

Data Quality Monitor of the Laser Calibration System in the g-2 experiment at Fermilab

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MUSE Mid-Term Meeting Frascati, 12 May 2017



g-2 Laser Calibration System

For each of 6 lasers
We are interested to monitor:

- **1 Source Monitor** (PMT and 2 PIDs)

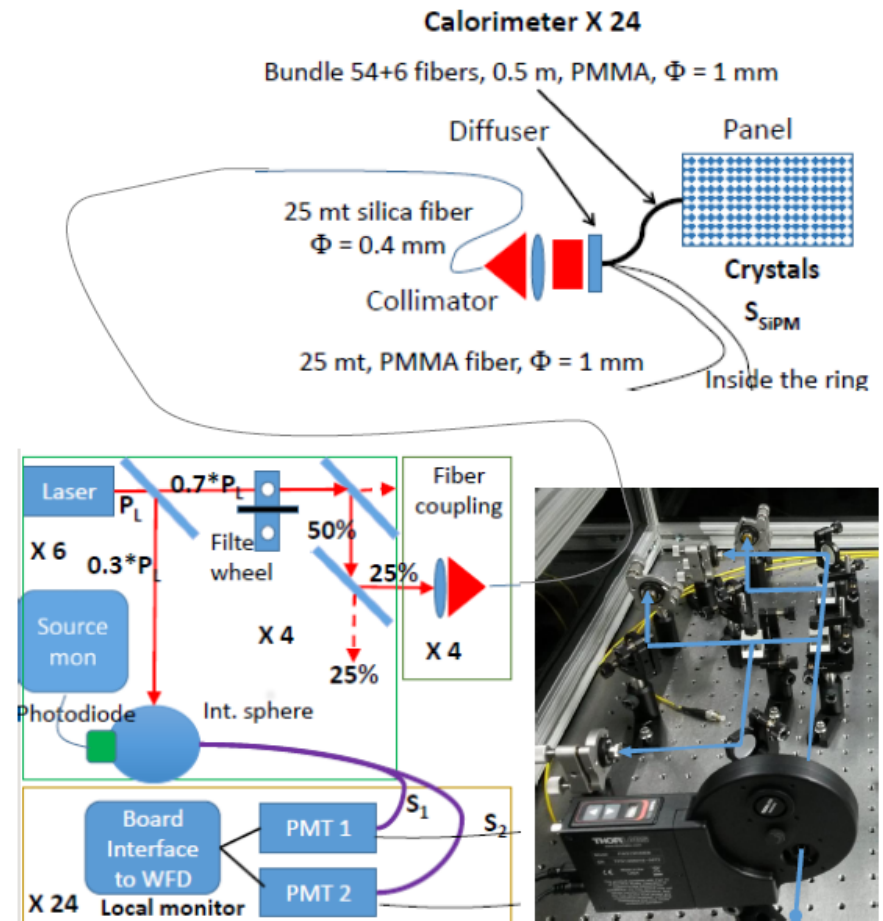


pmt pids-sum pids-ratio

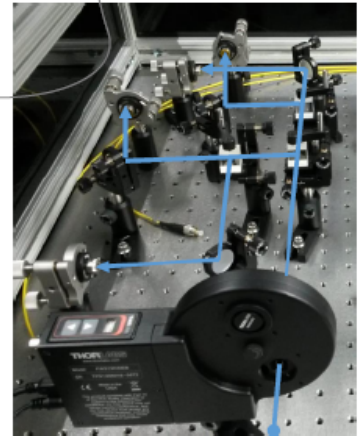
- **4 Local Monitors** (2 fibers as input of each PMT)



2 pulses ratio

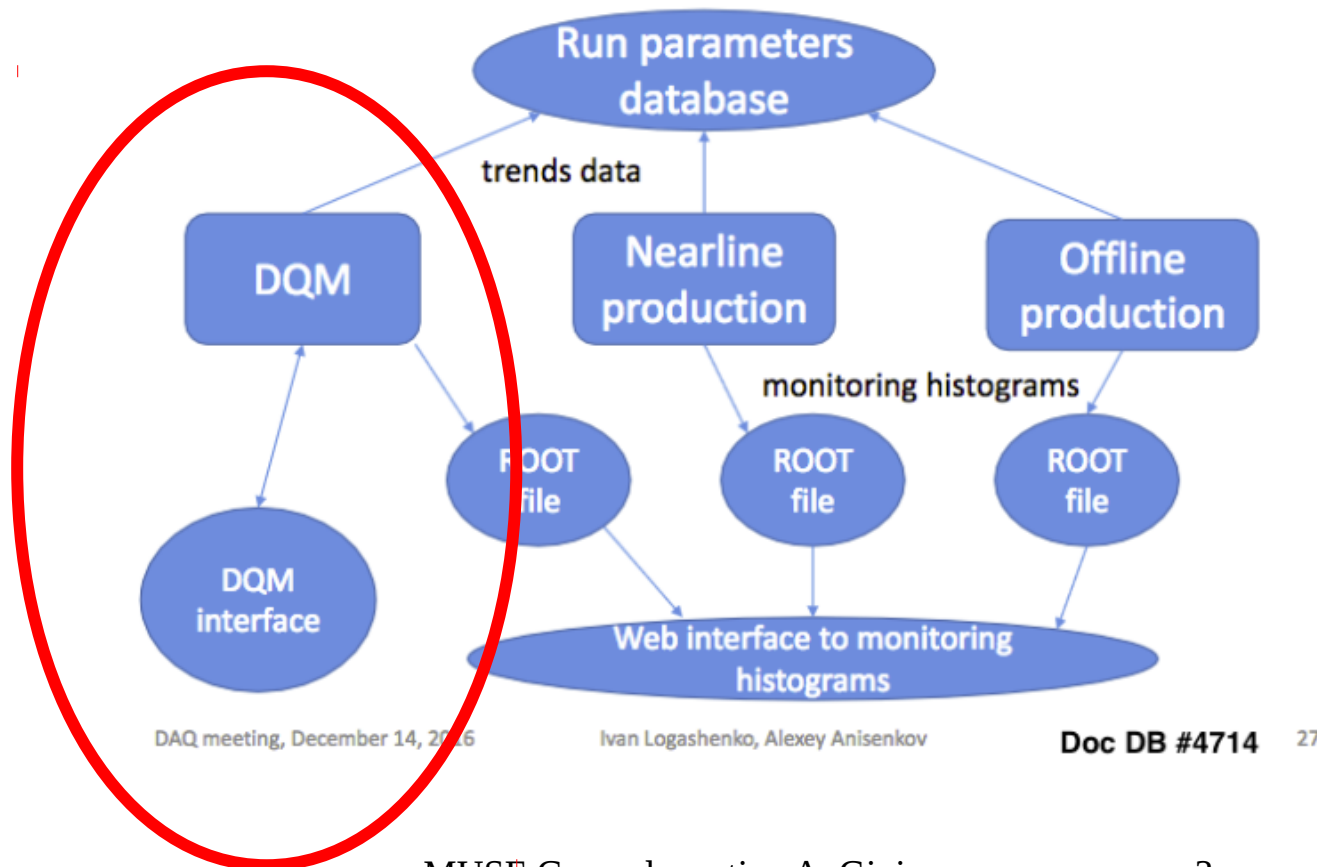


Courtesy Carlo Ferrari



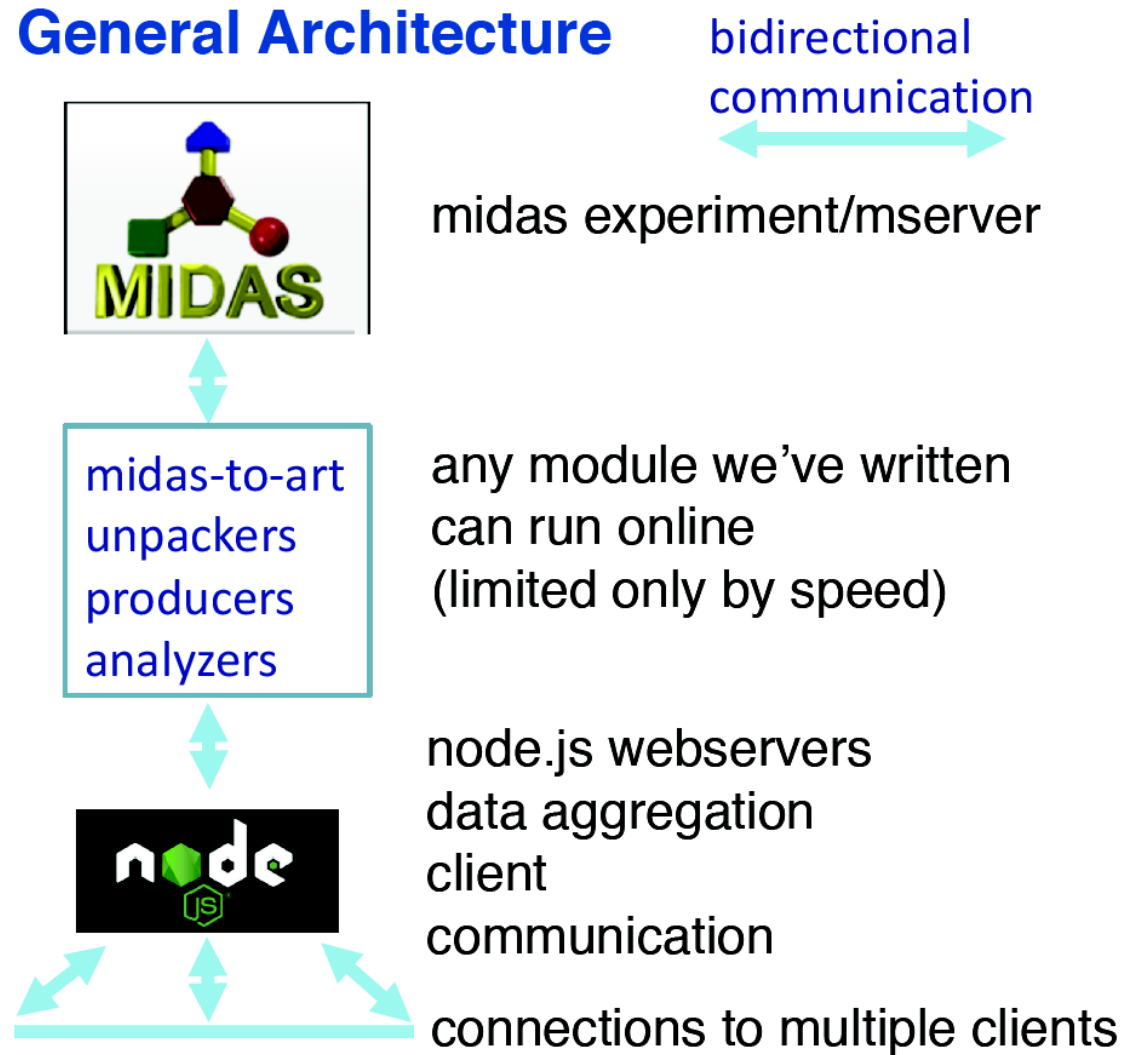
g-2 Online monitoring

Sidebar: sources of monitoring histograms



g-2 Online monitoring

General Architecture



Courtesy
Aaron Fienberg

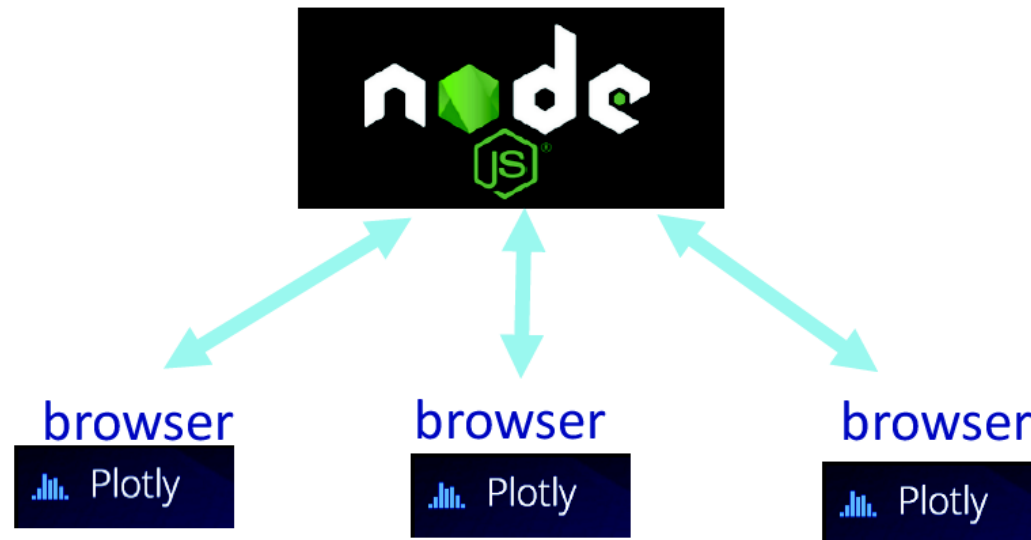
g-2 Online monitoring

Getting data out of the art job with ZeroMQ messaging library



zeromq.org

node.js webserver



g-2 Online monitoring

ALARMS

- **Internal Alarm** checks run inside a process
- **Program Alarm** triggered when a Program is not running
- **Evaluated Alarm** on a threshold condition
- **Periodic Alarm** periodically activated according to a time interval

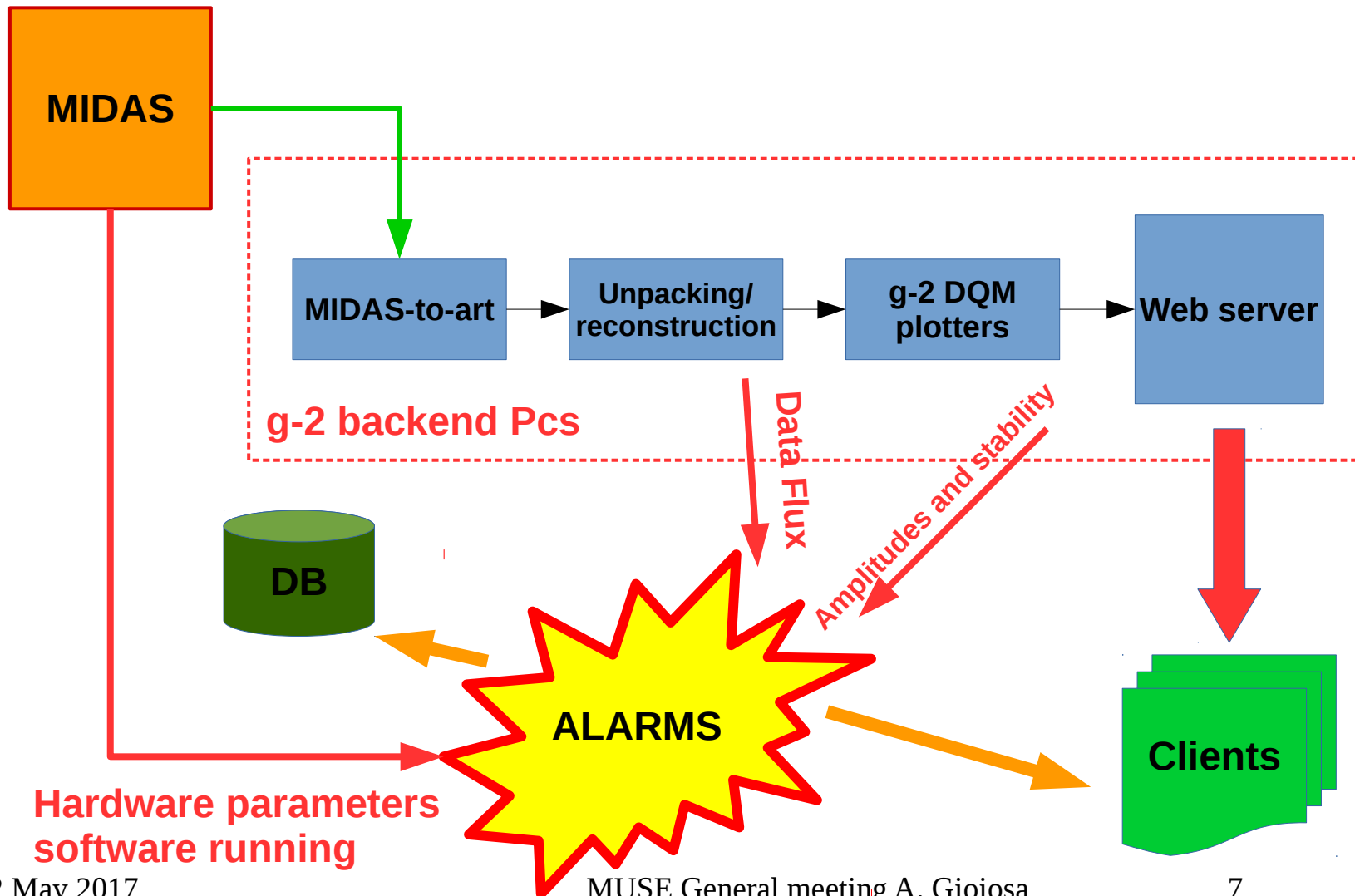


Alarm Message

- **destination:** (to system message log, to DB system, to elog)
- **Alarm Alerts:** visual, audial, email, SMS

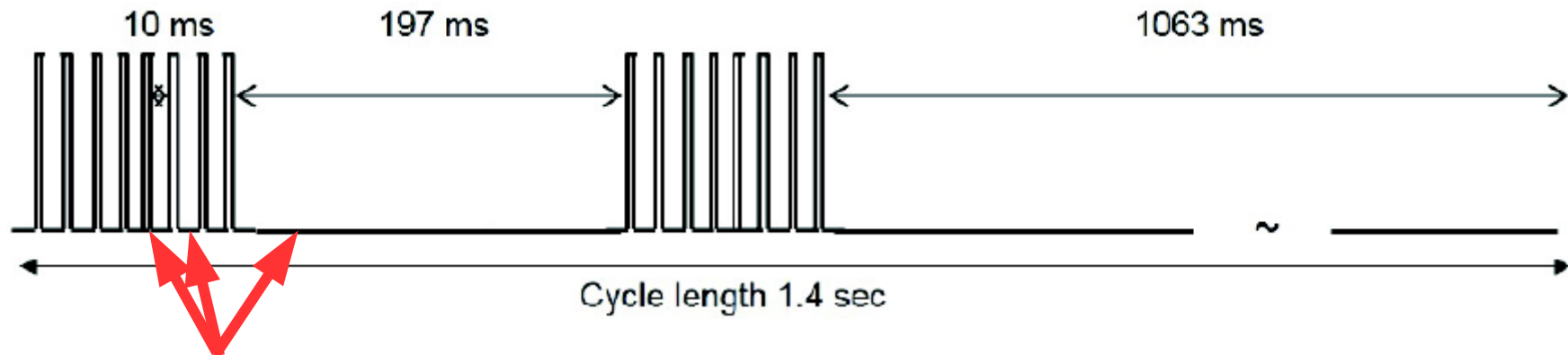
Courtesy Nikolay Khomutov

g-2 Online monitoring



g-2 Laser Calibration System online monitoring

Experiment supercycle



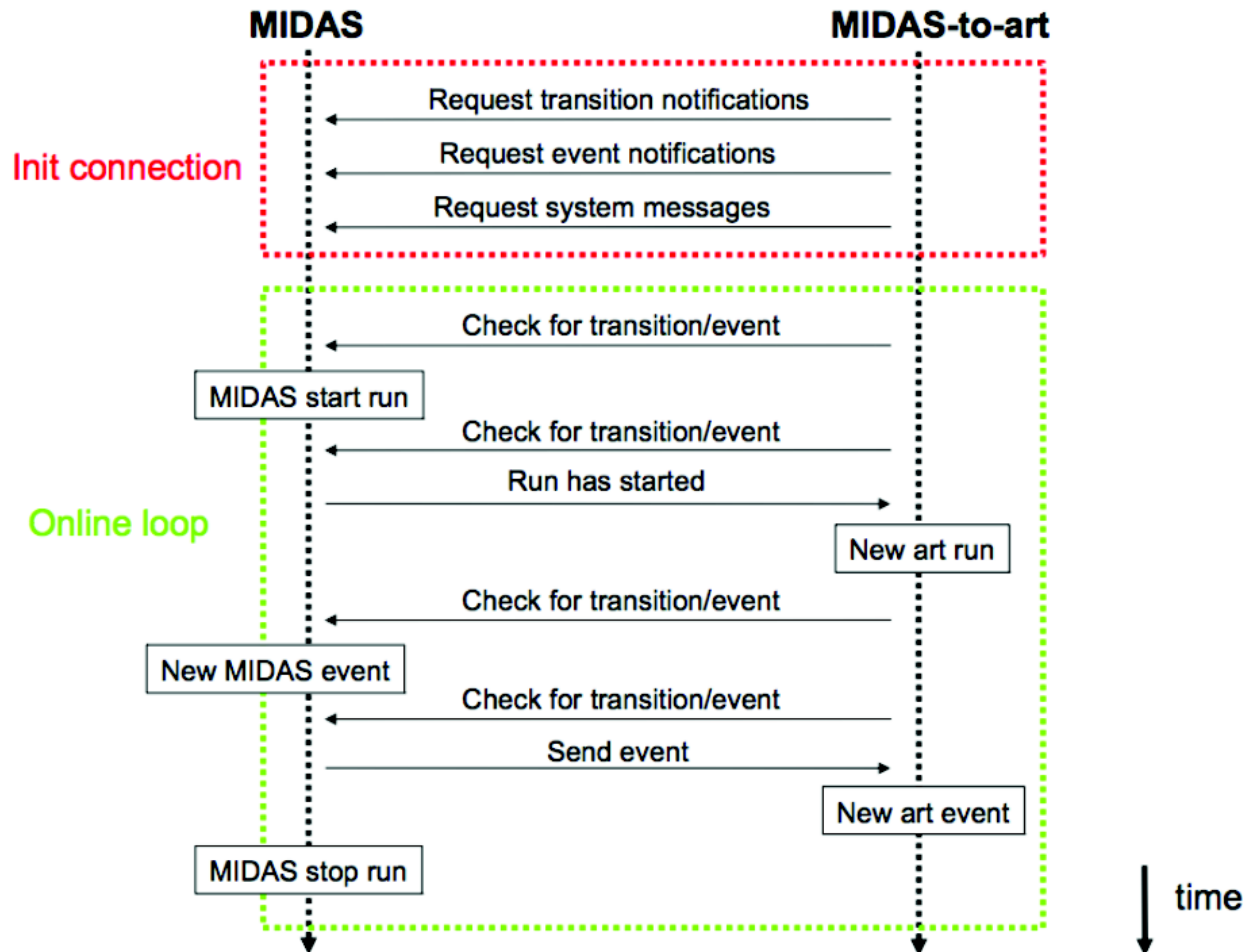
Laser pulses inside
and outside the muon
fill time windows

Laser Crate WFD



g-2 Online monitoring

midas-to-art online system



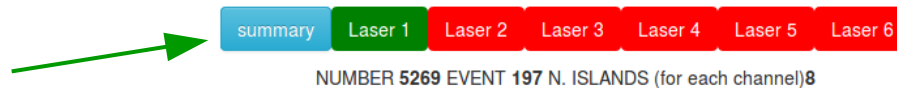
Laser Calibration System Online Monitor - Web Interface

Muon g-2 Laser Calibration System - Online Monitoring

Home

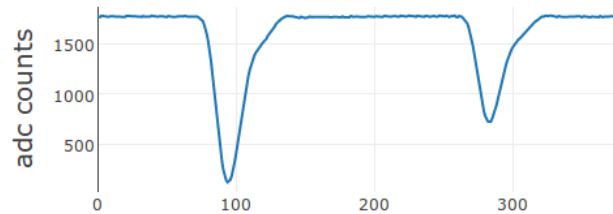
Status: **Connected**

Laser Crate 25 summary plots

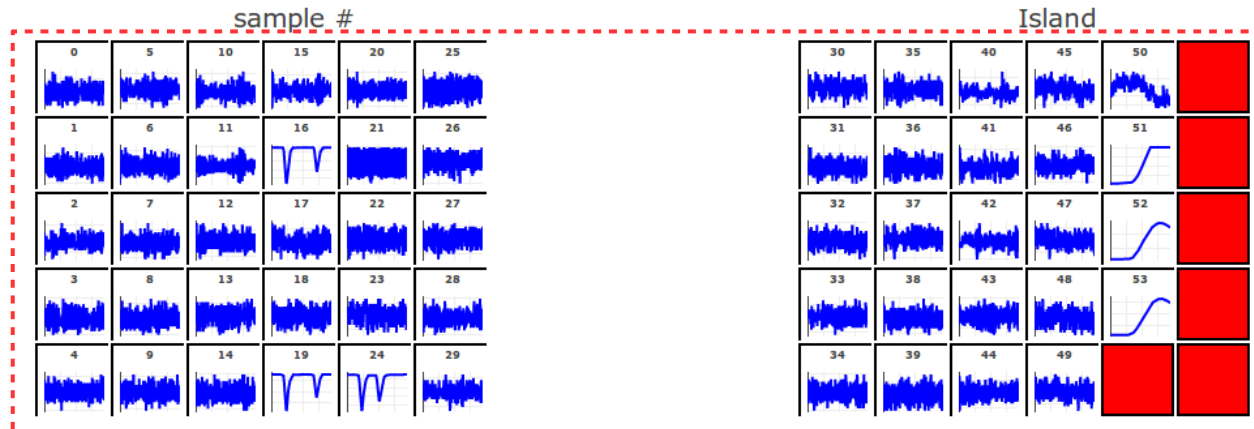
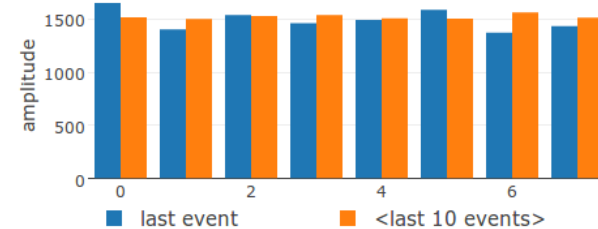


NUMBER 5269 EVENT 197 N. ISLANDS (for each channel)8

channel 19 Island num. 0



Channel 19 island amplitudes
(click on bars to change island in trace plot)



Laser Calibration System Online Monitor - Web Interface

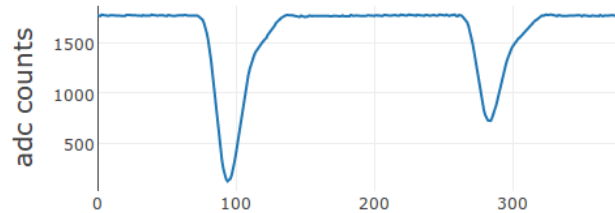
Muon g-2 Laser Calibration System - Online Monitoring [Home](#) Status: **Connected**

Laser Crate 25 summary plots

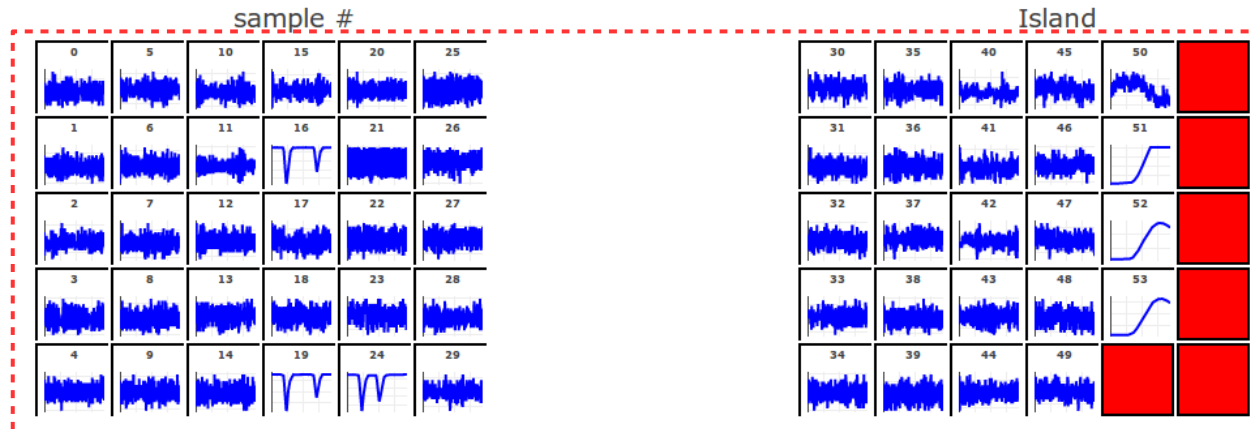
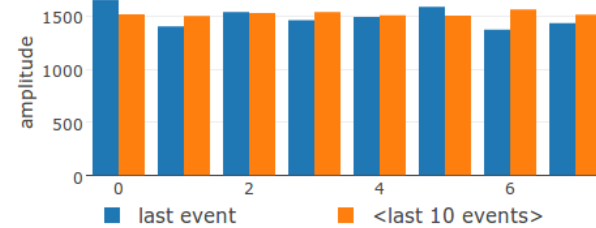
[summary](#) **Laser 1** Laser 2 Laser 3 Laser 4 Laser 5 Laser 6

NUMBER 5269 EVENT 197 N. ISLANDS (for each channel)8

channel 19 Island num. 0



Channel 19 island amplitudes
(click on bars to change island in trace plot)



Laser Calibration System Online Monitor - Web Interface

Muon g-2 Laser Calibration System - Online Monitoring

Home

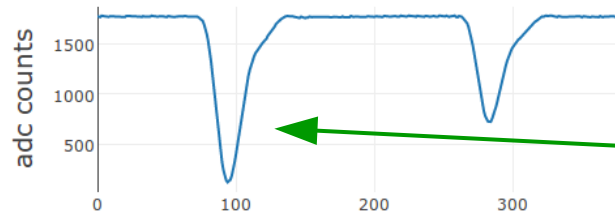
Status: **Connected**

Laser Crate 25 summary plots

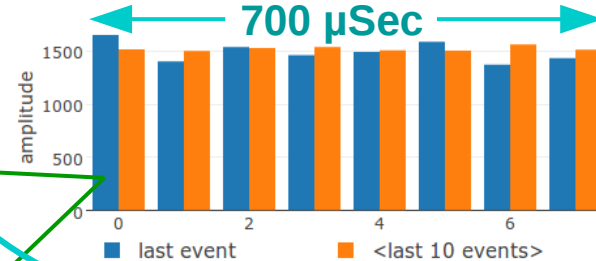
summary Laser 1 Laser 2 Laser 3 Laser 4 Laser 5 Laser 6

NUMBER 5269 EVENT 197 N. ISLANDS (for each channel)8

channel 19 Island num. 0

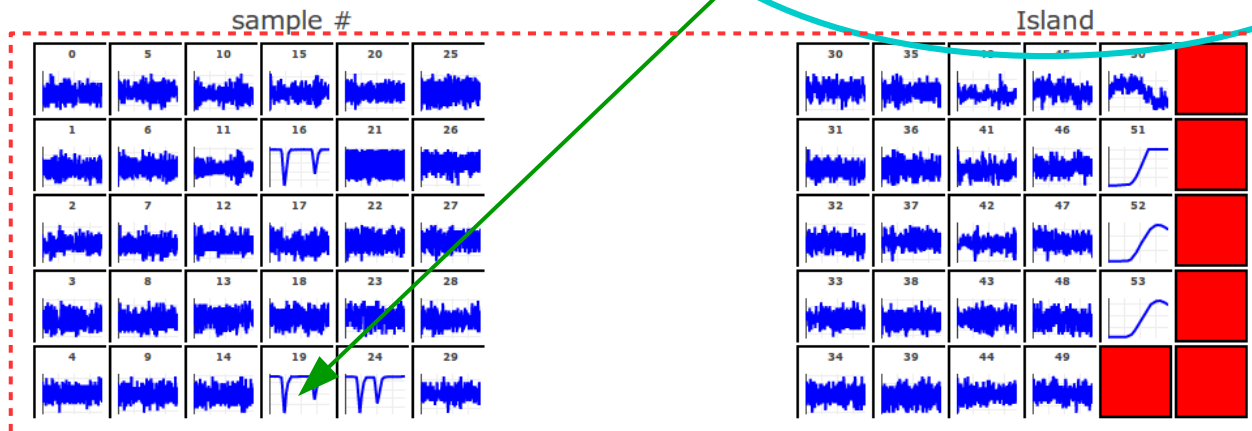


Channel 19 island amplitudes
(click on bars to change island in trace plot)



ISLAND
TRACE

LASER
CRATE



12 May 2017

MUSE General meeting A. Gioiosa

12

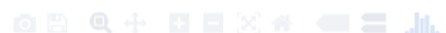


Laser Calibration System Online Monitor - Web Interface

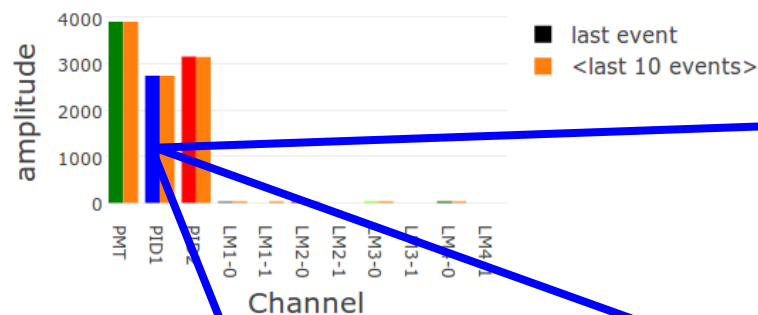
Laser Crate 25 summary plots for Laser 1

[summary](#)
[Laser 1](#)
[Laser 2](#)
[Laser 3](#)
[Laser 4](#)
[Laser 5](#)
[Laser 6](#)
[Laser 1 stability](#)

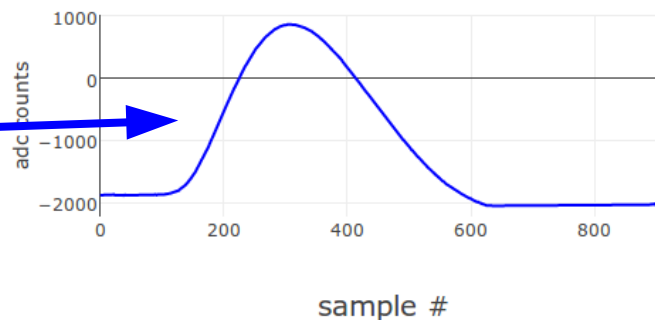
RUN 5617 EVENT 526 N. ISLANDS (for each channel)4



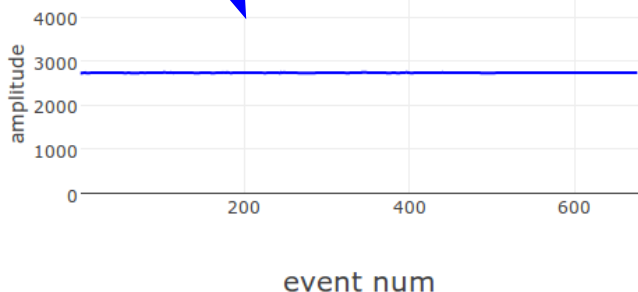
sync pulse amplitudes for laser 1
(click on bars to change channel in other plots)



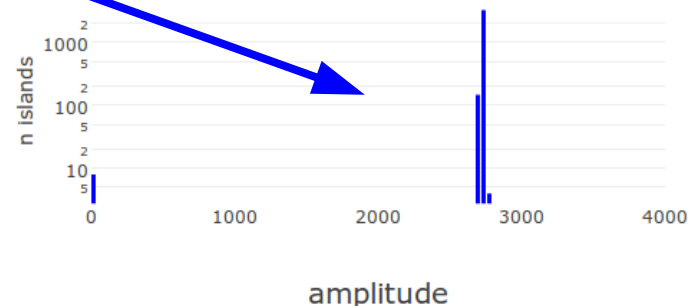
PID1 channel 37 sync Trace for laser 1



PID1 channel 37 sync amplitude history for laser 1



PID1 channel 37 amplitudes for laser 1



Laser Calibration System Online Monitor - Web Interface

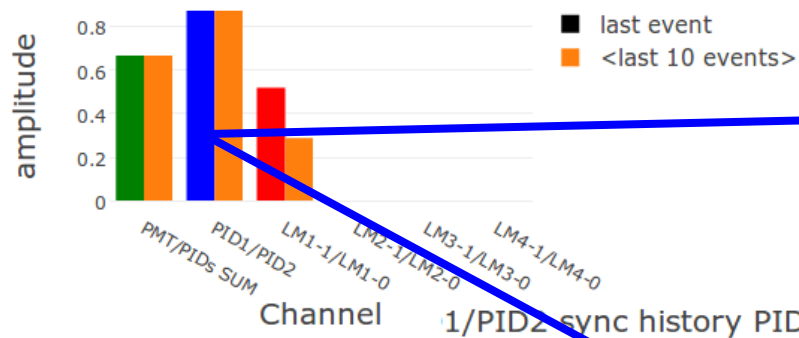
Laser Crate 25 light chain stability for Laser 1

summary Laser 1 Laser 2 Laser 3 Laser 4 Laser 5 Laser 6 Laser 1 stability

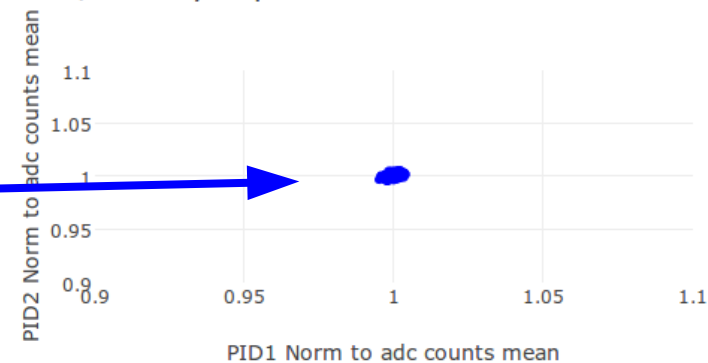
RUN 5617 EVENT 1142 N. ISLANDS (for each channel)4



sync pulse amplitudes for laser 1
(click on bars to change channel in next plot)



PID1/PID2 sync pulse - PID1-PID2 channels: 37-38

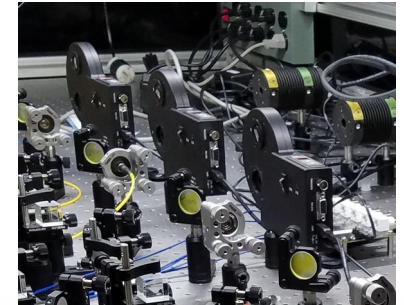


1/PID2 sync history PID1-PID2 channels: 37-38 for lase

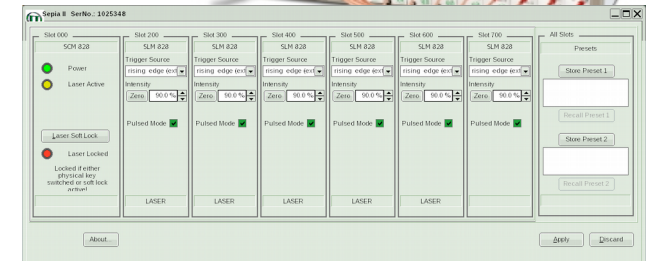


Others laser control and monitoring softwares

- **Filter wheels**



- **Laser Driver**



- **Local Monitors HV**



Laser Calibration System Online Monitor

Summary

- **With the Laser DQM On-line Monitoring we can follow the status of:**
- **Server connection**
- **Trace of each laser channel**
- **SM and LM of each Laser System**
- **Stability and time history of Laser System over the runs**
- **Alarms**