Deconvolution ProtoDUNE-HD

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Overview:

Goal: Test the digitizer and deconvolution modules for ProtoDUNE-HD.

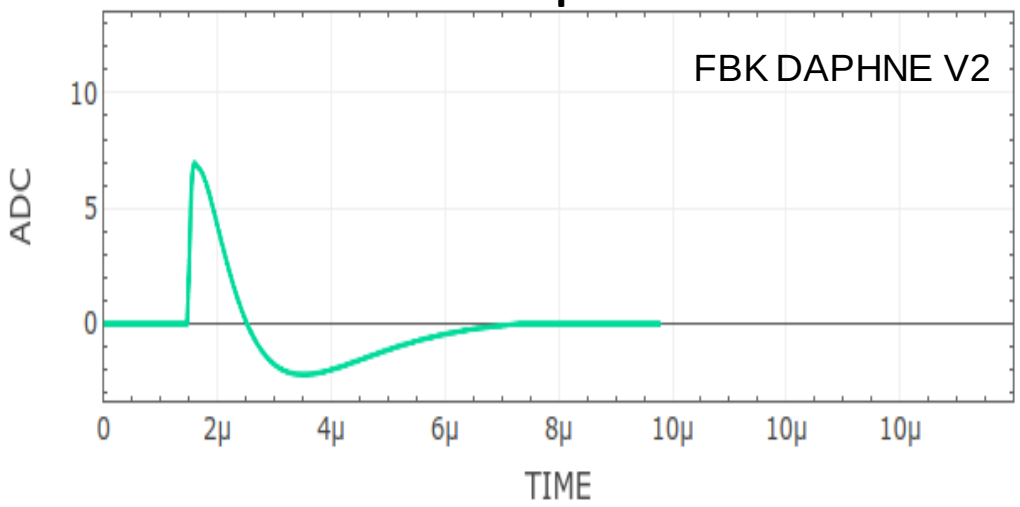
- ProtoDUNE HD -> The X-ARAPUCA signals so far present an undershoot (bipolar signals).
- A deconvolution module is needed:
    - The deconvolution module created for DUNE FD-HD is being implemented for ProtoDUNE HD and VD, in order to provide better charge and arrival time reconstruction.

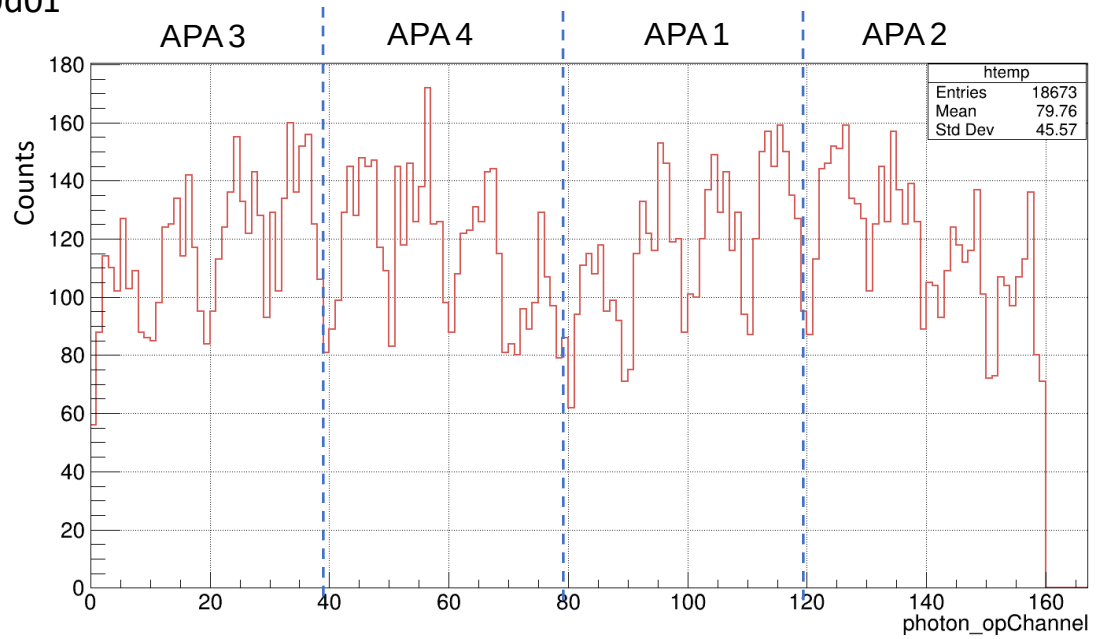
Worflow
gen_protodunehd_beam_cosmics_1GeV.fcl
protoDUNEHD_refactored_g4.fcl
protoDUNEHD_refactored_detsim.fcl
Deconvolution.fcl

Geometry
protodunehdv6_geo: @local::dune10kt_geo
protodunehdv6_geo.Name: "protodunehdv6"
protodunehdv6_geo.GDML: "protodunehd_v6_refactored.gdml"
protodunehdv6_geo.ROOT: "protodunehd_v6_refactored.gdml"

"larsoft_v09_81_00d01"

SPE template

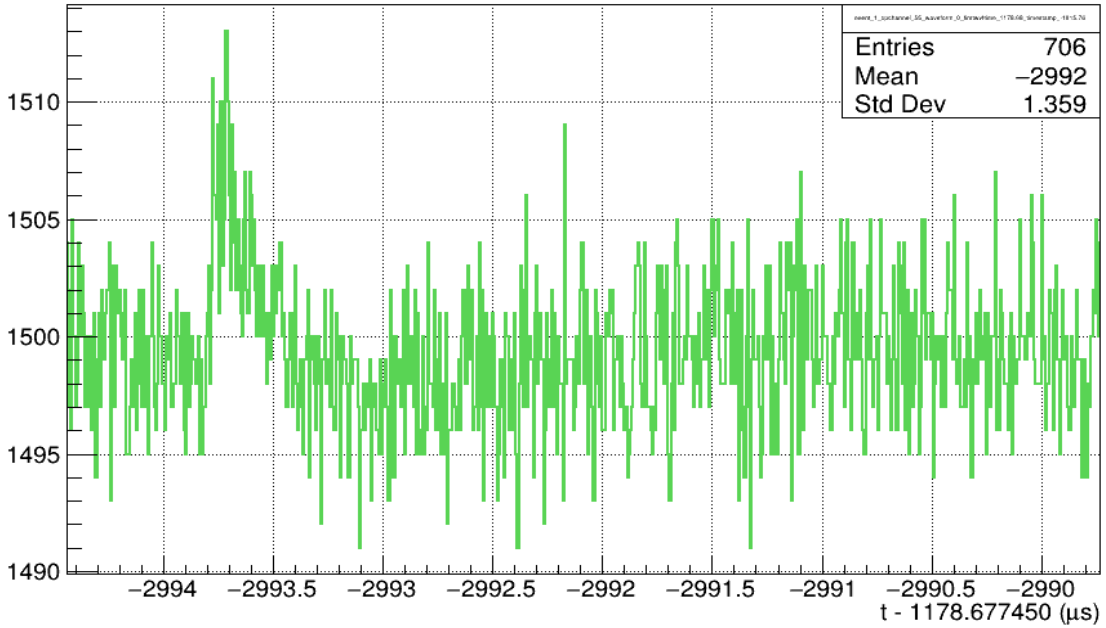




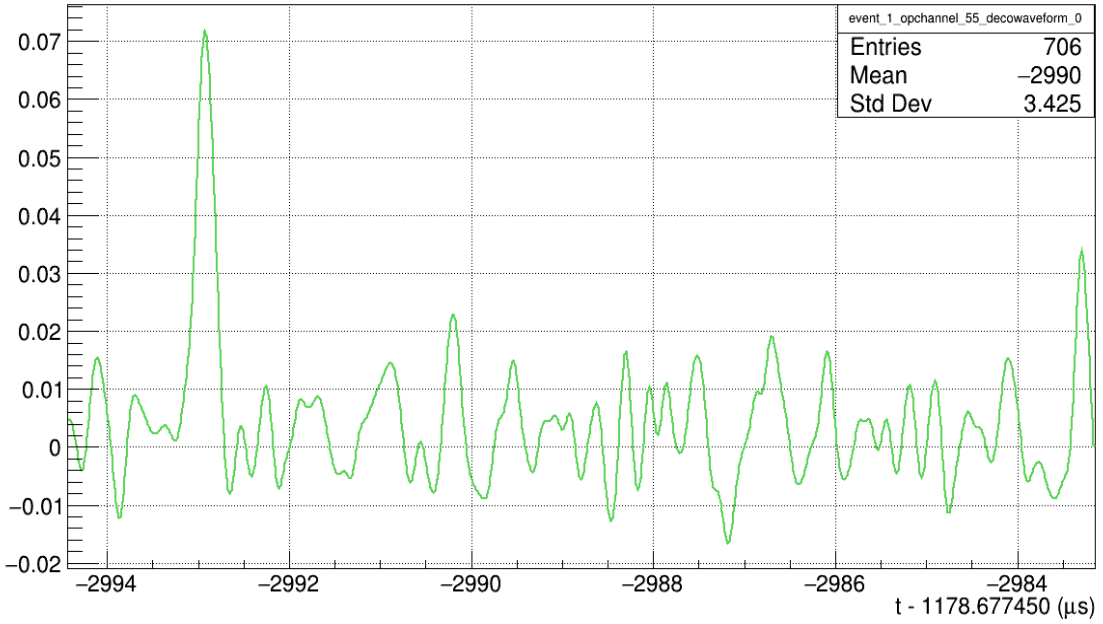
- Wvf amp ~7 ADC .
- Pulse width ~1us.
- All wvf evaluated at 45% PDE.

Module OutPuts

Digitizer module

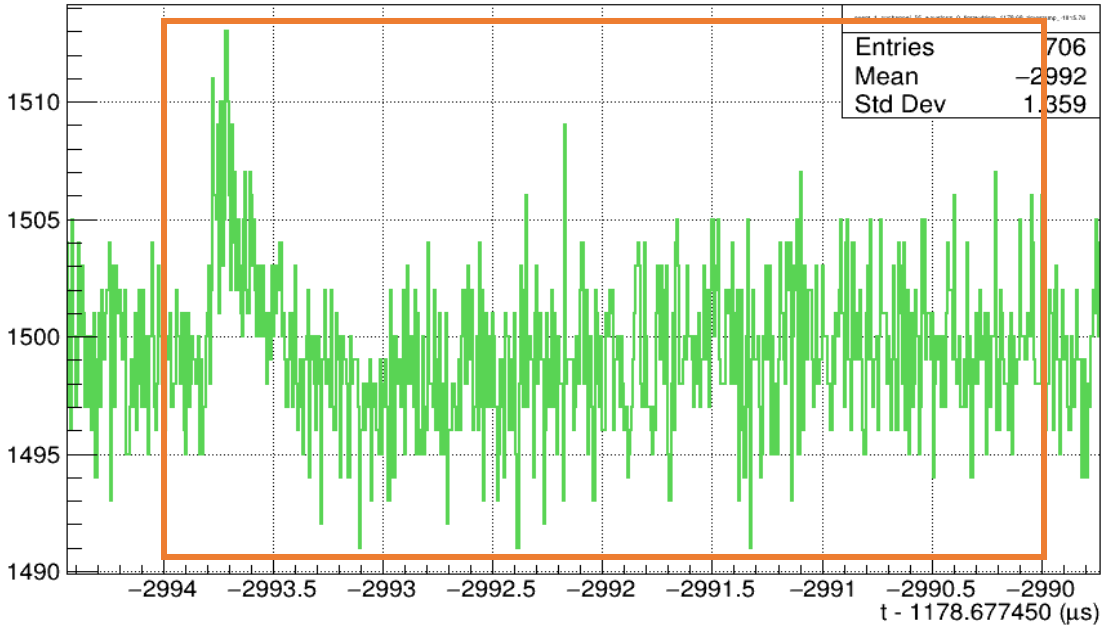


Deconvolution module

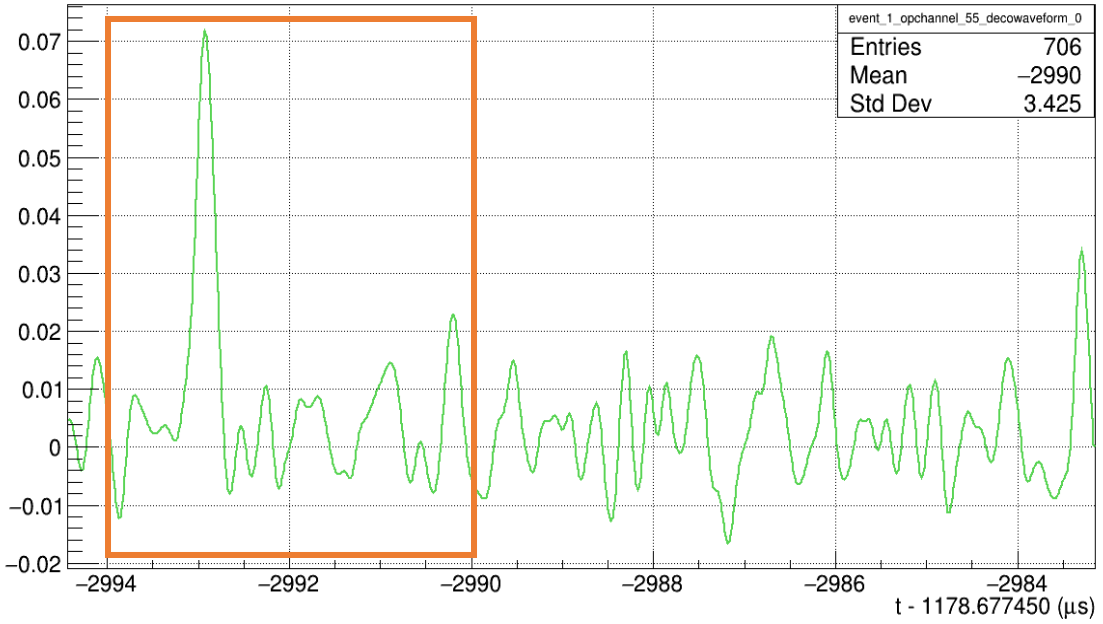


Module OutPuts

Digitizer module



Deconvolution module



TimeStamp class?

- raw:OpDetWaveform returns TimeStamp_t which is a double.
- recob::OpWaveform returns a raw::RDTimeStamp which returns a ULong64_t.

→ (Thanks to Jose Soto LArSoft/lardataobj#410) Changed TimeStamp of recob::OpWaveform from raw::RDTimeStamp to double to be consistent with raw::OpDetWaveform .

Next steps:

- Modify the lines in the Deconvolution and Ophitfinder module related to the TimeStamp_t and verify if this is the reason for the time difference in the waveforms.
- To complete the workflow: OphitFinder module.

Thanks!!