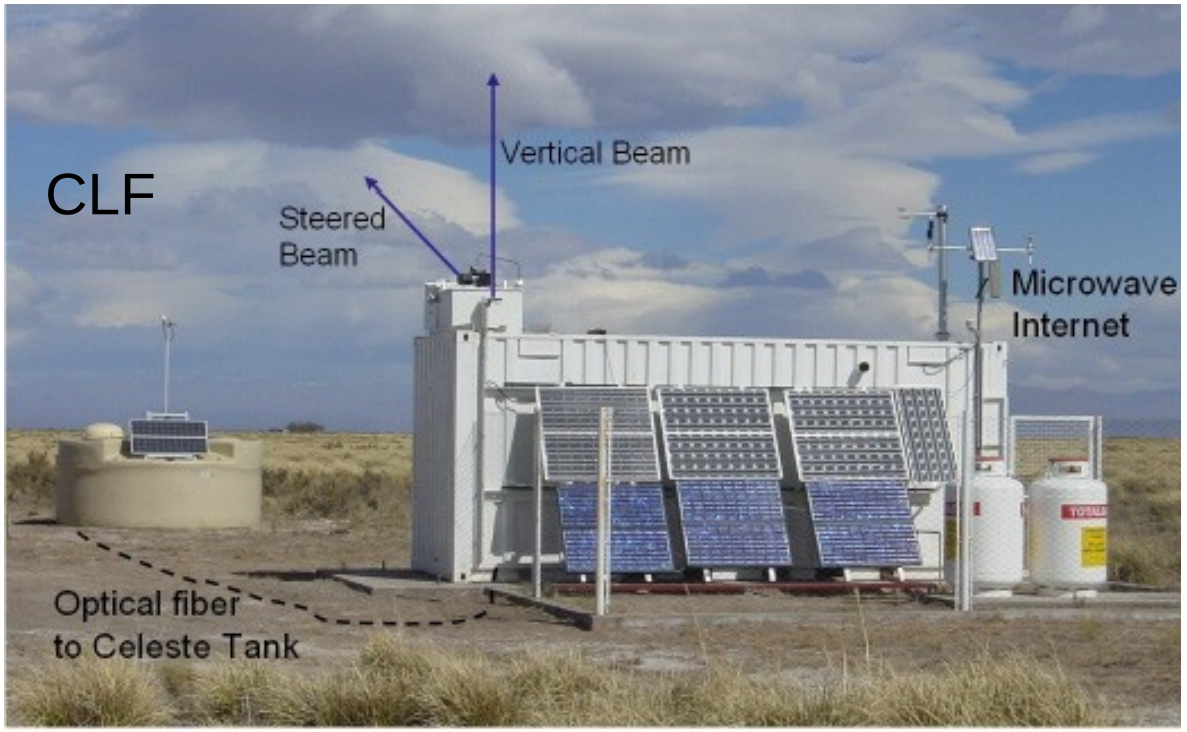
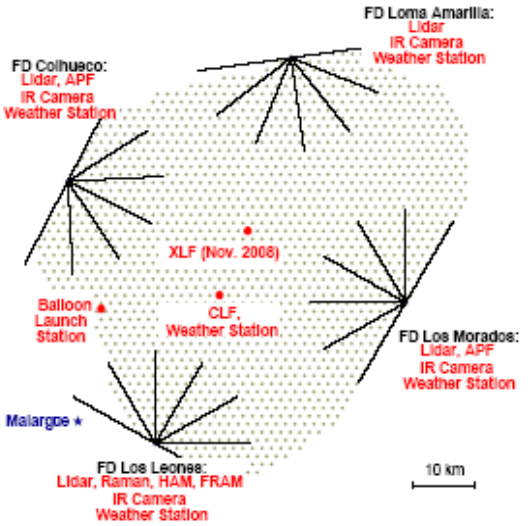
The Pierre Auger Observatory Central Laser Facility (CLF) and the eXtreme Laser Facility (XLF)

- Nd::YAG laser source @ 355nm
- Distance from FD buildings between 26km and 40km
- Position, direction and energy known





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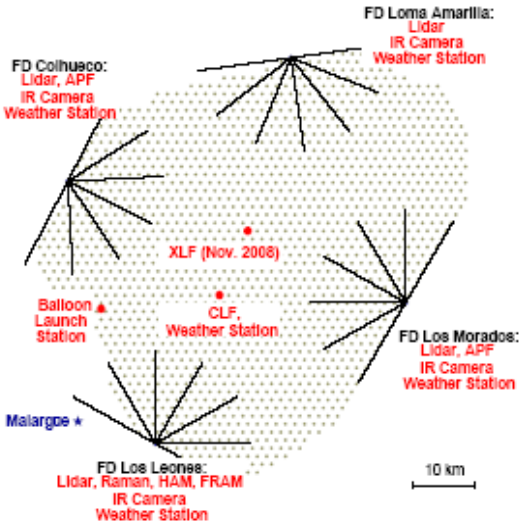
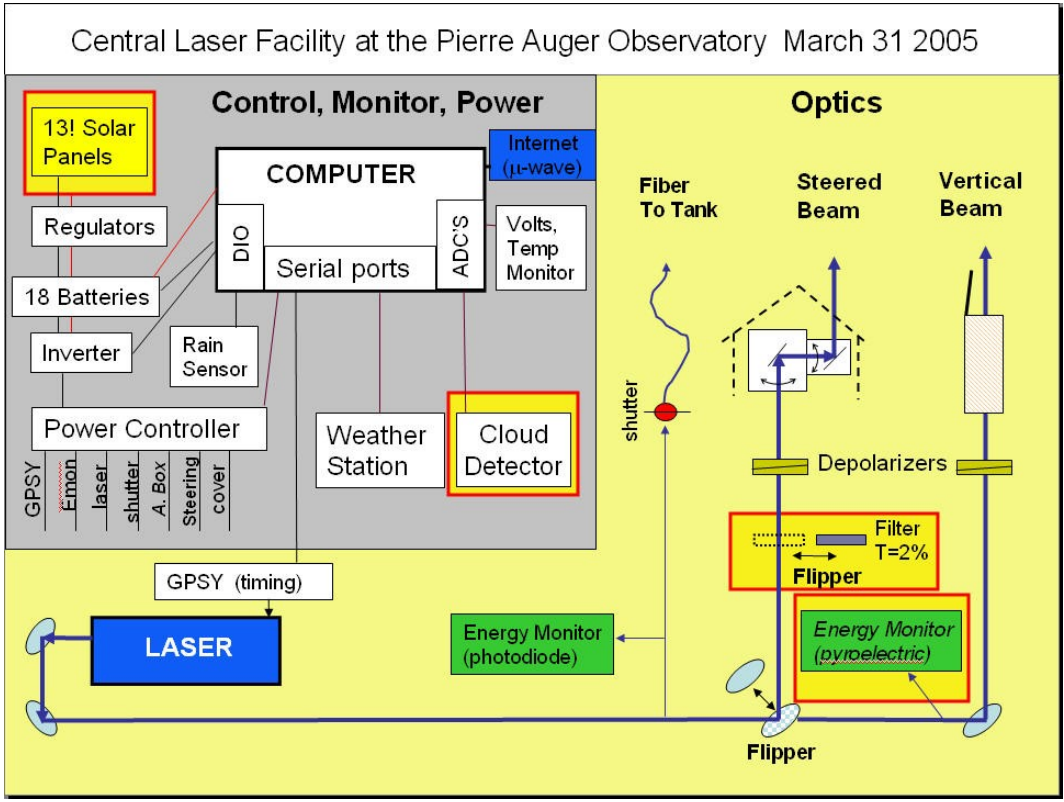
UPGRADE TO CLRF (2013)

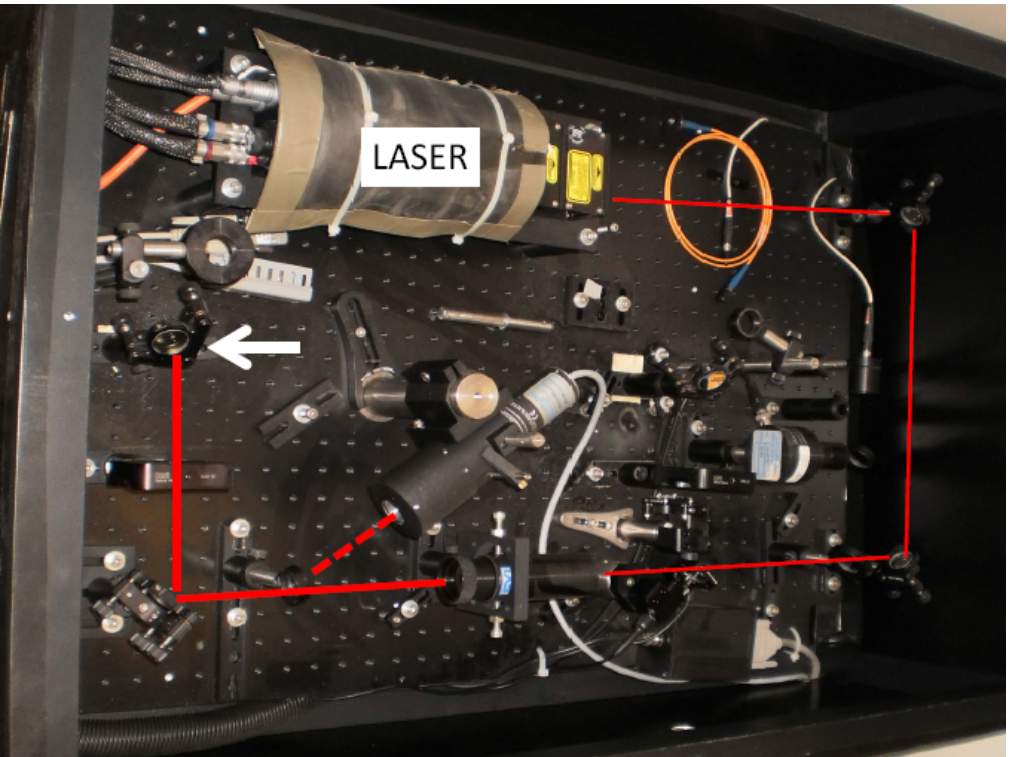


CLF hardware
(version 1.0)

The CLF system is described in :

JINST 1 P11003 (2006) *"The Central Laser Facility at the Pierre Auger Observatory"*





The trajectory of the vertical beam is shown.

The dashed line indicates the fraction of the laser beam going into the pyroelectric probe for the relative shot by shot calibration.

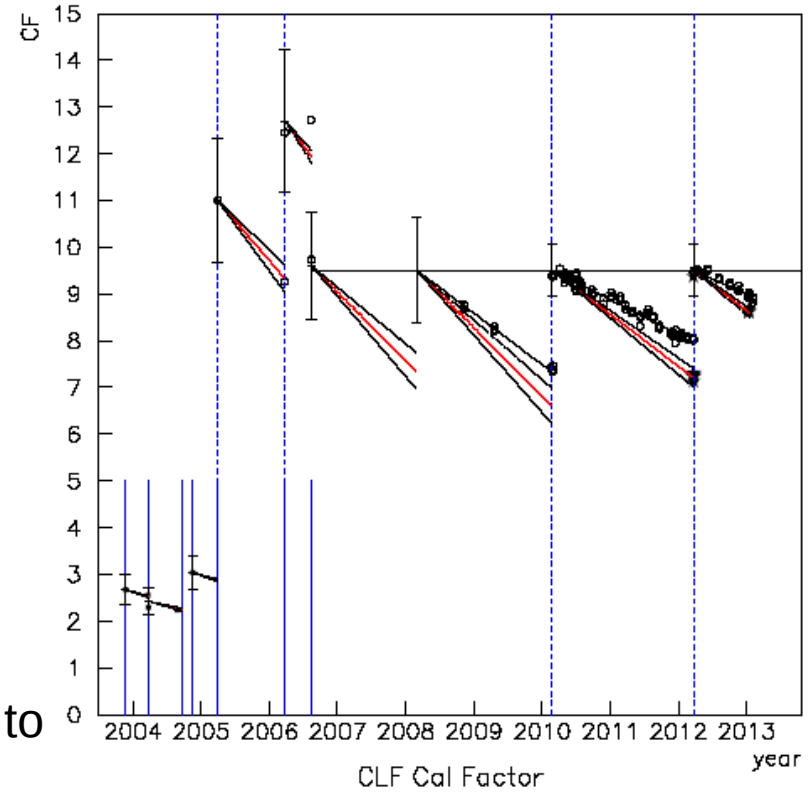
CLF calibration system (v 1.0)

Relative and absolute energy calibration of the laser are mandatory! The sky energy of each shot must be known with the highest precision for aerosol profiles measurements.

The laser energy of the CLF is monitored by two pick-off probes inside the optical table : a photodiode ad a pyroelectric probe. The second one is used for the relative calibration since 2005. In addition, absolute calibrations were periodically performed.

BUT !

dust accumulating on the last mirror of the optical table, downstream the probe, caused a reduction of the effective energy sent to the sky that was revealed by absolute calibration measurements.

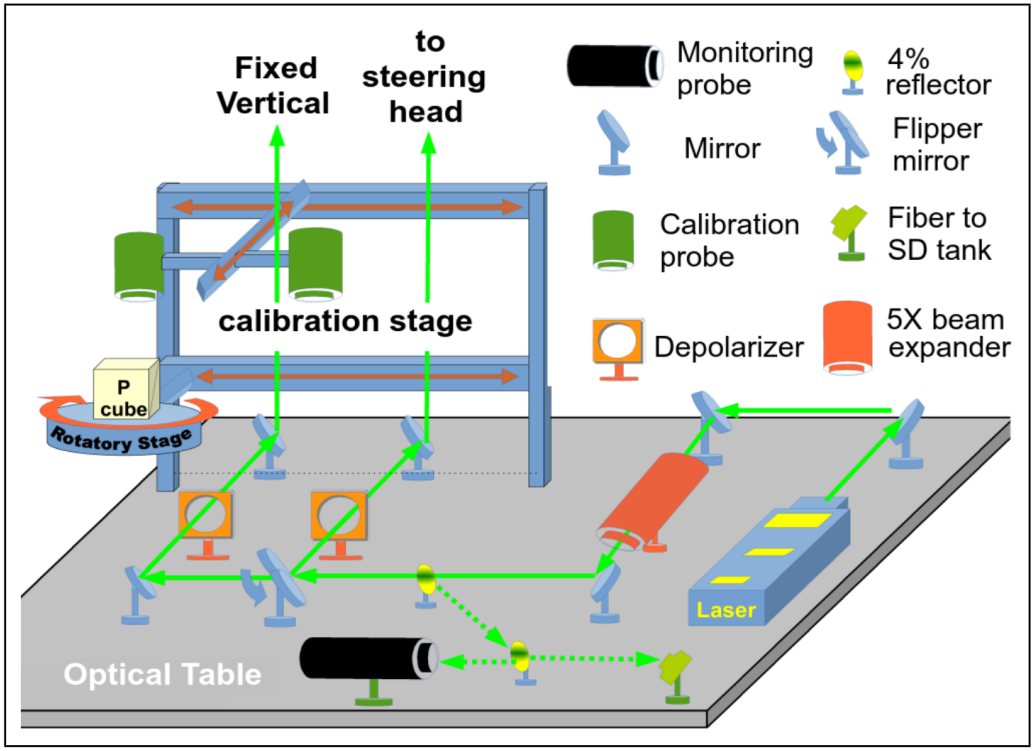


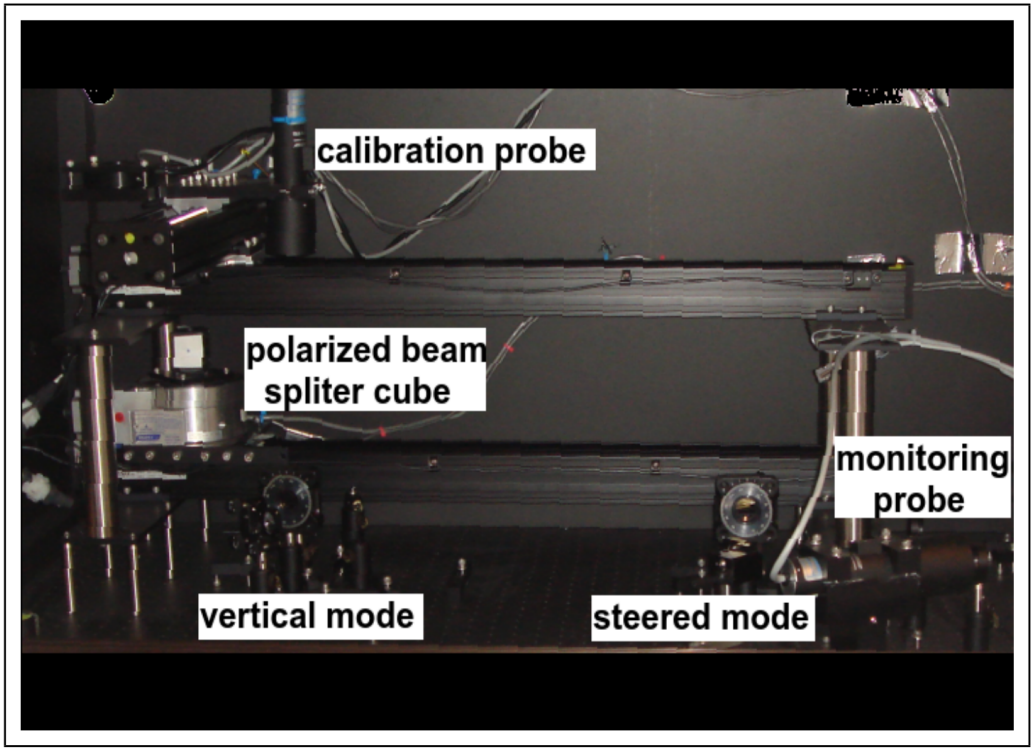
Since 2010, monthly absolute calibrations are performed at the CLF to trace this trend accurately

Since 2013, the calibration system was improved to perform authomatic measurements of the energy sent to the sky.

CLRF calibration system (v2.0, since 2013)

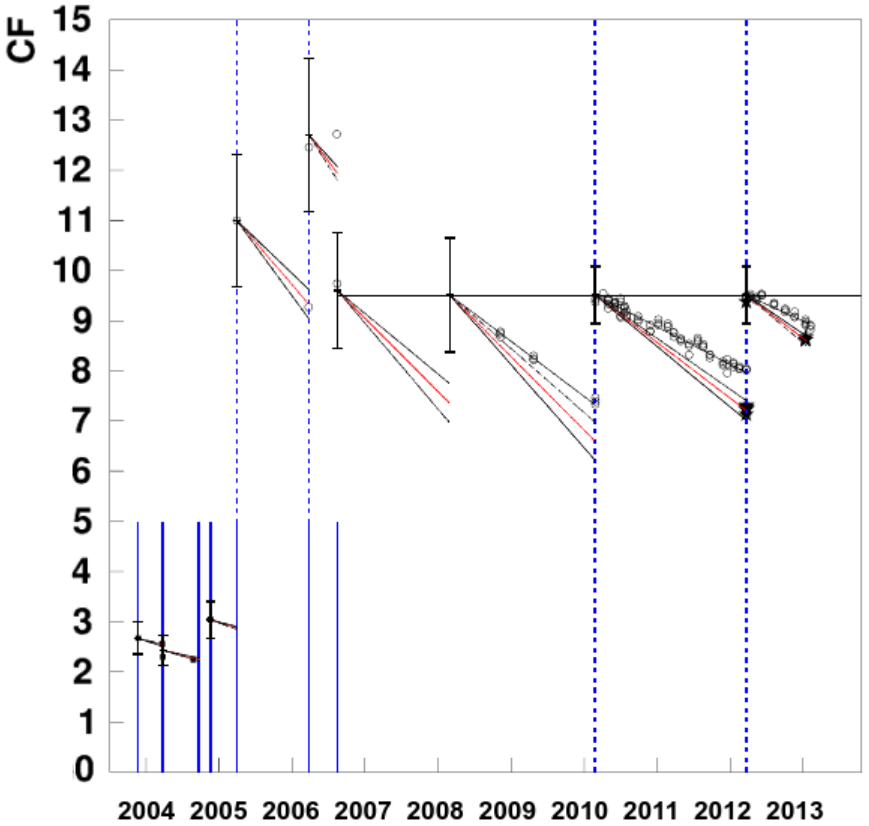
Authomatic absolute calibration of the effective energy sent to the sky : a robotic arm moves a calibration probe in the beam path of the laser every night.

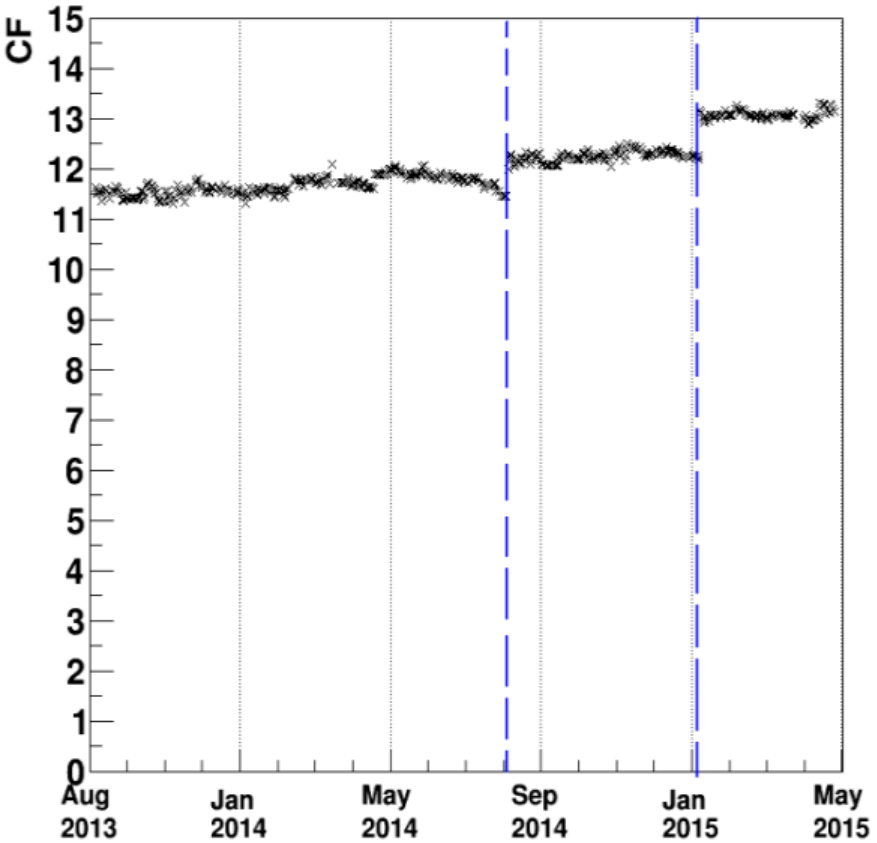




CLF calibration factors

from Carlos Medina's PhD thesis



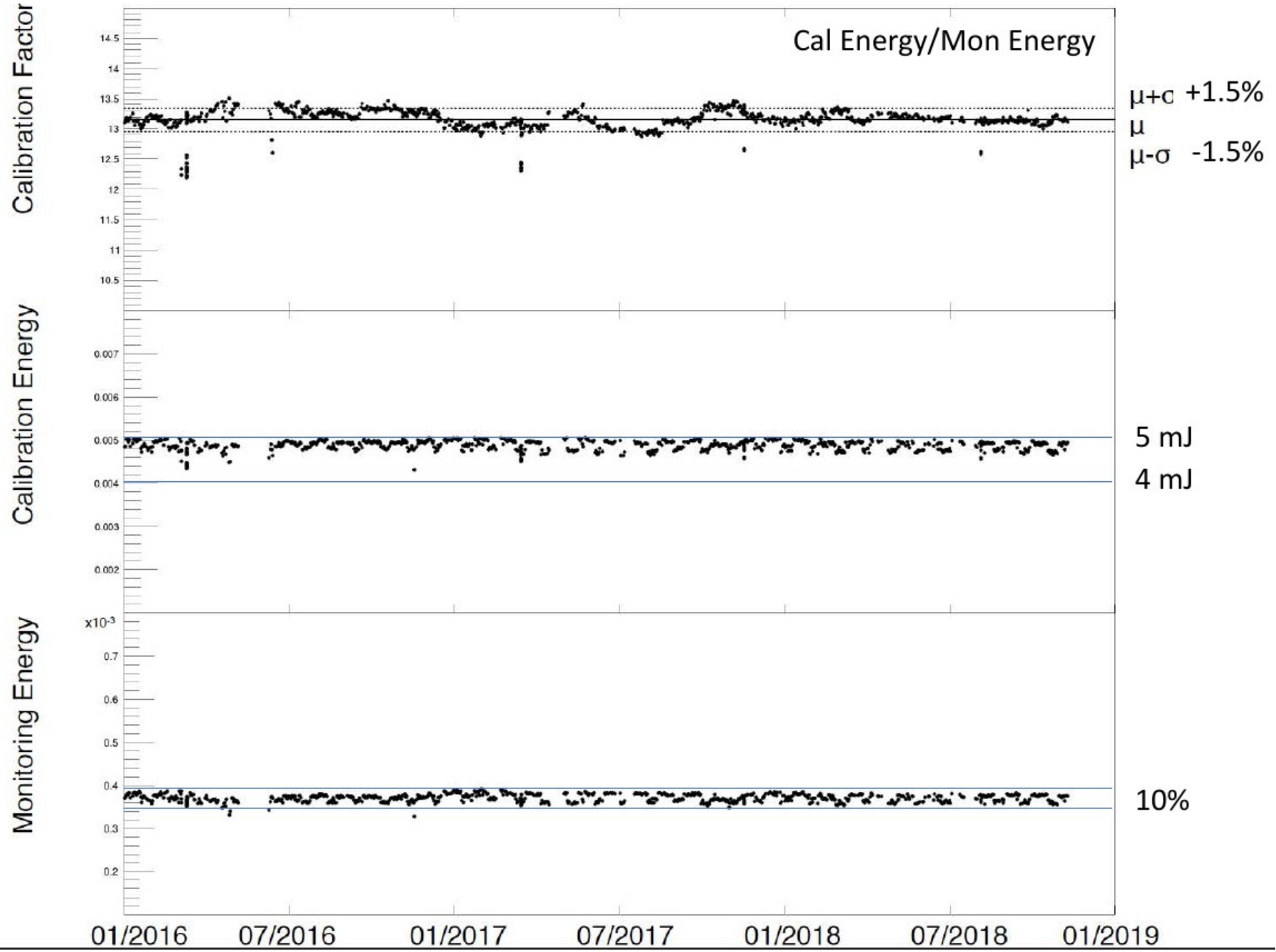


old ⟶ new

$$\text{calibration factors} = \frac{\text{absolute measurement}}{\text{relative measurement}}$$

L. Wiencke presentation – Nov 2018 meeting

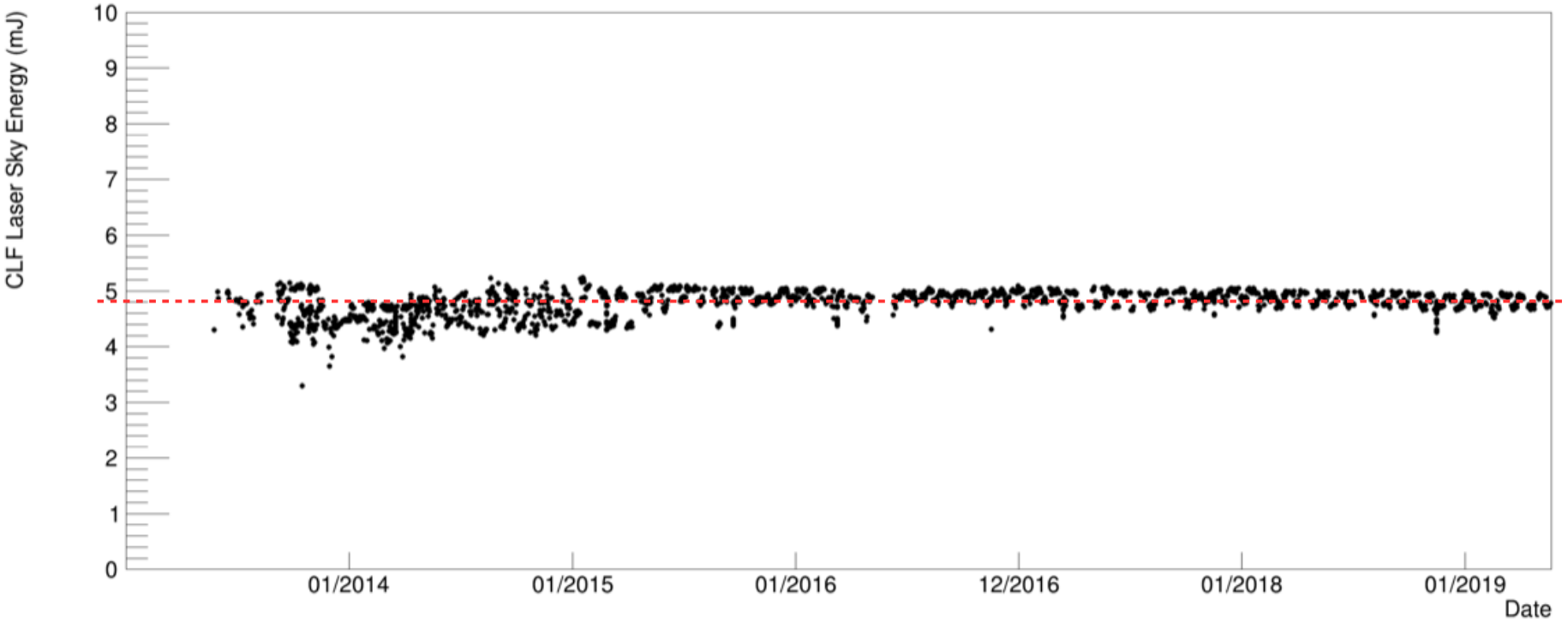
CLF



CLF stability plot 2013-now

from Lawrence Wiencke :
this plot shows the stability of the CLF laser as measured by the robotic calibration system that is operated before and after each night.
The pick-off probe that measures every shot fired shows a similar behavior.
The ratio of the two is the calibration factor takes this out.
The long term plot of the calibration factor shows other features, especially in the first few years.

We decided to provide for the this general ICRC poster the flattest and most simple plot because it is the easiest to explain in a limited amount of space.



L. Wiencke presentation – Nov 2018 meeting