# SPE template Studies for ProtoDUNE-HD

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ProtoDUNE PDS Sim/Reco meeting
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MOTIVATION

- Generate the SPE templates per channel for the deconvolution module in LArSoft using PDS data (NP04 runs).

- DUNE X-ARAPUCA signals **have undershoot** .

- To better **estimate the total charge and time** of each pulse, a deconvolution needs to be implemented.

- SPE template was obtained using my modified version of the script written by Renan in Waffles.

- Waffles is the NP04/NP02 PDS analysis framework Written in python, initially developed by Julio Ureña with contributions with other ~10 person.
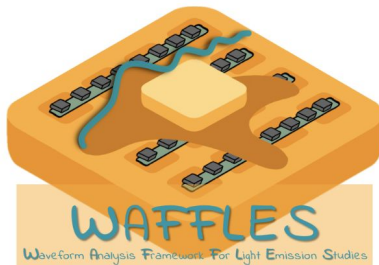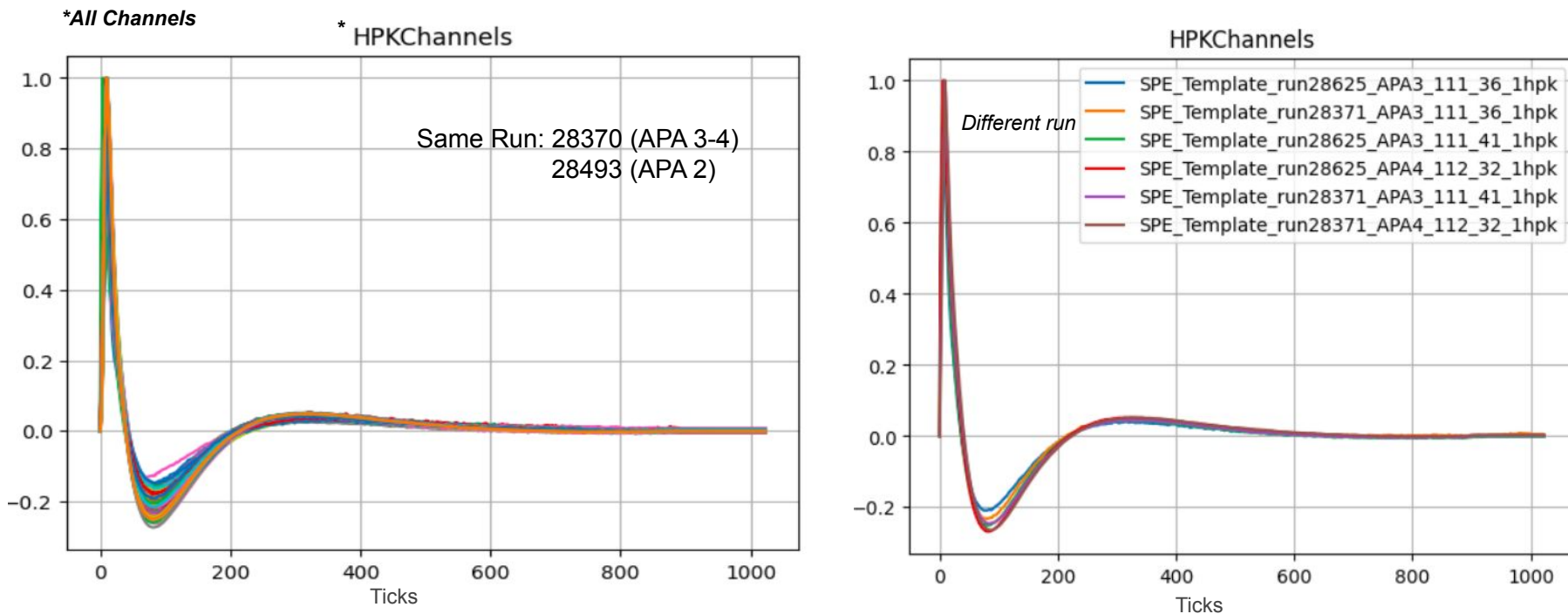
SPE template requirements in LarSoft
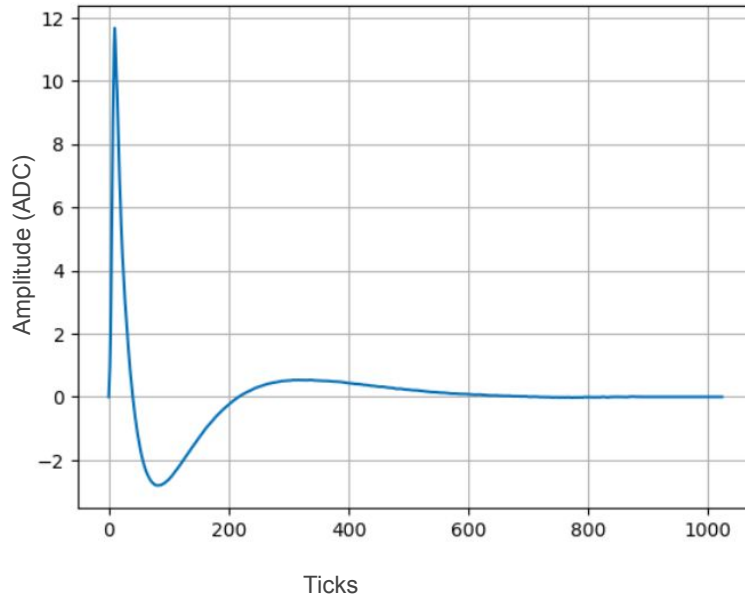
• 62.5 MHz sampling time (Digitizer and deconvolution module).

• 1024 ticks (ProtoDUNE data).

• Smooth.

• Without pretrigger. (Avoid time delay between true photons and signal peak).

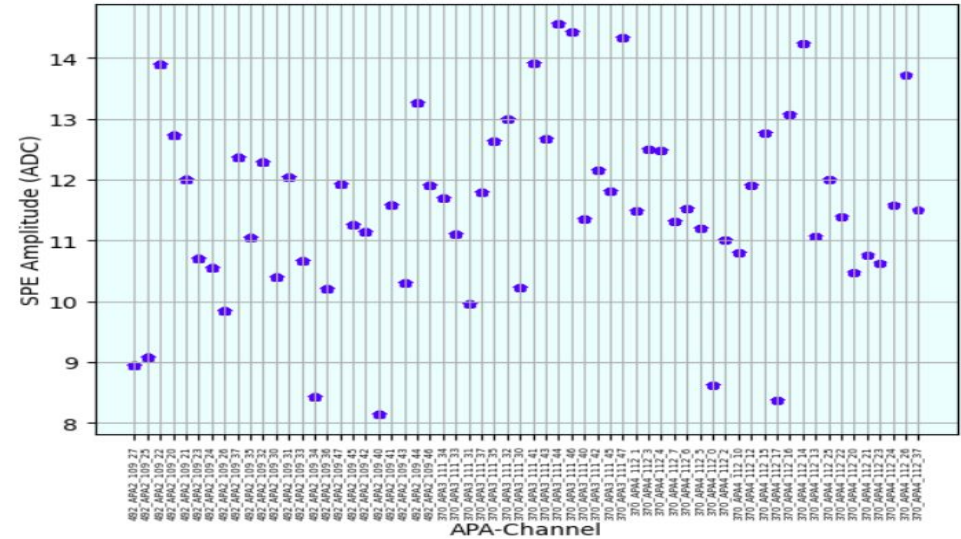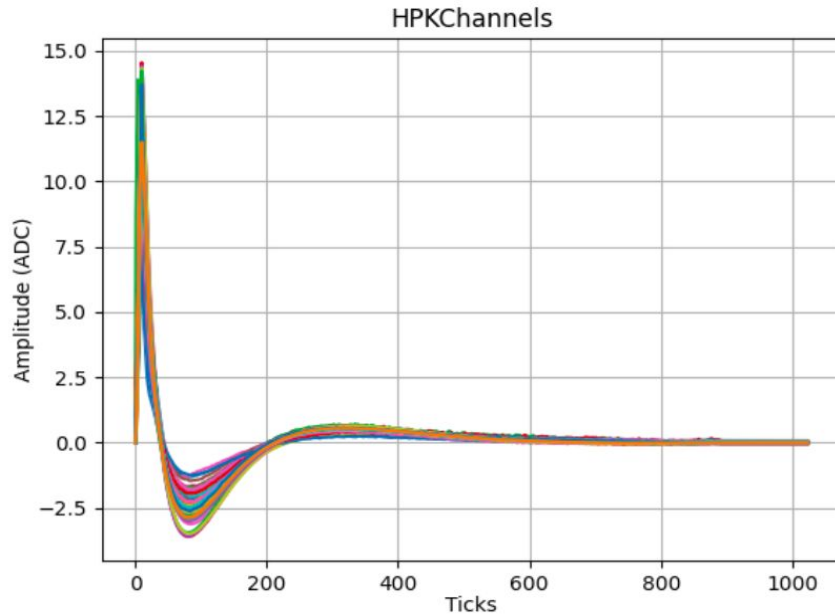• Template by manufacturer and by Channel (fbk and HPK).

Analysis of the shape of the SPE in HPK channels

All Channels
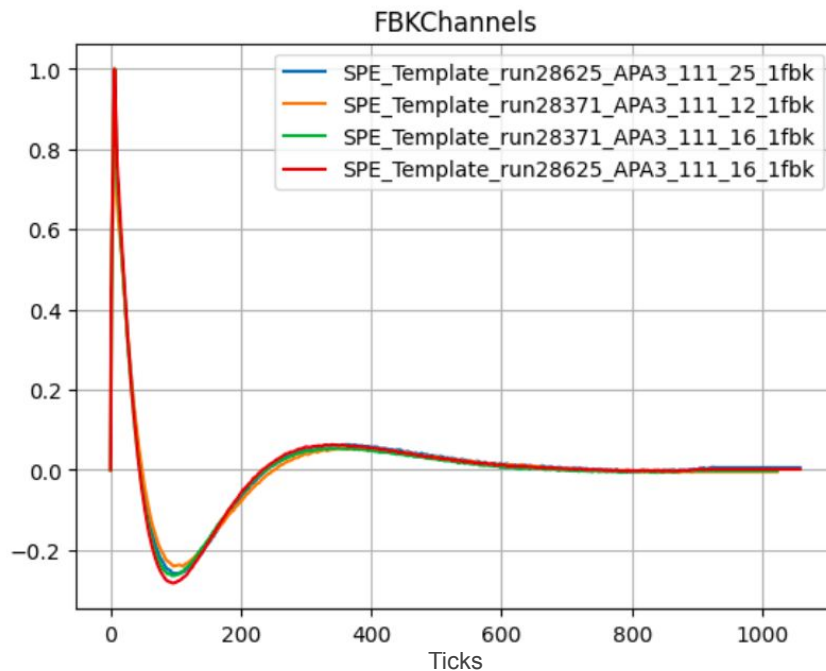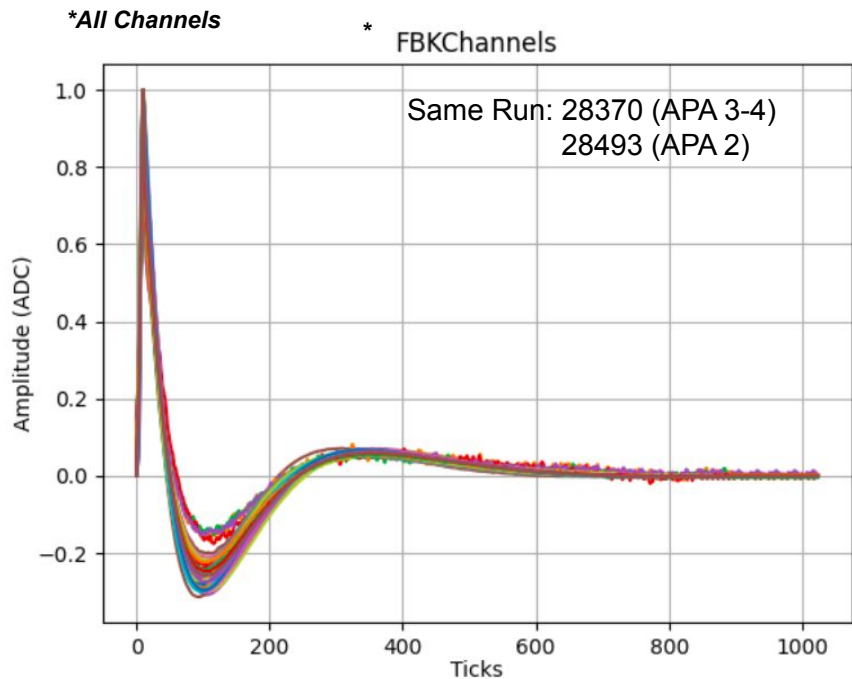

Single photoelectron normalized to 1

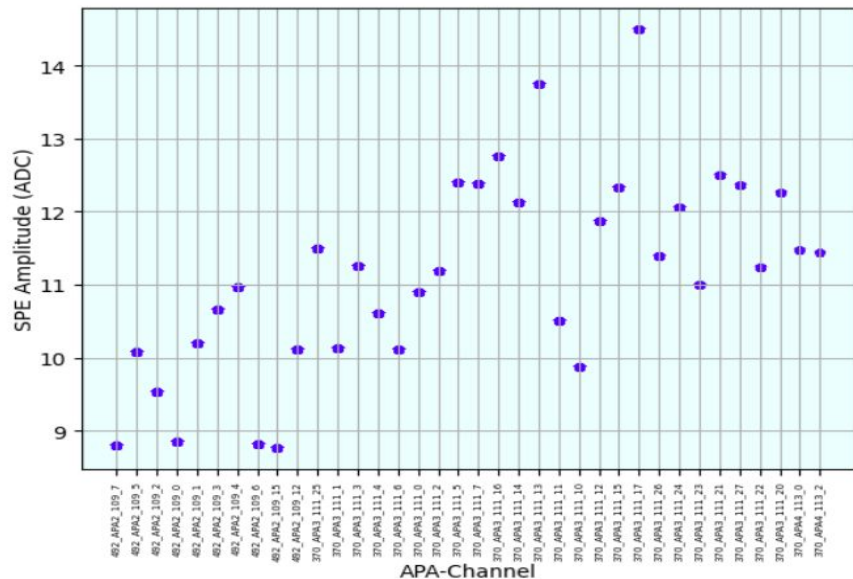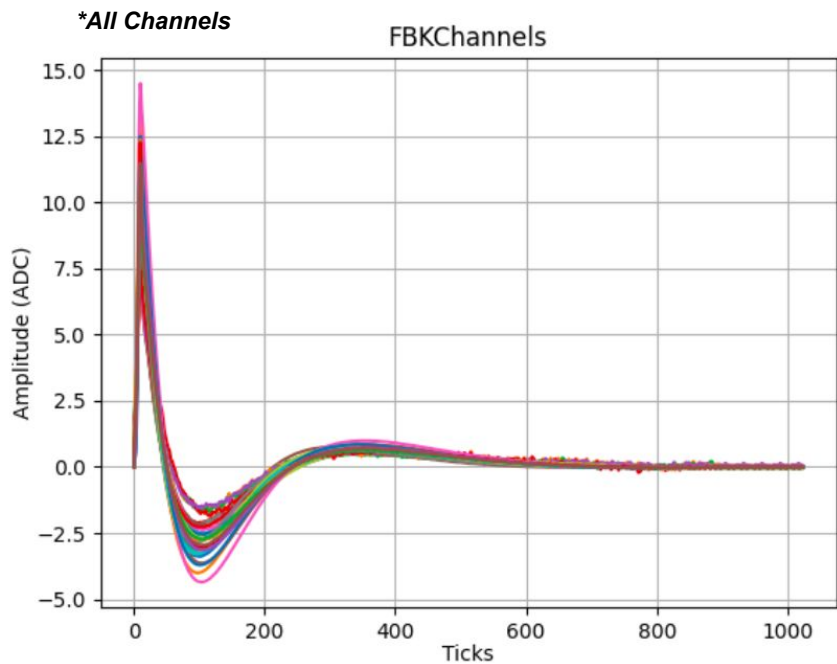# SPE amplitudes in all HPK channels

All Channels

Before VGain Tuning (See Federico's presentation Collaboration Meeting - Santa Fe)

Analysis of the shape of the SPE in FBK channels

Single photoelectron normalized to 1

SPE amplitudes in all FBK channels

All Channels

Before VGain Tuning (See Federico's presentation Collaboration Meeting - Santa Fe)

Channel Map

SPE templates "Noisy"

NEXT STEPS

- The SPE and Noisy templates were stored in */pnfs/dune/persistent/stash/ProtoDUNE/HD/*
  Thanks to Jose Soto and Ken Herner!!

- Verify that the deconvolution module works with the new SPE templates, especially the noisy ones.

- Analyze and Include some noise and SPE templates from the latest PDS runs

Thank you!!

Amplitude changes, same channel, different run.