

PMT measurements with the laser in the blue box

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Introduction

- Laser pulse in order of picoseconds
- Laser pulse is fed to individual PMT's using fiber
- Hit time modulo pulse period plots where made
- Laser synchronized to DOM using naobecaon connector on CLB
- Power of laser determined without synchronization

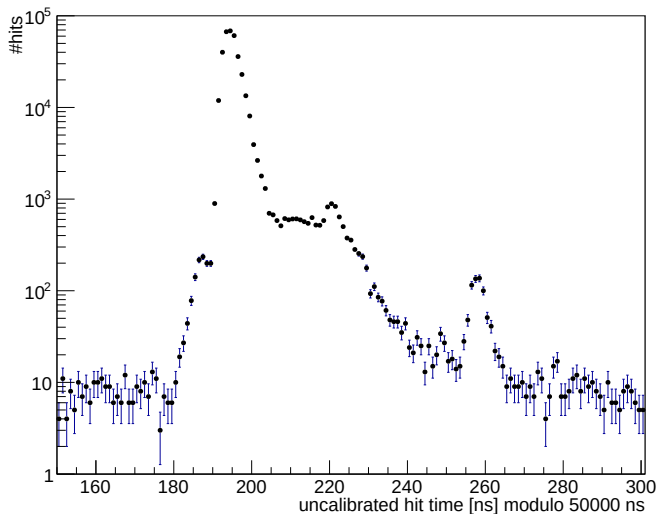
Laser Setup

- External trigger at 20 MHz was used
- Signal visible in Δt plot at power of 700
- No visible peak in hit time modulo pulse period
- External synchronization with nanobeacon connector gave results

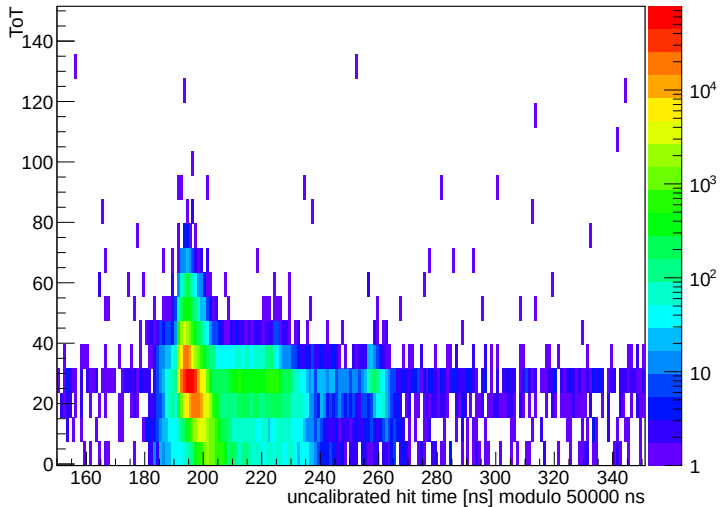
Nanobeacon settings

Period:	50000 ns
Duration:	16000 ns
Delay:	0 ns
Pulse count:	16960
Voltage:	3000 mV

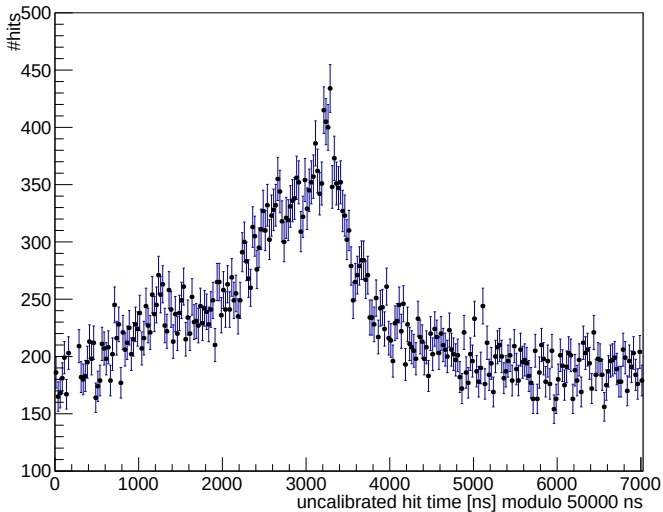
Hit time modulo pulse period S1F1 DAQ Ch. 1



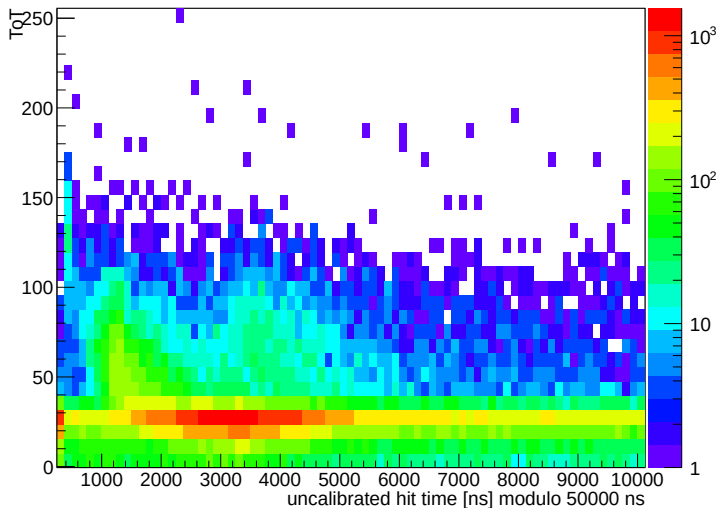
Hit time modulo pulse periodS1F1 DAQ Ch. 0



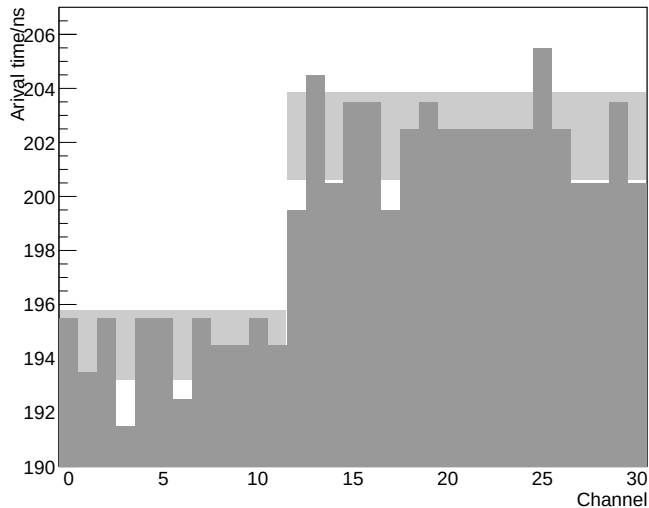
Hit time modulo pulse period S1F1 DAQ Ch. 1

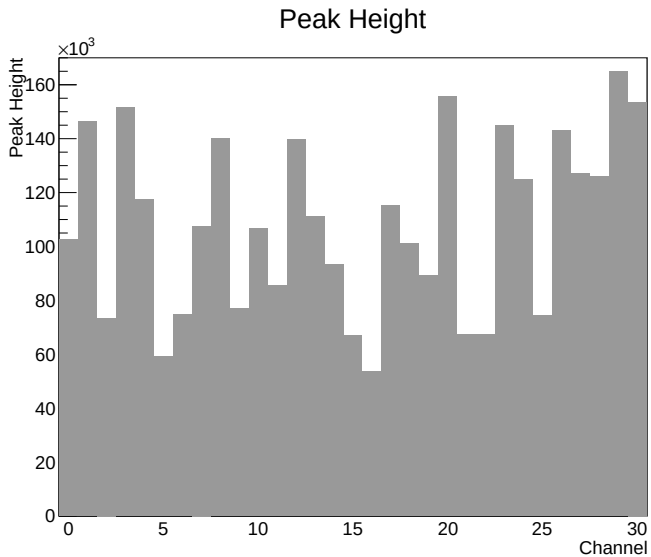


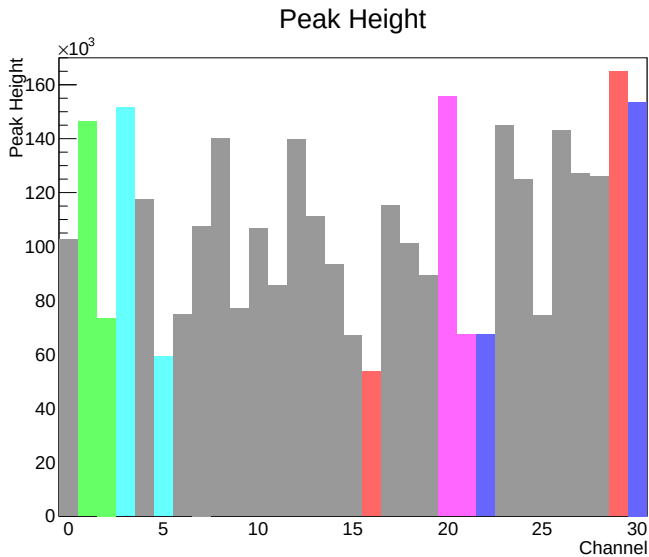
Hit time modulo pulse periodS1F1 DAQ Ch. 0



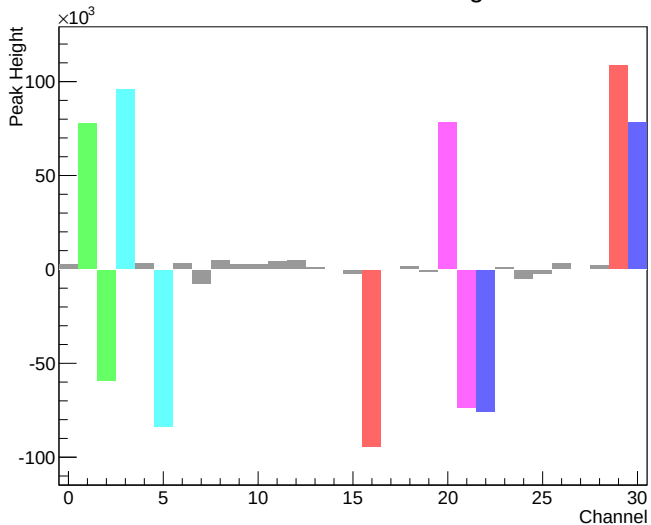
Transit Time







Difference in Peak Height



Afterpulses

All hits in $[387.5 \text{ ns}, 1285.5 \text{ ns}]$ - Background large

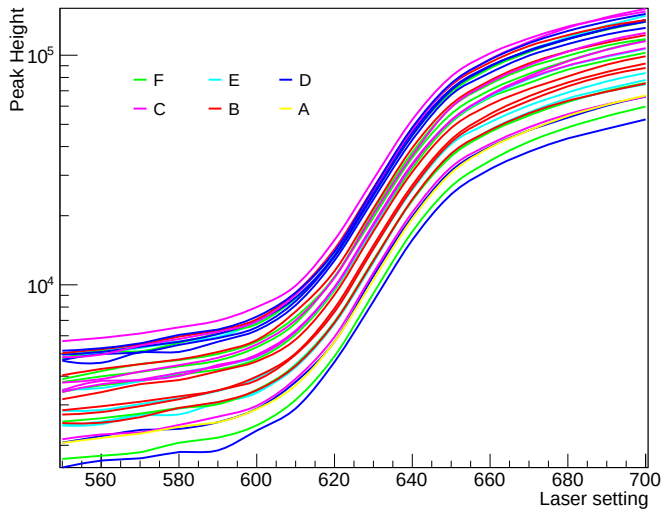
Delayed pulses

First hits in $[t_{\text{peak}} + 15.5 \text{ ns}, t_{\text{peak}} + 60.5 \text{ ns}]$ - Background small

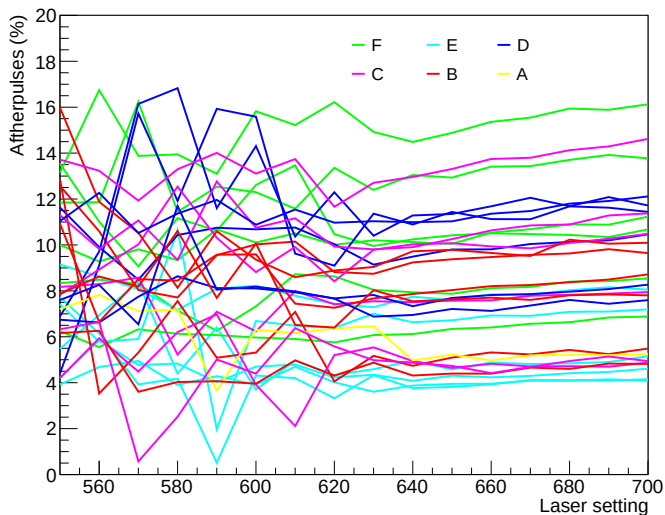
Early pulses

First hits in $[t_{\text{peak}} - 60.5 \text{ ns}, t_{\text{peak}} - 10.5 \text{ ns}]$ - Background small

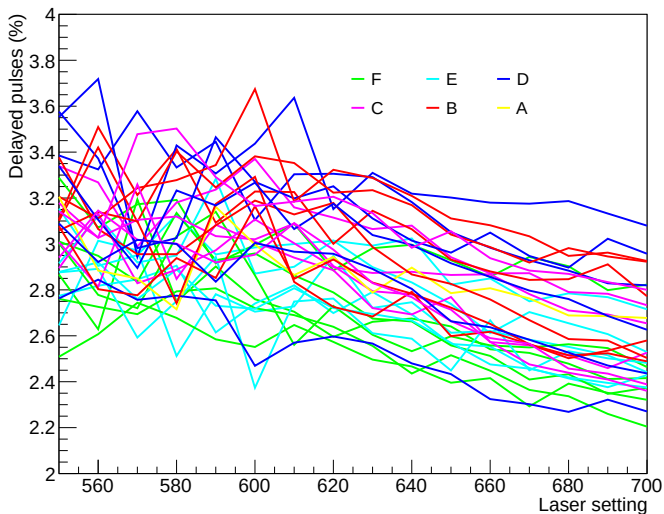
Peak Height



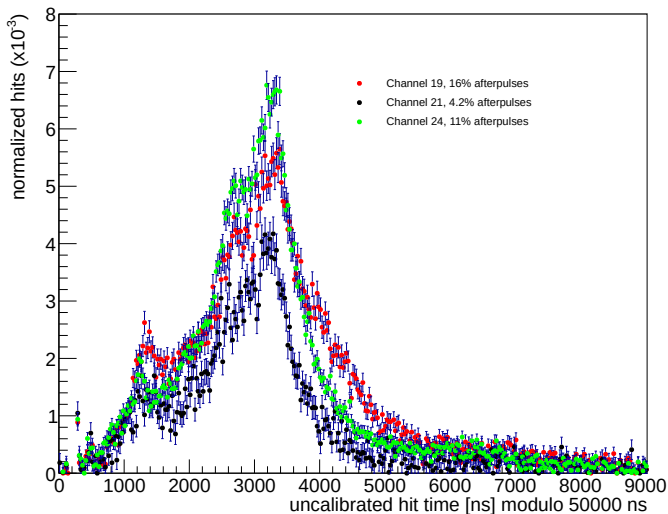
Afterpulses



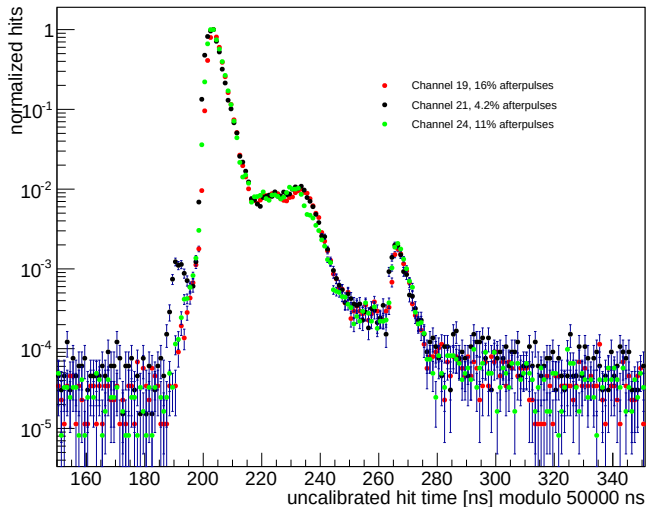
Delayed pulses



Hit Time Afterpulses



Hit Time Main Peak



Afterpulse ratio comparrison

PMT	Napoli	My value	Difference
12	0.089	0.097	8.2%
13	0.089	0.094	5.4%
14	0.136	0.145	6.7%
15	0.093	0.101	8.1%
16	0.055	0.054	-2.9%
17	0.118	0.120	1.6%
18	0.057	0.067	17.5%
19	0.038	0.036	-6.2%
20	0.120	0.134	12.1%
21	0.117	0.118	0.2%
22	0.063	0.061	-3.3%
23	0.052	0.048	-8.2%
24	0.072	0.073	0.6%
25	0.052	0.058	10.9%
26	0.072	0.071	8.6%
27	0.084	0.090	6.4%
28	0.055	0.060	9.3%
29	0.059	0.060	2.7%
30	0.063	0.071	12.3%

Delayed pulse ratio comparison

PMT	Napoli	My value	Difference
12	0.0295	0.0287	-2.6%
13	0.0288	0.0290	0.7%
14	0.0271	0.0261	-3.5%
15	0.0291	0.0285	-2.0%
16	0.0288	0.0294	2.1%
17	0.0237	0.0245	3.6%
18	0.0303	0.0259	-14.5%
19	0.0272	0.0297	9.2%
20	0.0264	0.0246	-6.8%
21	0.0267	0.0287	7.6%
22	0.0293	0.0278	-5.1%
23	0.0282	0.0253	-10.3%
24	0.0290	0.0253	-12.6%
25	0.0333	0.0278	-16.7%
26	0.0000	0.0255	93482.5%
27	0.0250	0.0245	-1.9%
28	0.0287	0.0270	-6.1%
29	0.0270	0.0238	-11.9%
30	0.0298	0.0236	-20.8%