Karlsruhe Institute of Technology

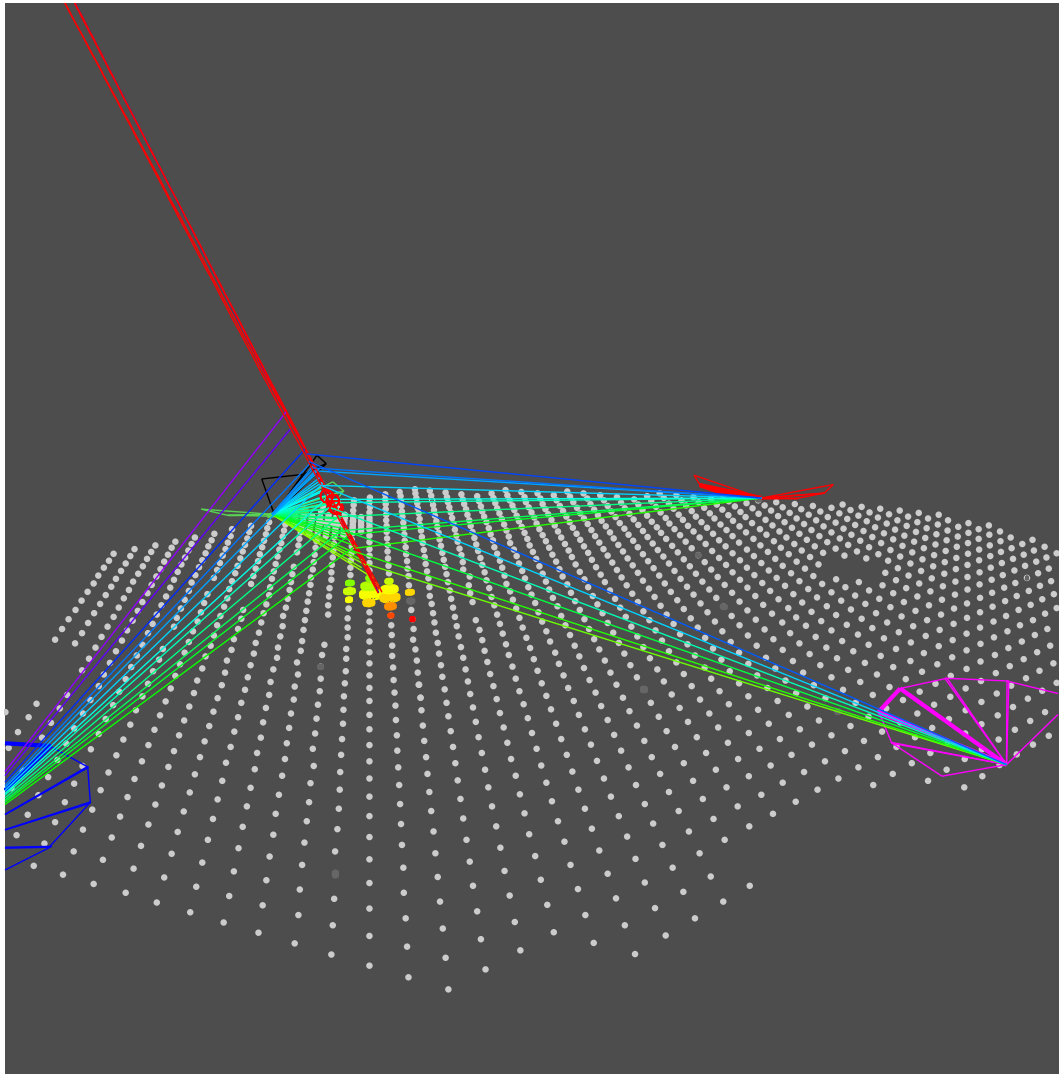
Towards a laser calibration of the Auger fluorescence telescopes

Joachim Debatin, for the Auger Collaboration | October 10, 2014

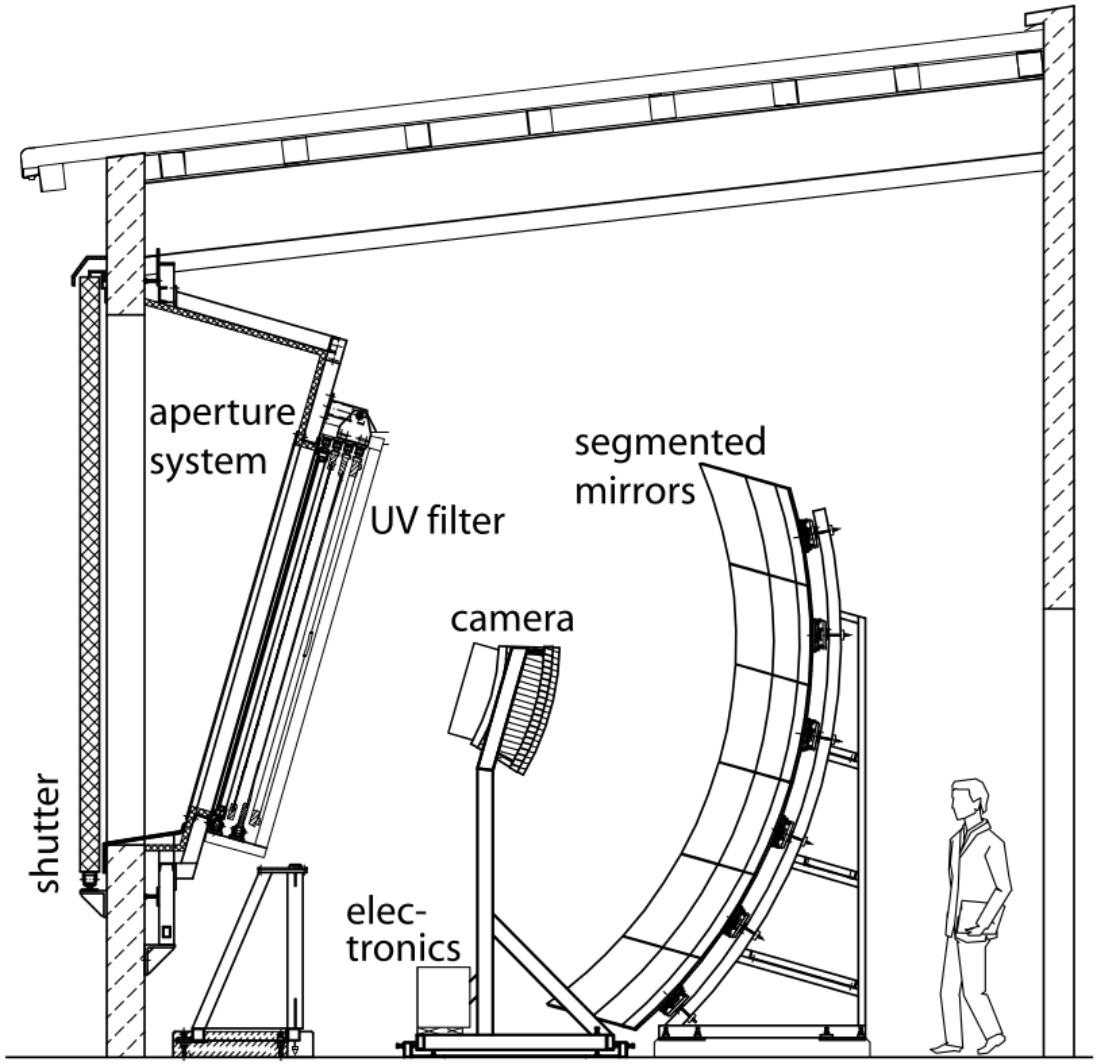
IKP

Outline

An Auger Event



The Pierre Auger Telescopes



Calibration

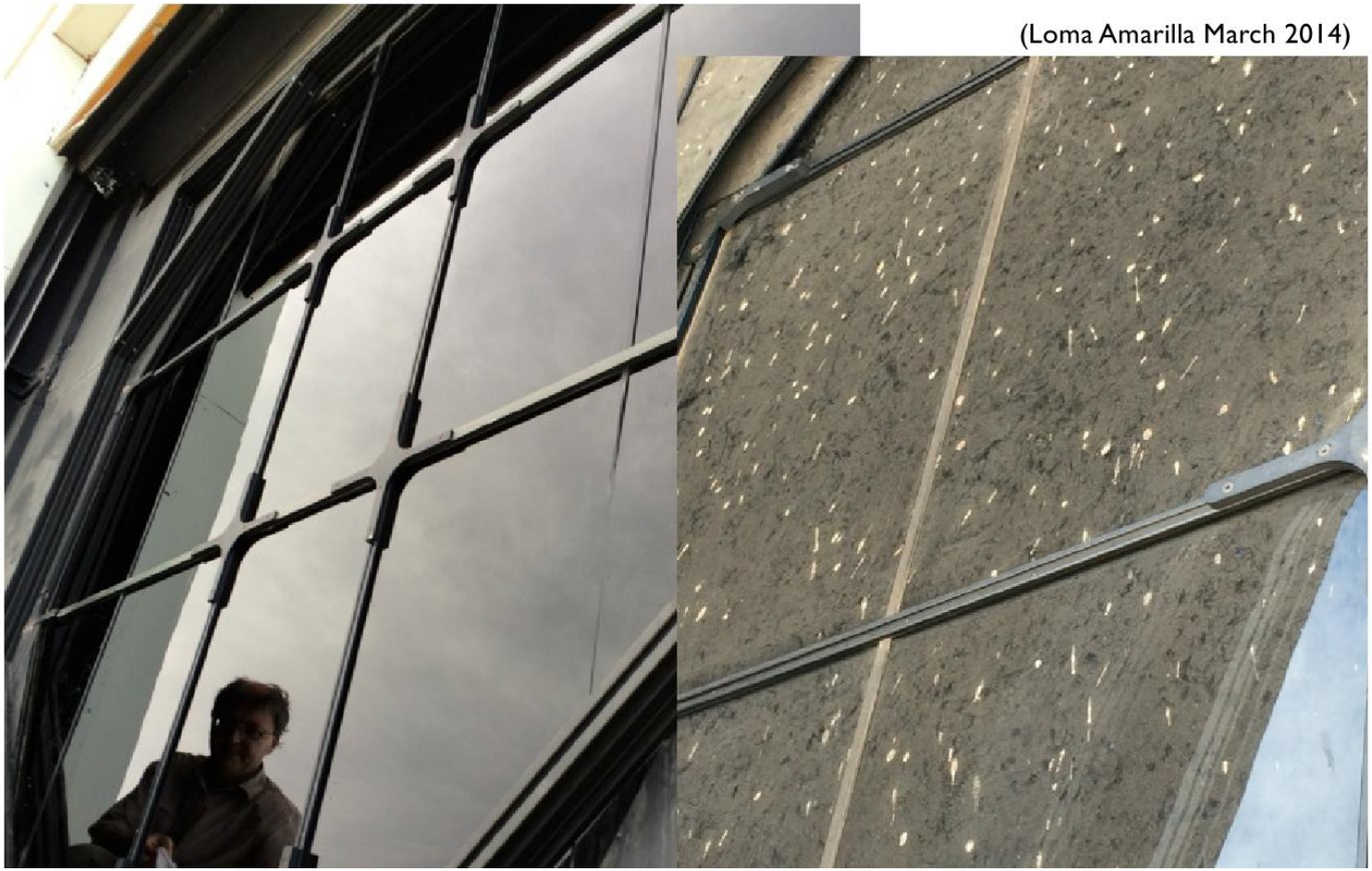
Absolute calibration: Drum

typically done once a year

Relative calibration: LED and xenon flashers at different positions of the telescope.

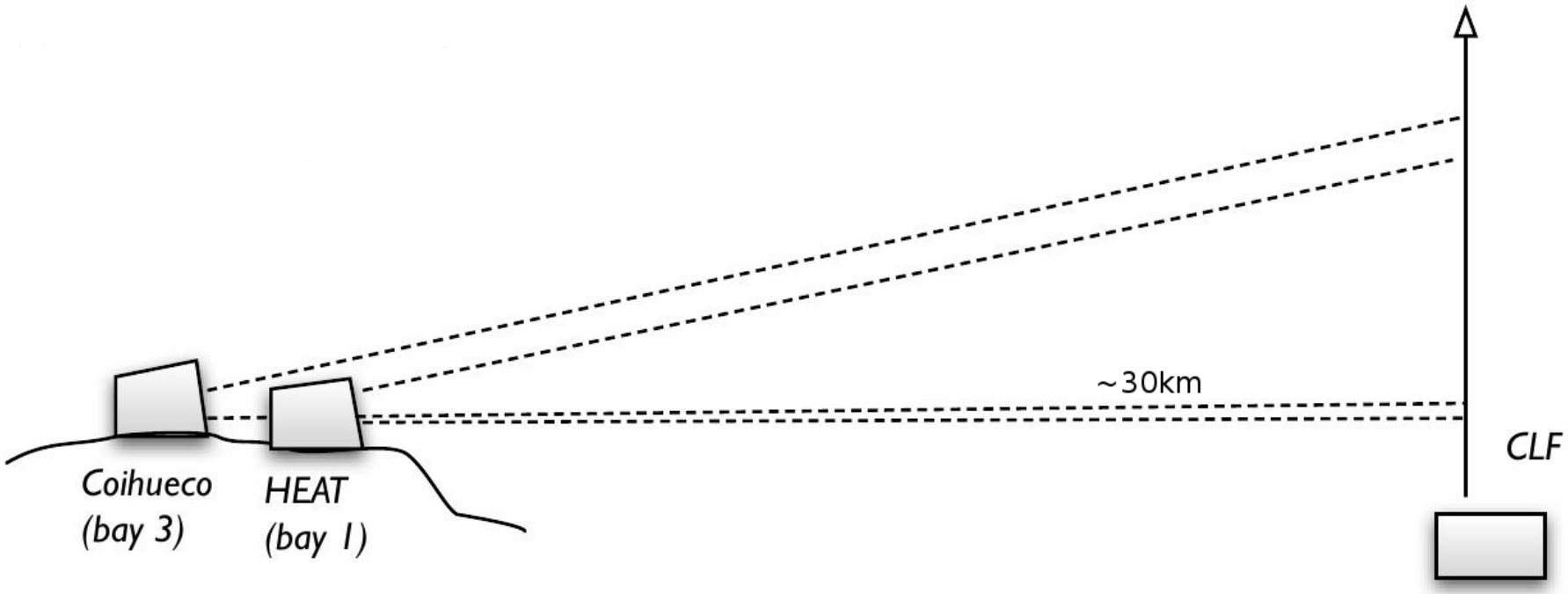
Cross check:
Use a laser outside the FD-Building for relative calibration of the whole telescope?

Importance of dust on telescope filters



The Measurements

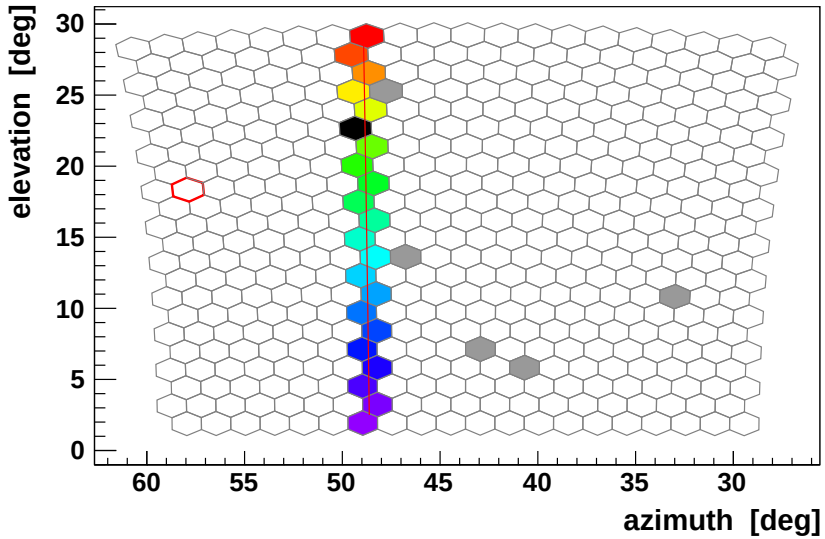
Measurements from 2nd to 10th March 2014.
HEAT cleaned after 04th of march
Coihueco cleaned after 07th of march



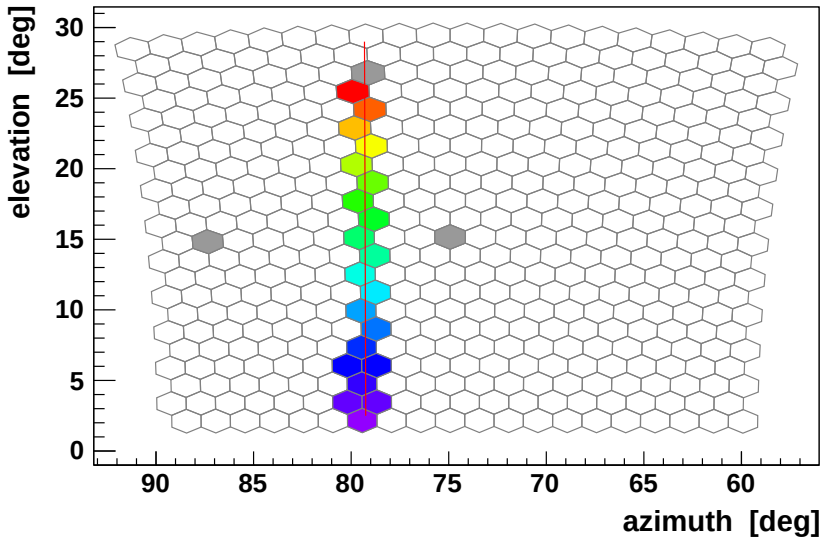
Laser energy and atmospheric variation identical for Coihueco and HEAT.

Position on Camera

Heat:

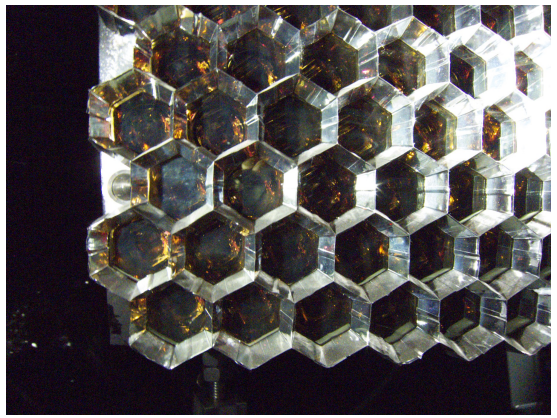


Coihueco:

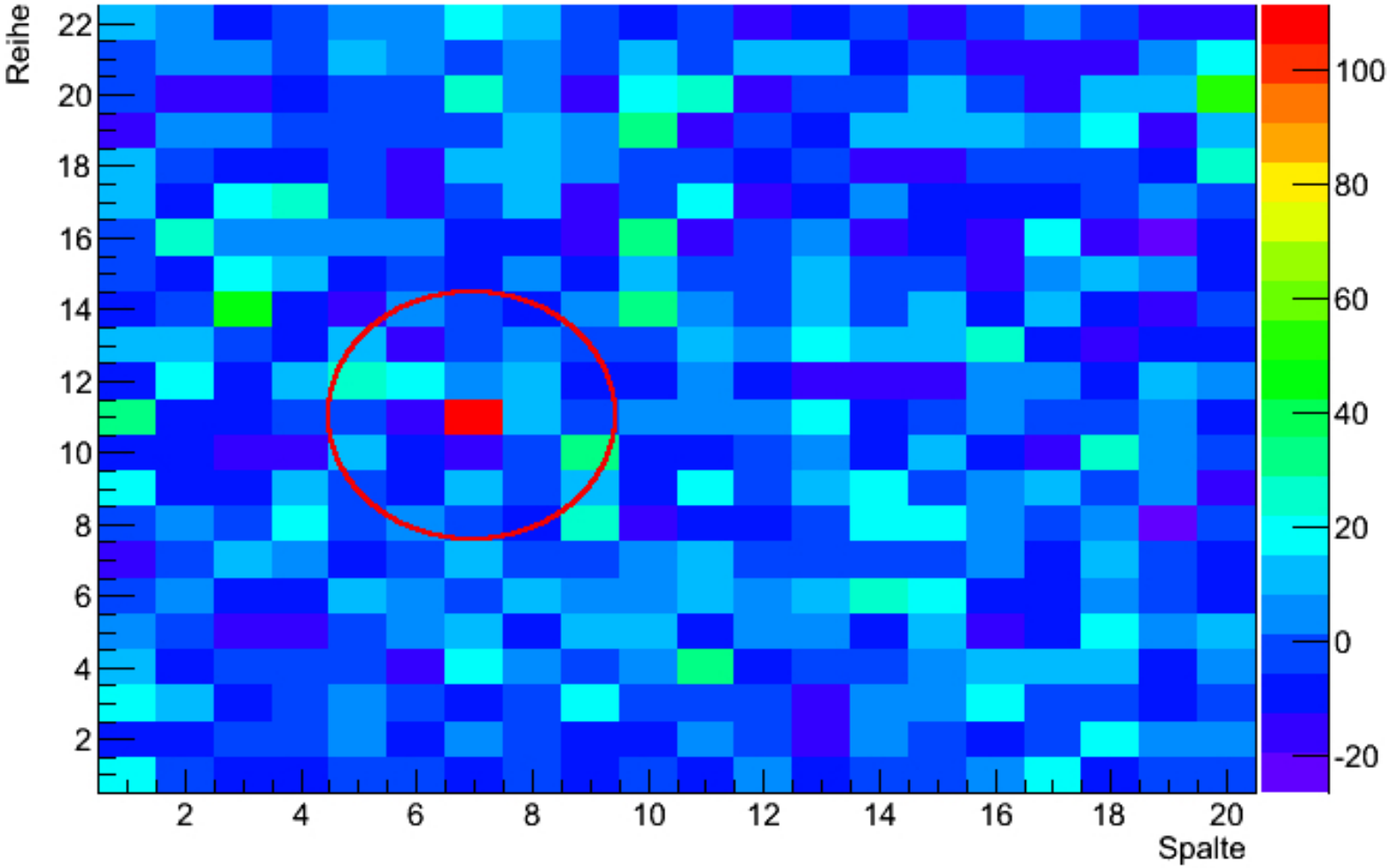


Position on camera influences the measurement.

$\rightarrow$ Small difference expected.

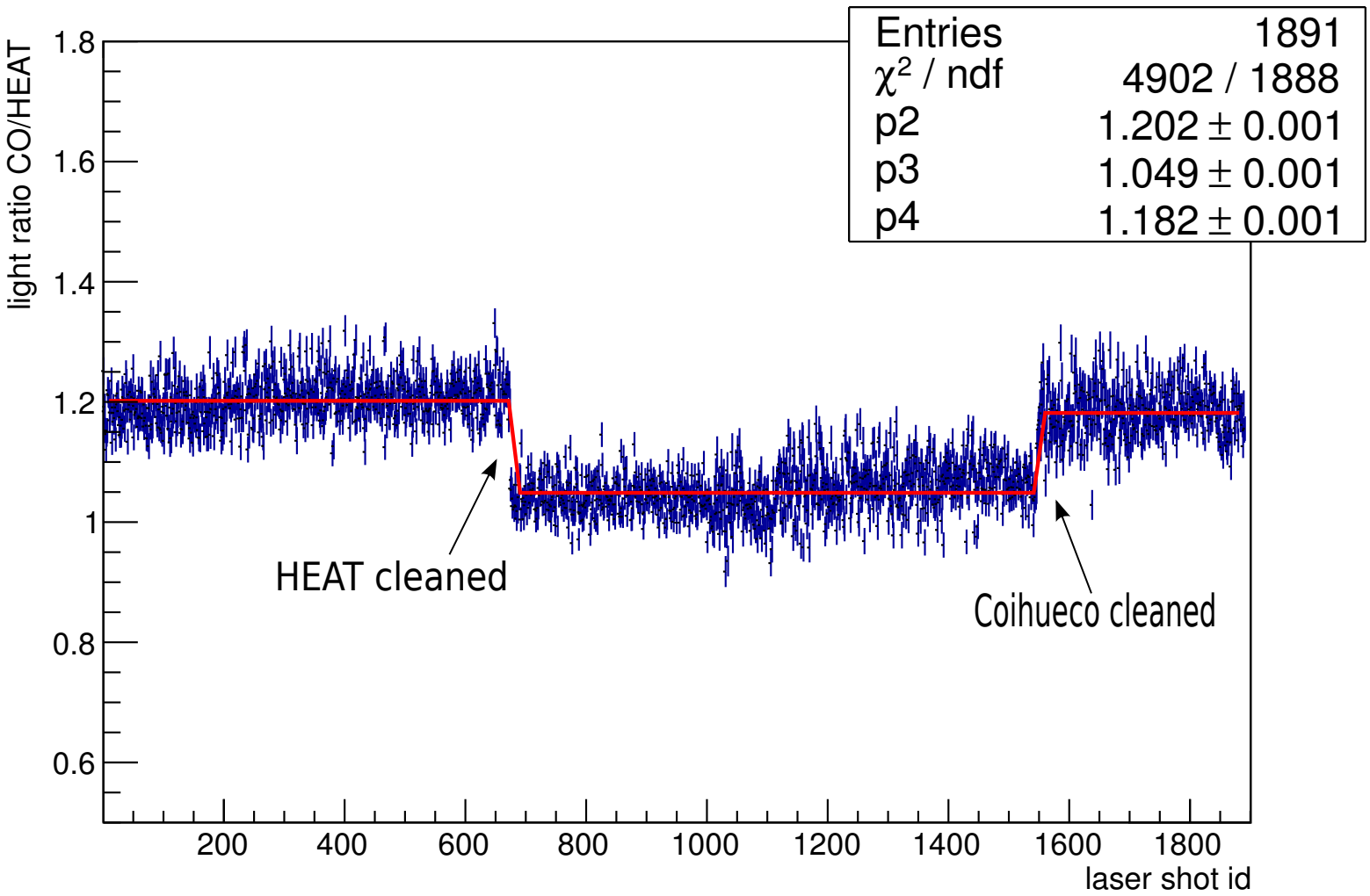


The angle ζ



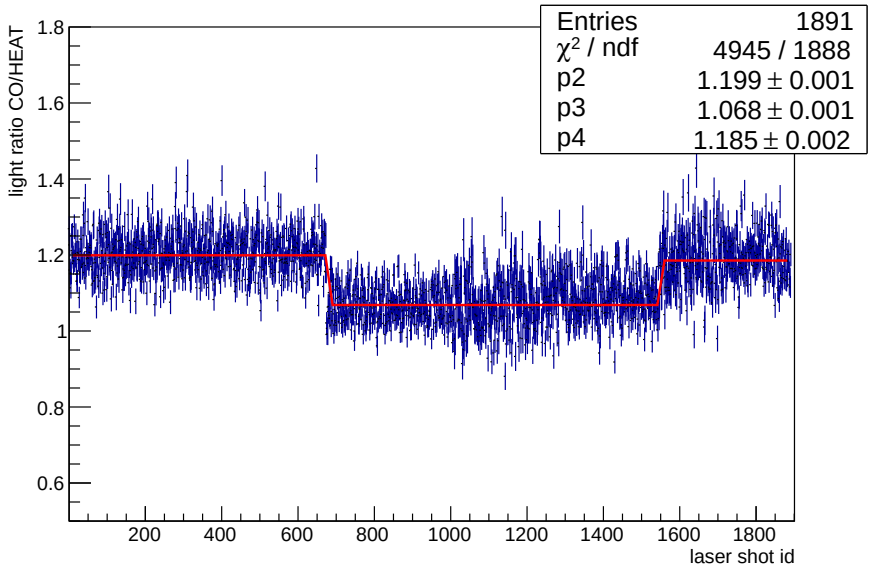
Results for dust study

$\zeta = 1°$

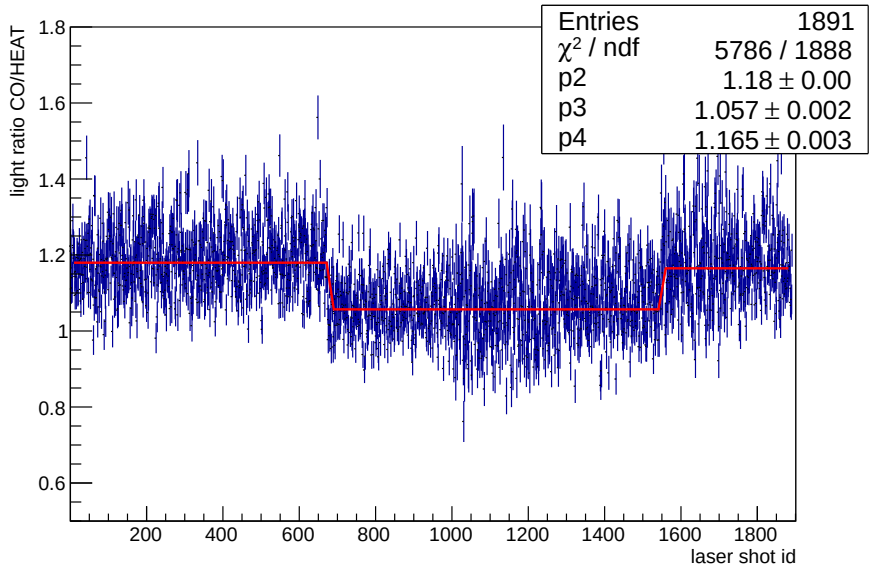


Energy

$\zeta = 2^\circ$



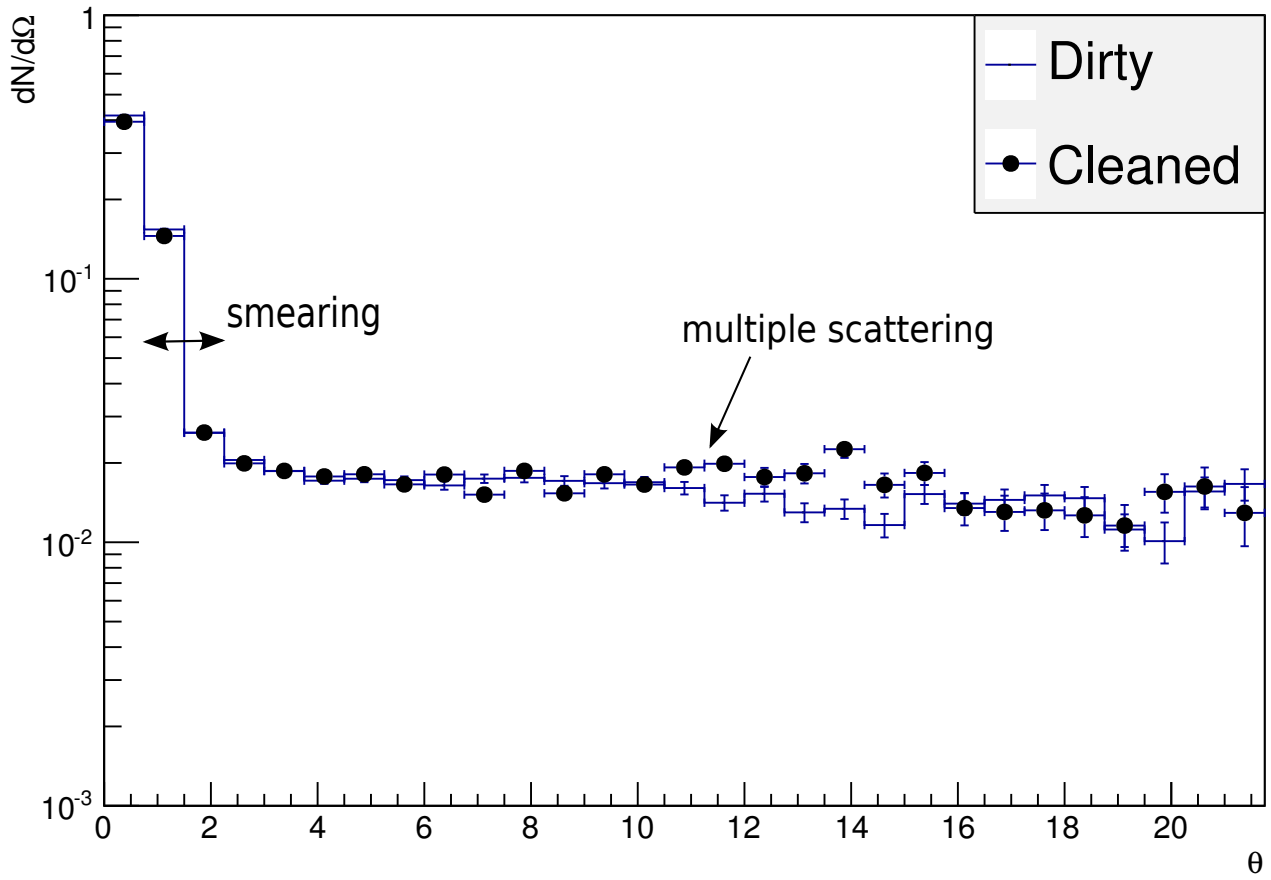
$\zeta = 3^\circ$



If the effect was caused by diffraction on the dust grains it should disappear with growing ζ.

$\rightarrow$ Absorption

Point spread function



dust negligible to atmosphere, dominated by multiple scattering

Outlook

Measurements with a roving laser:

- 1-2 km distance to the telescope
- Less atmospheric influence
- Multiple scattering negligible

Planned for November.
Might be an alternative method for calibration.
$\rightarrow$Auger analysis module (Offline)!

Laser reconstruction in Offline

$S = C_{Atm} \cdot E_0$