

PDS time stability

Niccolò Gallice

University of Milan - INFN



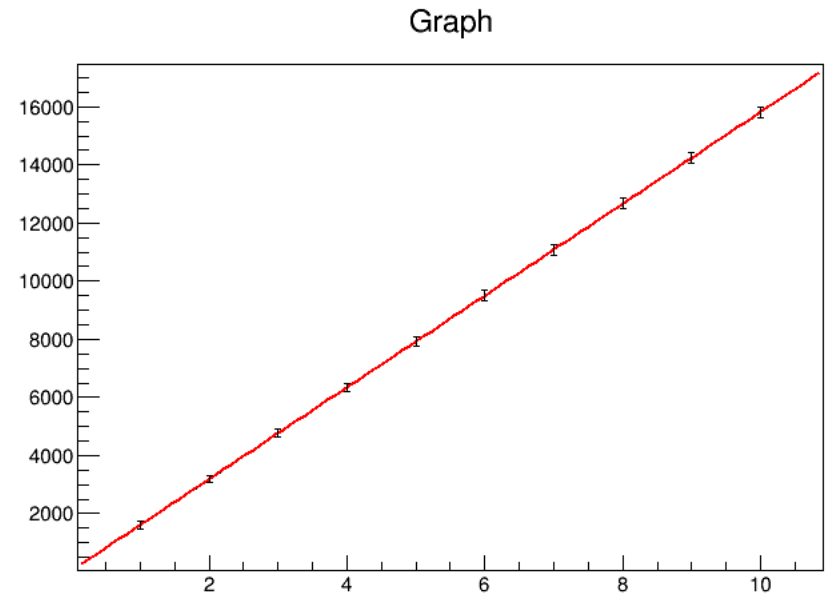
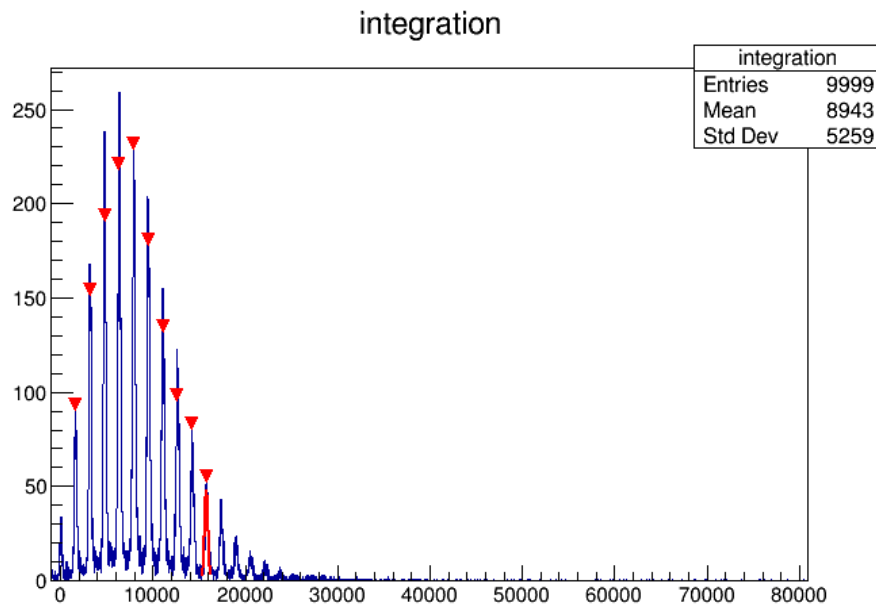
Analyzed runs

# Run	HV (V)	Bias	Pulse Height	Date
6800	180	Nominal	689	13/02/2019
6846	180	Nominal	689	20/02/2019
6948	180	Nominal	689	04/03/2019
7218	0	Nominal	689	19/03/2019

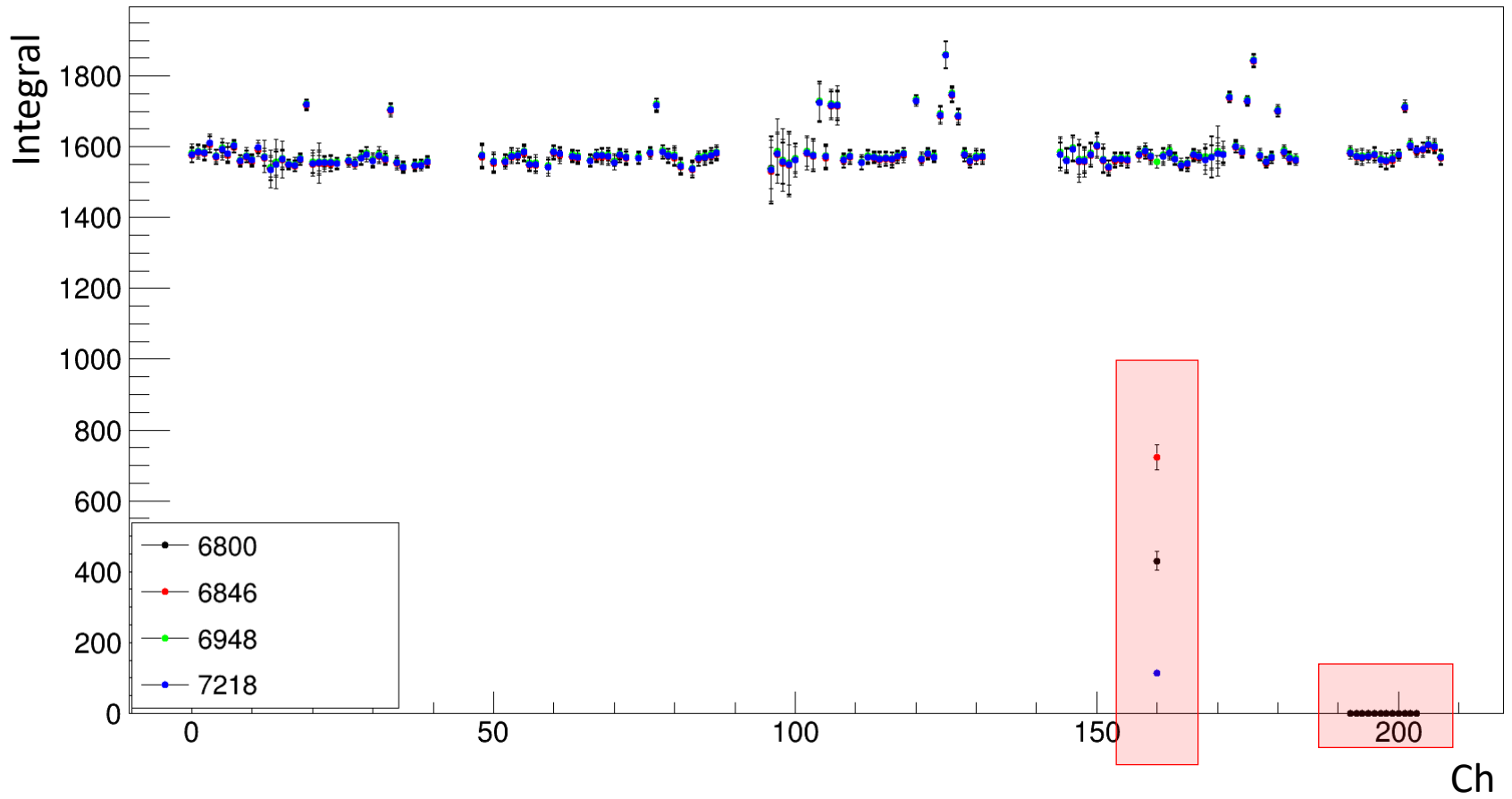
- Calibration of channels
- Gain vs Time
- Light collection vs time

SensL channel calibration

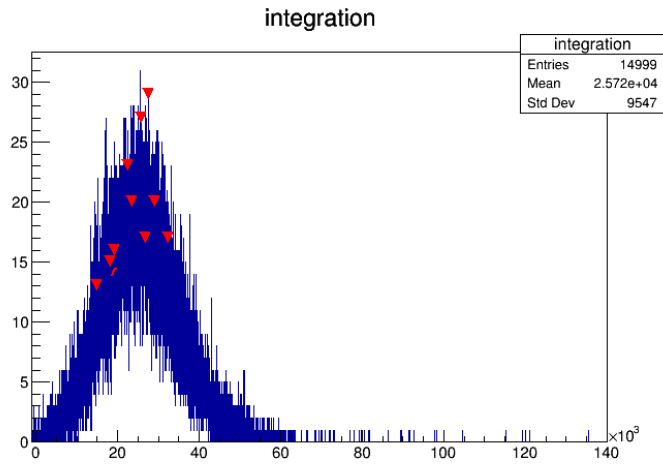
- Taking distributions from preprocessed data
- Peak finder giving as much as possible photo-electrons peaks
- Linear regression to find out calibration



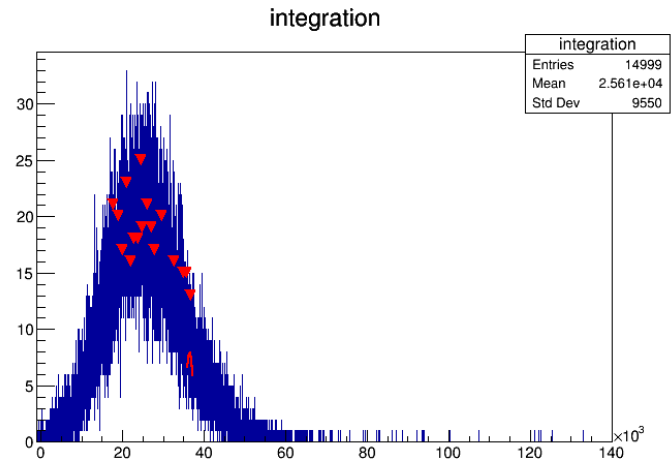
Gain



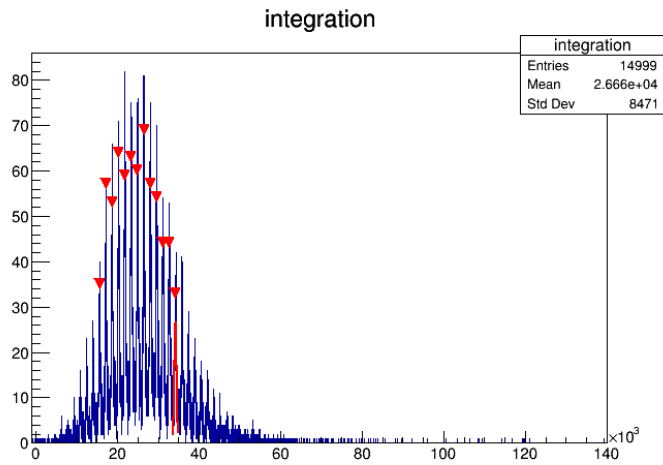
Channel 160



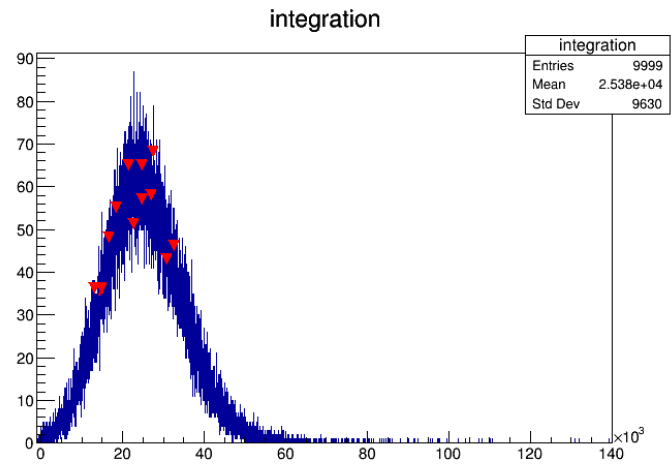
6800



6846

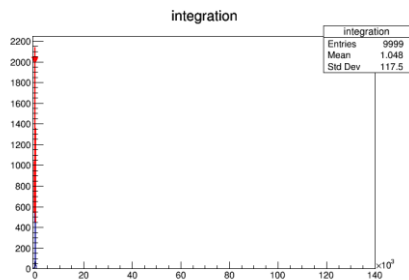


6948

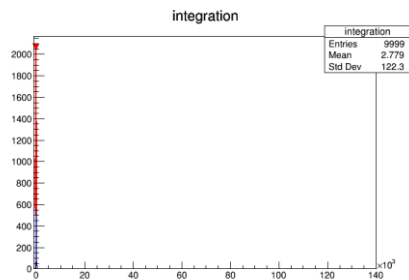


7218

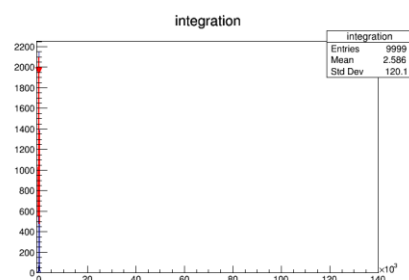
Run 6800



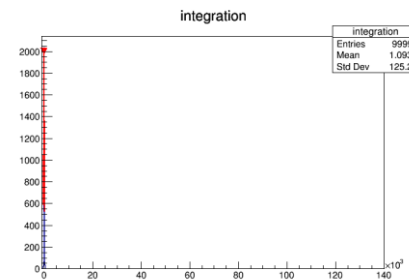
192



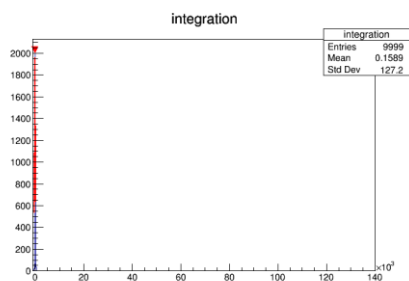
193



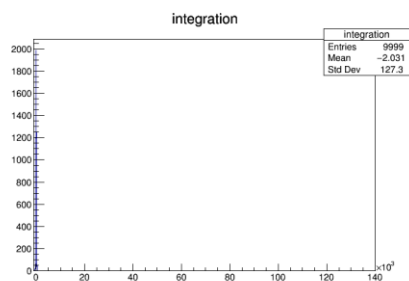
194



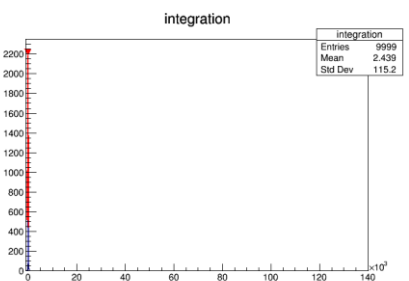
195



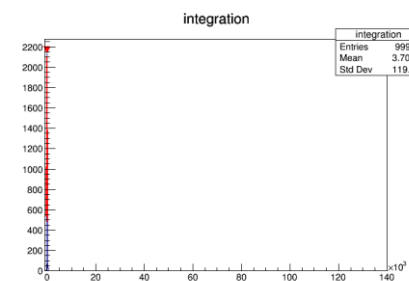
196



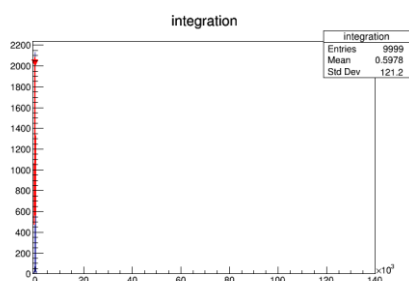
197



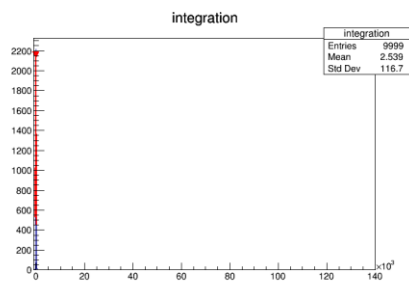
198



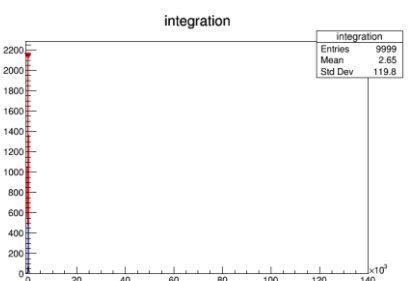
199



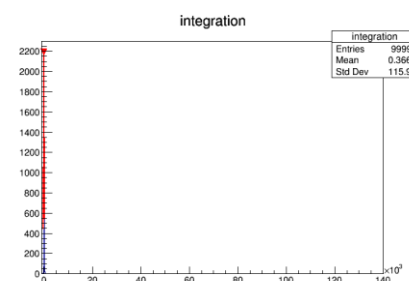
200



201

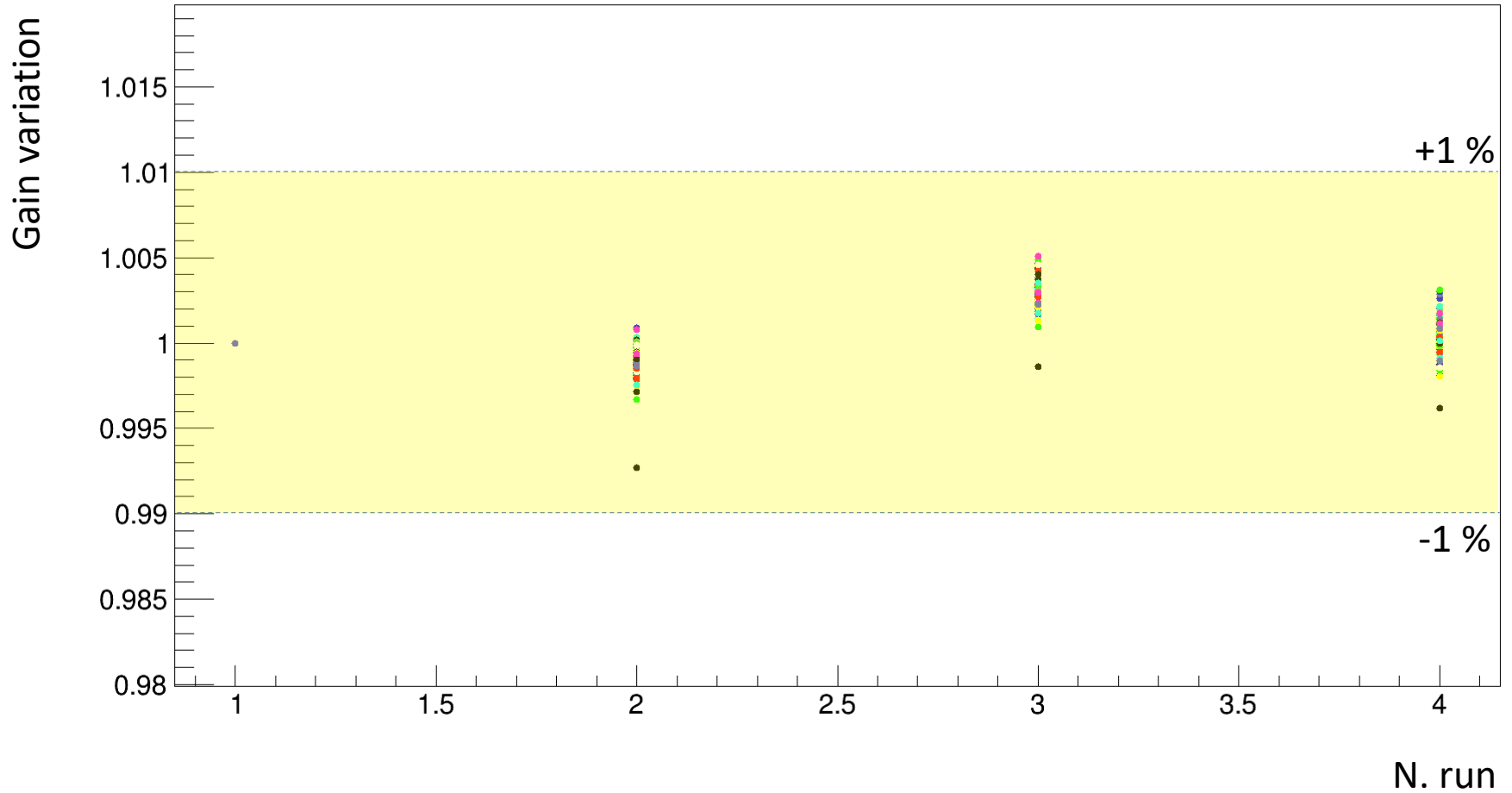


202



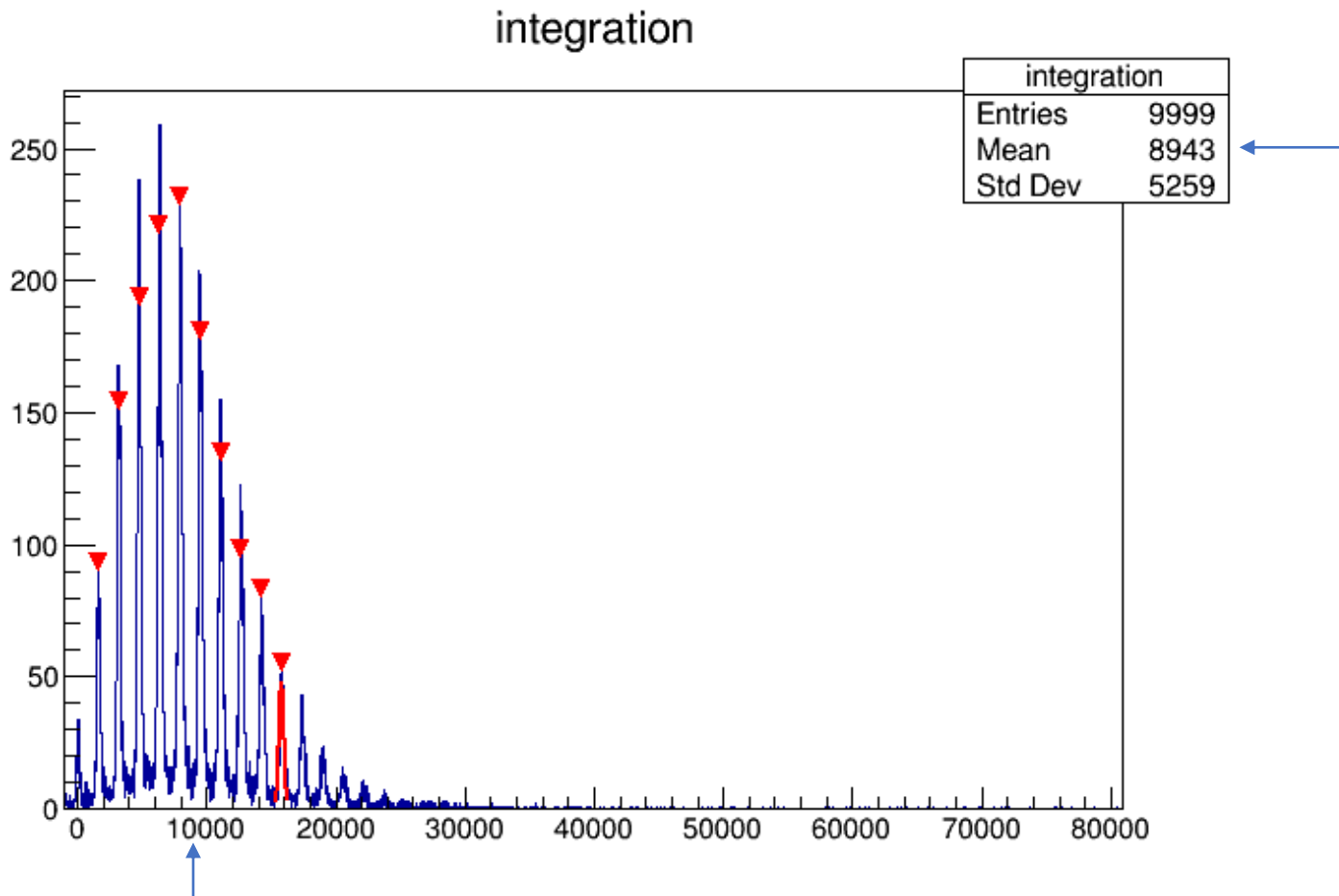
203

Gain vs time

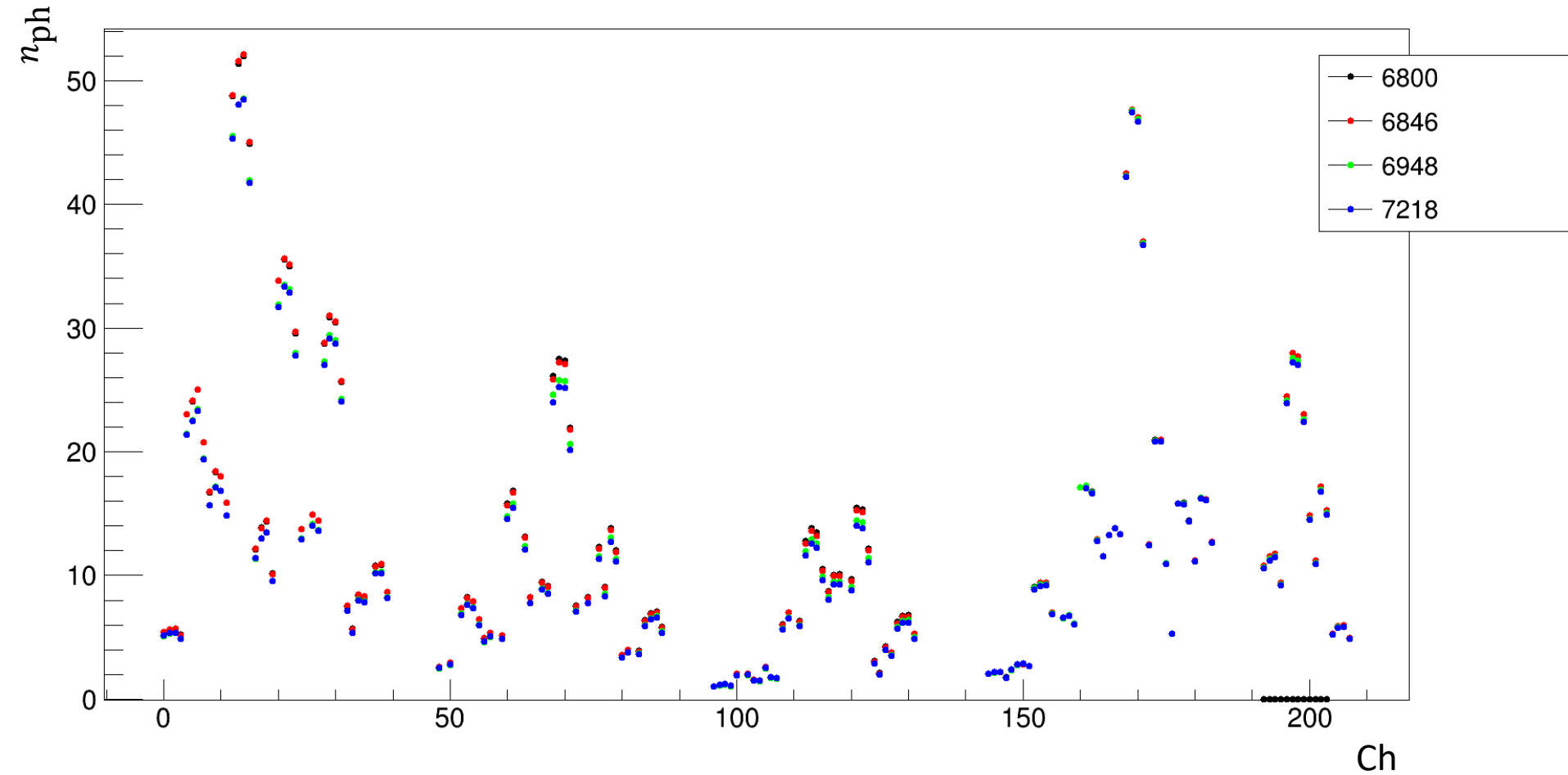


Light collection

- Average number of incoming photons used as parameter
- $n_{\text{ph}} = \text{Mean} / \text{Gain}$



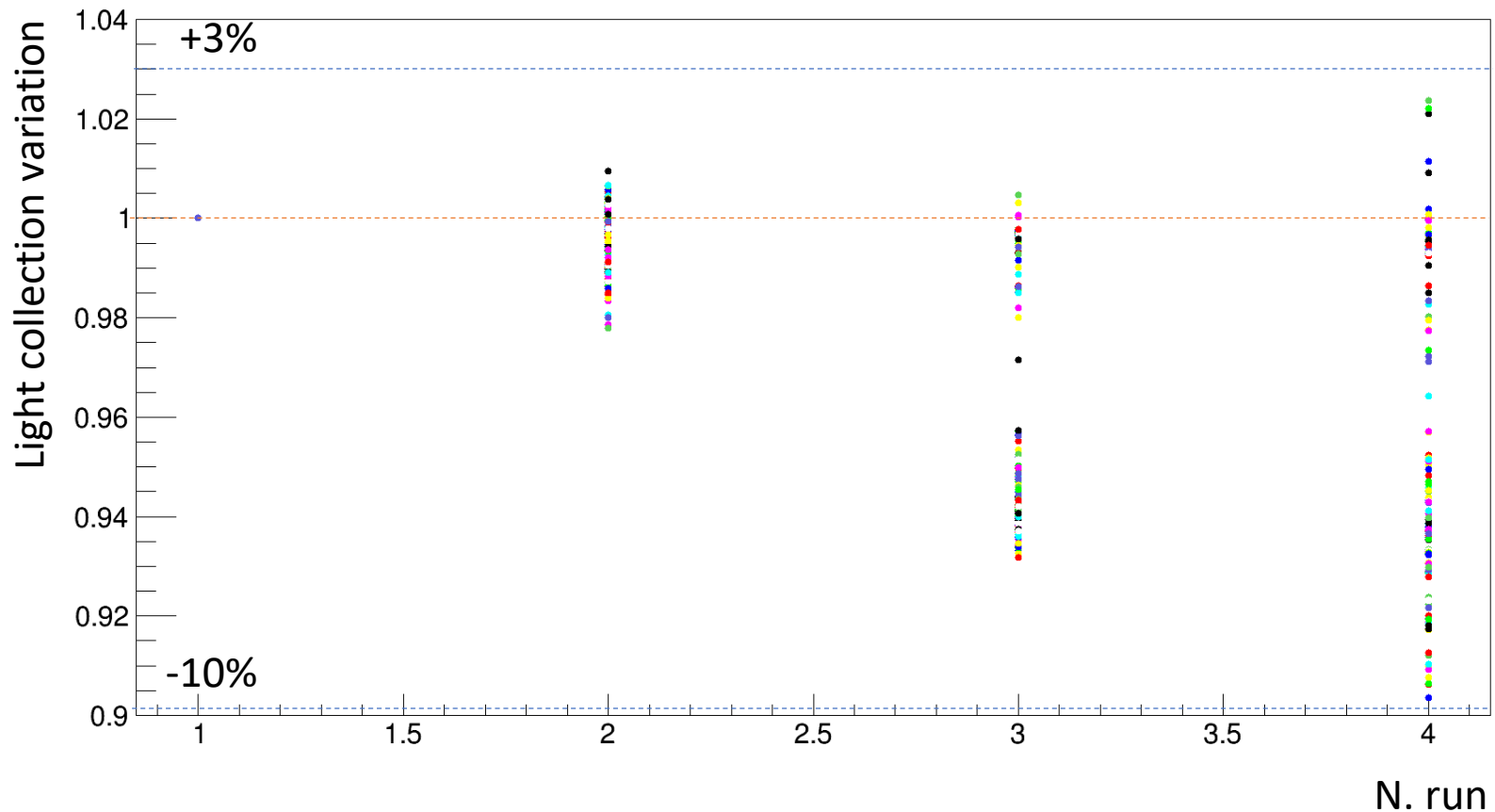
Light collection



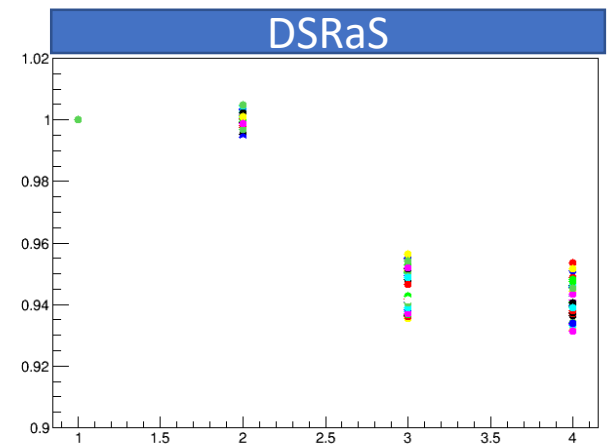
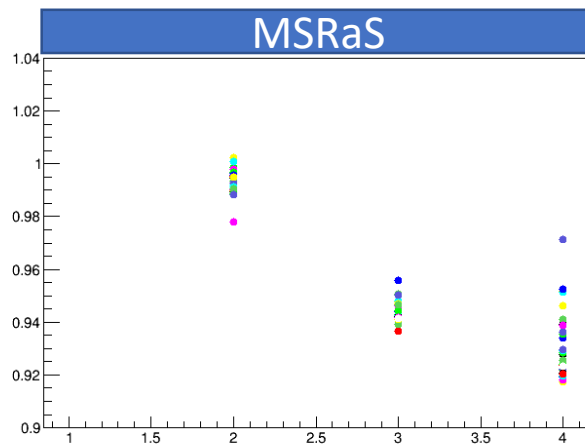
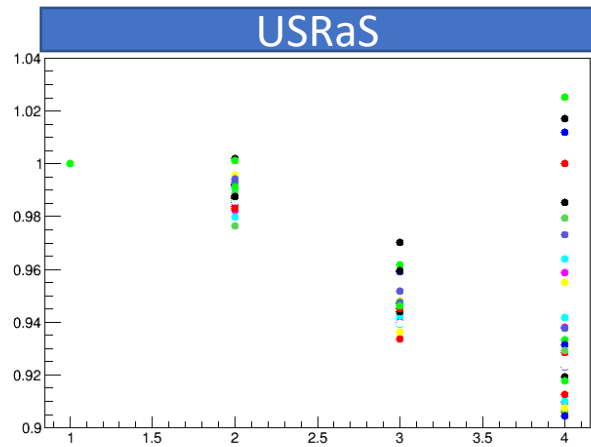
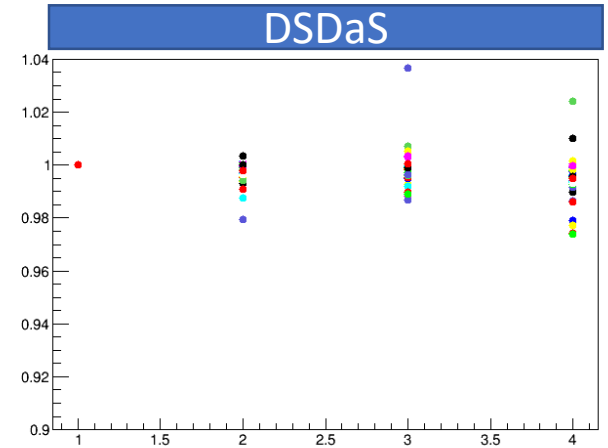
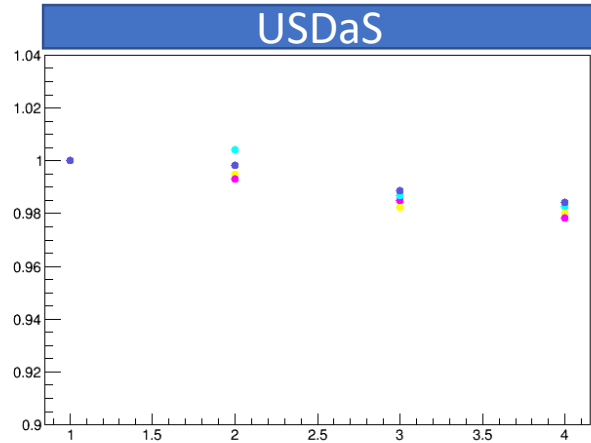
Light collection

- The light collected shows differences between runs
- Let's consider the ratio:

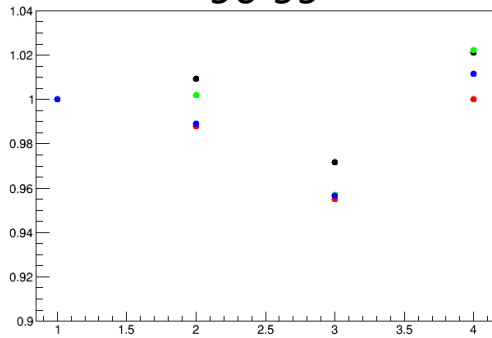
$$r = \frac{n_{ph}}{n_{ph \text{ of } 1^{st} \text{ run}}}$$



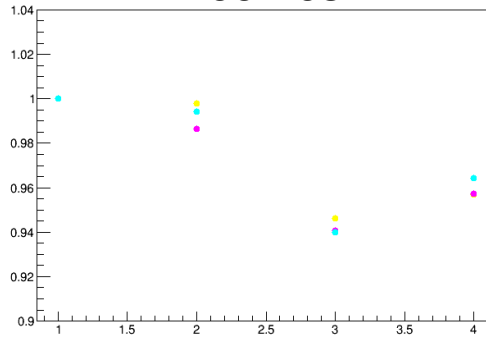
Light collection



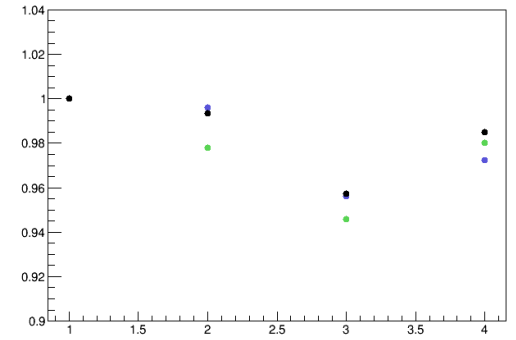
96-99



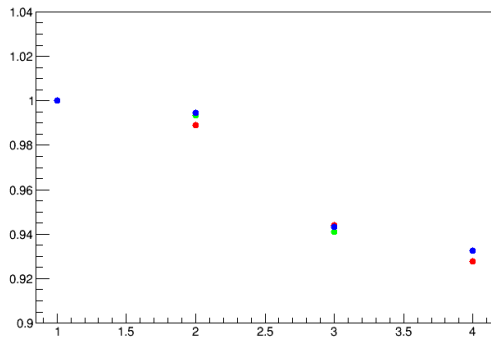
100-103



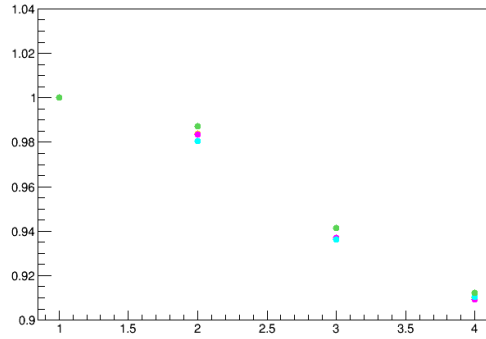
104-107



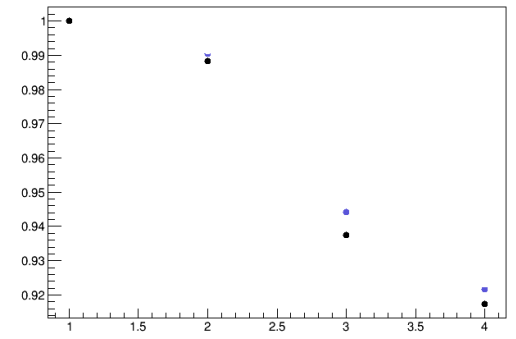
108-111



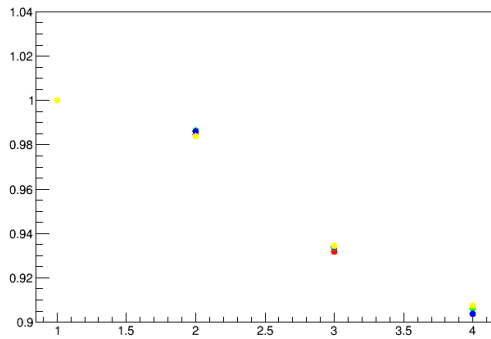
112-115



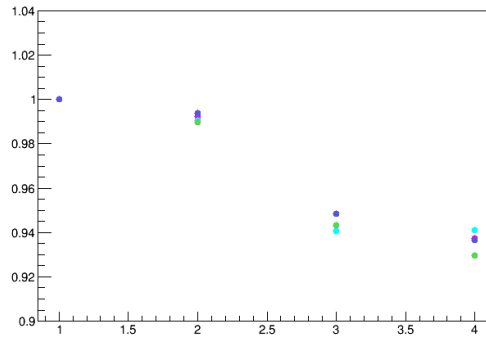
116-119



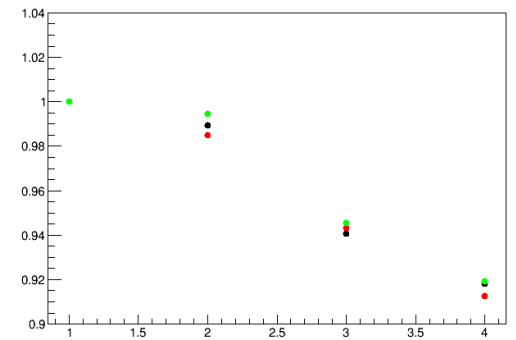
120-123



124-127

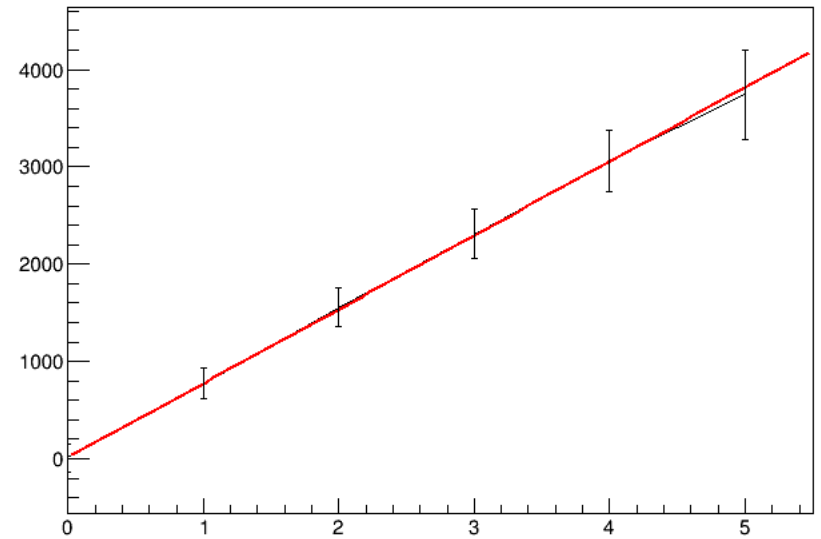
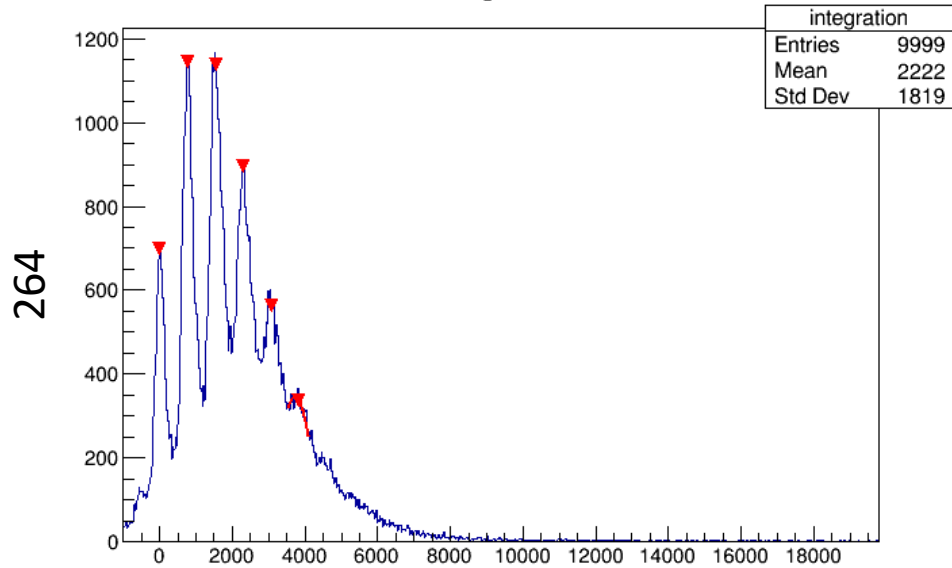


128-131

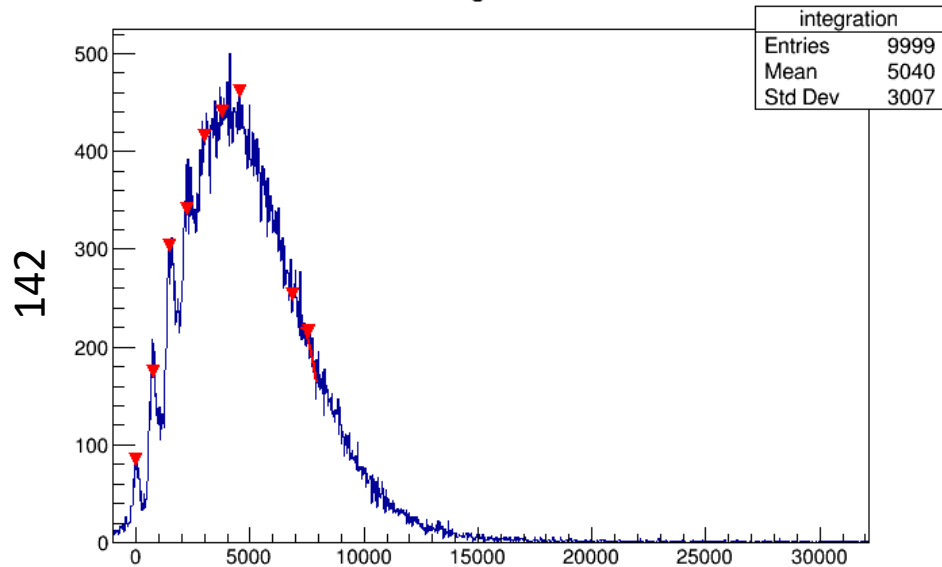


Arapuca channel calibration

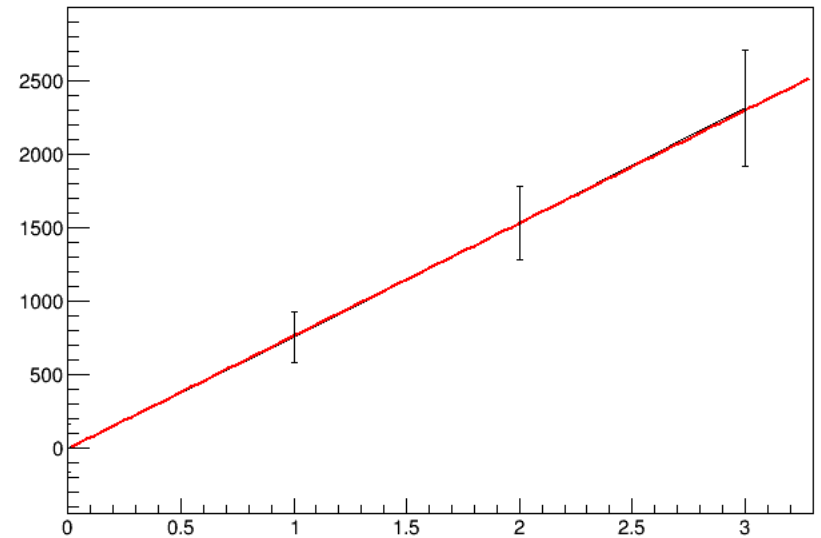
integration



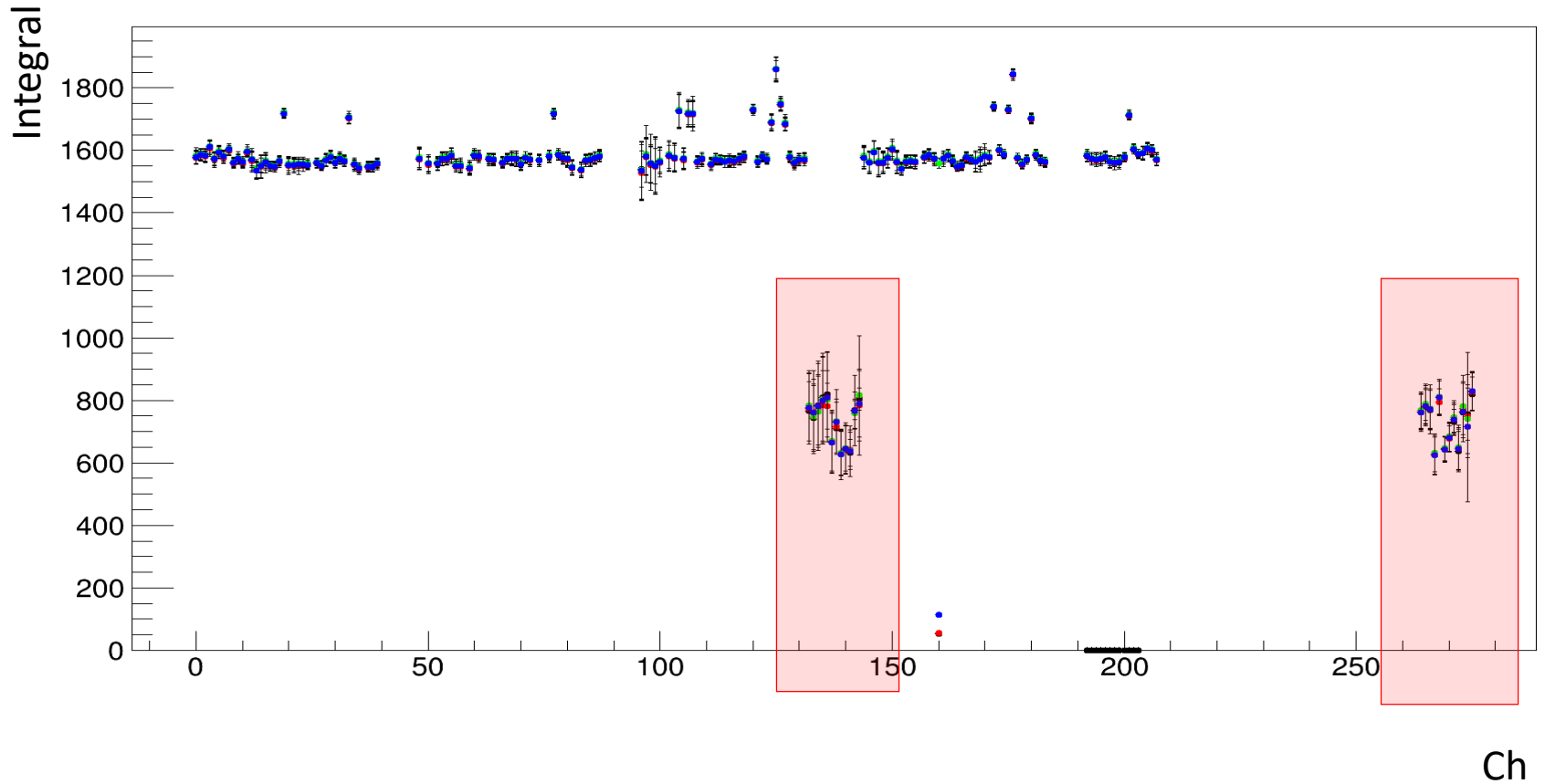
integration



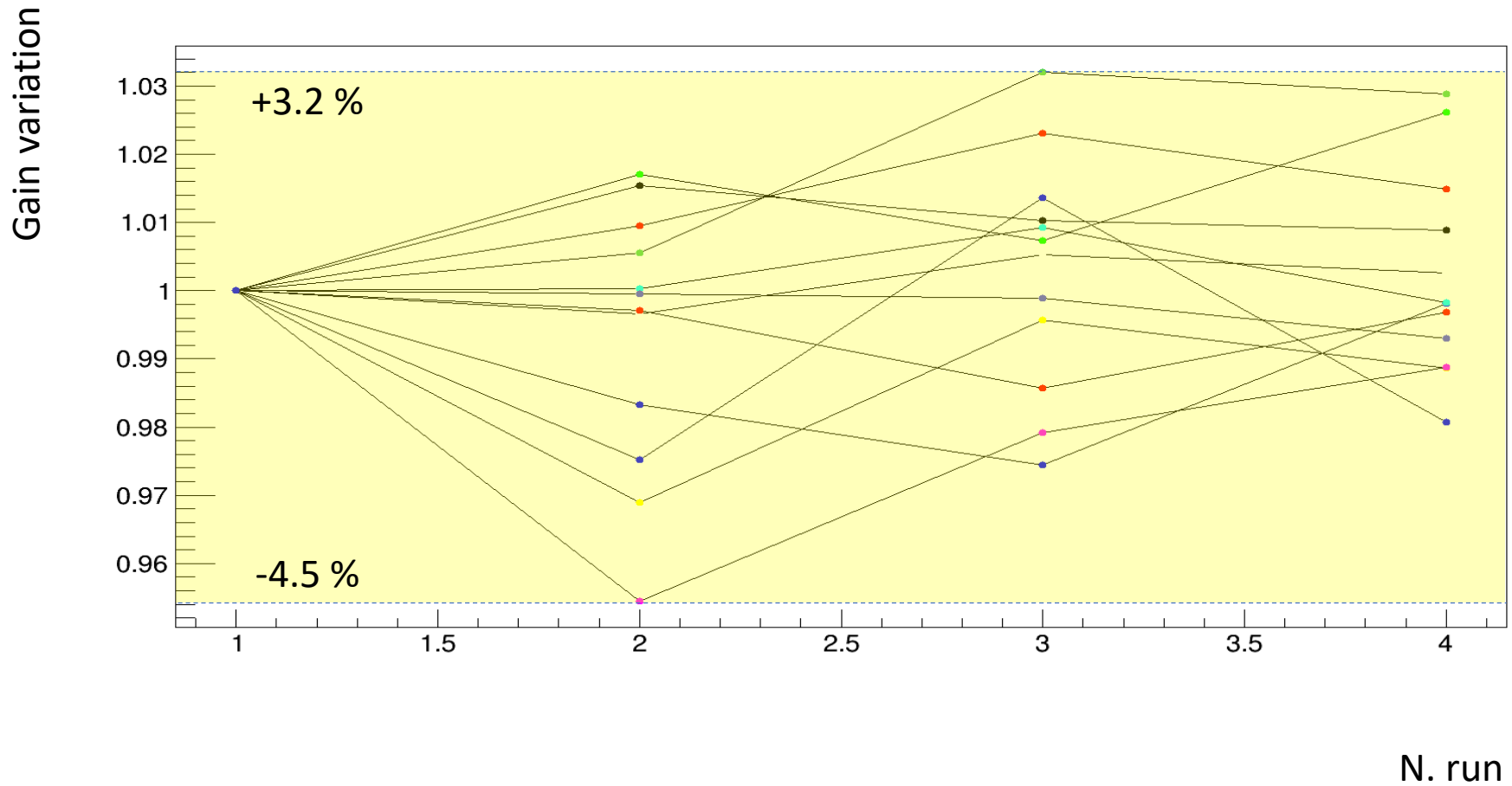
Graph



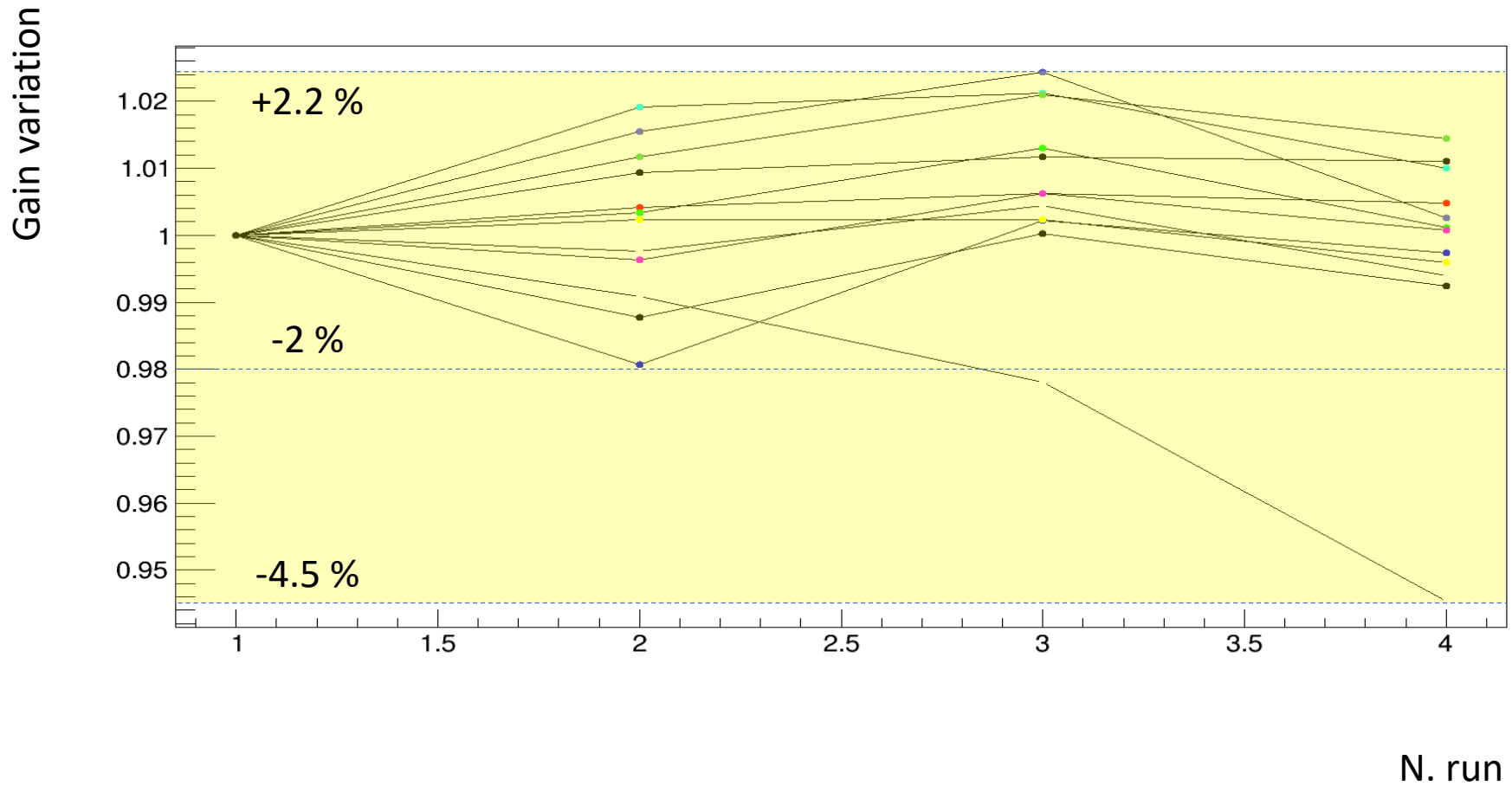
Gain with Arapuca



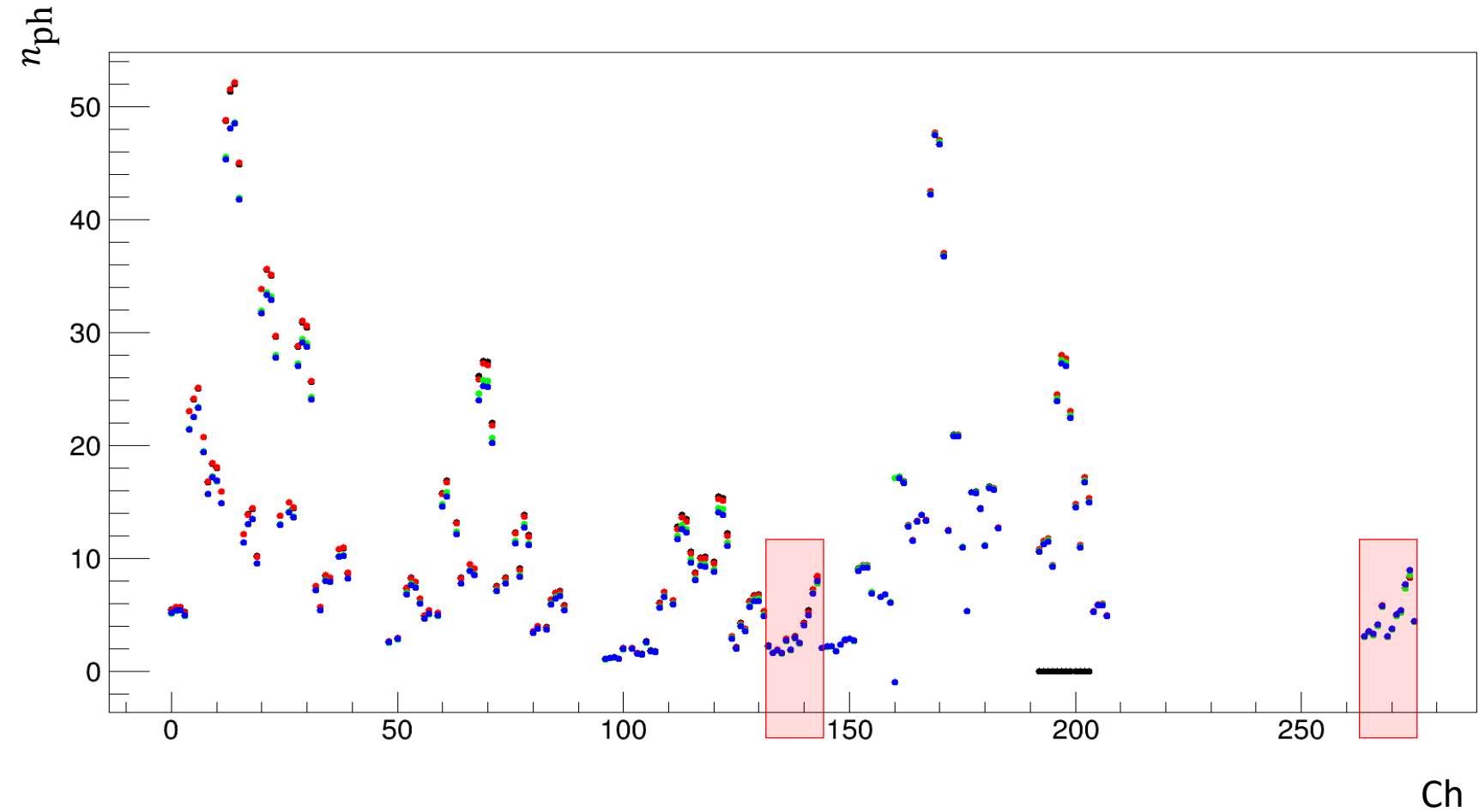
Gain vs time – Arapuca 1



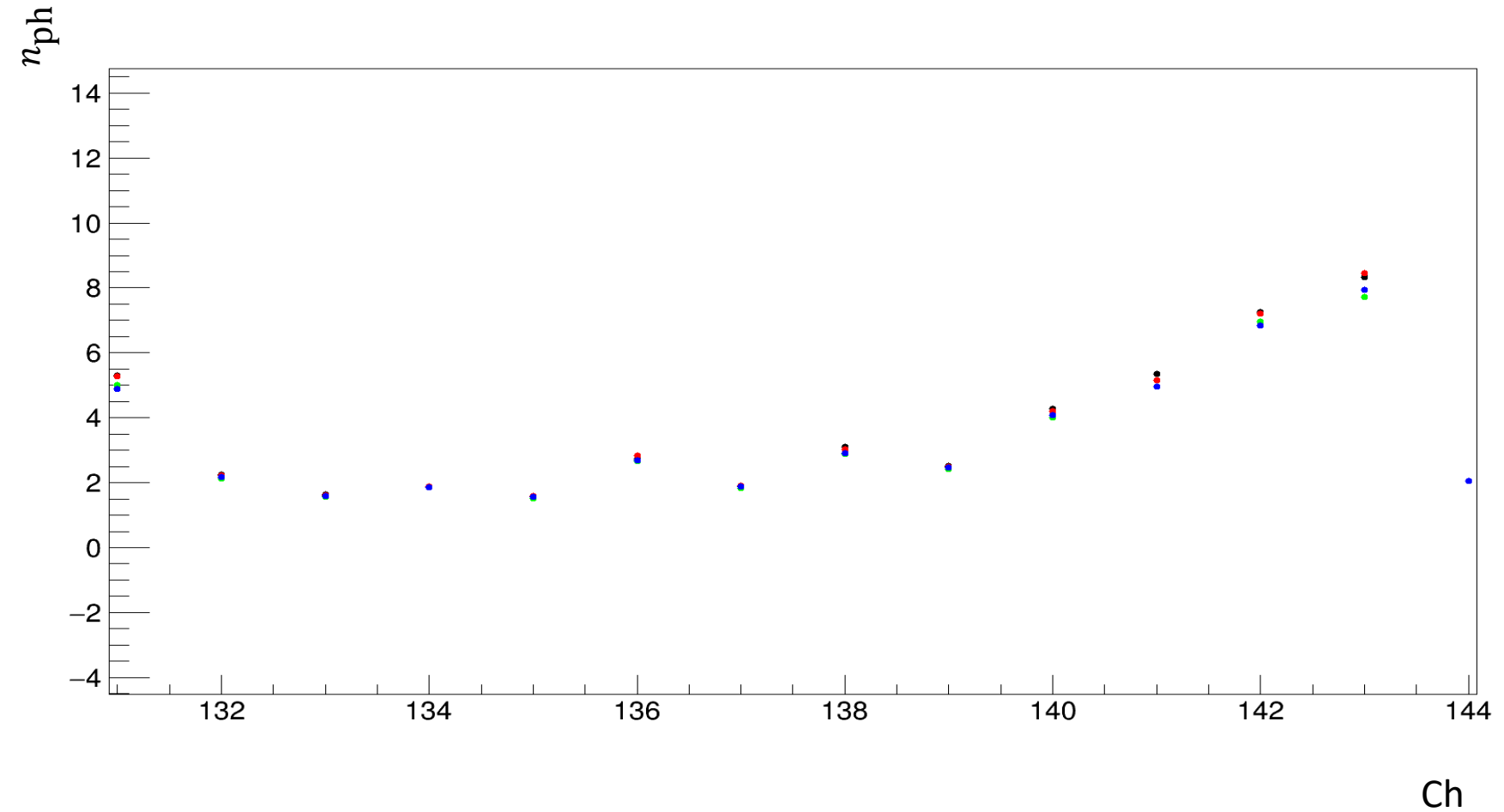
Gain vs time – Arapuca 2



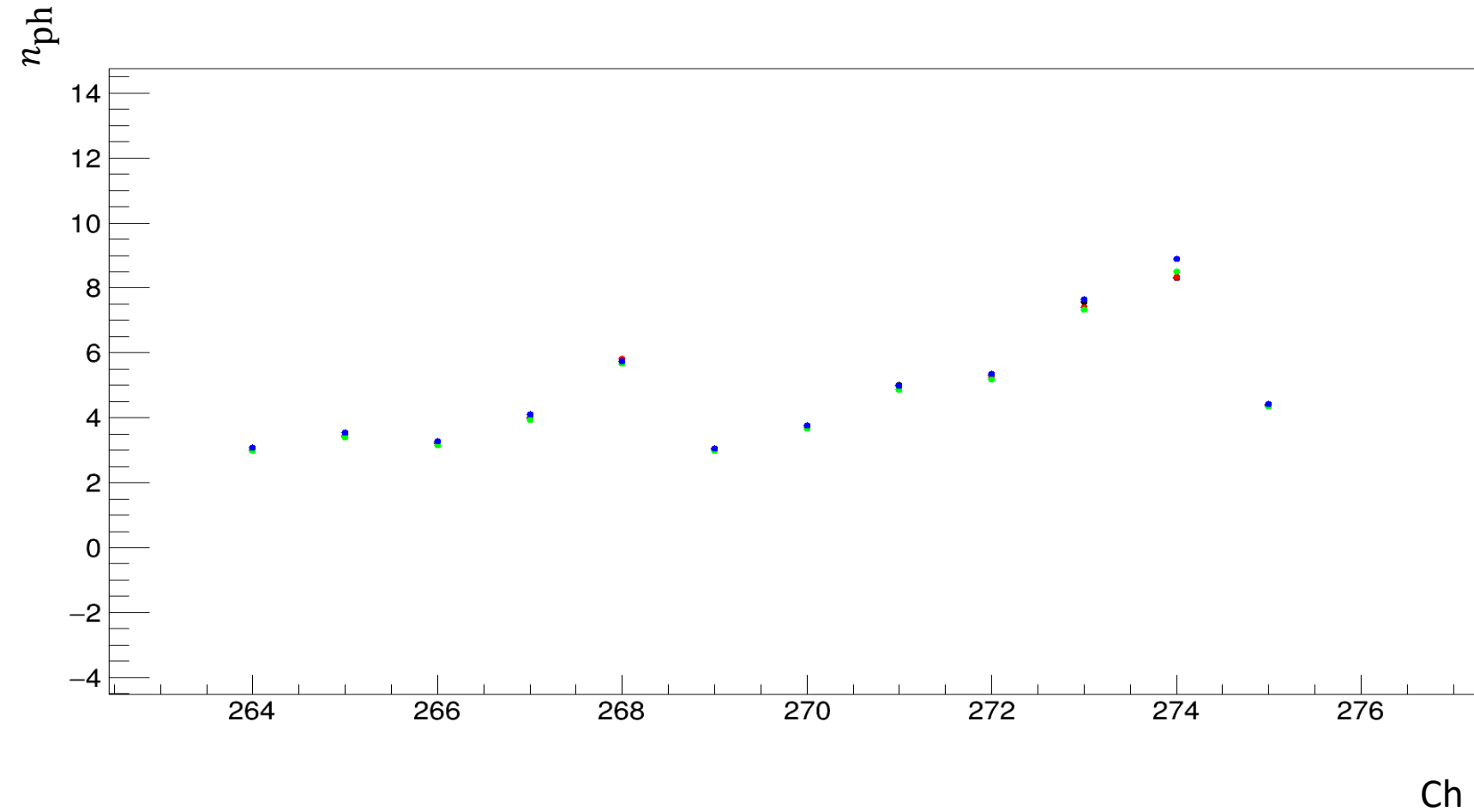
Light collection with ARAPUCA



Light collection – ARAPUCA 1

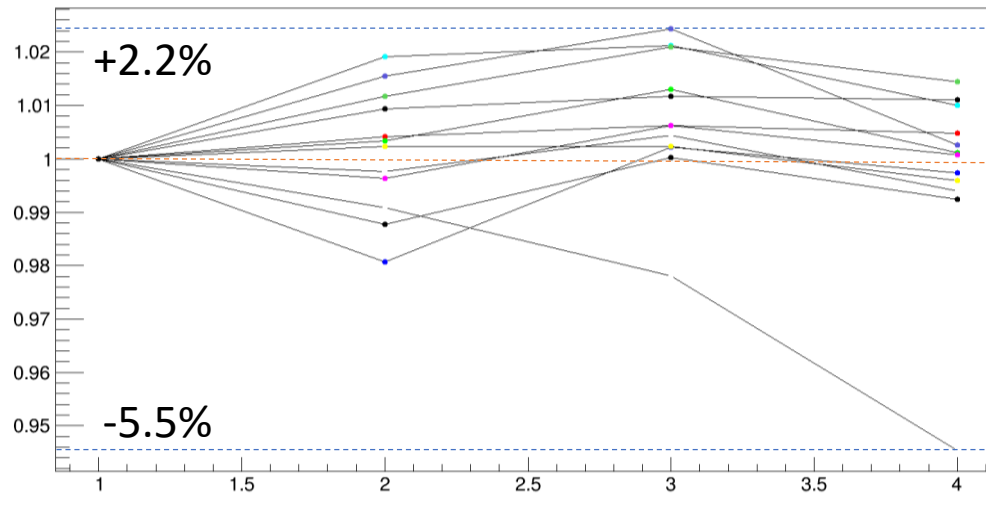
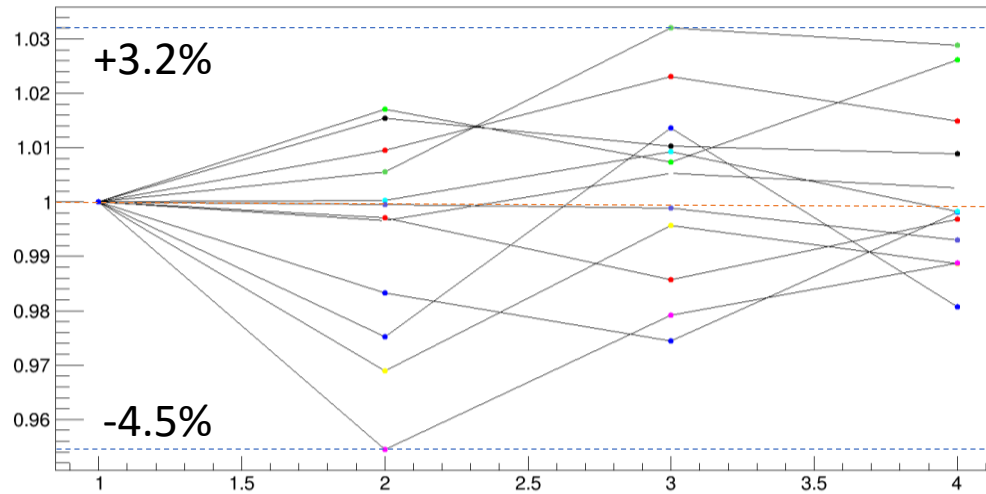


Light collection – ARAPUCA 2

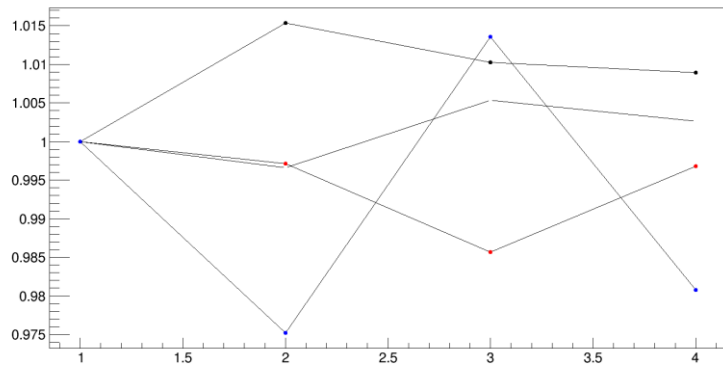
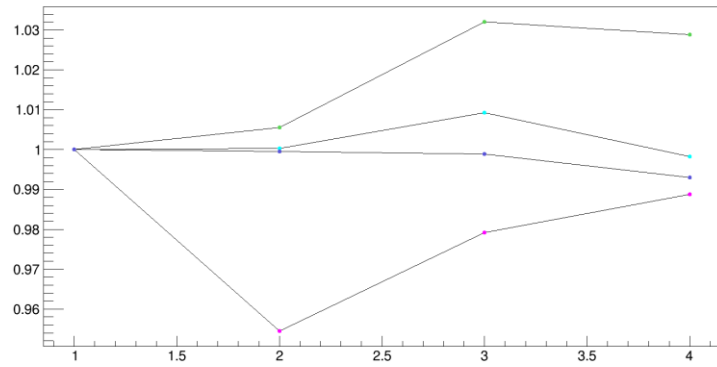
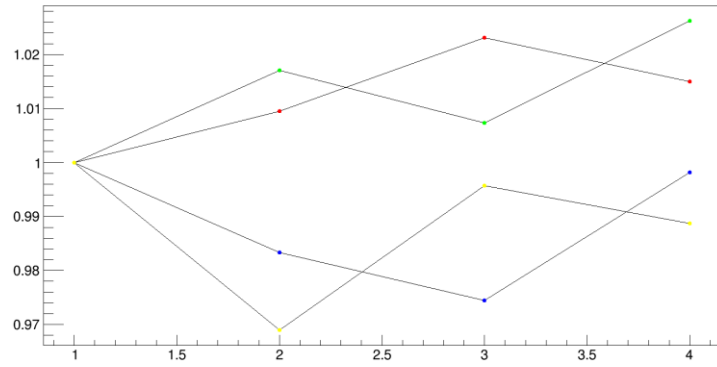


Light collection

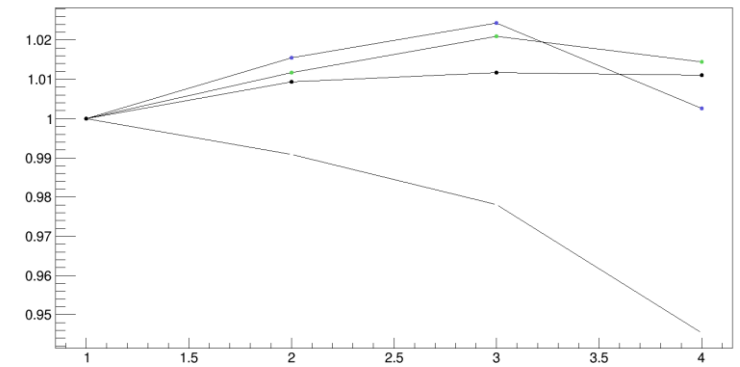
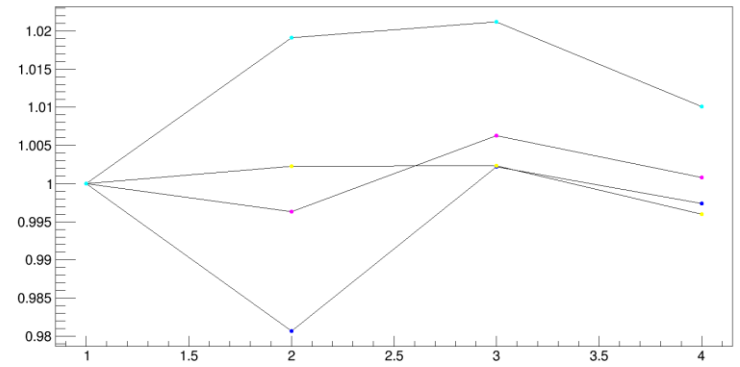
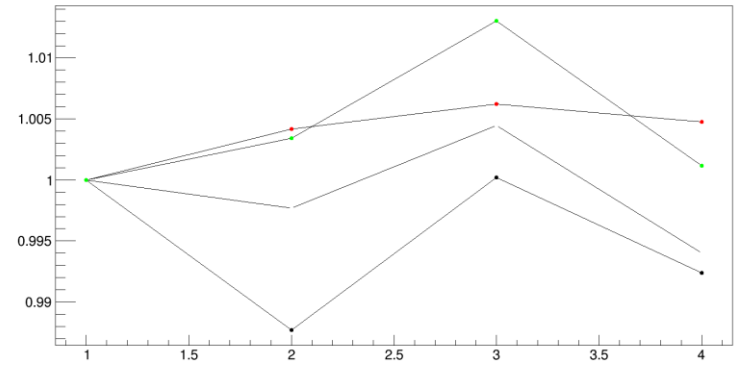
Light collection variation



ARAPUCA 1



ARAPUCA 2



Conclusions

- The gain of SensL sensors is stable
- Some variation of light collection with respect to time is seen in some devices
- The variation seems correlated with DCM position
- The ARAPUCA channels seem stable
- Need to process more data, on longer time interval and with lower led intensity
- To decouple DCM behaviour from light collection efficiency a standard light source is needed (e.g. vertical/horizontal crossing muons)