PDS and TPC timing studies

Aleena Rafique

PDS working group meeting
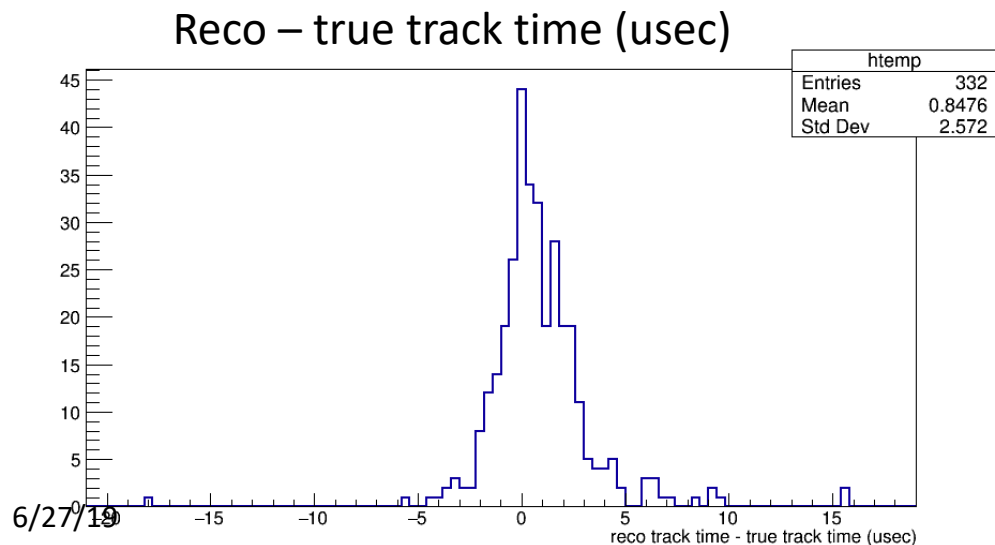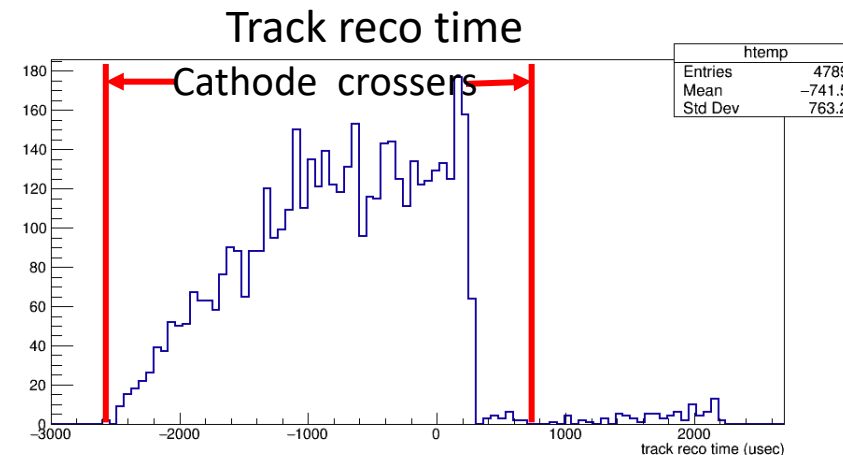
06/27/2019

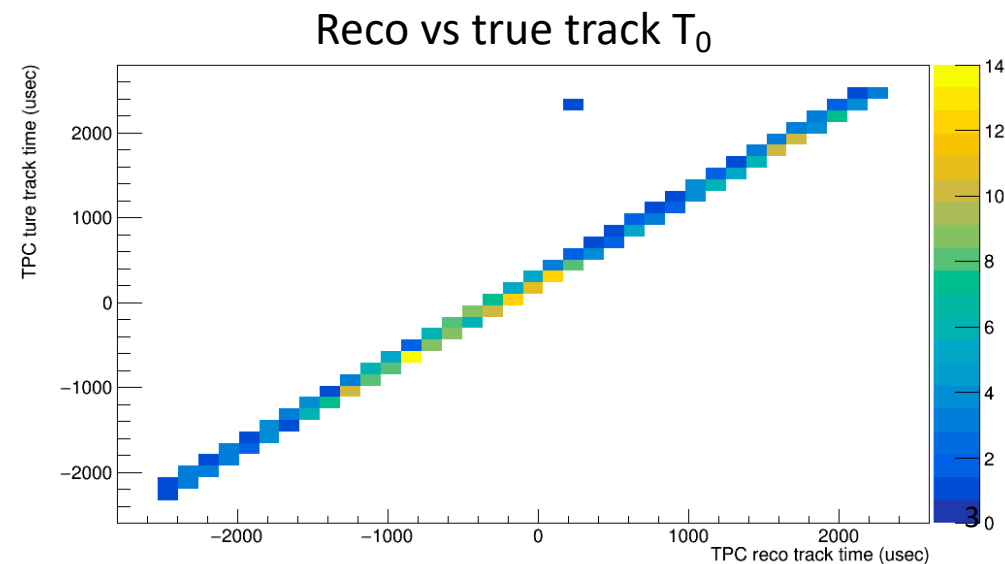DUNE DEEP UNDERGROUND NEUTRINO EXPERIMENT

Updates

- ~30k data events with MCC12
  - Updated flash reconstruction (no bugs, no scale factors are needed)
- Contains run 5809 and 5387 (1 GeV beam momentum)
  - latest available validation samples
- All T_0 tagged, stopping, unbroken, and long (>75 cm) tracks
  - ~4500 selected tracks
- Calculated reco track T_0 (TPC time)
- Calculated matched flash time (PDS time)
  - Opflash algorithm
  - Opslicer algorithm

Track reco (TPC) time

- Track reco time = T_0 time – TPC trigger offset
  - Mostly cathode crossing tracks
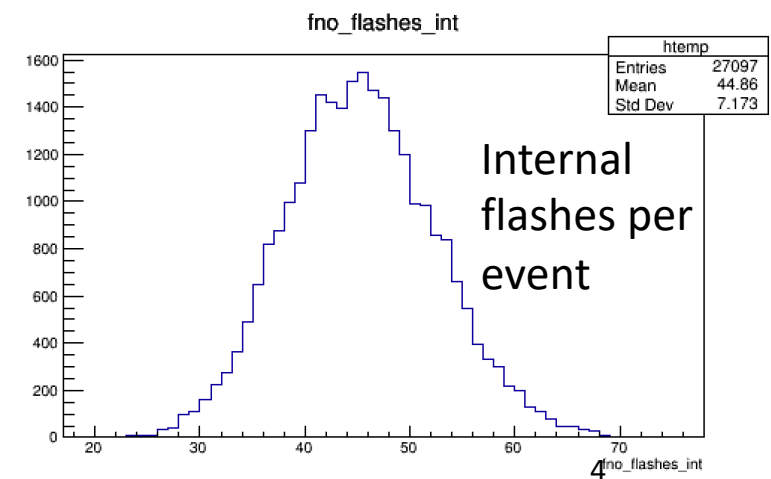- Verified by checking the true reco time from MC sample

-250 usec

Track reco time

htemp	
Entries	4789
Mean	−741.5
Std Dev	763.2

Cathode crossers

track reco time (usec)

Reco – true track time (usec)

htemp	
Entries	332
Mean	0.8476
Std Dev	2.572

reco track time - true track time (usec)

Reco vs true track T_0

TPC ture track time (usec)
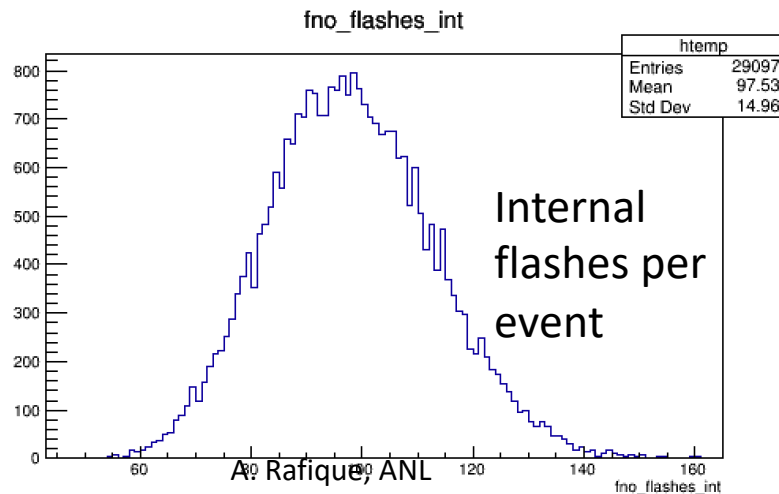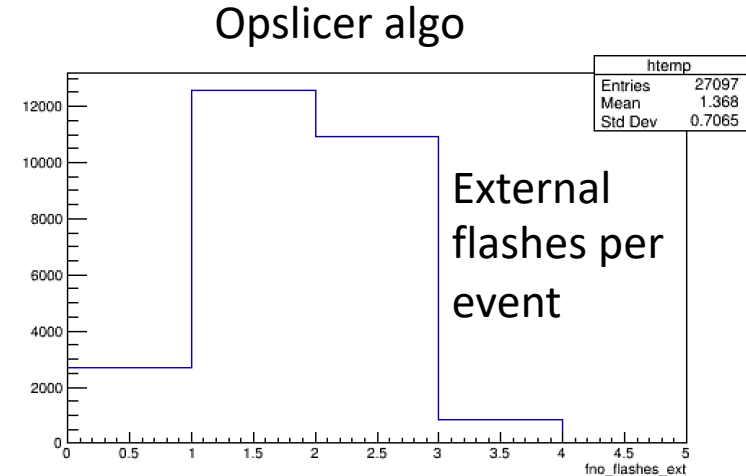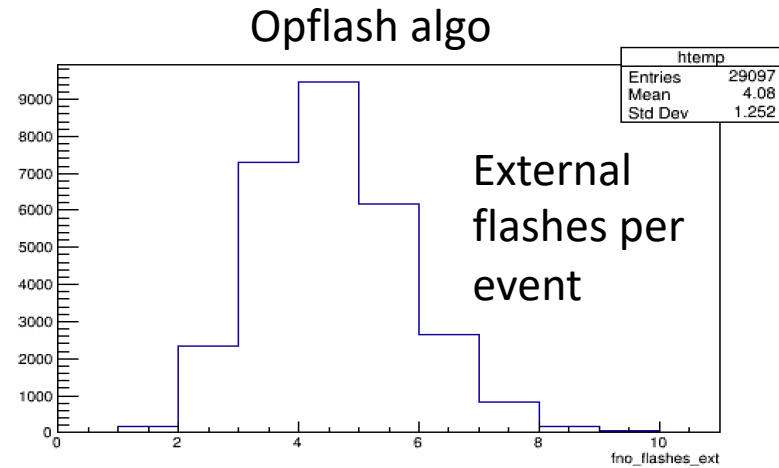
TPC reco track time (usec)

6/27/19

A. Rafique, ANL

Matched flash (PDS) time

- PDS time = closest internal flash – largest external flash
- Flash reco algorithms:
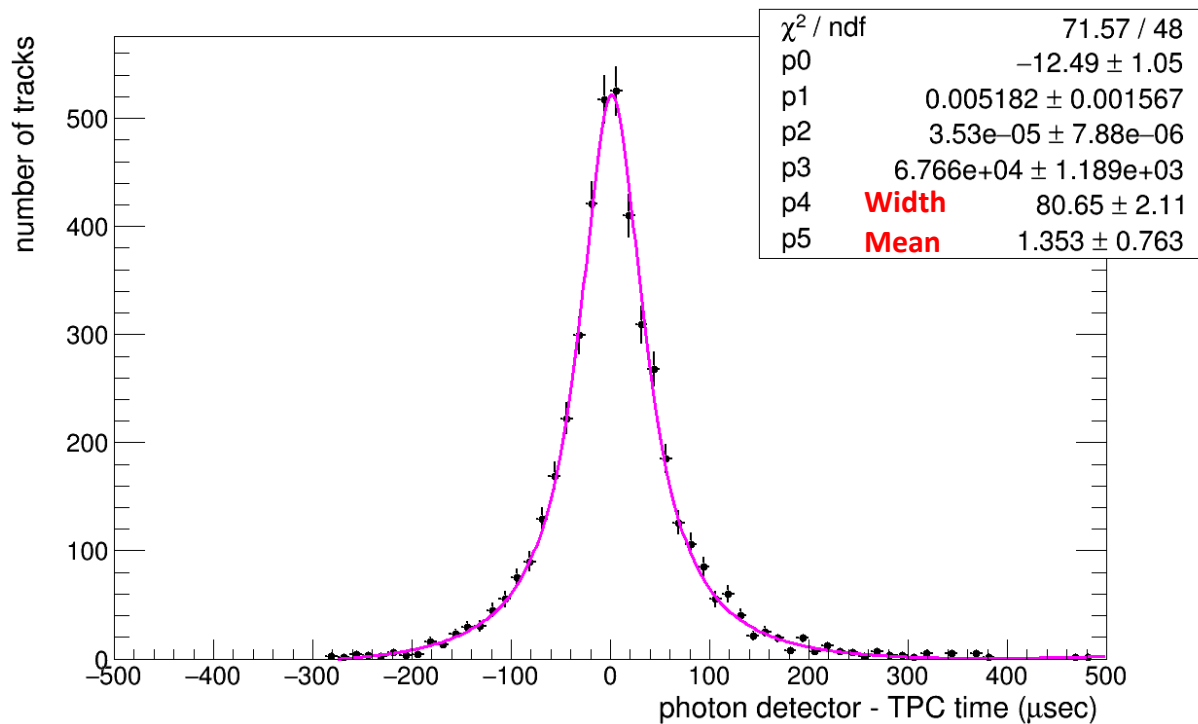 - Opflash algo
  - Opslicer algo

Opflash algo

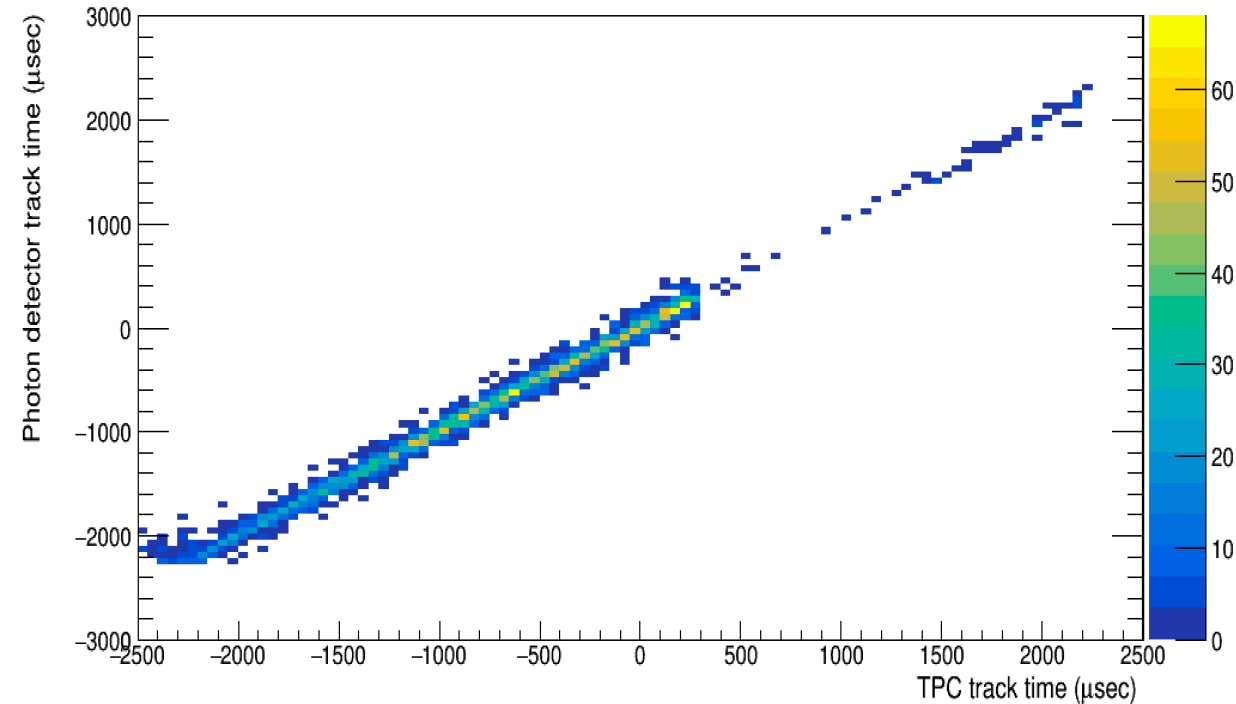External flashes per event

Internal flashes per event

Opslicer algo

External flashes per event

Internal flashes per event

TPC vs PDS timing plots

Opflash algorithm

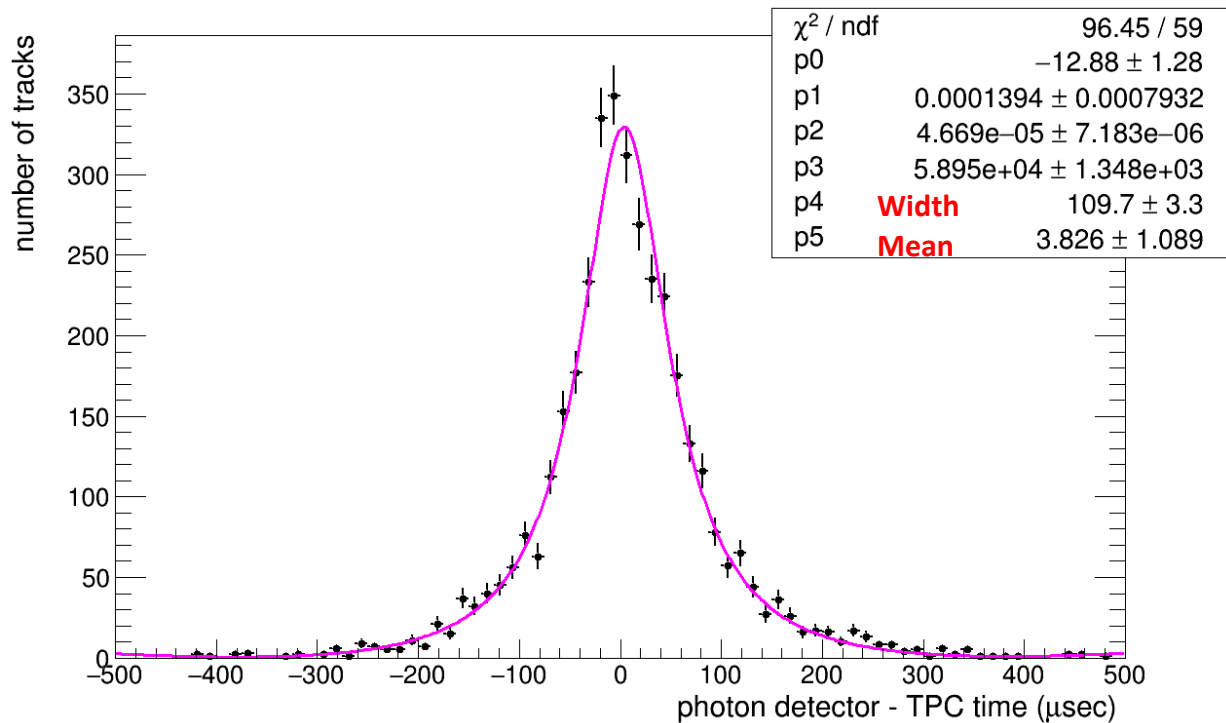Fit function = Lorentzian + Quadratic bkg function

The width of the distribution may depend on reconstruction effects and/or other detector physics properties

A. Rafique, ANL

TPC vs PDS timing plots

Opslicer algorithm   Fit function = Lorentzian + Quadratic bkg function

The width of the distribution may depend on reconstruction effects and/or other detector physics properties

PDS system time resolution

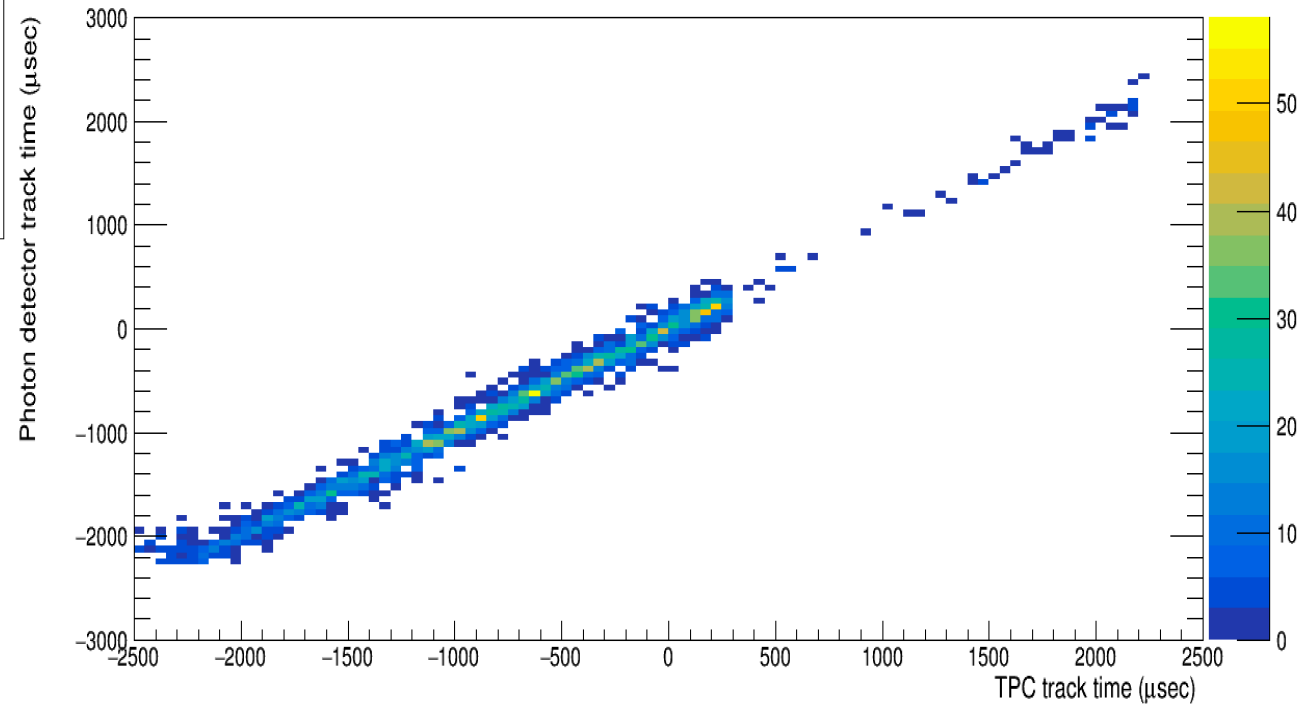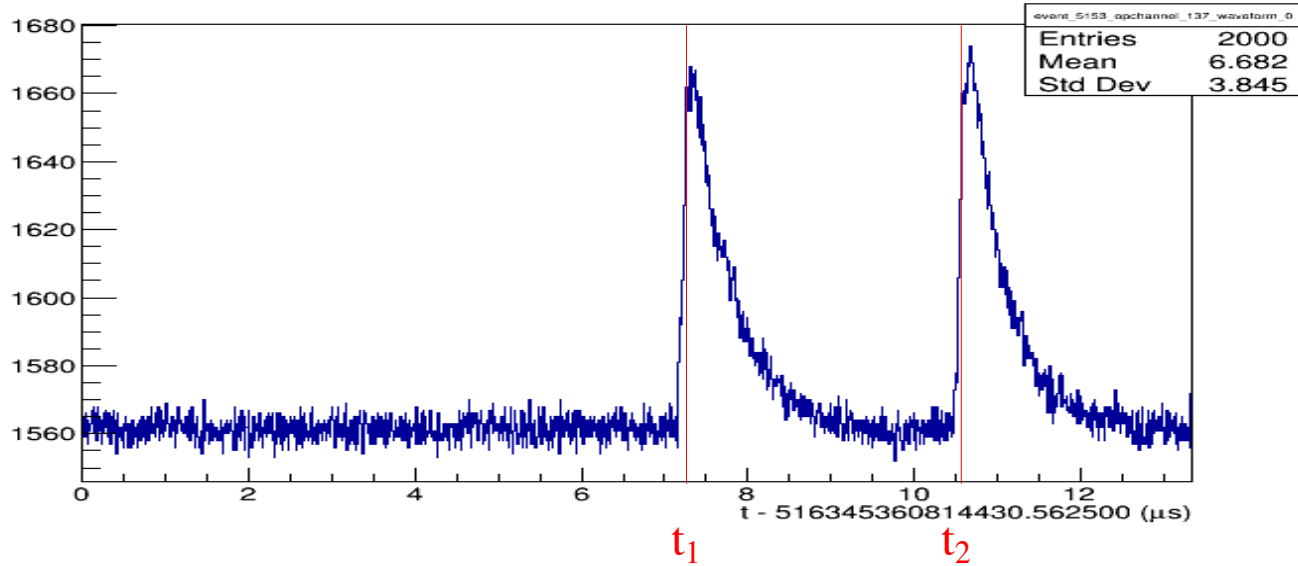Studies by Zelimir

- Looked at an ARAPURA channel
- PDS alone timing resolution is ~15 nsec
- Can be candidate plots for the TDR.

6/27/19   A. Rafique, ANL