

LArSoft Optical Simulation update

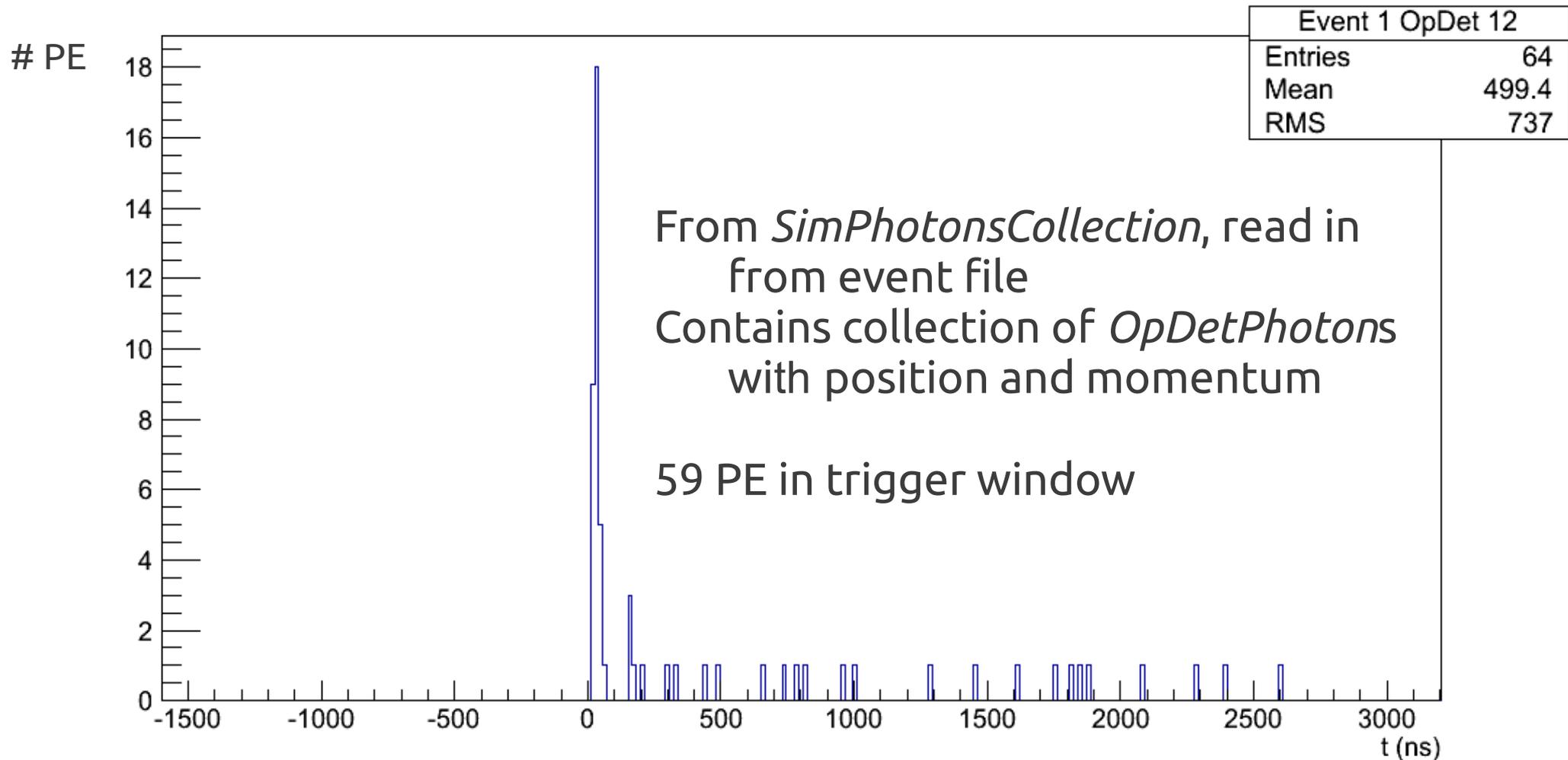
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August 1, 2012

Key Updates

- OpDet digitized signal simulation
- Digitized signal deconvolution
- Gaussian fits
- Data extraction

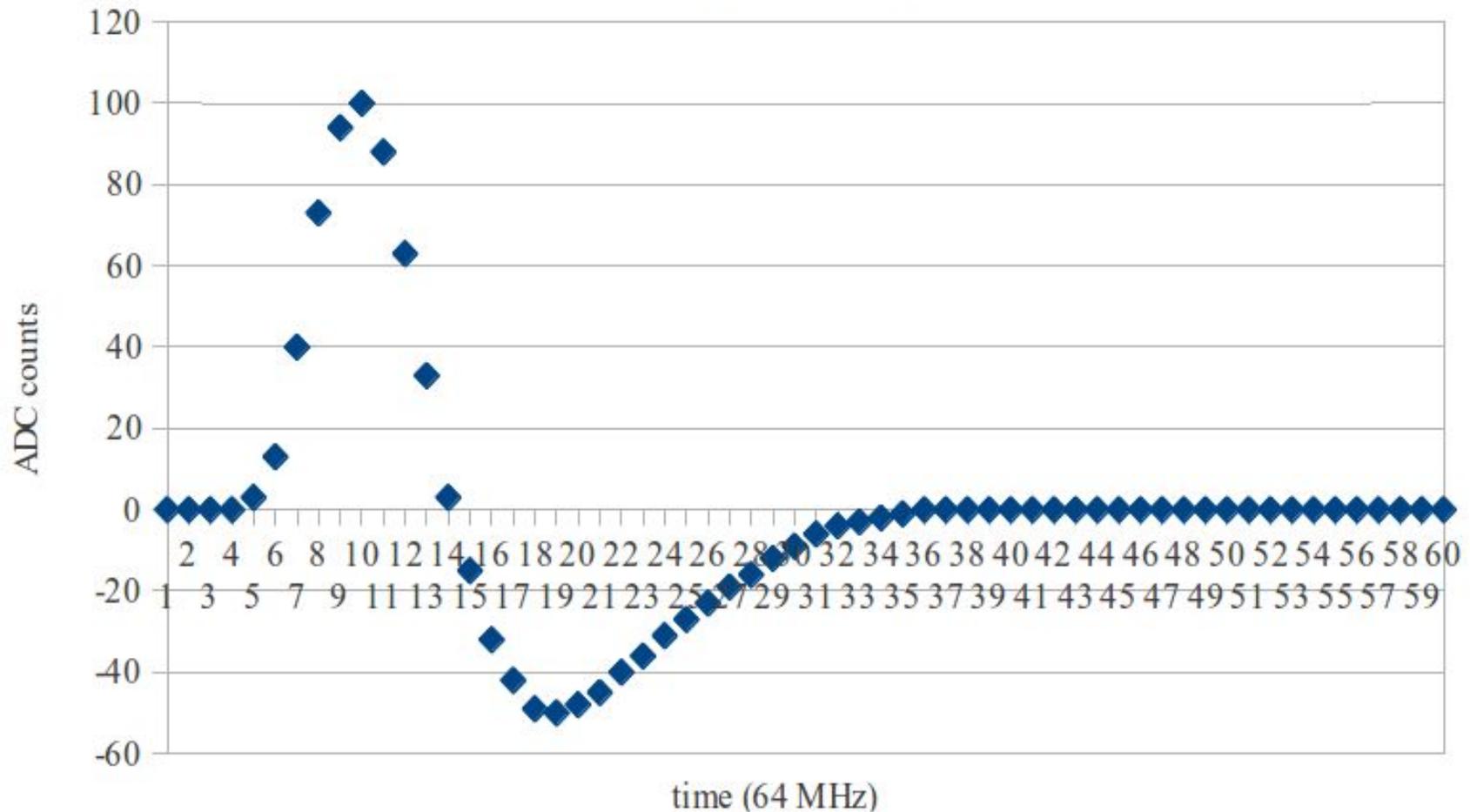
OpDet digitized signal simulation

Photon arrival times



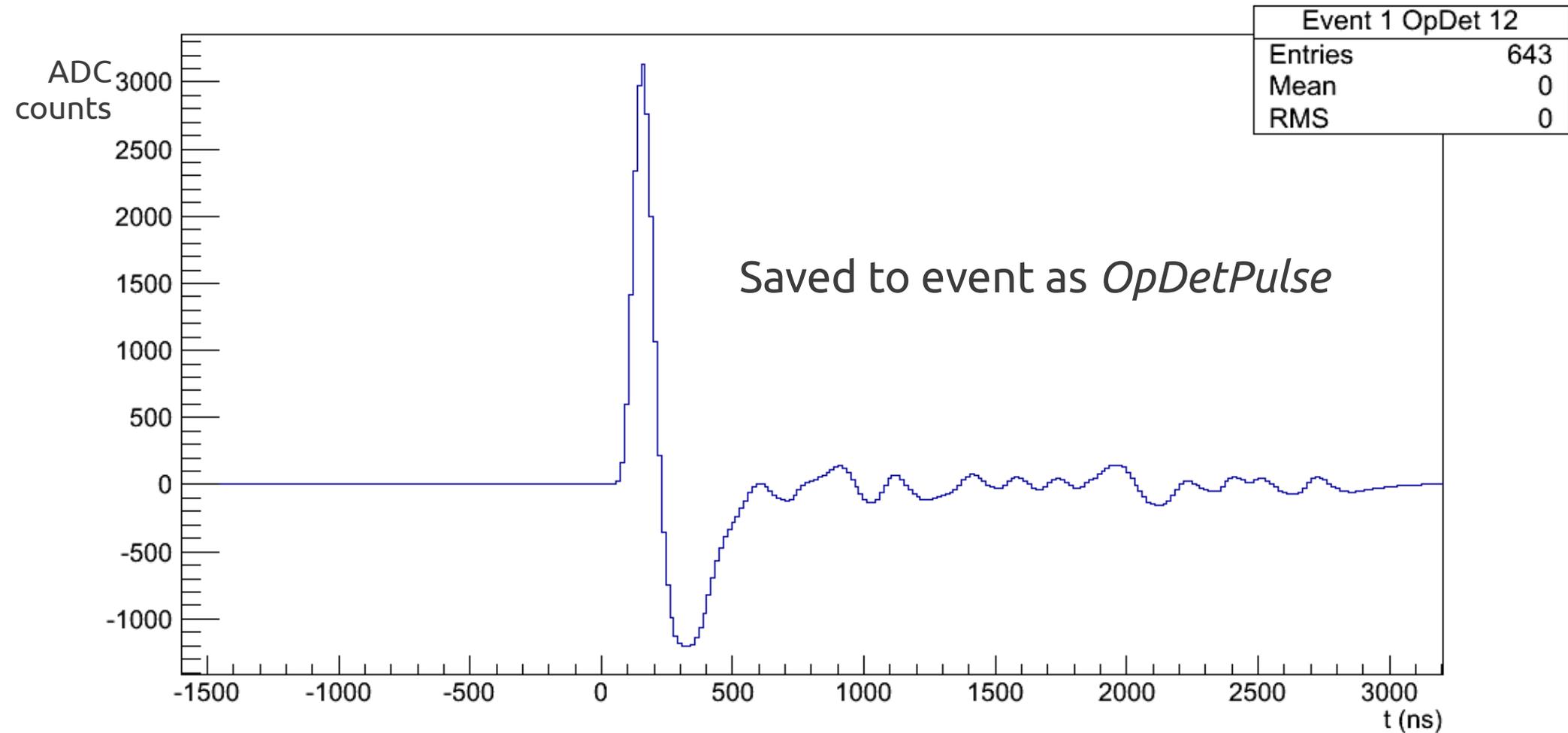
OpDet digitized signal simulation

Bare 1 PE signal (input parameter)



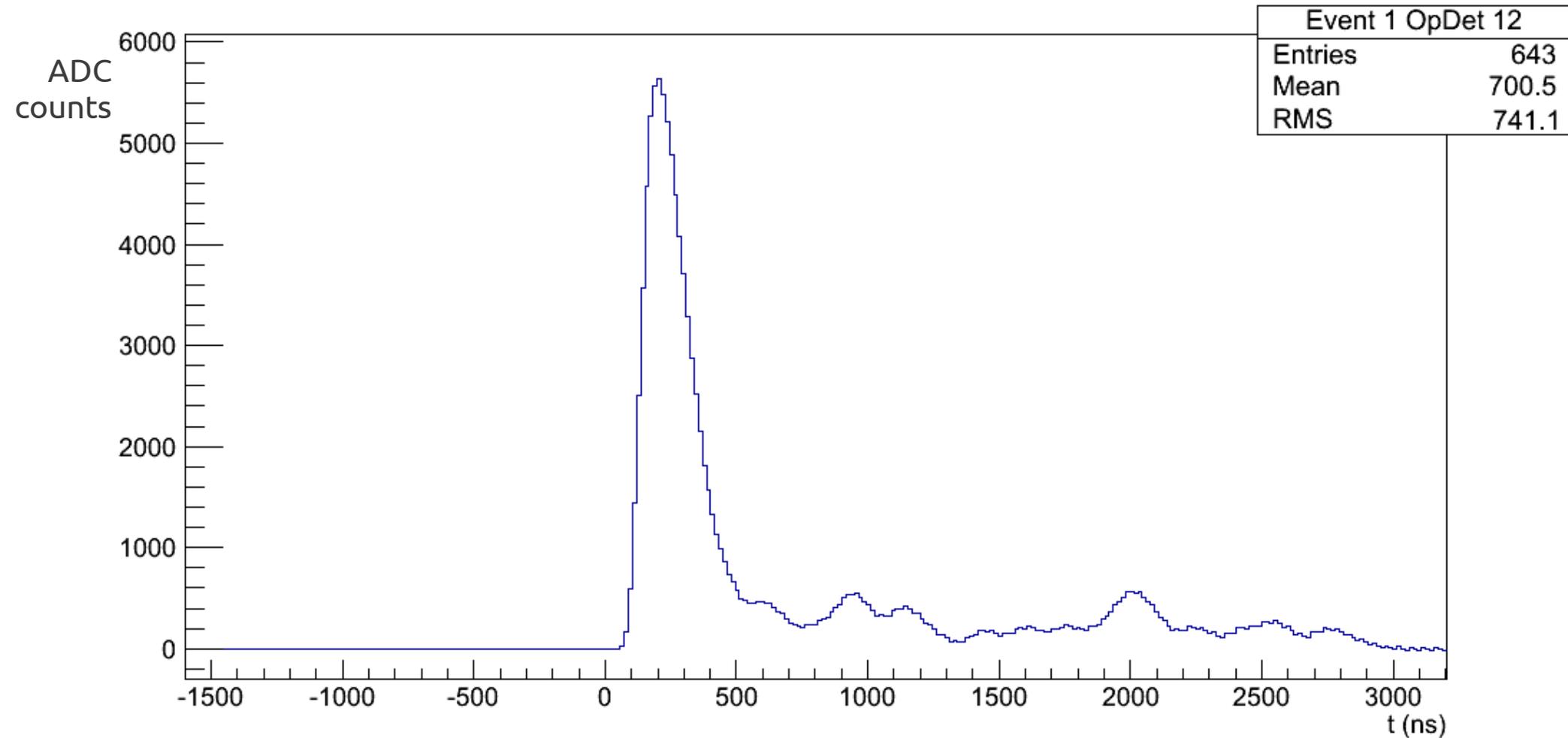
OpDet digitized signal simulation

Digitized PMT signal



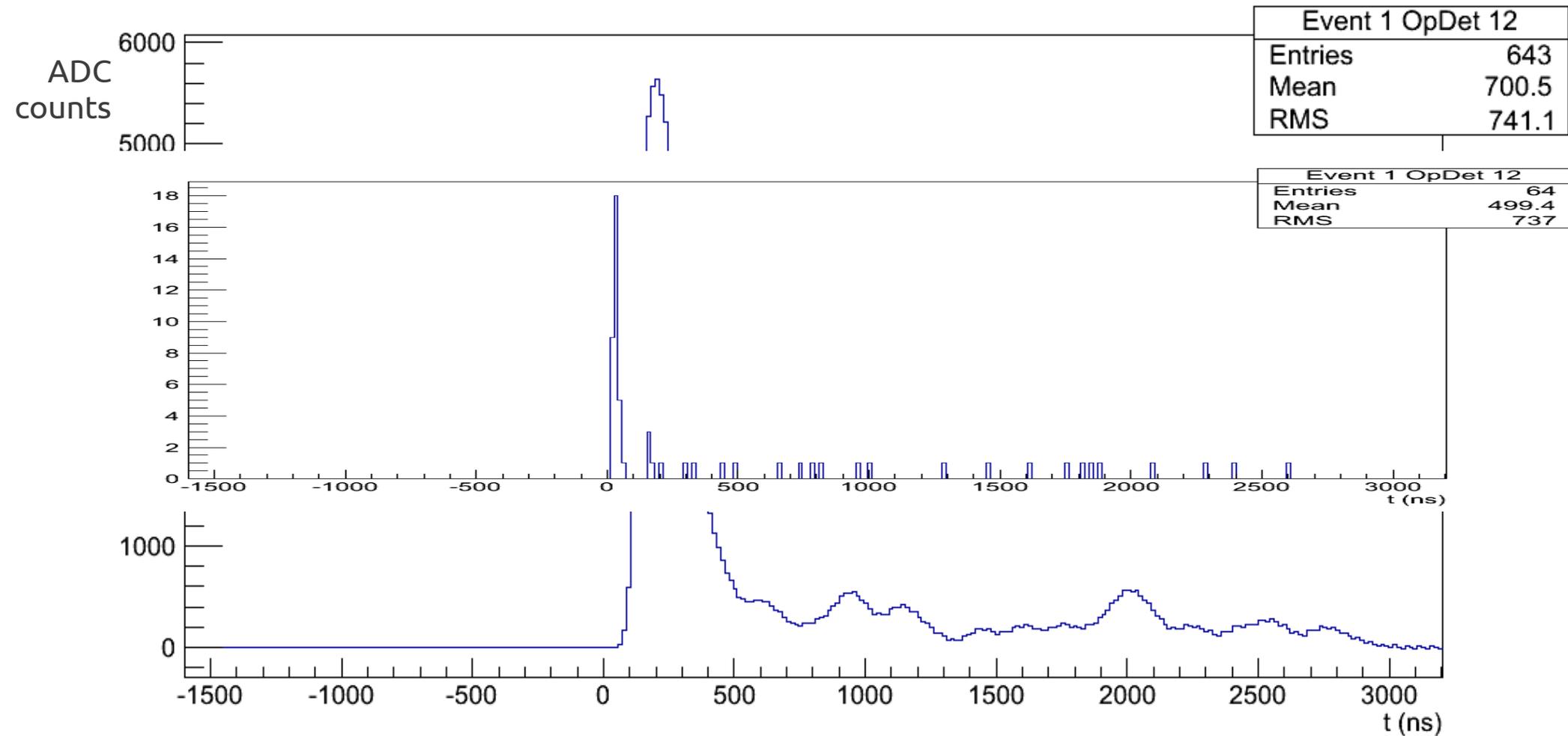
Signal deconvolution

$$\tilde{a}_n = a_n - a_{n-3}$$

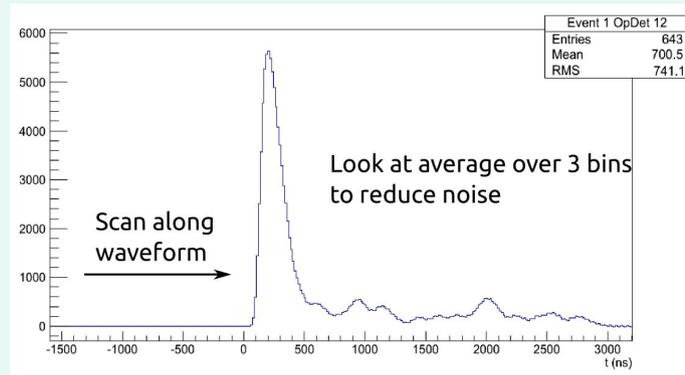


Signal deconvolution

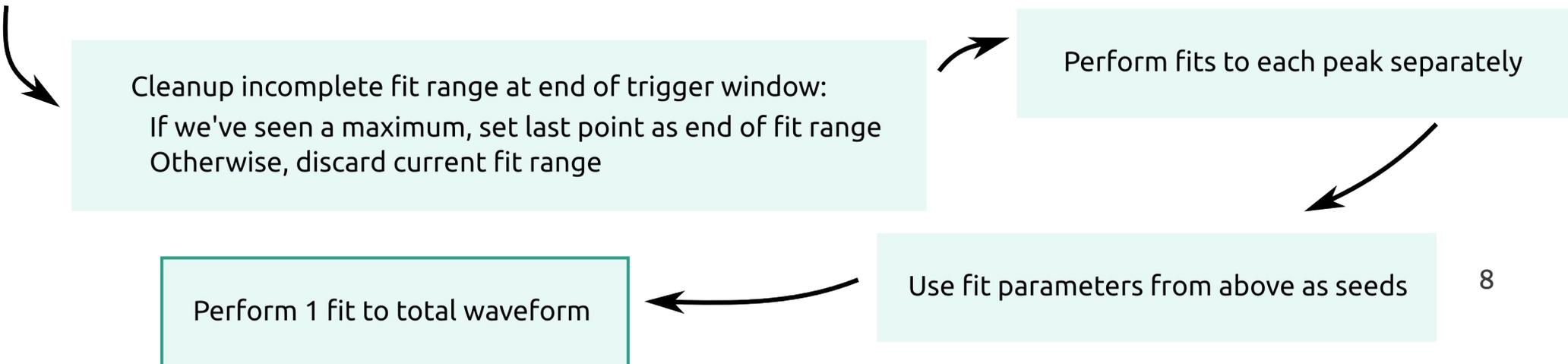
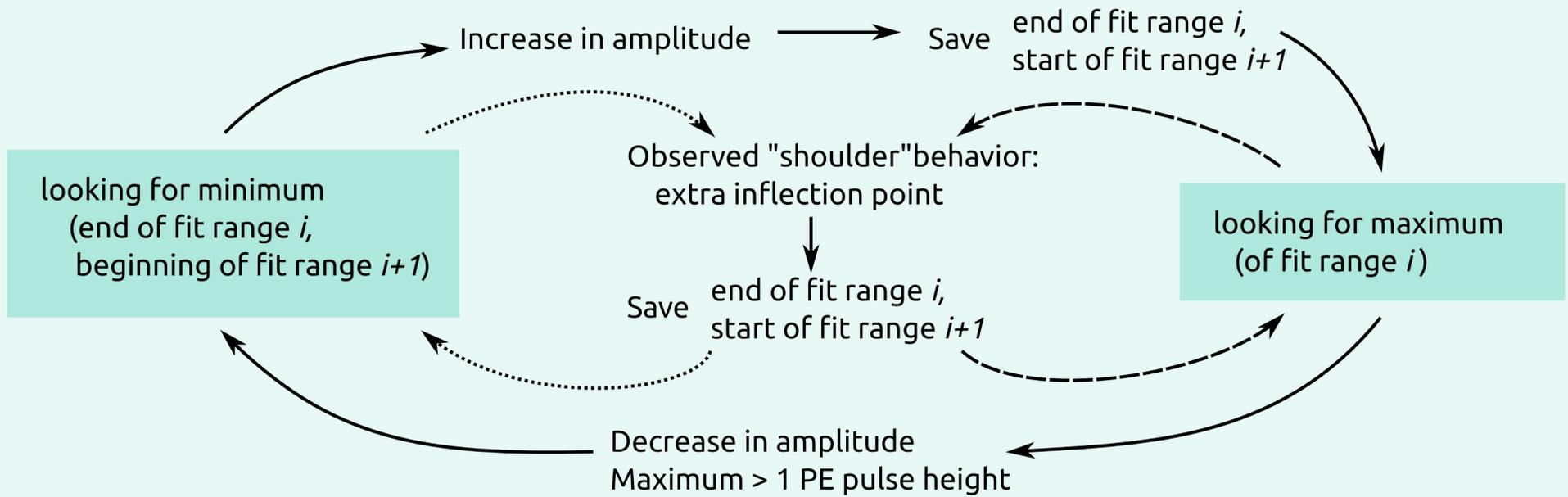
Notice peaks line up with photon arrival times



Find fit regions for each peak

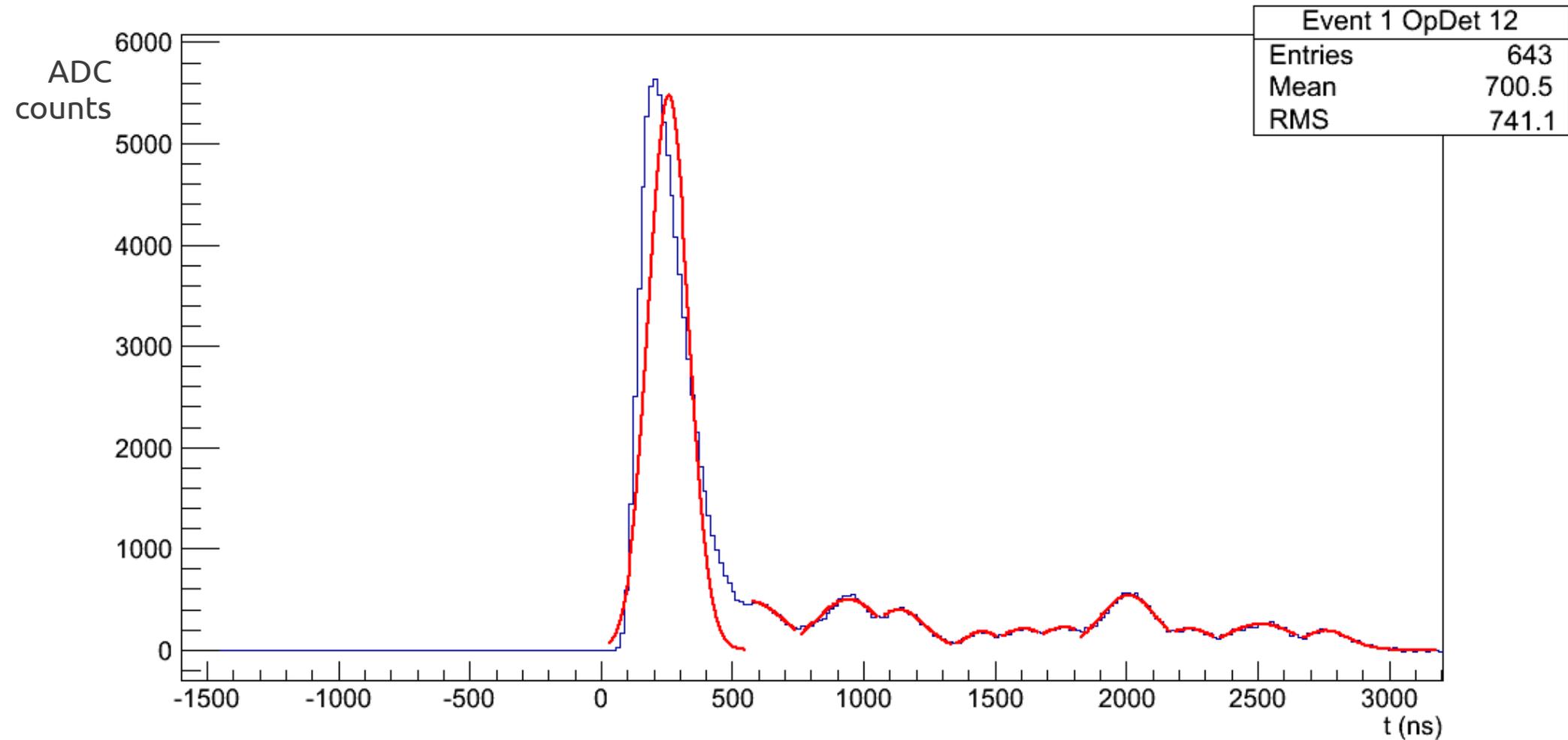


Gaussian fits



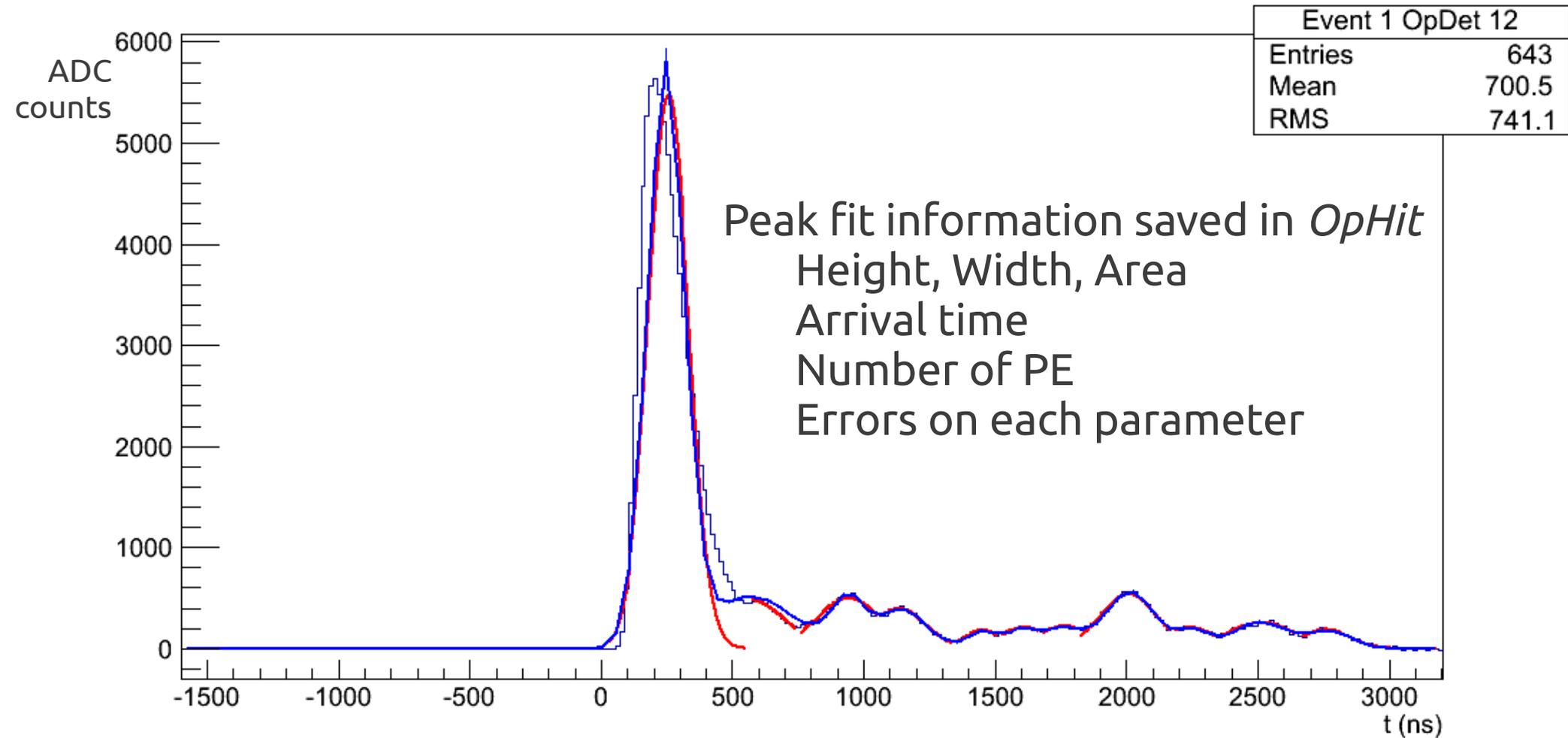
Gaussian fits

Preliminary 1-peak fits



Gaussian fits

Preliminary 1-peak fits & Final n -peak fit

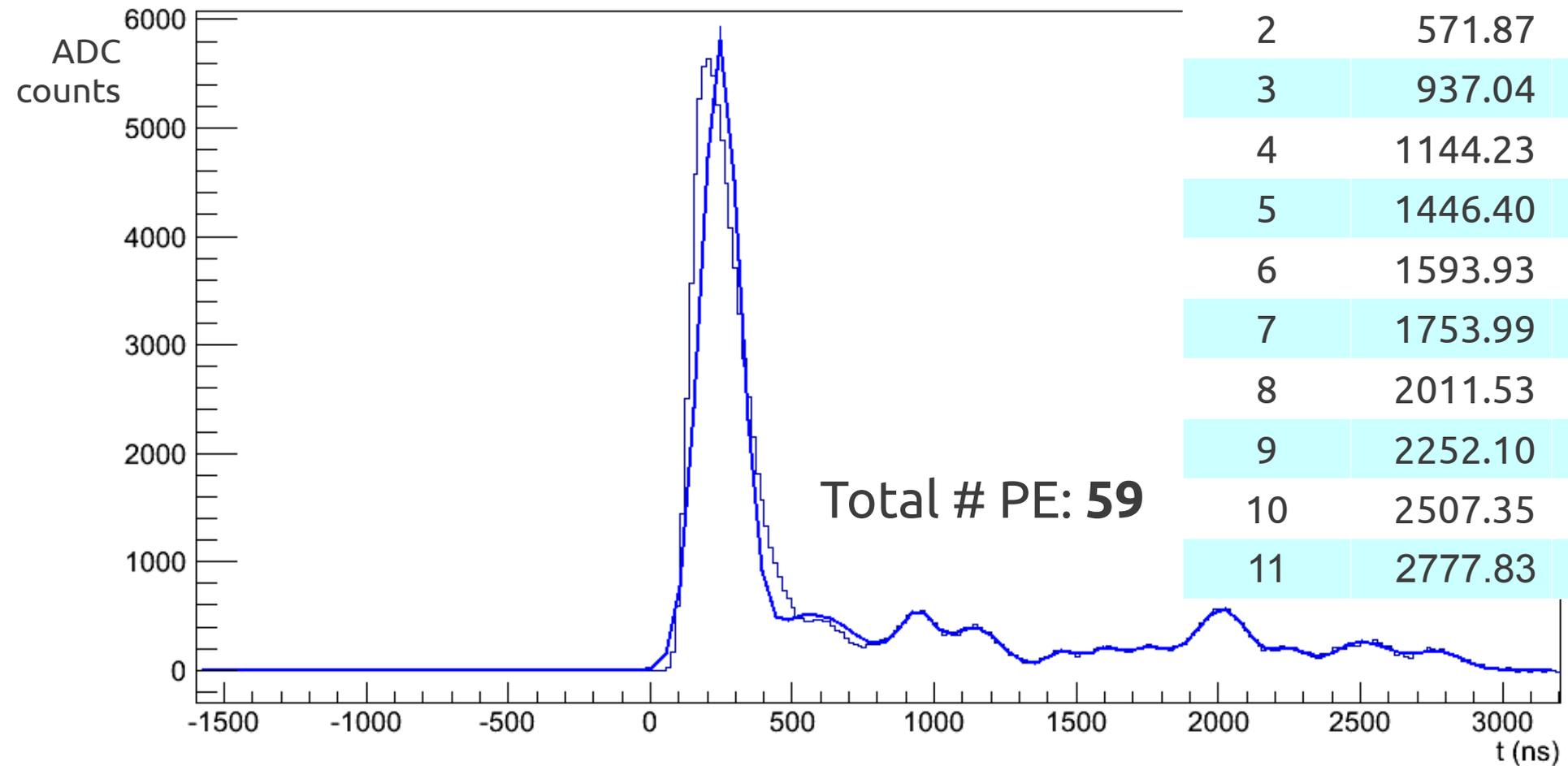


Data extraction

Use pulse area to find # of PE

Peak #	Time (ns)	# PE
1	244.57	35
2	571.87	7
3	937.04	3
4	1144.23	3
5	1446.40	1
6	1593.93	1
7	1753.99	1
8	2011.53	4
9	2252.10	1
10	2507.35	2
11	2777.83	1

Total # PE: **59**



Data extraction

Accuracy:

- PE counts are off by ± 3 at most
- 2.6% error

Tested on 66 signals so far

Finding subevents

- Preliminary method:
 - Match by time (region)
 - Filter out late light (by pulse size?)
 - Require that a minimum number of PMTs receive pulse