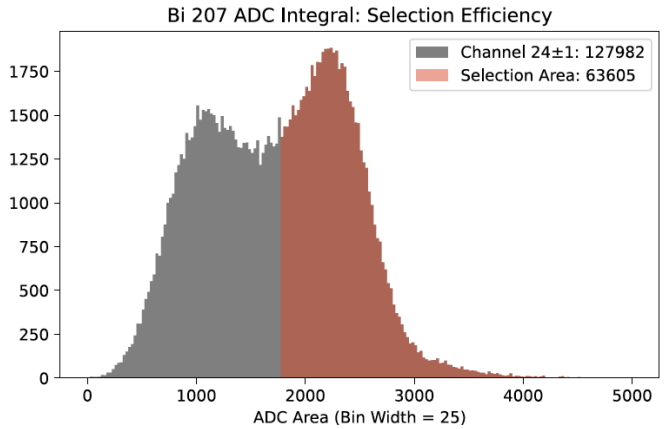


Link to Alex's presentation

Bismuth ADC Histogram



- ADC integral distribution of Bismuth region TPs
- Extrapolated background distribution using two different parameters



Link to Alex's presentation

Outline of Bismuth TP Analysis

1. Raw data for APA 2 channels for run 026482 TR datafile
2. Analysis with more data:

```
channel_map = detchannelmaps.make_map("PD2HDChannelMap")

fp1 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0000_dataflow0_datawriter_0_20240528T145108.hdf5.copied"
fp2 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0002_dataflow0_datawriter_0_20240528T150028.hdf5"
fp3 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0003_dataflow0_datawriter_0_20240528T150508.hdf5"
fp4 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0004_dataflow0_datawriter_0_20240528T150948.hdf5"
fp5 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0005_dataflow0_datawriter_0_20240528T151428.hdf5"
fp6 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0008_dataflow0_datawriter_0_20240528T152828.hdf5"
fp7 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0009_dataflow0_datawriter_0_20240528T153308.hdf5"
fp8 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0011_dataflow0_datawriter_0_20240528T154228.hdf5"
fp9 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0012_dataflow0_datawriter_0_20240528T154708.hdf5"
fp10 = "/cephfs/dice/users/gj23442/protodune-data/hd-protodune/np04hd_raw_run026482_0017_dataflow0_datawriter_0_20240528T161028.hdf5"

# List of file paths
file_paths = [fp1, fp2, fp3, fp4, fp5, fp6, fp7, fp8, fp9, fp10]
```

3. Set of Background TPs:
    1. Clustering to remove data from cosmics
    2. Zoom in on Bismuth active region
4. Plotting ADC value histogram for signal (Bismuth) and background region
5. To get only Bismuth TPs: Subtraction of the expected background TPs in the signal region to estimate only Bismuth TPs

Steps for accessing ProtoDUNE data in DICE: Rucio

Use metacat to find the files and rucio to locate where they are stored and also download
Requirements: FNAL Username and Password (both Services and Kerberos)
Get list of datafiles from here: https://metacat.fnal.gov:9443/dune_meta_prod/app/gui/datasets
List of commands:

```
. /cvmfs/larsoft.opensciencegrid.org/spack-packages/setup-env.sh
spack load r-m-dd-config experiment=dune
spack load kx509
kinit <FNAL_username>@FNAL.GOV
kx509
export ROLE=Analysis
voms-proxy-init -rfc -noregen -voms=dune:/dune/Role=$ROLE -valid 120:00
export RUCIO_ACCOUNT=<fnal_username>
rucio whoami
rucio list-file-replicas <detector-source>:<file-name>*
rucio download <detector-source>:<file-name>
```

* Example: hd-protodune:np04hd_raw_run026482_0002_dataflow0_datawriter_0_20240528T150028.hdf5

Steps for accessing ProtoDUNE data in DICE

In Alma9 (done in sc01):

Requirements: Fermilab username and Kerberos password

Get list of datafiles from here: https://metacat.fnal.gov:9443/dune_meta_prod/app/gui/datasets

List of commands:

```
. /cvmfs/larsoft.opensciencegrid.org/spack-packages/setup-env.sh
spack load metacat
spack load kx509
kinit <username>@FNAL.GOV
kx509
export ROLE=Analysis
voms-proxy-init -rfc -noregen -voms=dune:/dune/Role=$ROLE -valid 120:00
export METACAT_AUTH_SERVER_URL=https://metacat.fnal.gov:8143/auth/dune
export METACAT_SERVER_URL=https://metacat.fnal.gov:9443/dune_meta_prod/app
metacat auth login -m password <fnal_username>
metacat query "files from dune:all where core.file_type=detector \
  and core.run_type=hd-protodune and core.data_tier=raw \
  and core.data_stream=cosmics and core.runs[any]=27296 limit 2”
```

* Further metacat operating instructions: Here