

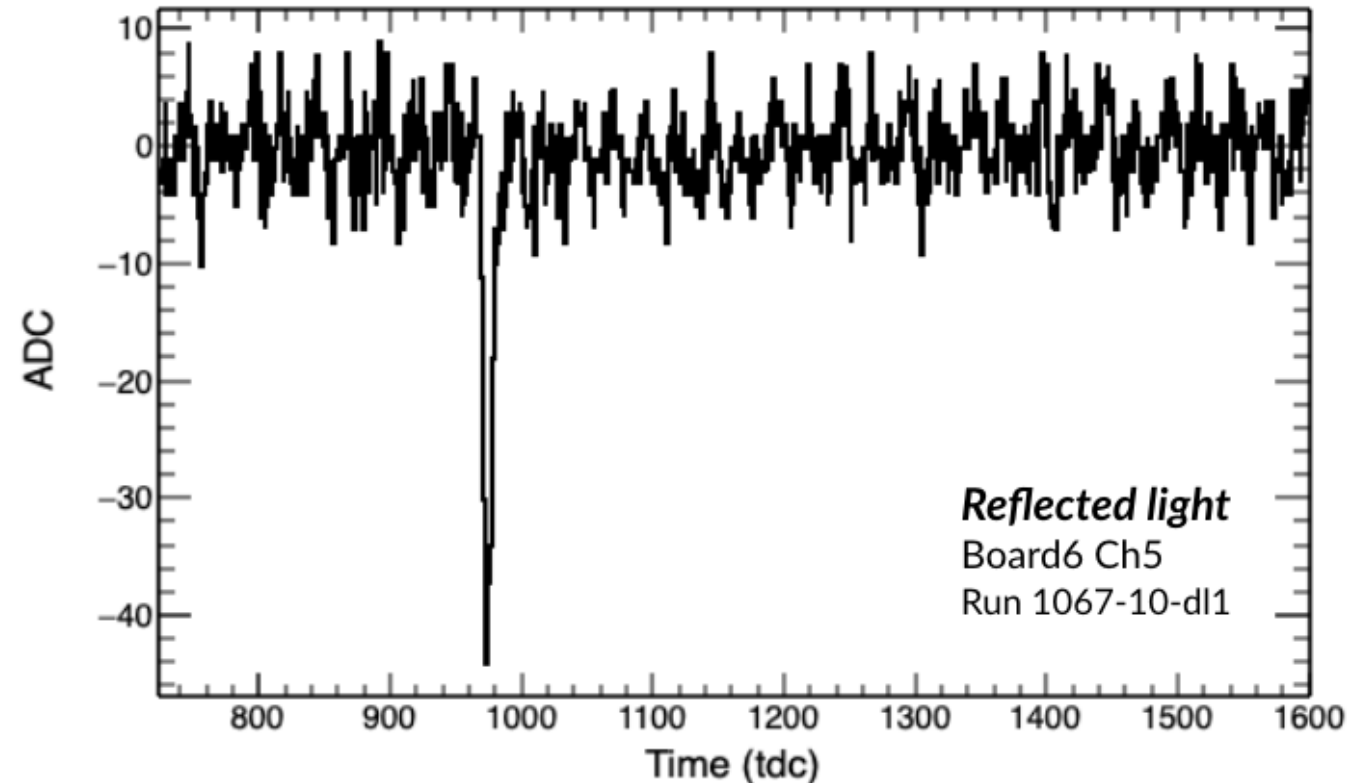
PMT noise

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02/27/2020

Introduction

- We observed quite important noise level on the latest calibration runs taken between January and February 2020
- More difficult SPE calibration
- Other subsystems have recorded anomalous noise levels
 - Checking PMT noise might also help investigating the source

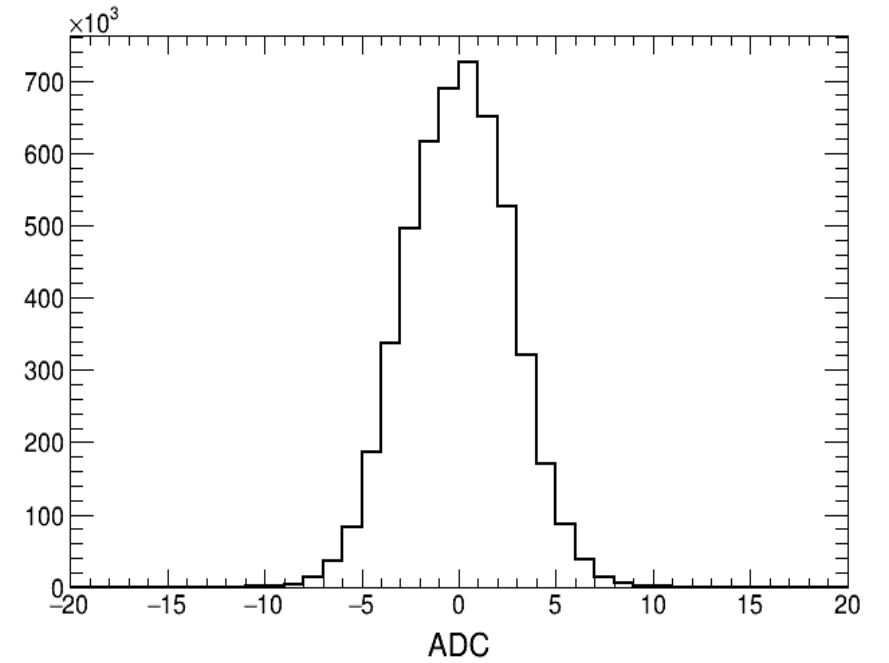
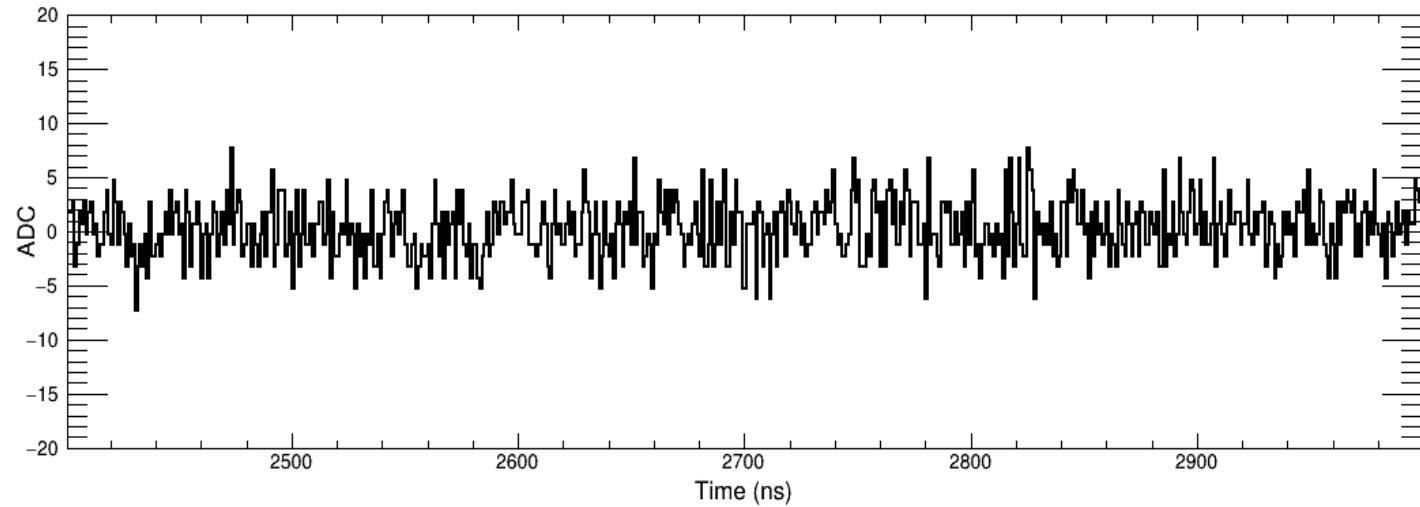


Sample considered

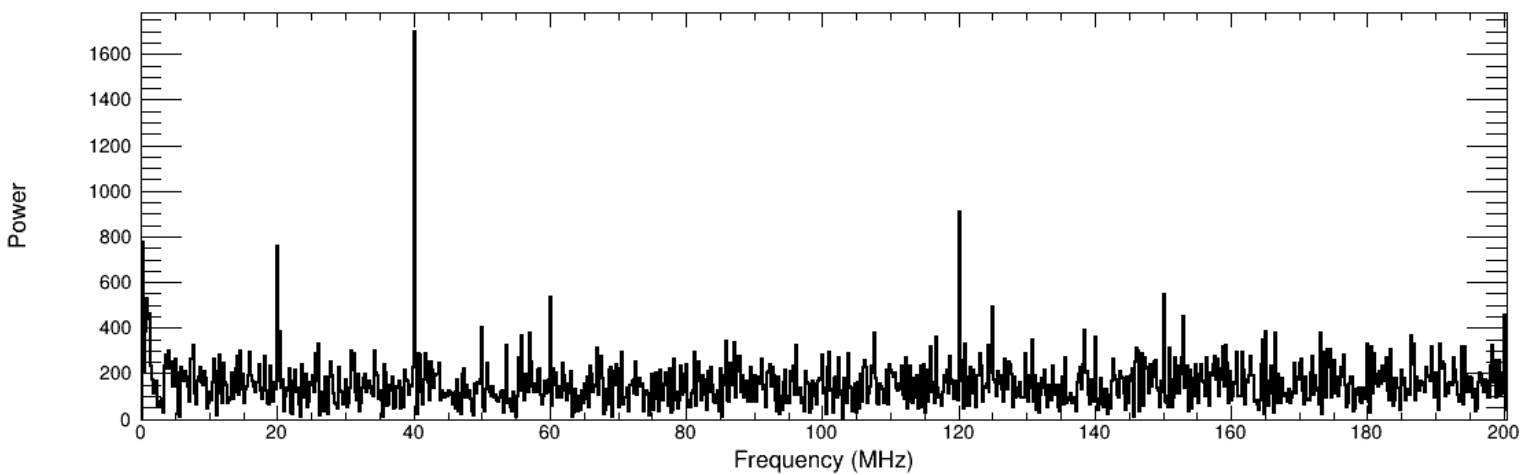
RUN	DATE	LASER SYSTEM	HV	CRYO
212	11/21/1019	OFF	ON	N/A
468	01/24/2020	ON	ON	OFF
1240	02/26/2020	OFF	OFF	ON

- All three runs are related to WW and WE boards and contain only noise. Baseline is subtracted using the mean over the full 10 us window

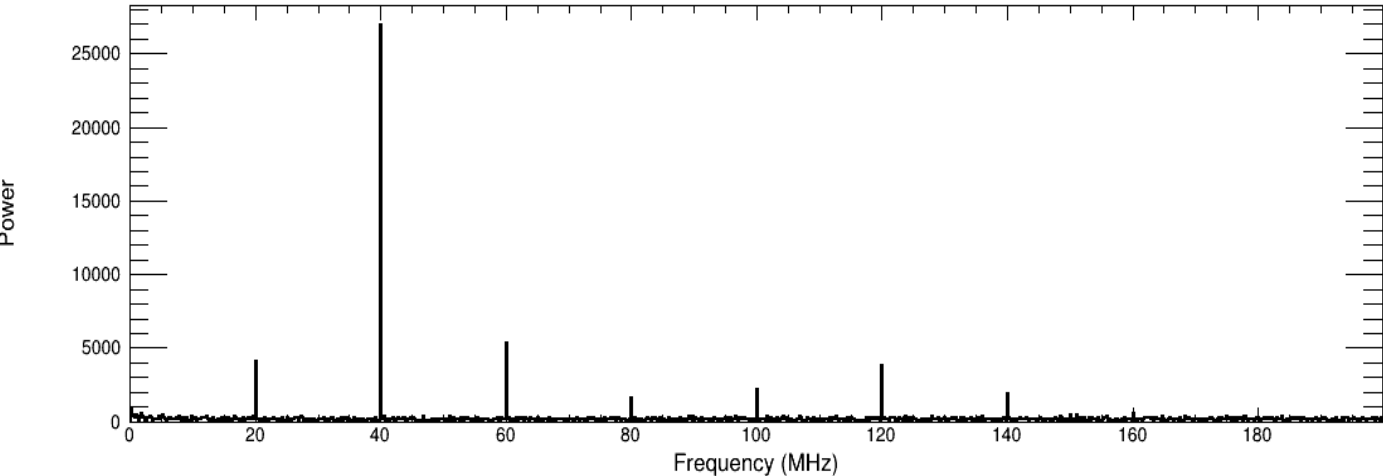
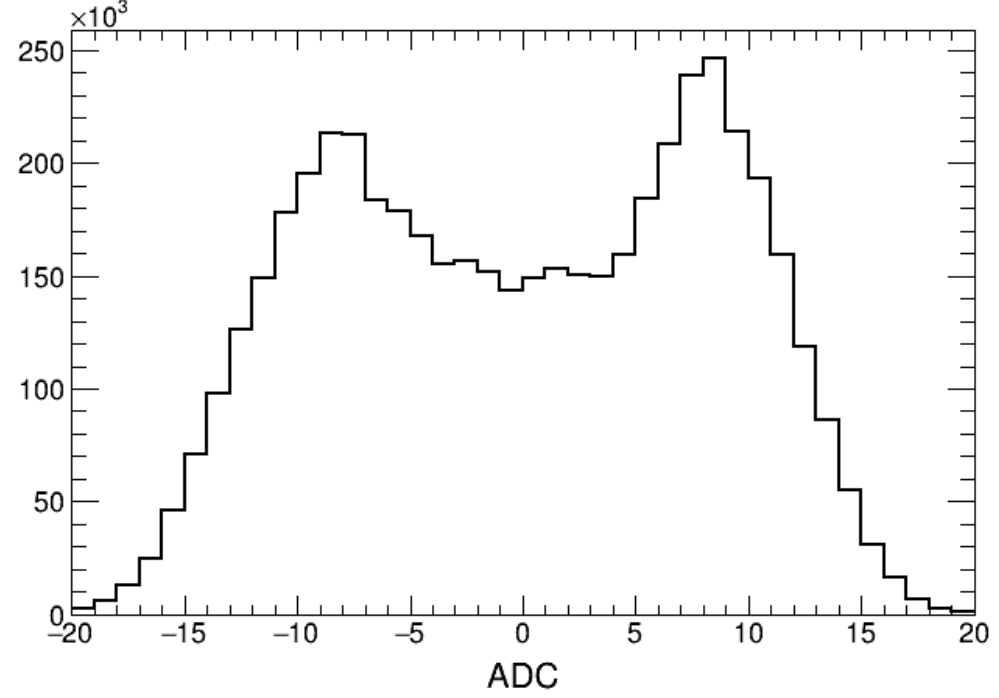
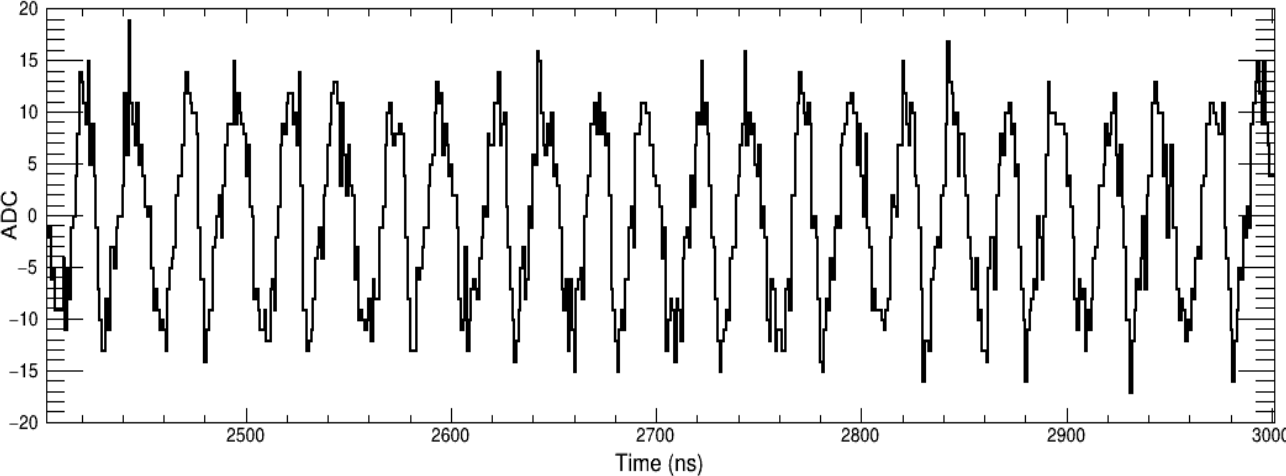
November 2019 (Run 212)



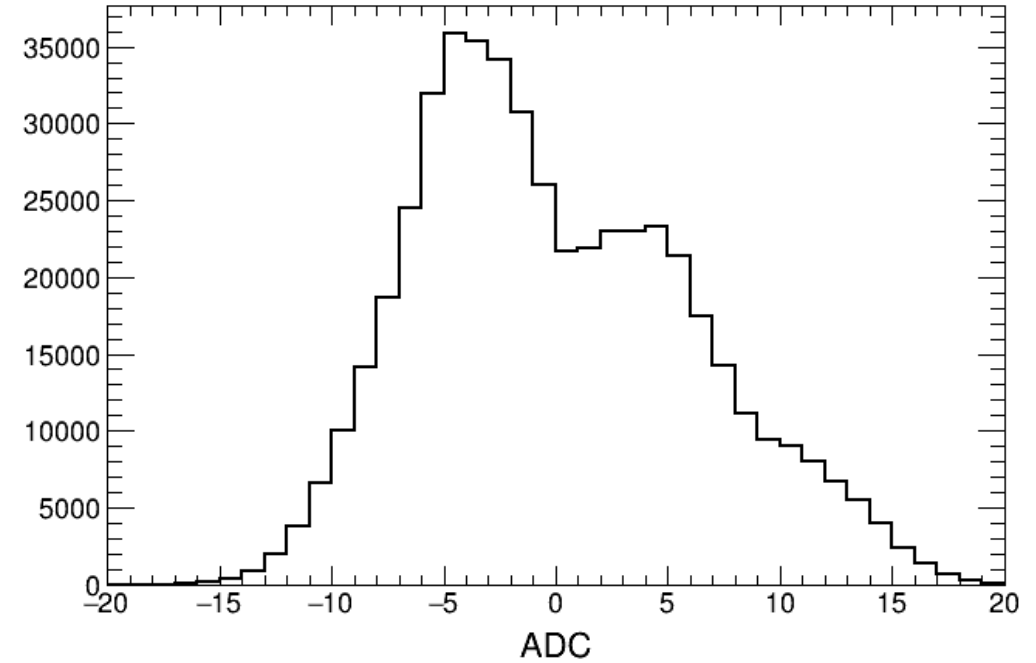
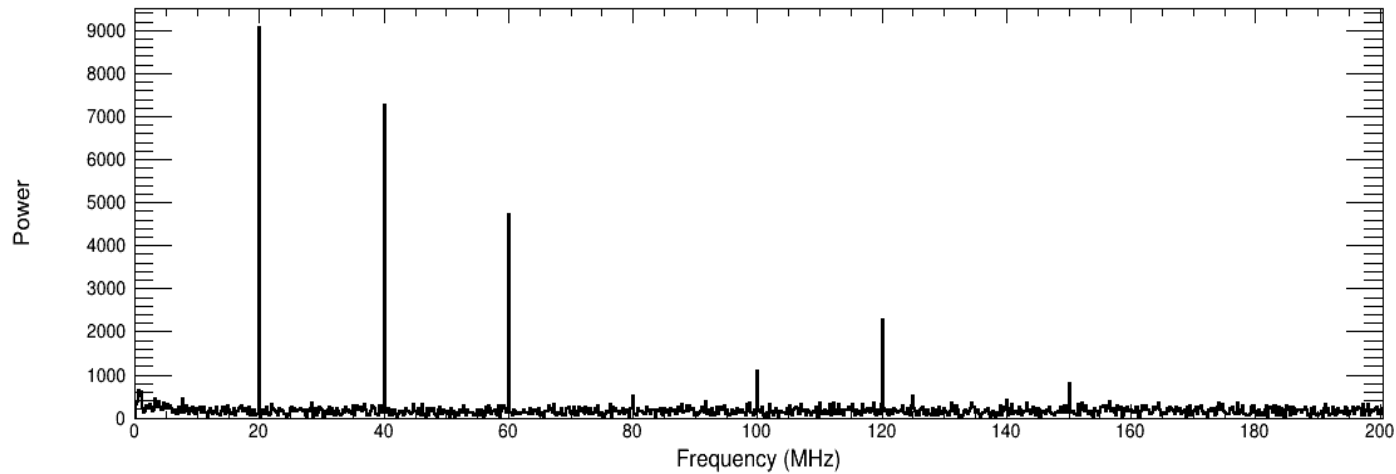
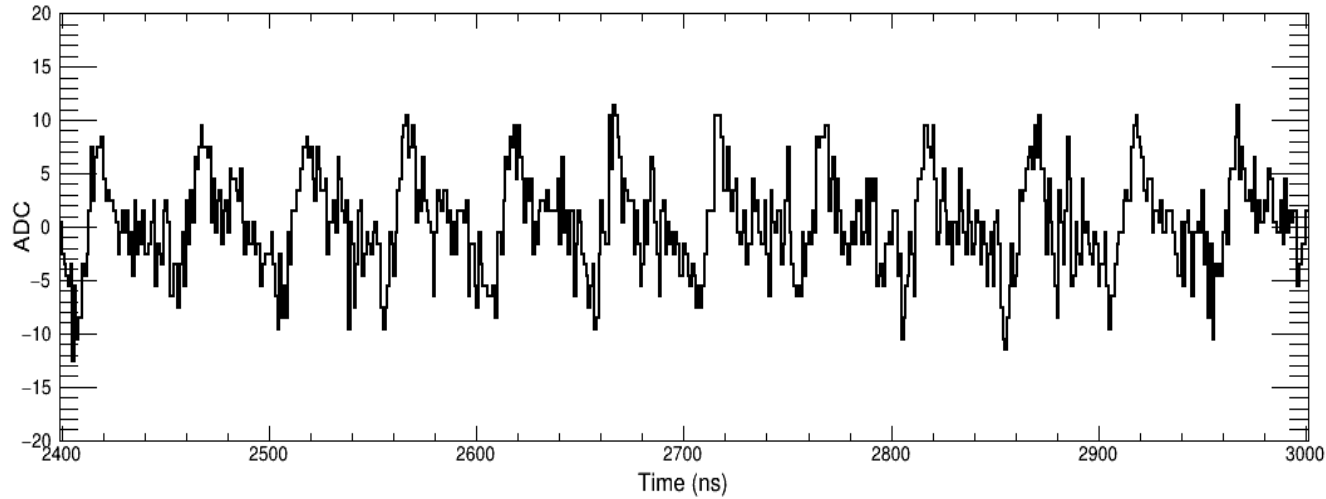
- Reference level RMS: 2.7 ADC



January 2020 (Run 468)



February 2020 (Run 1240)

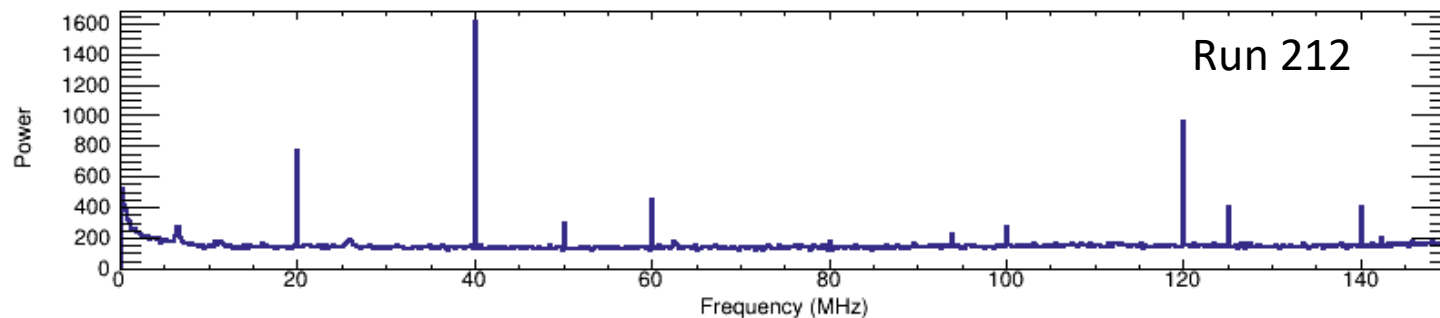
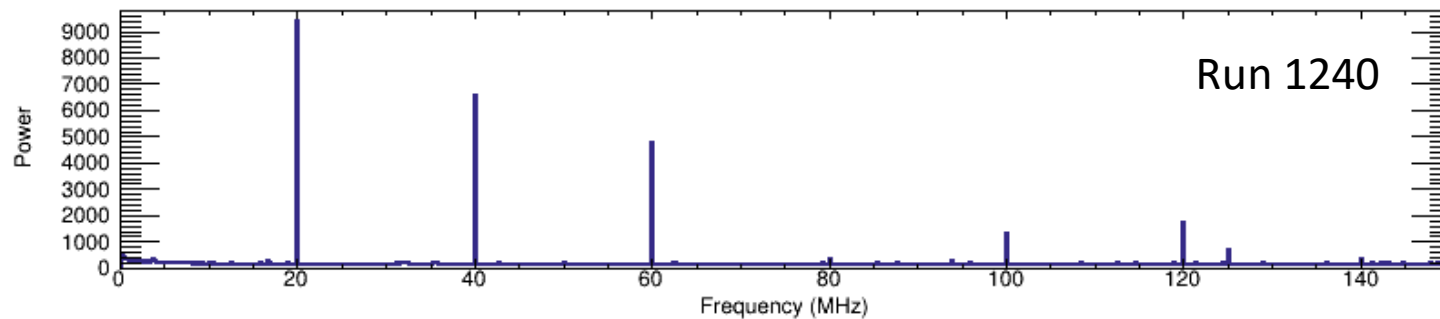
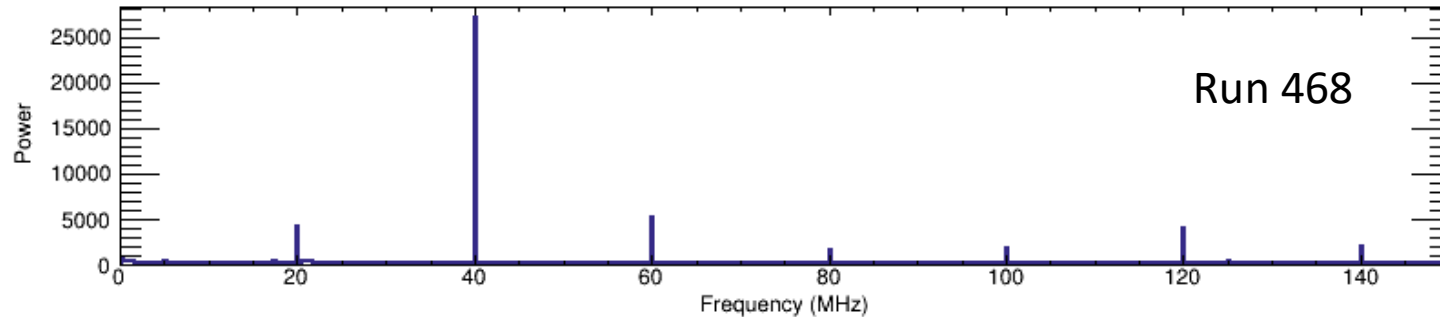


- NB: less counts because only 100 events per file

Frequencies

Board: WW-TOP-B

Channel: 1

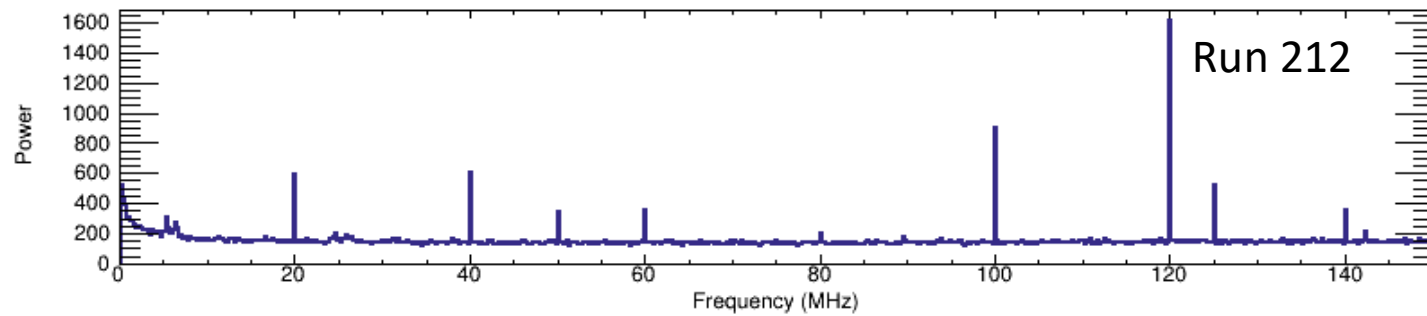
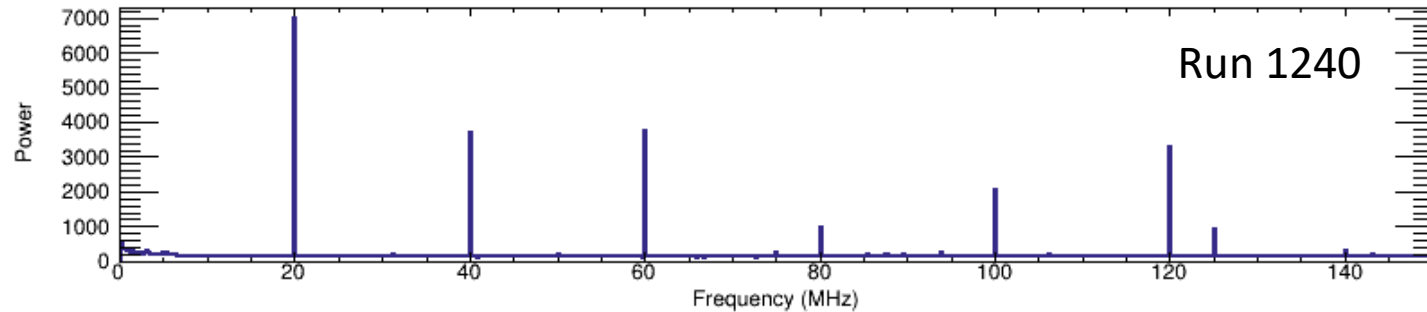
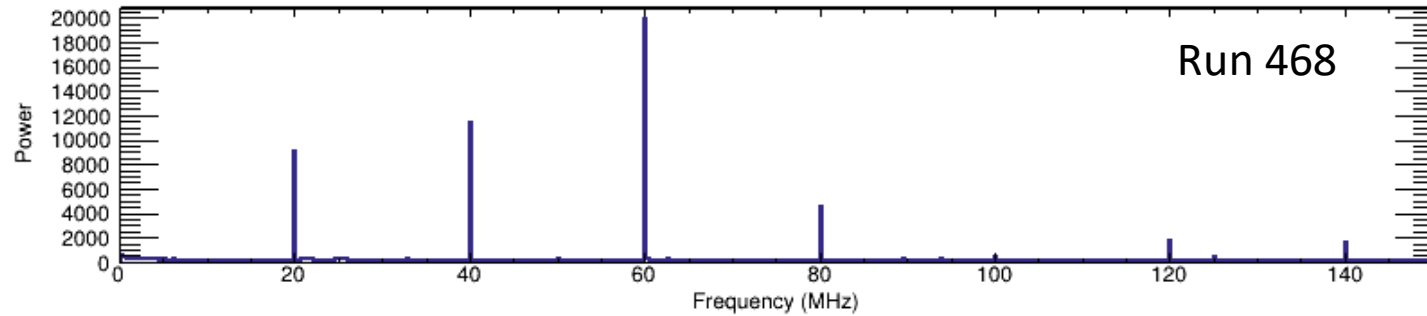


- Relevant frequencies in the PMT signal composition are always multiples of 20 MHz, with relevant amplitudes
- Plot obtained from the average of 100 events
- **NB: Y scale difference between three plots!!**

Frequencies

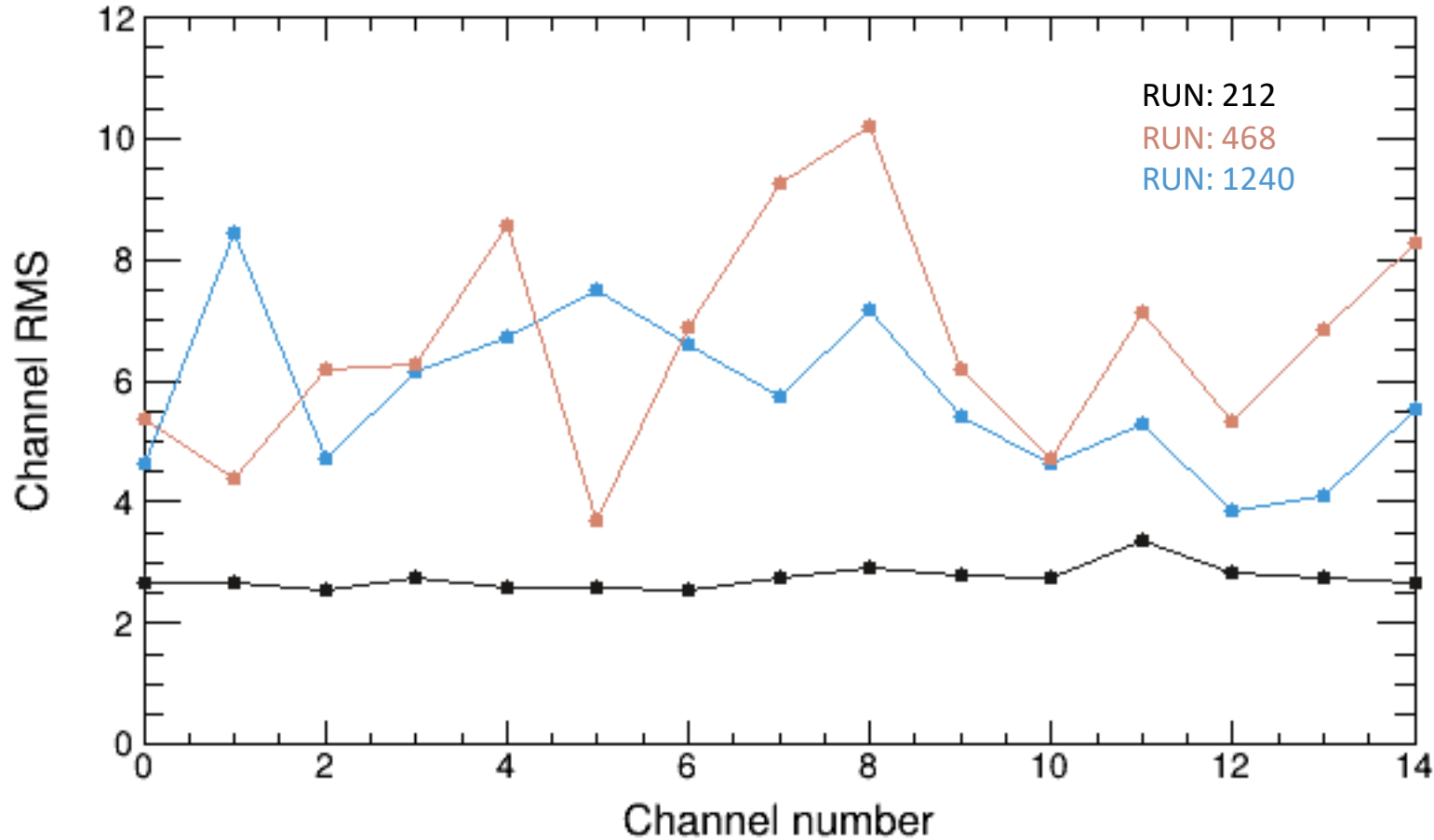
Board: WW-TOP-B

Channel: 5



- Relevant importance of frequency changes from channel to channel

Compare RMS variation



- Compare RMS variation on each run o board WW-TOP-B

Summary

- Noise on the PMTs is caused by frequencies multiples of 20 MHz
 - When Laser system is on noise tends to be 30% larger
 - Different channels have different noise
- RMS variations between channels are significant too
 - Might be related to the different importance of the pickup frequencies on that channel.
 - No clear space correlation has been identified, although some fluctuations seem smaller on certain boards and larger on others
- IDEAS...

RMS variation per channel (run 1240)

