



ALBA optical fiber BLMs

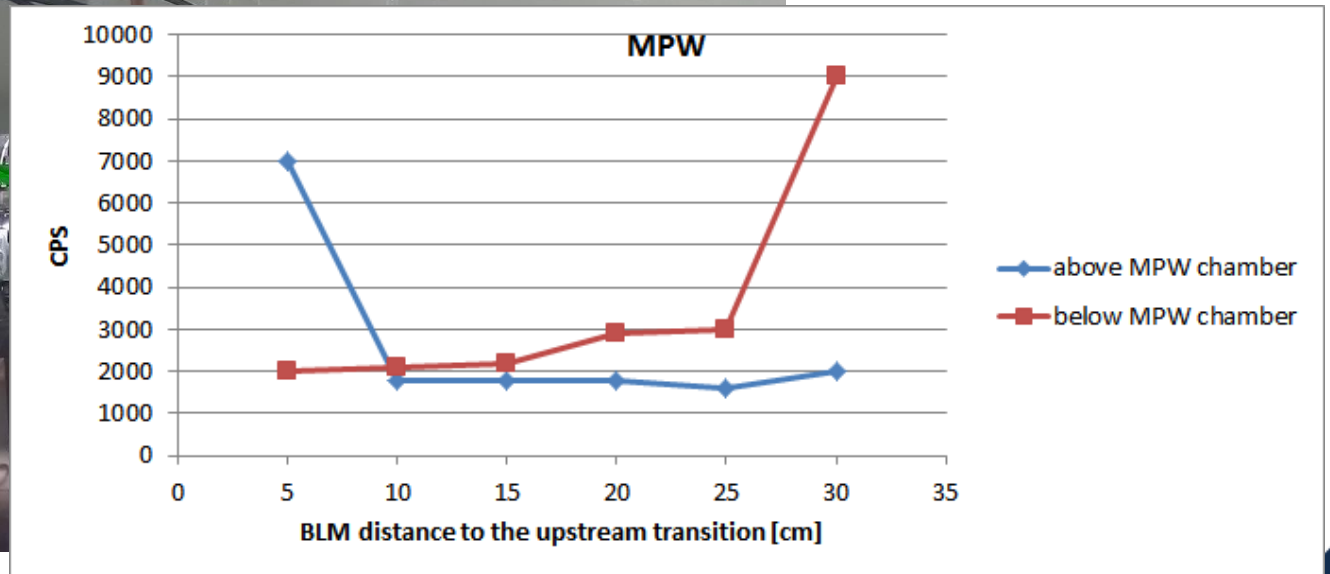
Angel Olmos

(on behalf of the ALBA and ICCUB/SiUB teams)

DEELS19, ESRF - Grenoble

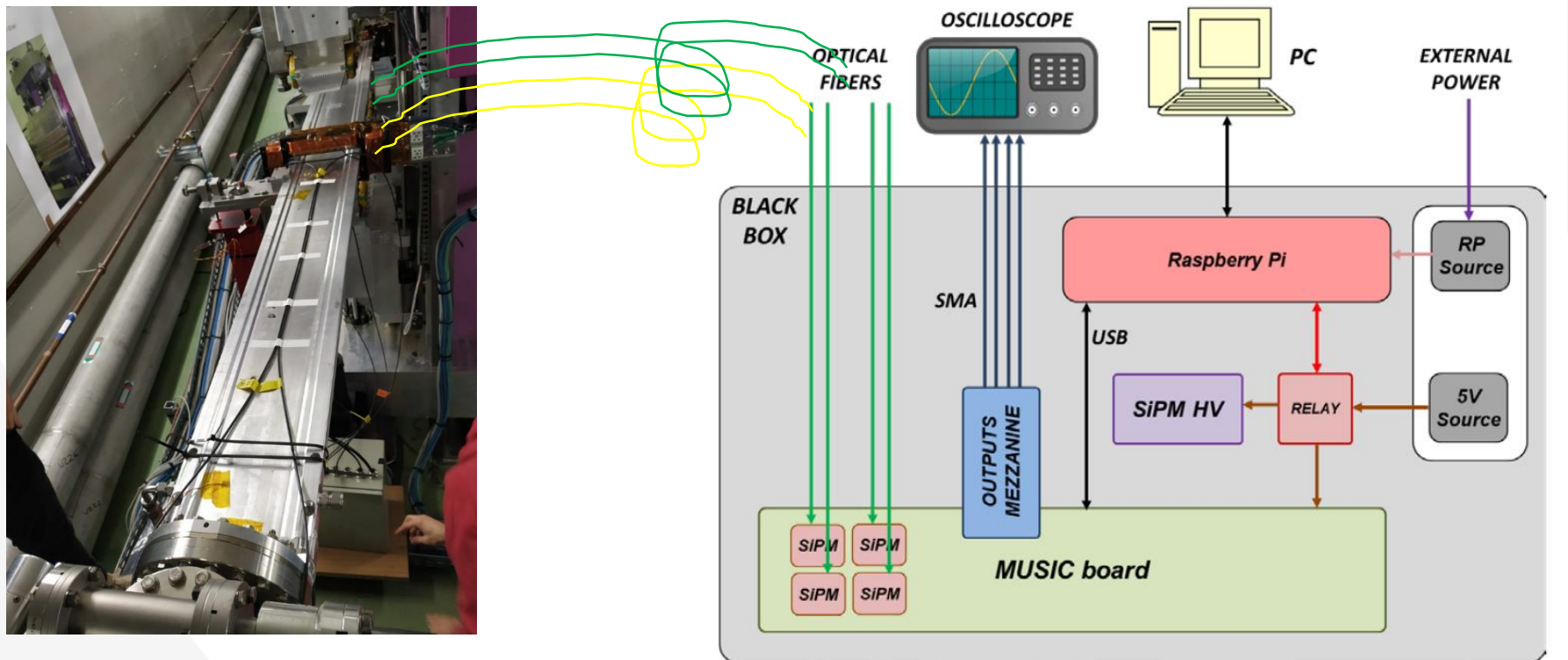
MOTIVATION

- We suspected to have a Physical Aperture problem in our MPW chamber
- Vertical bumps seem to point out towards a chamber misalignment
- In order to diagnose, many Bergoz BLMs were placed on the chamber (top/bottom)
- Results were contradictory and so we decided to look for other methods
- Development of a BLM based on optical fibers, which will provide integrated losses all along the chamber and possibilities of losses location



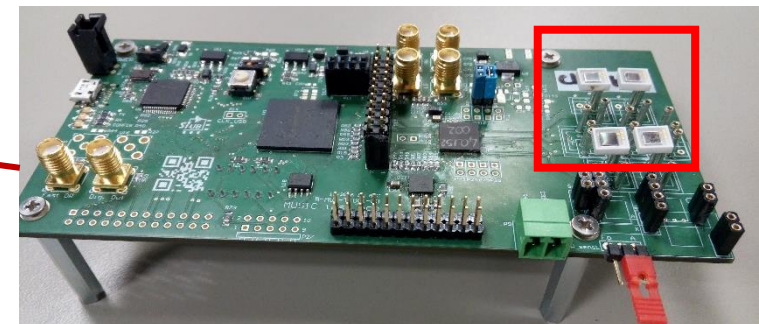
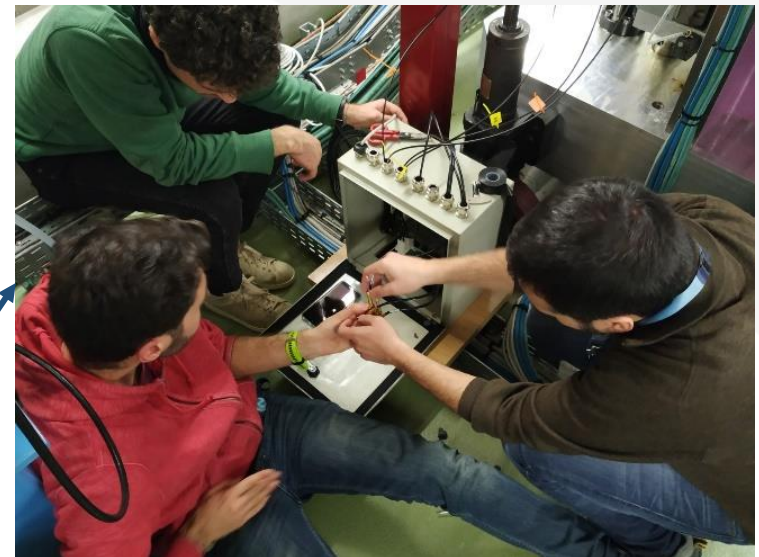
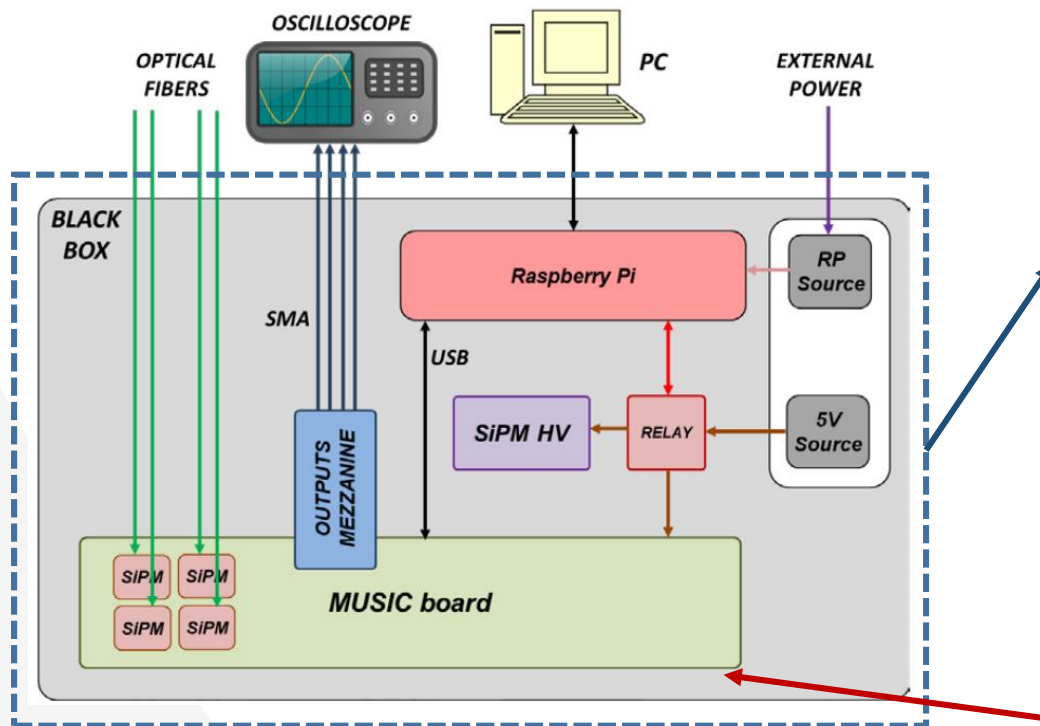
PARTS OF THE SYSTEM

- Beam lost monitor system based on scintillating optical fibers + SiPM detectors
- Possibility to identify the place of the losses
- Preliminary tests of remote control done using a skippy-TANGO interface

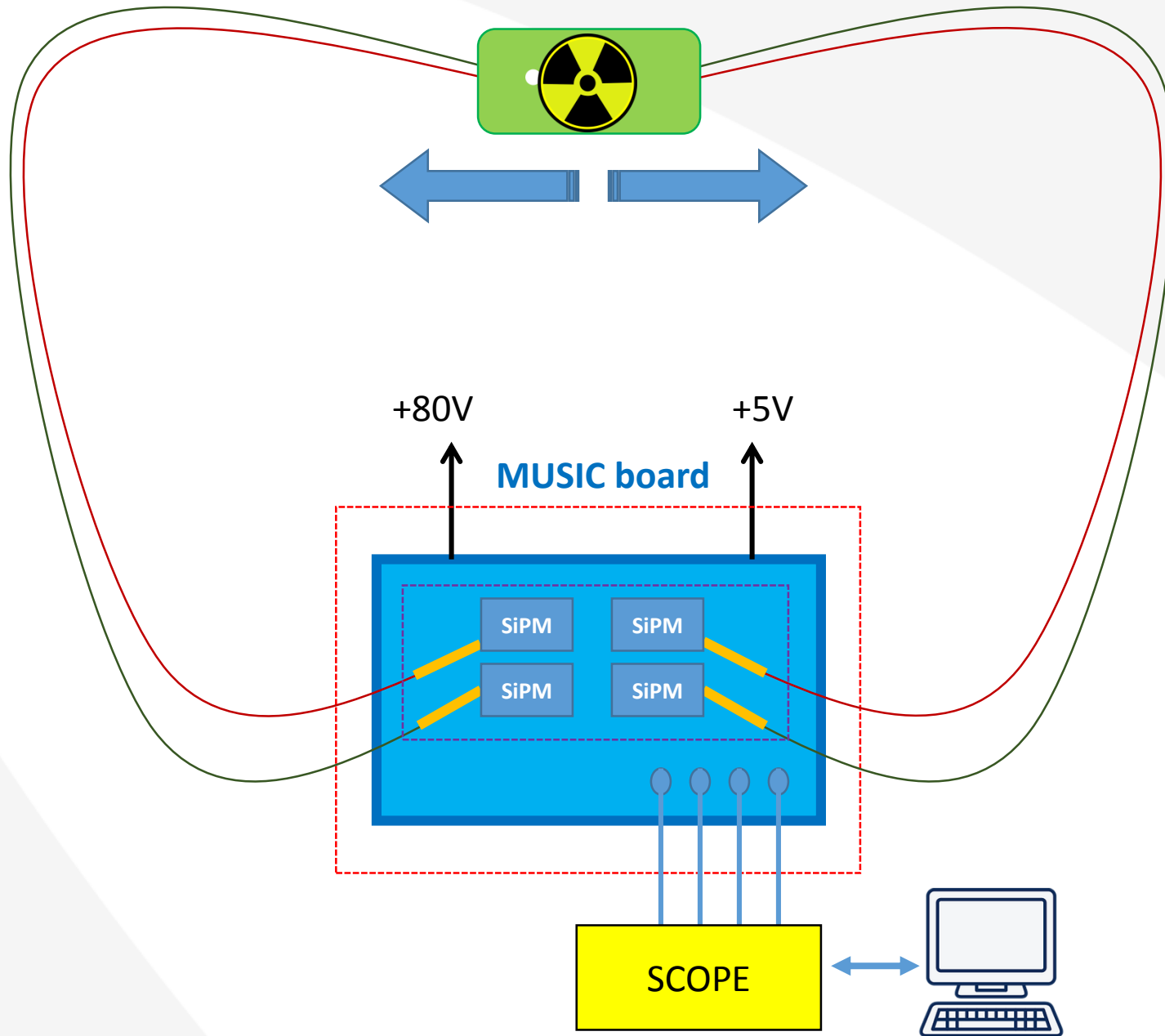


PARTS OF THE SYSTEM

- MUSIC board developed by ICCUB/SiUB team
- It takes care of the SiPM reading + digitalization
- Provides analog/digital signals to scope (debugging) and data to Raspberry Pi

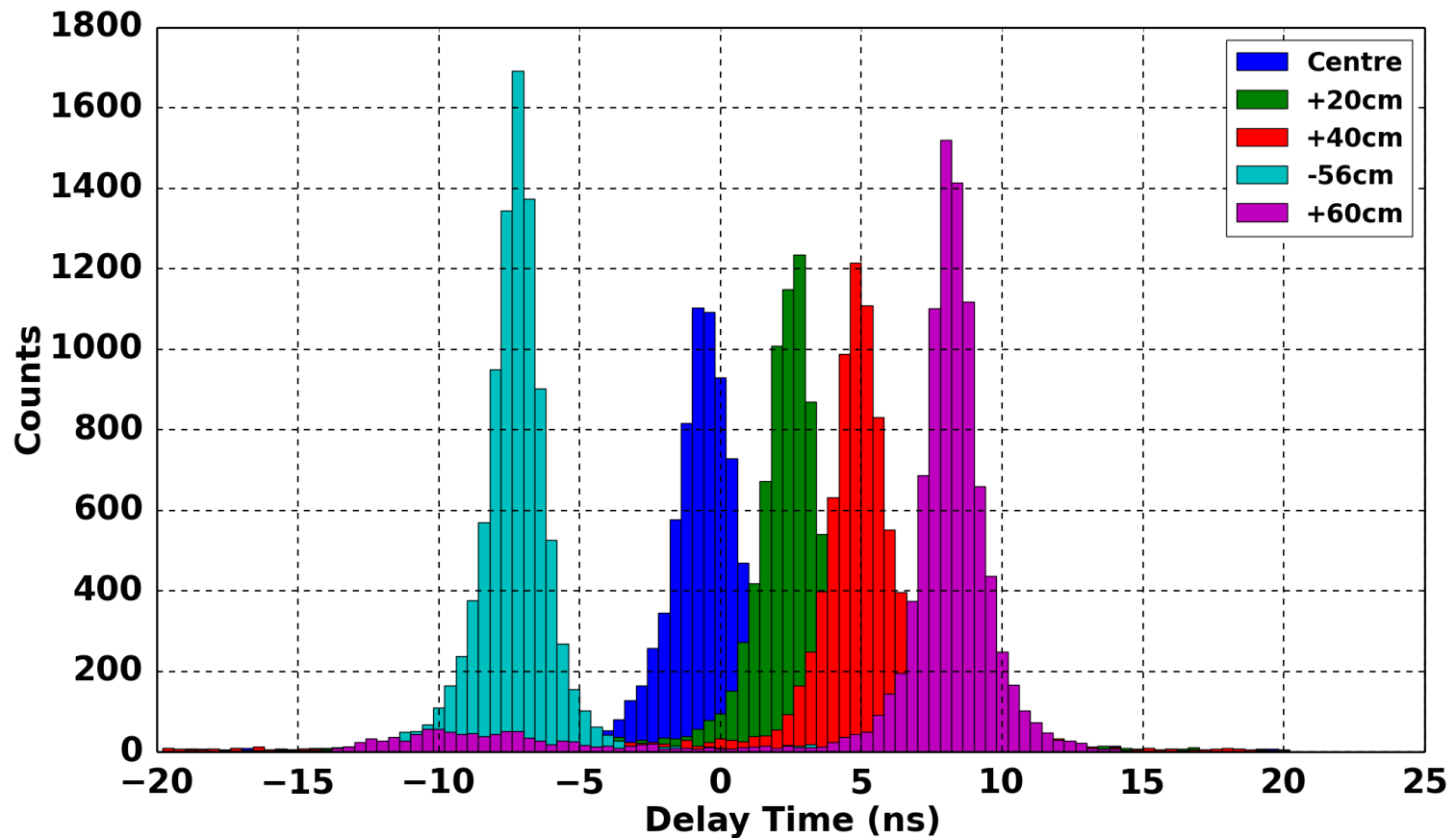


LAB TESTS



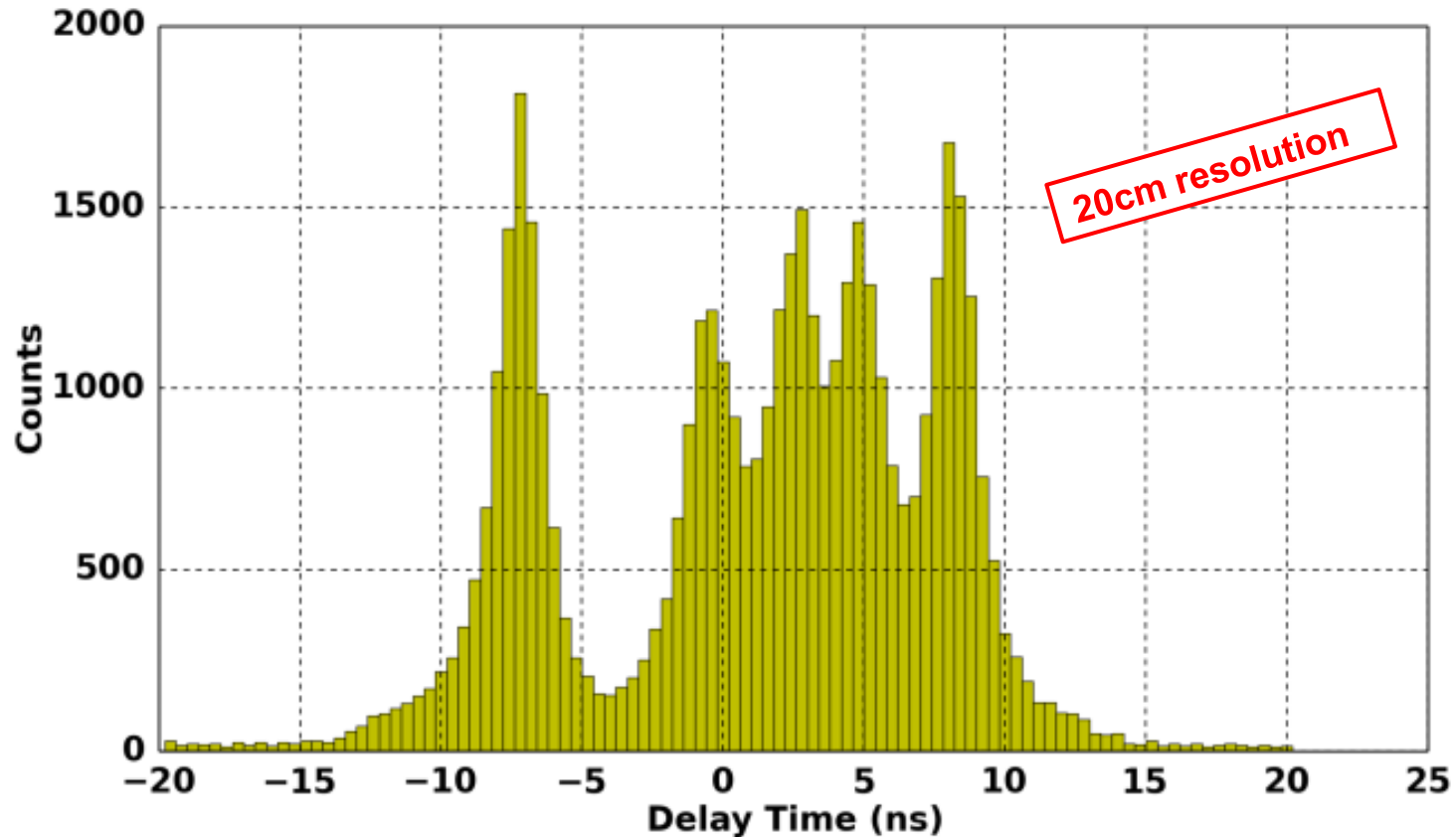
Losses location / Delay Distribution

Delay time between the signals from the SiPM at both ends of the fiber, processed with MUSIC ASIC and recorded with Scope.



Losses location / Delay Distribution

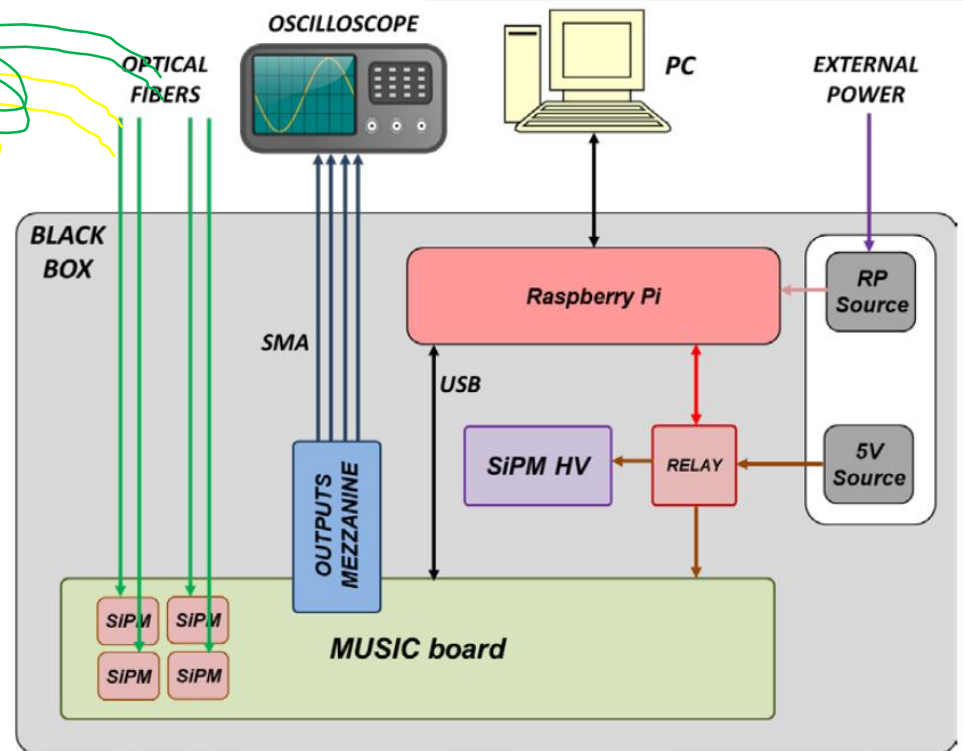
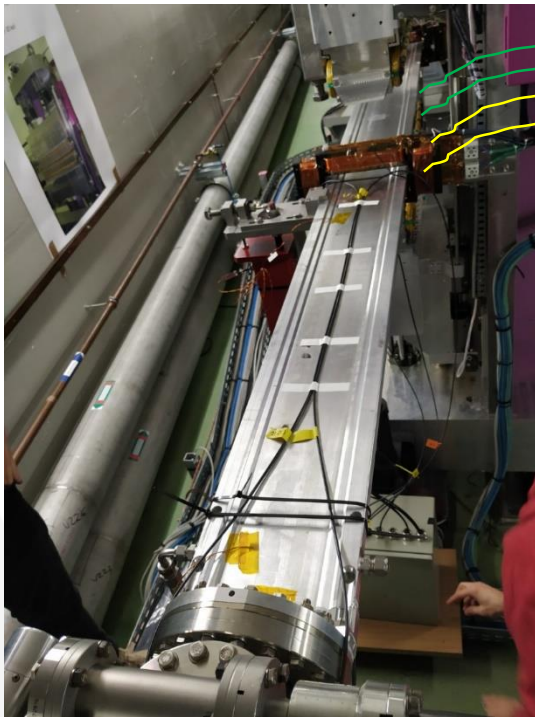
Histogram summation for all the delay times from the different positions



Enough resolution to distinguish two losses with 20cm of separation in a 2m optical fiber

TESTS WITH BEAM

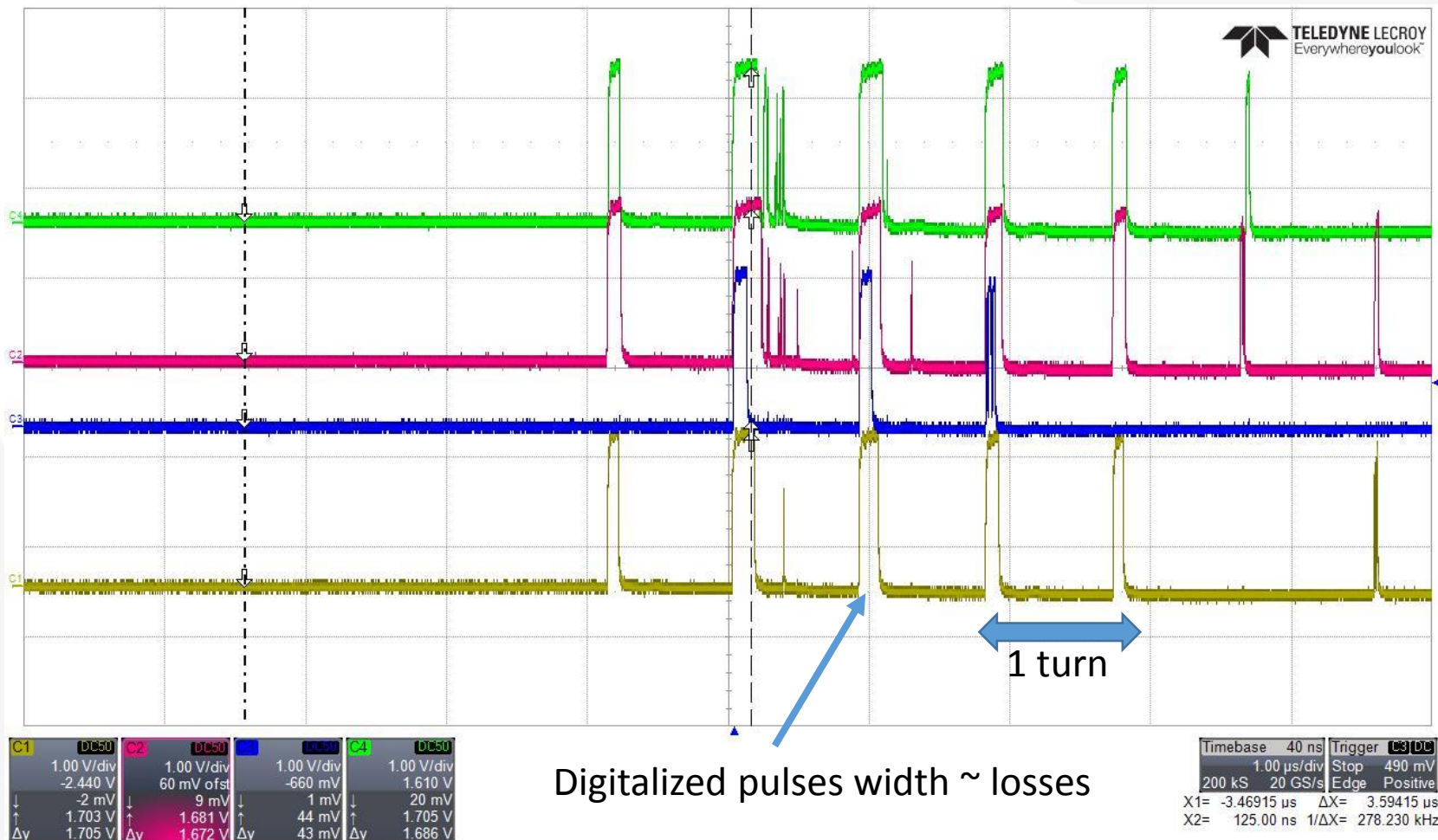
Setup



TESTS WITH BEAM

Scope Mode

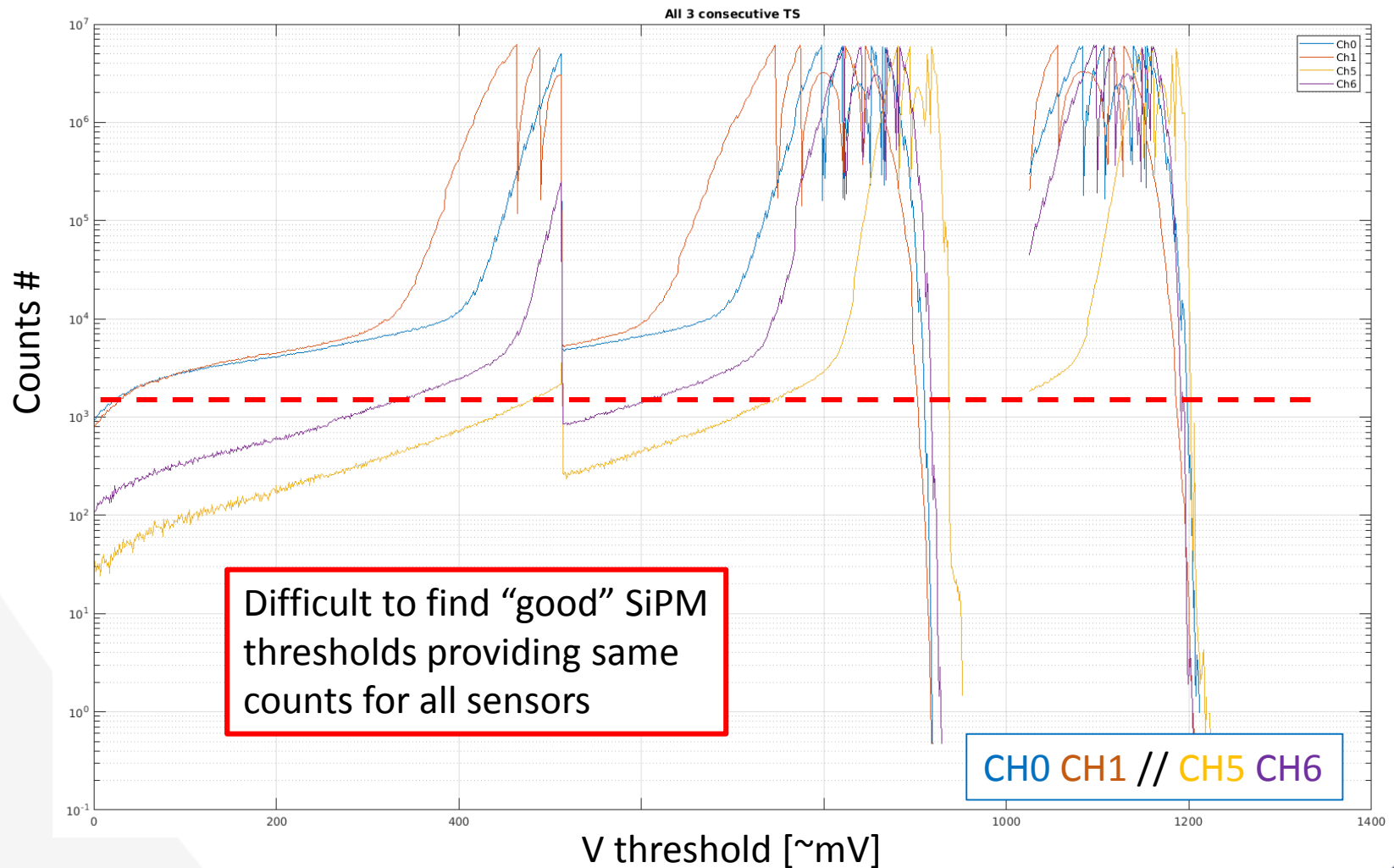
- Debug mode not intended for normal operation, just for calibration
- Example of turn by turn losses during a TopUp injection cycle



TESTS WITH BEAM

Calibration

SiPM response calibration with beam turned to be too complicated

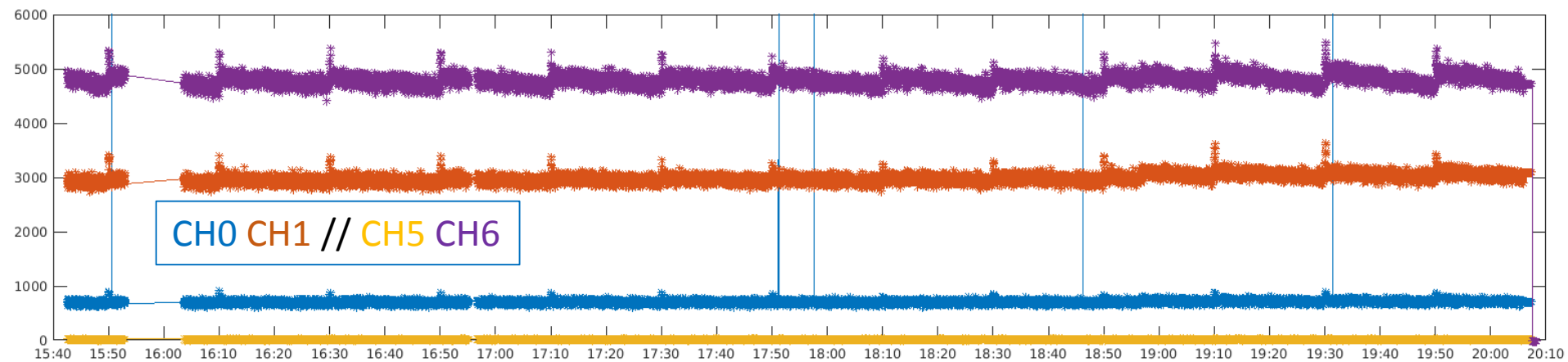
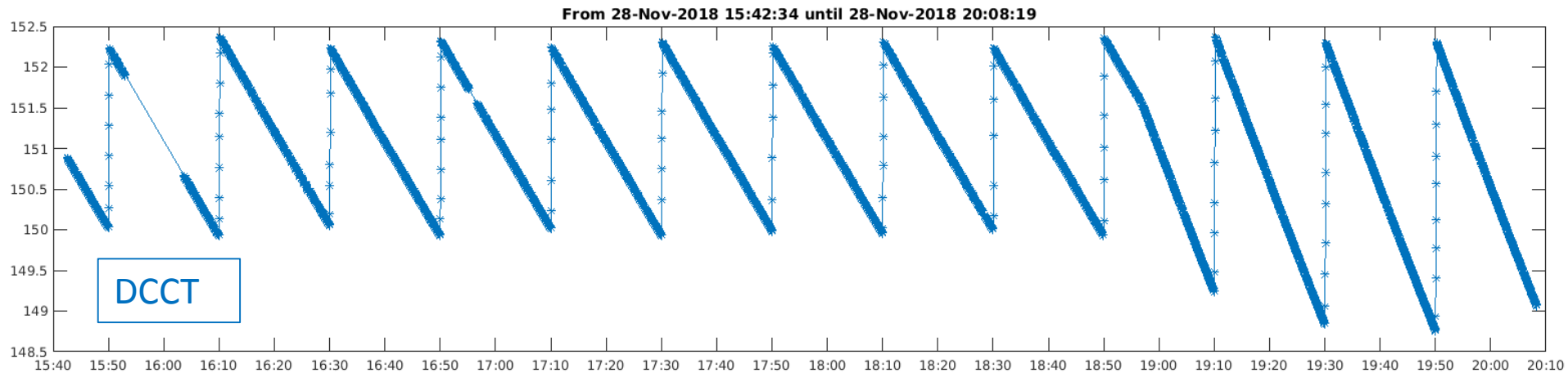


TESTS WITH BEAM



Counting Mode

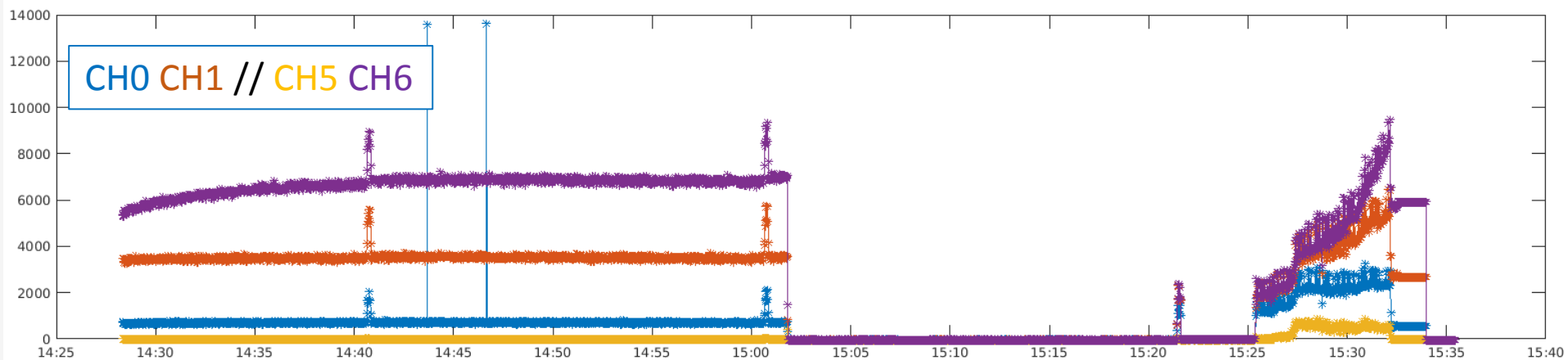
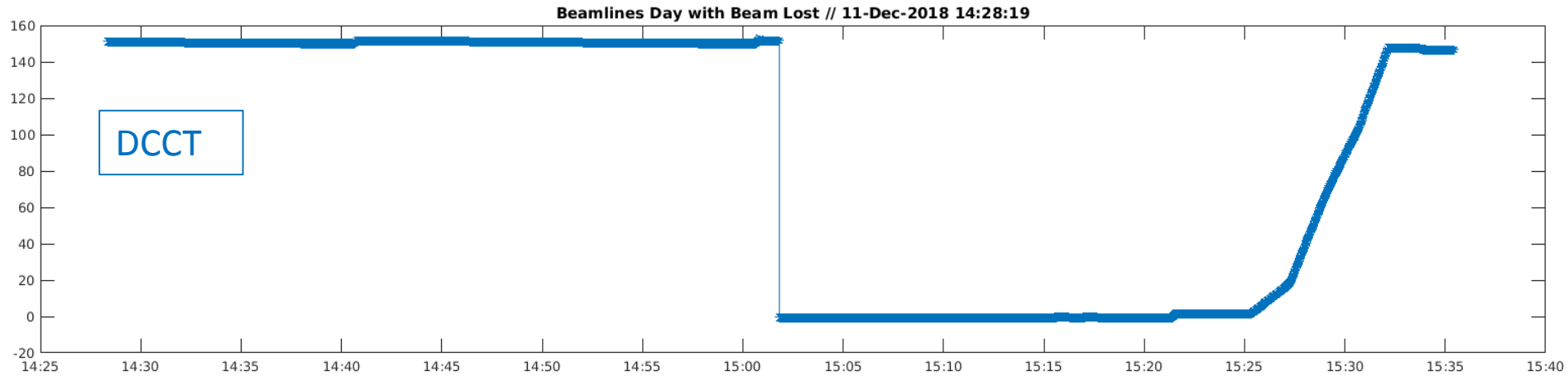
Example: Losses during normal Beamlines operation



TESTS WITH BEAM

Counting Mode

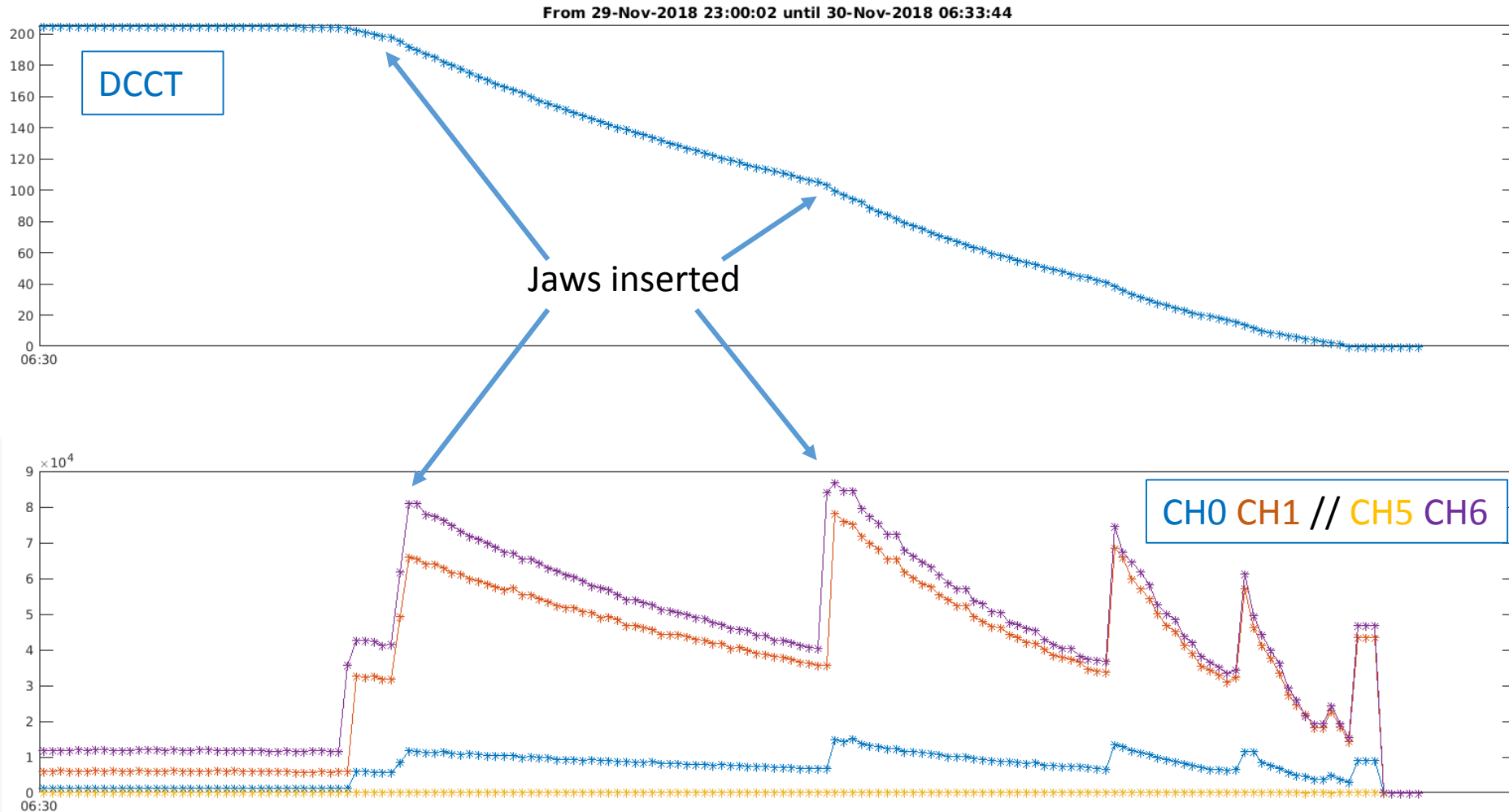
Example: Beam lost and reinjection



TESTS WITH BEAM

Counting Mode

Example: Acquired losses during a beam scraping

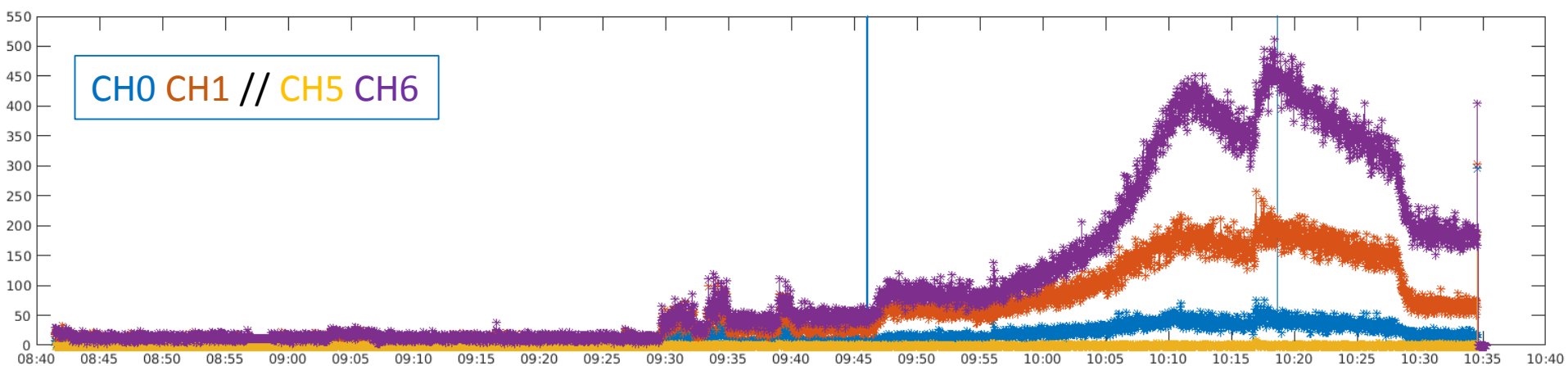
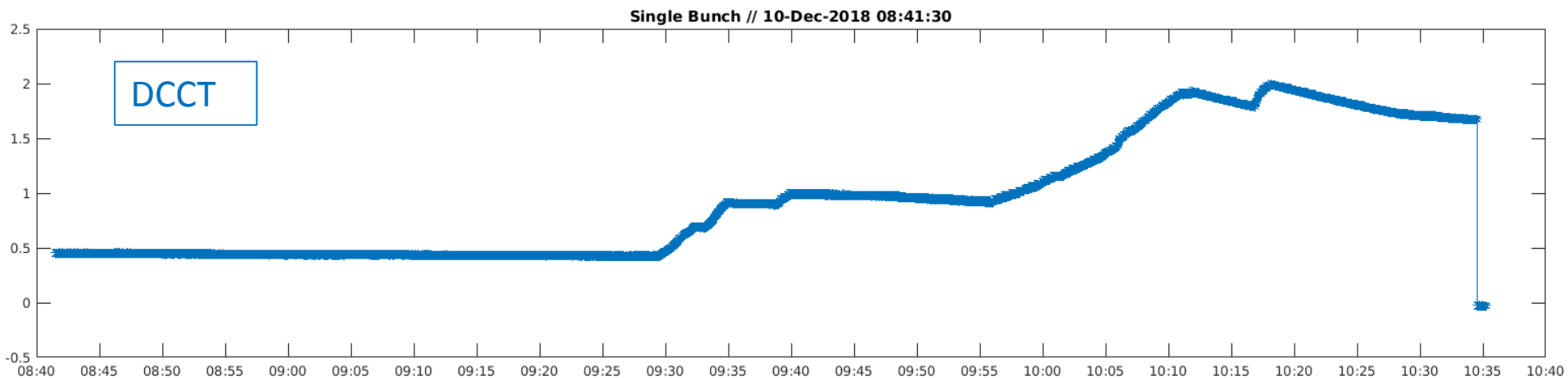


TESTS WITH BEAM



Counting Mode

Example: Single Bunch operation



TESTS WITH BEAM

Losses Location Mode

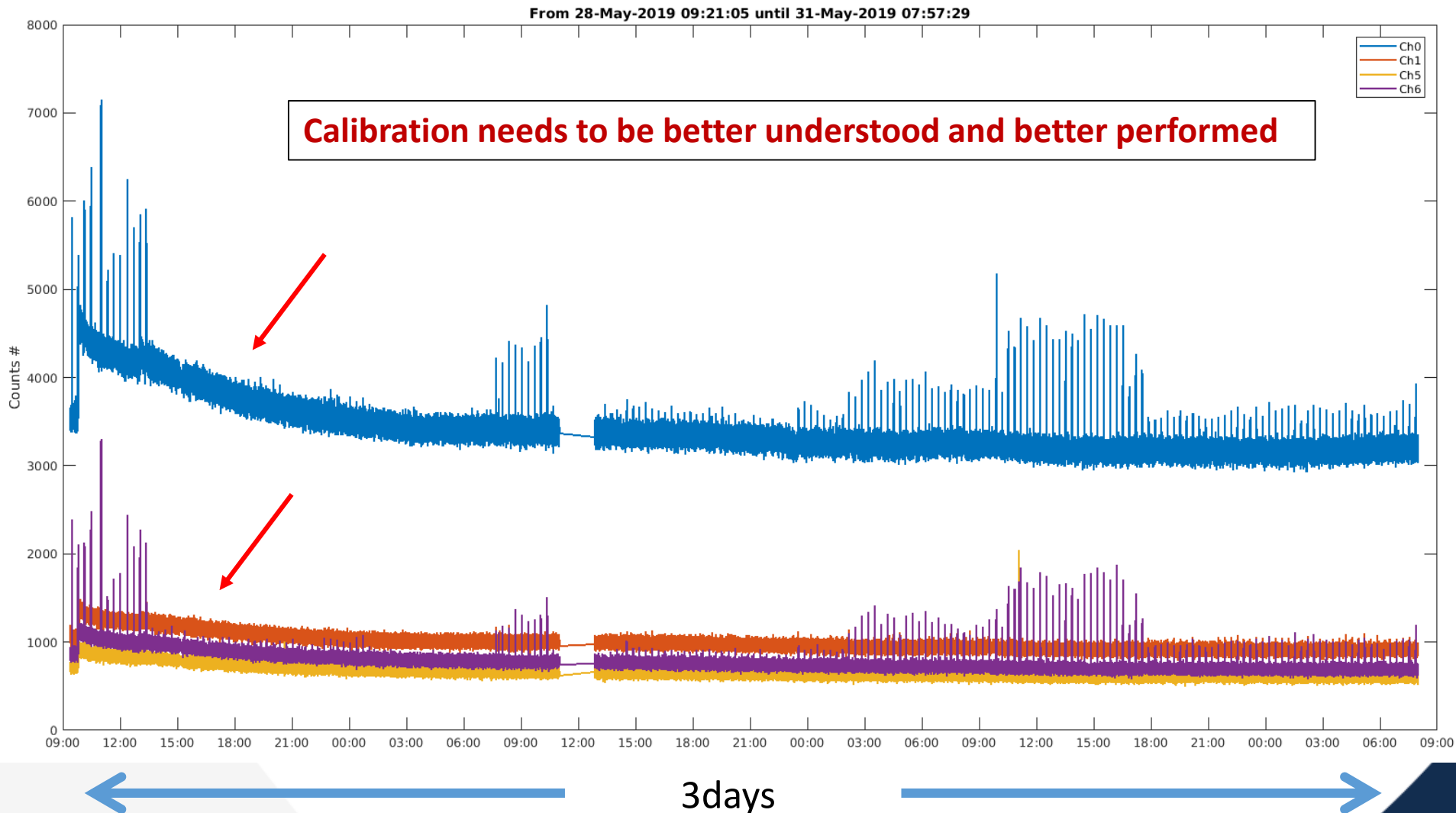
Not yet done !!!



PROBLEMS / To be understood



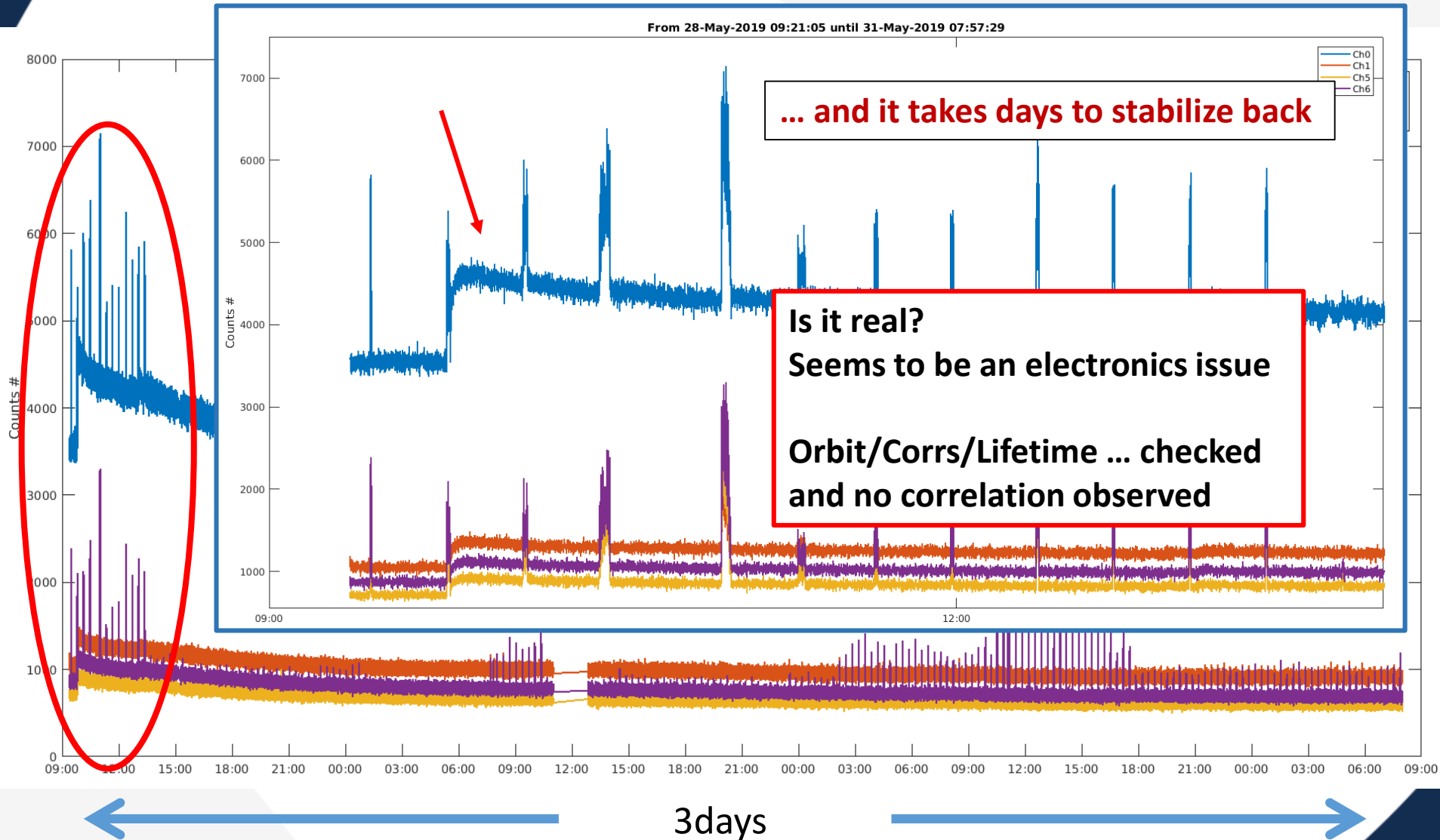
Too different channels counts even after calibration



PROBLEMS / To be understood



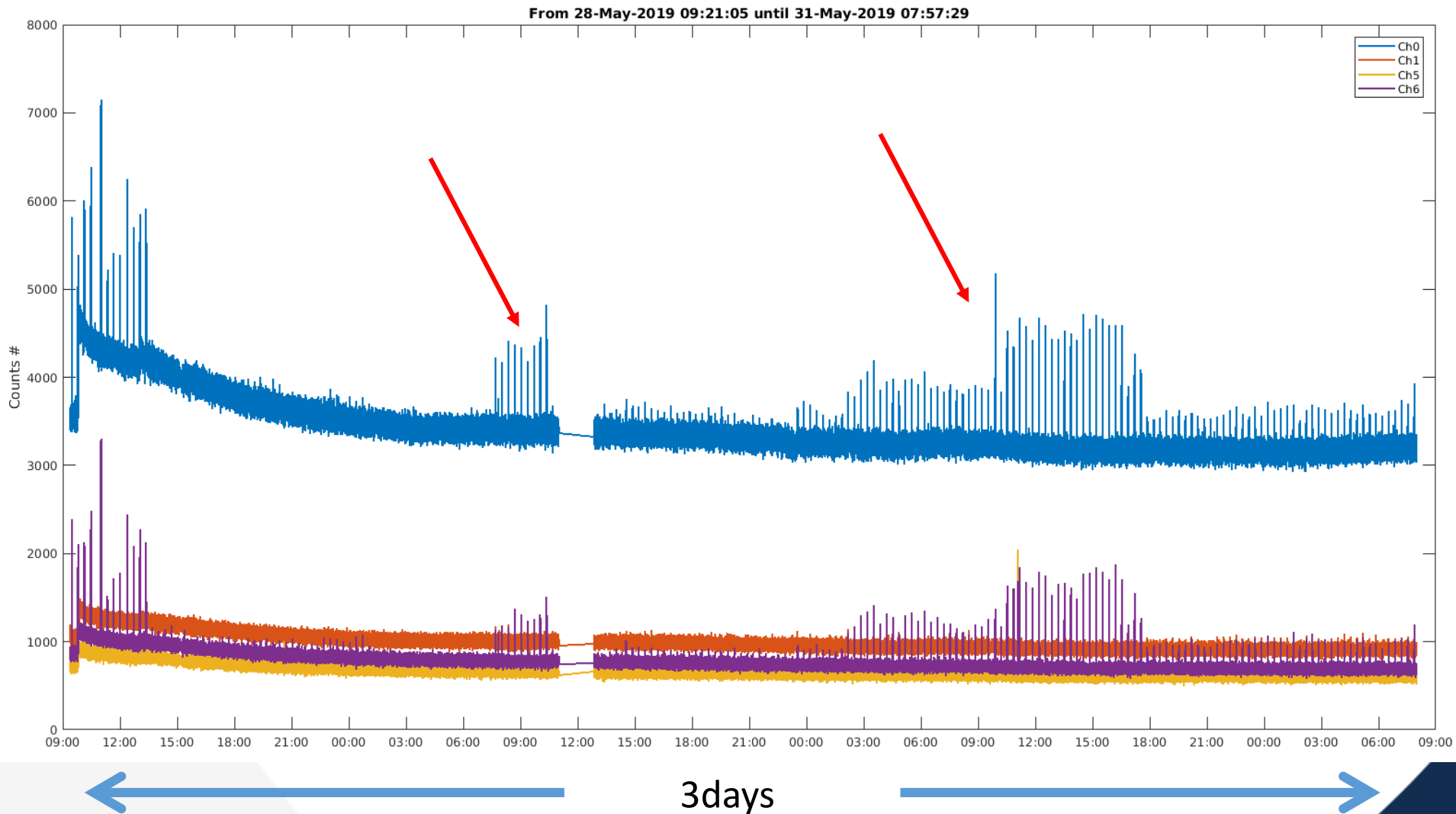
Sudden counts increase w/o correlation to other machine parameters



PROBLEMS / To be understood



Counts fluctuation with time

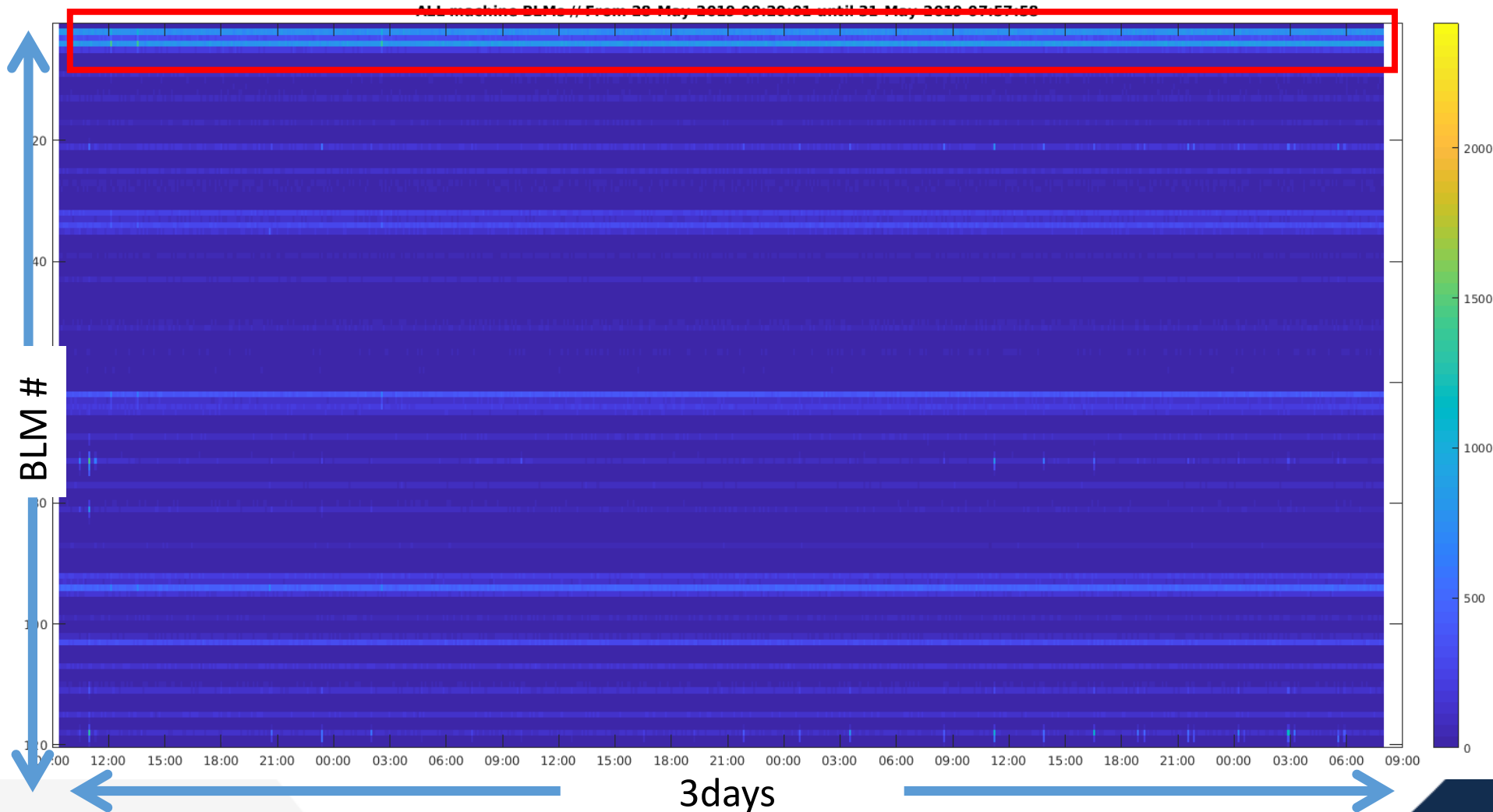


PROBLEMS / To be understood



Counts fluctuation with time

120 storage ring Bergoz BLMs



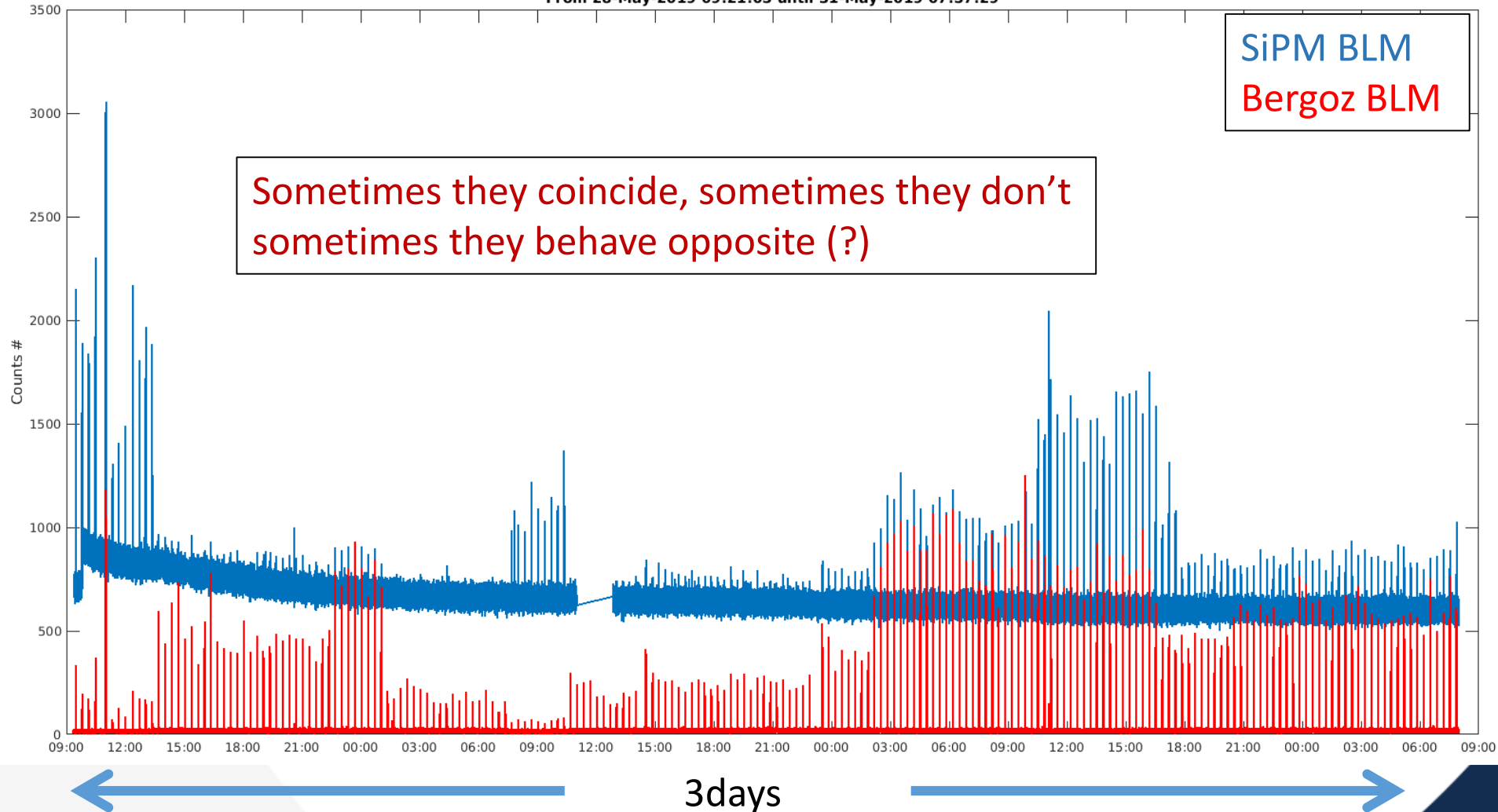
PROBLEMS / To be understood



Counts fluctuation with time

Comparison wrt Bergoz BLM with higher counts

From 28-May-2019 09:21:05 until 31-May-2019 07:57:29



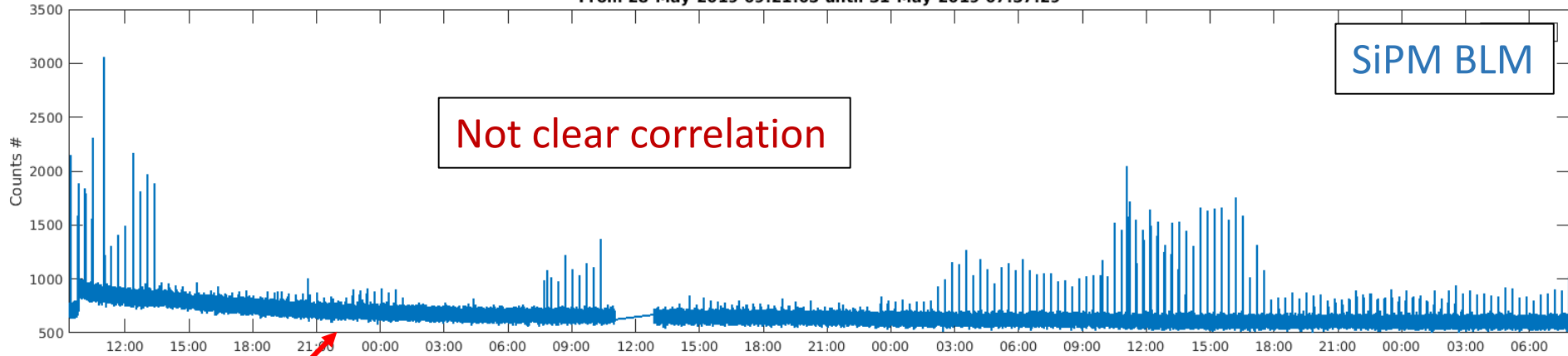
PROBLEMS / To be understood



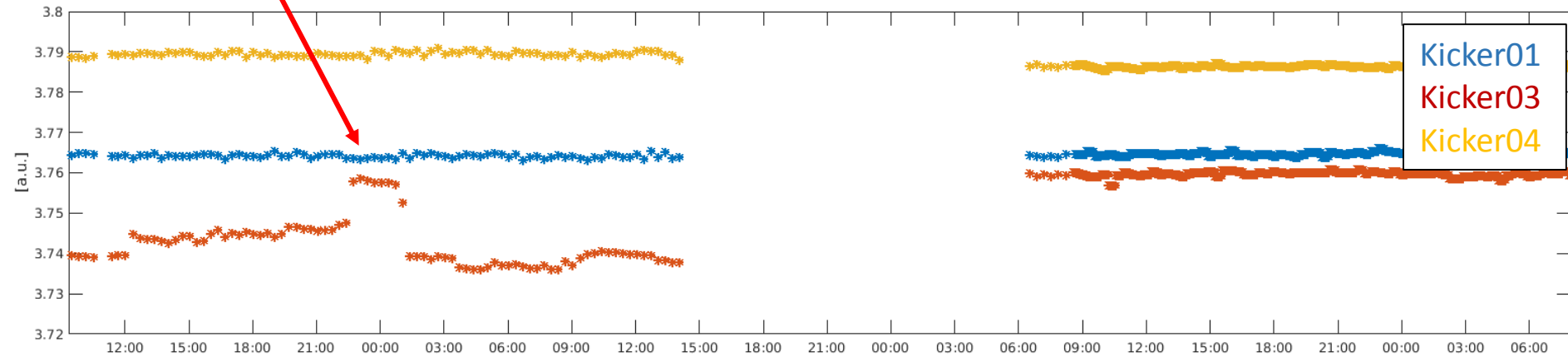
Counts fluctuation with time

Comparison wrt Injection Bump

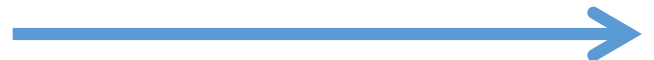
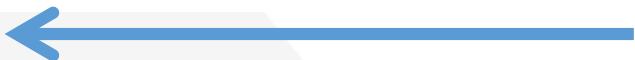
From 28-May-2019 09:21:05 until 31-May-2019 07:57:29



Maybe



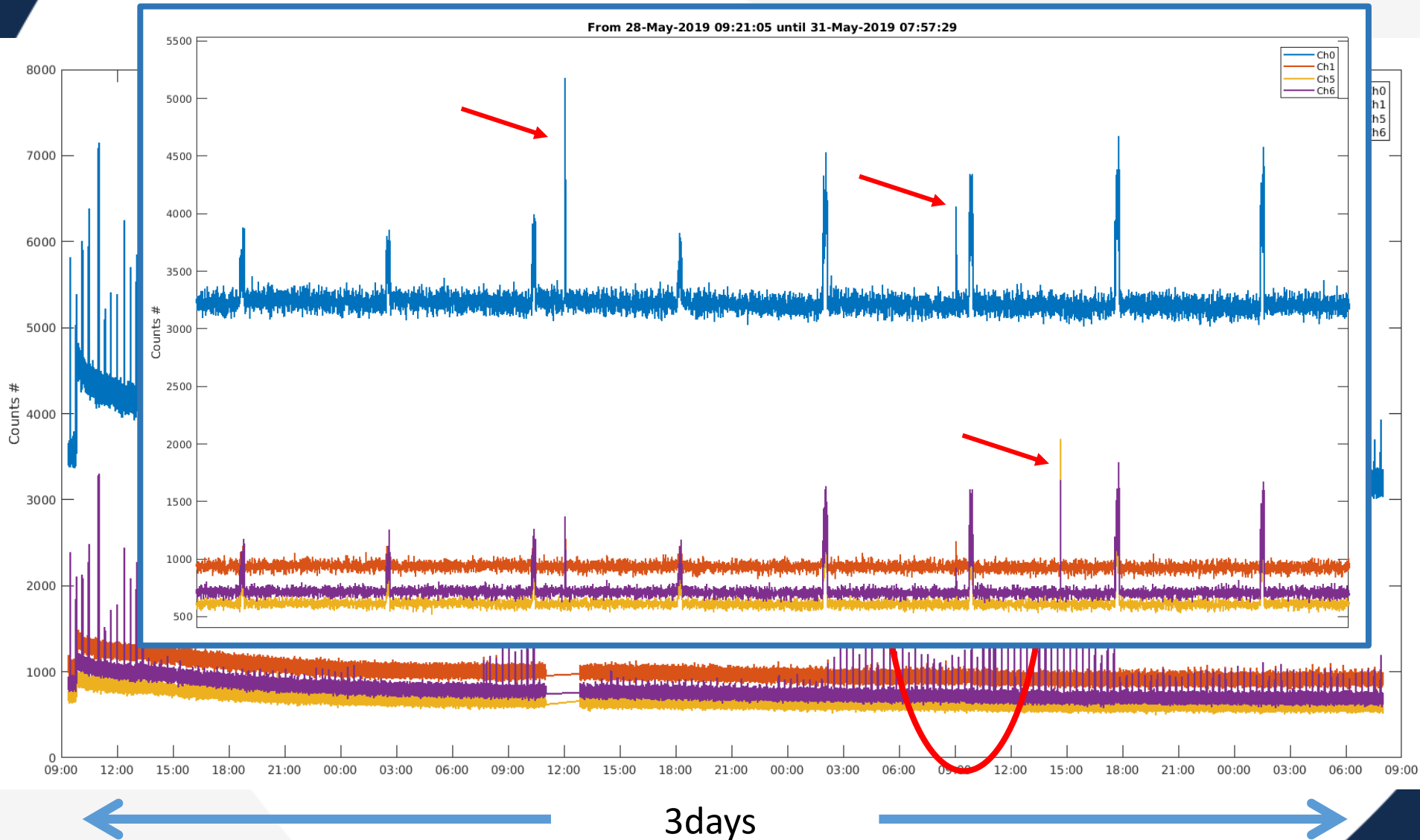
3days



PROBLEMS / To be understood



Spurious counts / glitches



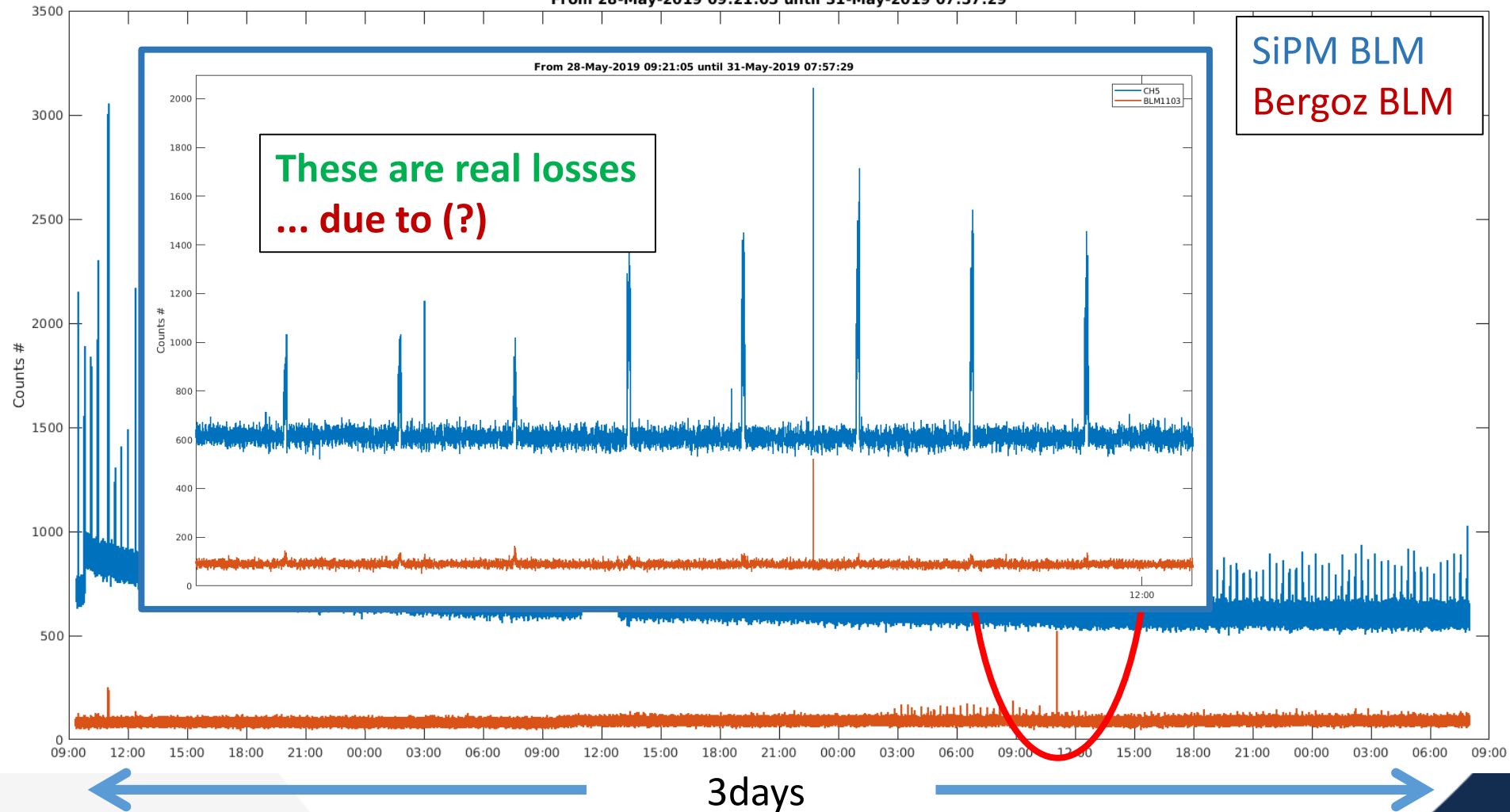
PROBLEMS / To be understood



Spurious counts / glitches

Comparison wrt closest Bergoz BLM

From 28-May-2019 09:21:05 until 31-May-2019 07:57:29



SUMMARY



- Preliminary results show that it should work as an standard BLM
- Extra feature of losses location to be tested
- Problems with RaspberryPI hanging → Replaced by NUC-PC seems to work ... **but it is Windows**

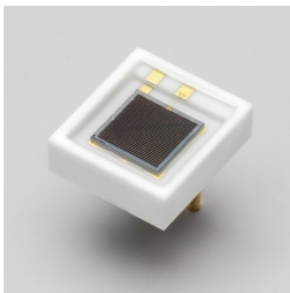
- **Too different channels counts even after calibration**
- **Extremely sensible to fibers placing on the SiPM → company needed to perform proper connectorized setup**
- **Sudden counts increase w/o correlation to other machine parameters**
- **TANGO Device Server not yet fully operational**

Many thanks for you attention!!

EXTRA SLIDES

SiPM Hamamatsu

S13360-3050CS



MPPC for precision measurement, Photosensitive area: 3.0 x 3.0 mm, Pixel pitch: 50 μm

The S13360 series is an MPPC (SiPM) for precision measurement. It inherits the superb low afterpulse characteristics of its predecessor and further provides lower crosstalk and lower dark count. They are suitable for precision measurement, such as flow cytometry, DNA sequencer, laser microscope, and fluorescence measurement, that requires low noise characteristics.

Features

- Reduced crosstalk and dark count (compared to previous products)
- Outstanding photon counting capability (outstanding photon detection efficiency against incident photons)
- Compact
- Operates at room temperature
- Low voltage operation
- High gain
- Excellent time resolution
- Immune to the effects of magnetic fields
- Operates with simple readout circuits

Fiber Kuraray SCSF-78
1mm diameter

Scintillating fibers¹

Type	Luminescence			Attenuation time (ns)	Attenuation length ² (m)	Characteristics
	Color	Spectra	Peaks (nm)			
SCSF-78	Blue	Refer to catalogue	450	2.8	>4.0	High luminescence High attenuation length
SCSF-81	Blue		437	2.4	>3.5	High attenuation length
SCSF-3HF (1500)	Green		530	7	>4.5	Radiation resistance

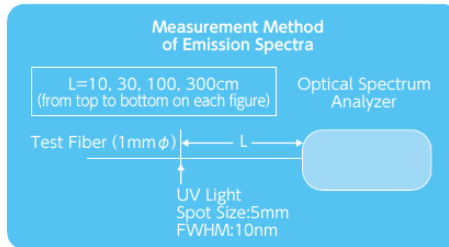
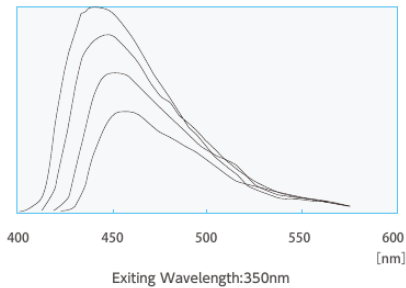
1. Tested using non-S type, 1 mmφ.
2. Measured using bialkali PMT and UV light (254 nm).

SCSF-78 / SCSF-81 / SCSF-3HF(1500)

Technical Data

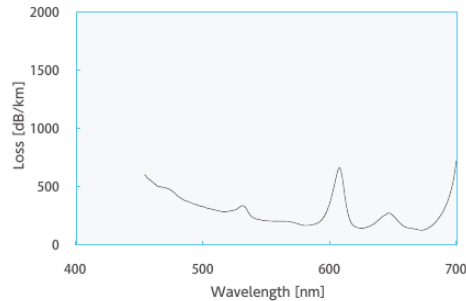
Emission Spectra

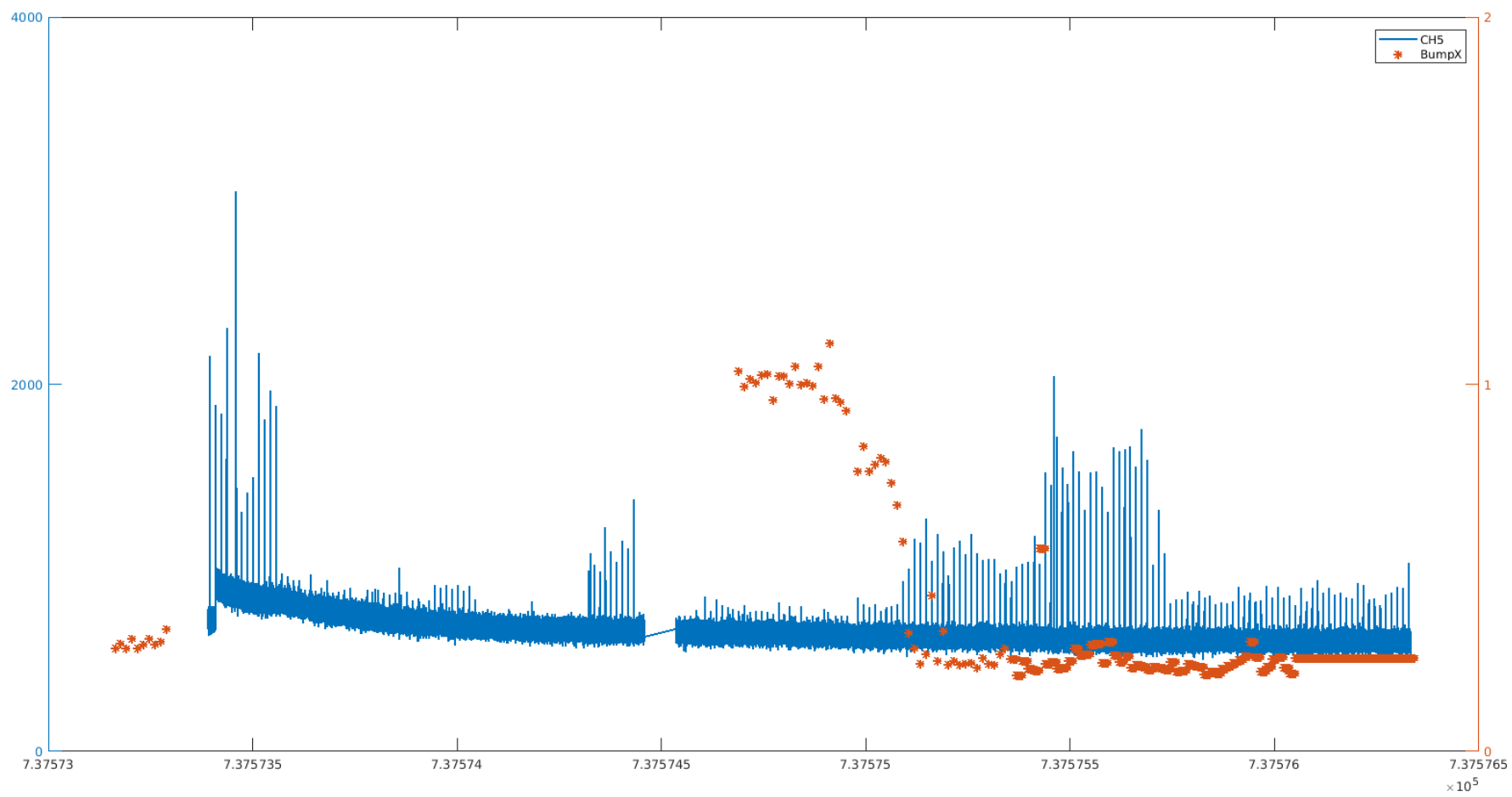
SCSF-78



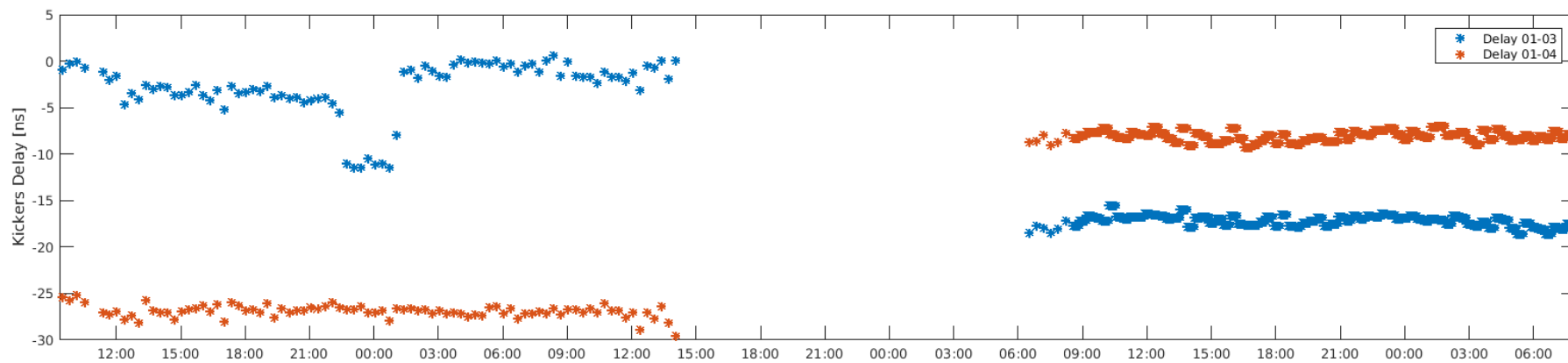
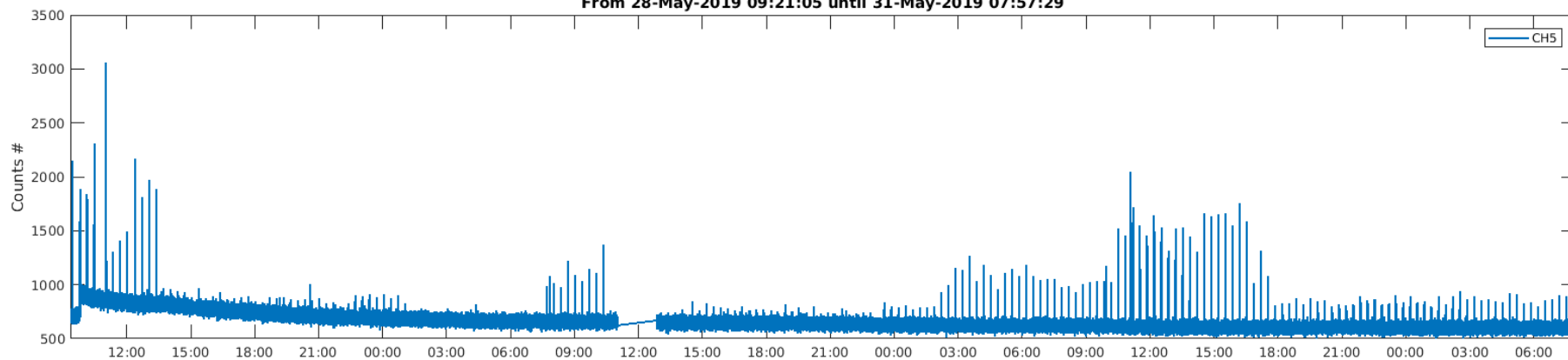
Transmission Loss

SCSF-78





From 28-May-2019 09:21:05 until 31-May-2019 07:57:29



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