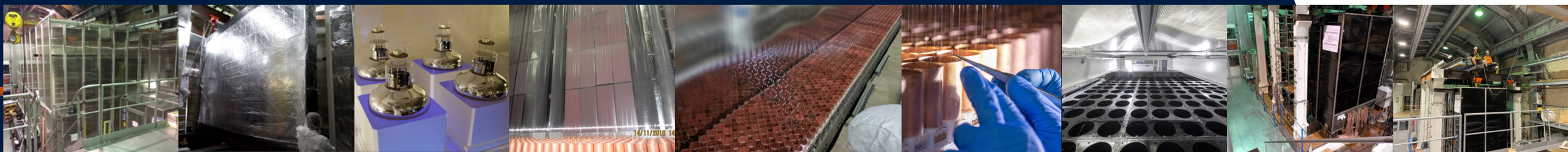
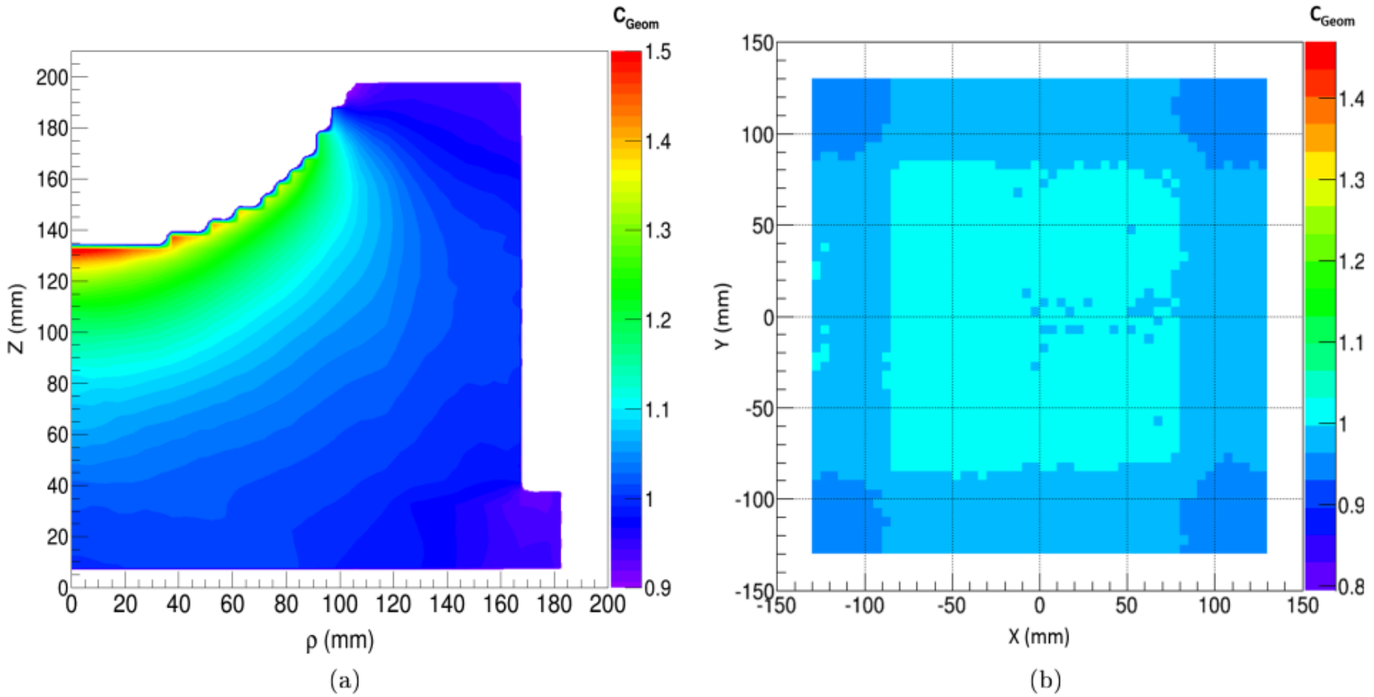
Geometrical measured correction

Granjon Mathis



Geometrical correction in simulation

MC: **general** energy correction based on optical simulations



Can we compute energy electron on front face scintillator using data?

Geometrical correction in data

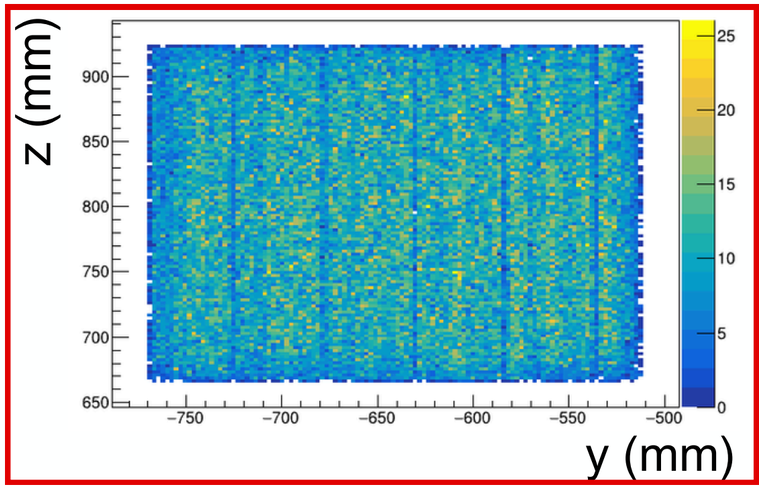
Using Cimrman we can reconstruct interaction point on scintillator faces

Using several ^{207}Bi calibration runs

Build the electron impact map on the OMs **front face**

Determine the OMs dimensions with a door-function algorithm

Interaction point of OM 100



Geometrical correction in data

Using Cimrman we can reconstruct interaction point on scintillator faces

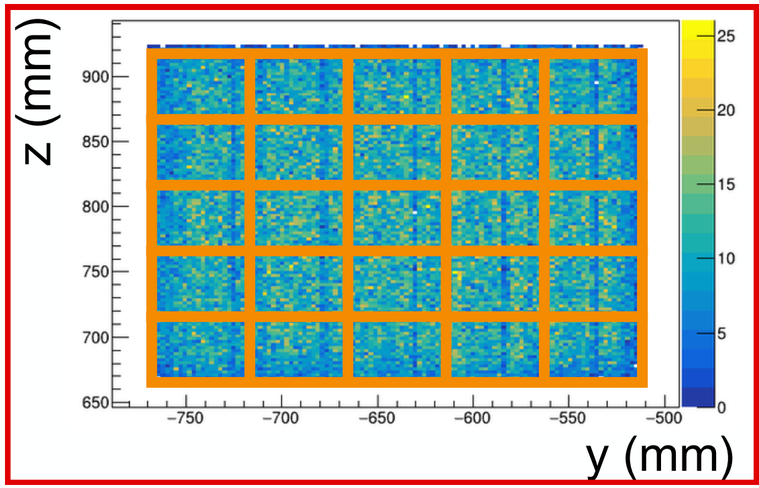
Using several ^{207}Bi calibration runs

Build the electron impact map on the OMs **front face**

Determine the OMs dimensions with a door-function algorithm

Then divide the OM in **25 pixels**

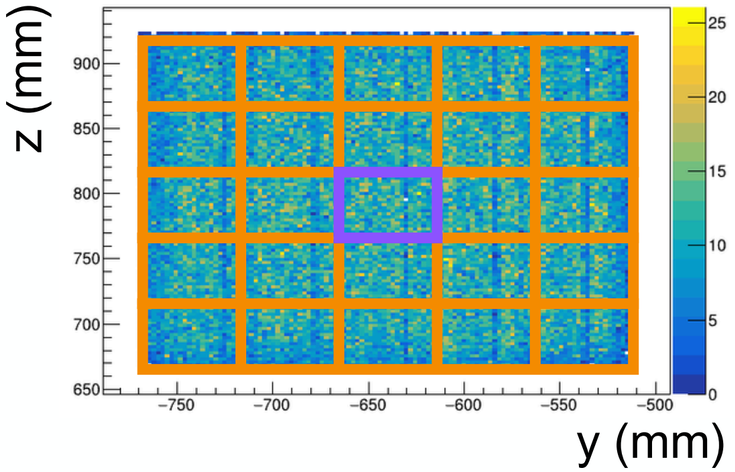
Interaction point of OM 100



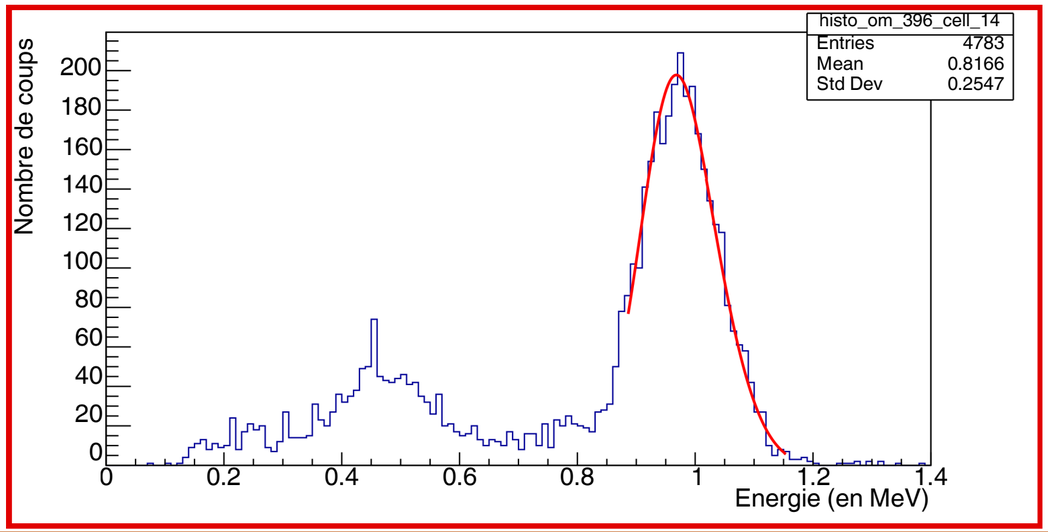
Geometrical correction in data

- for each **pixel** → draw energy spectra
- **fit each energy spectra** with triple gaussian fit from ^{207}Bi
- get the mean value of the fit
- normalise energy value by **central energy value**

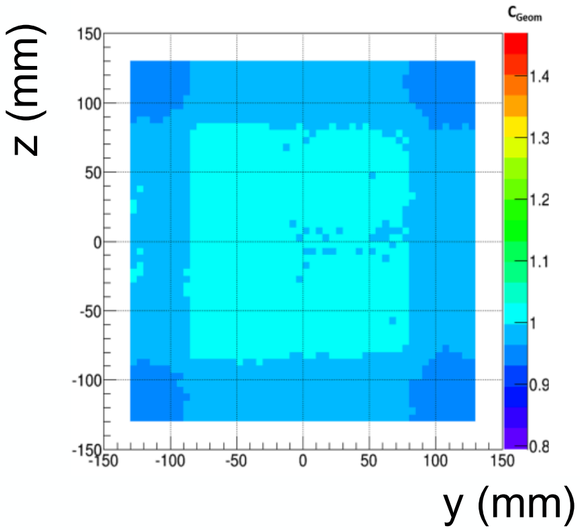
Interaction point of OM 100

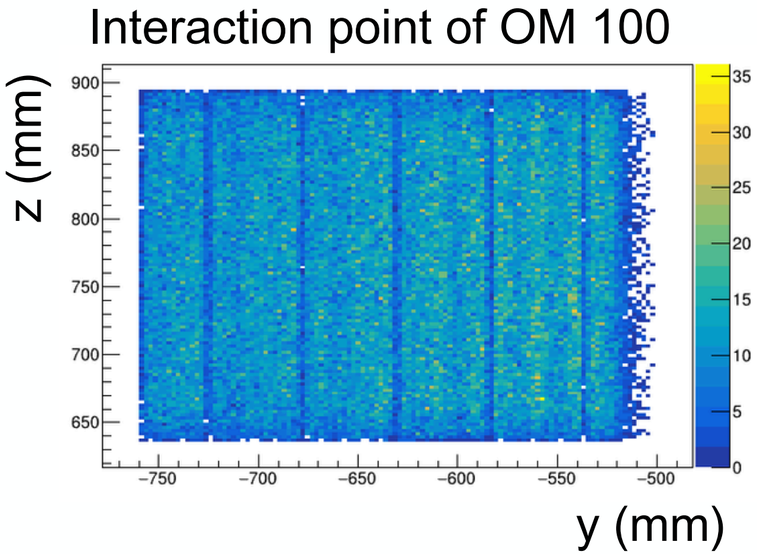


Energy spectra for one OM and central pixel



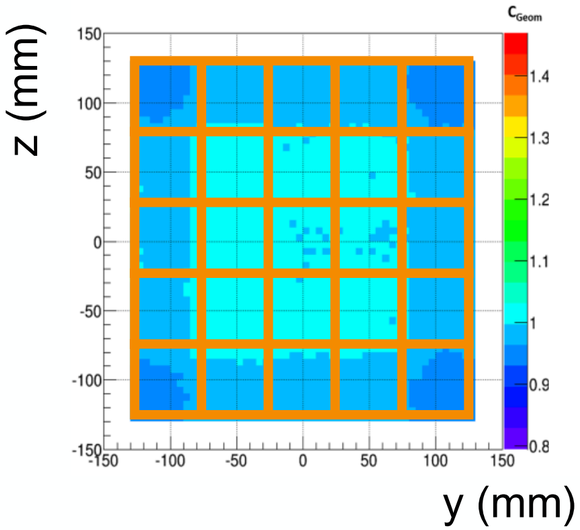
Geometrical correction in MC

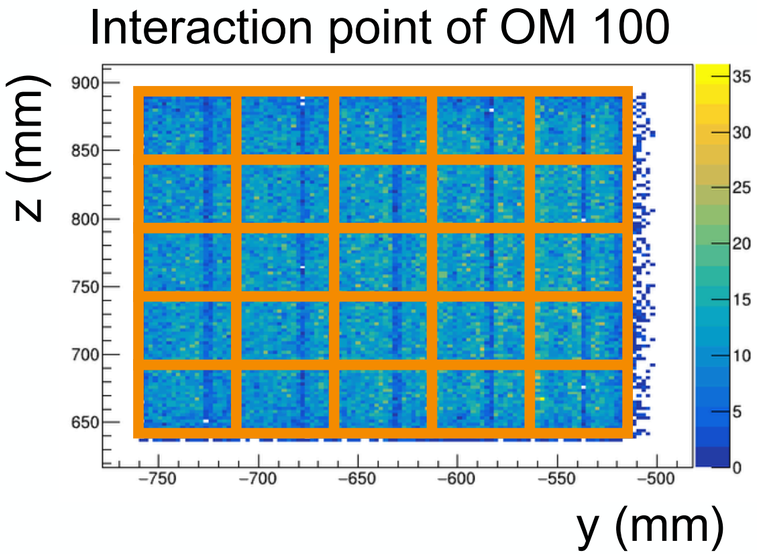




- Same procedure in MC
- Include geometrical correction

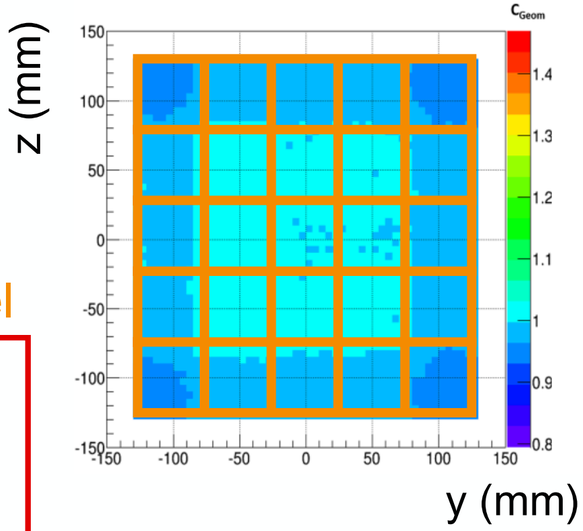
Geometrical correction in MC



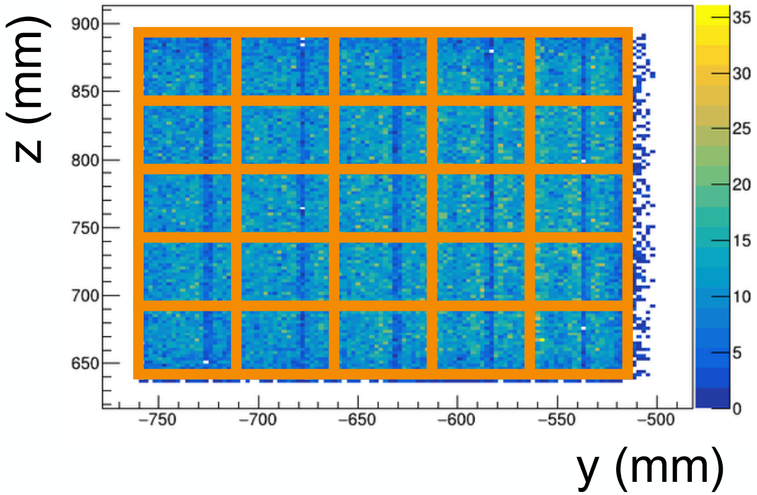


- Same procedure in MC
- Include geometrical correction
- Divide projected impact point in 25

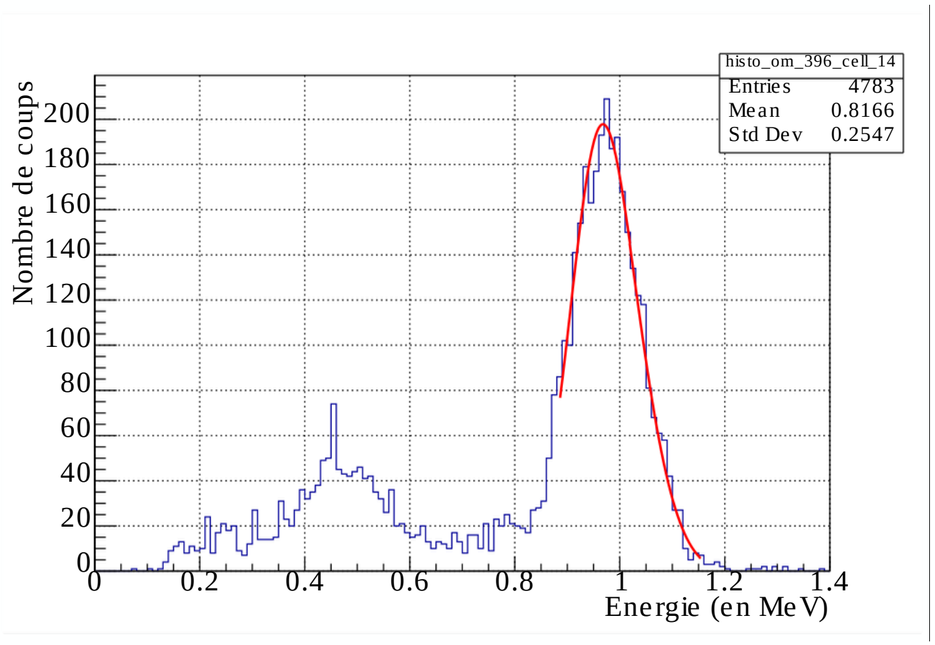
Geometrical correction in MC



Interaction point of OM 100



Energy spectra for one OM and central pixel

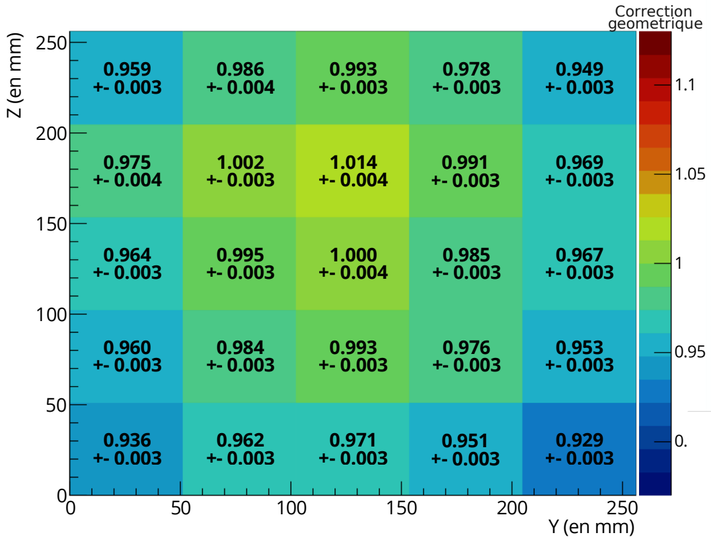


- Same procedure in MC
- Include geometrical correction
- Divide projected impact point in 25
- fit every energy spectra

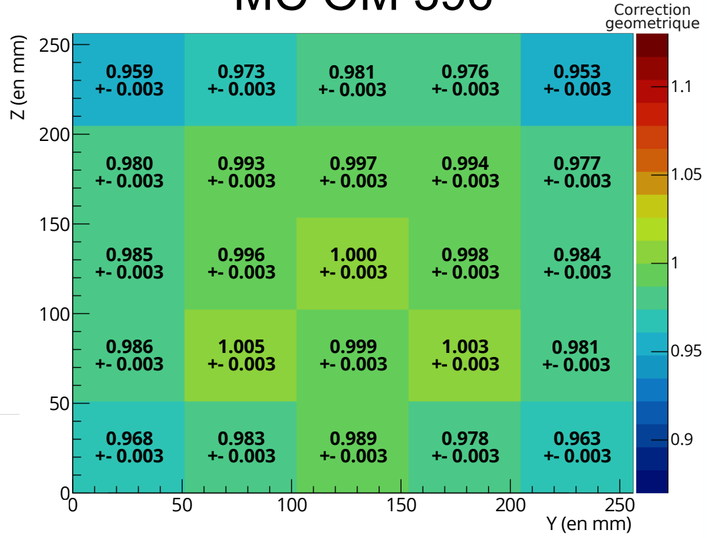
Geometrical correction comparison

Compare geometrical correction MC/data

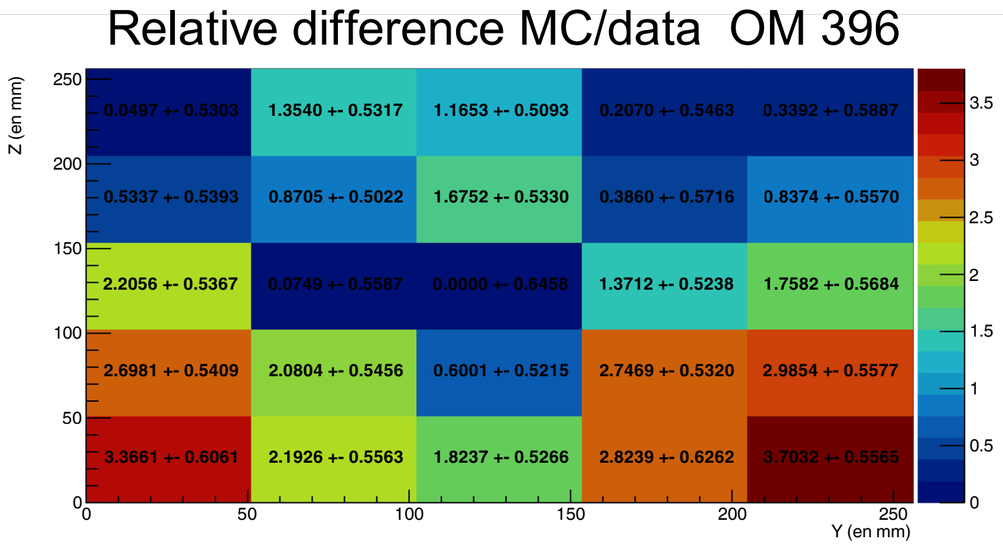
Data OM 396



MC OM 396



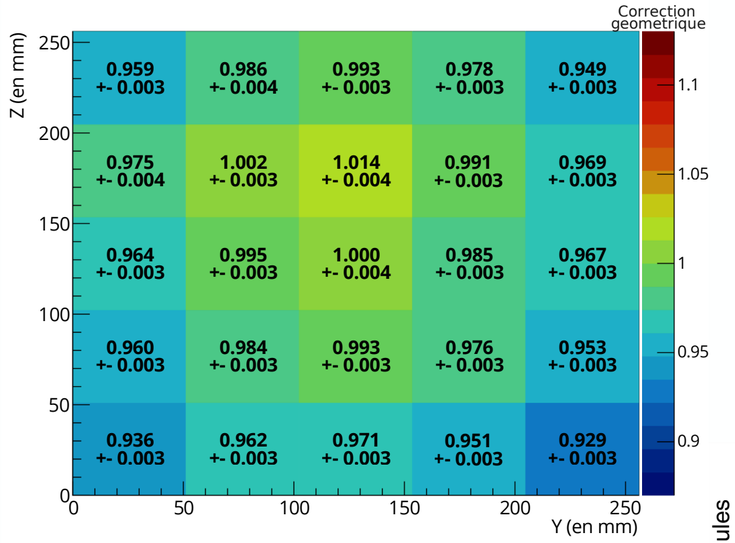
Relative difference MC/data OM 396



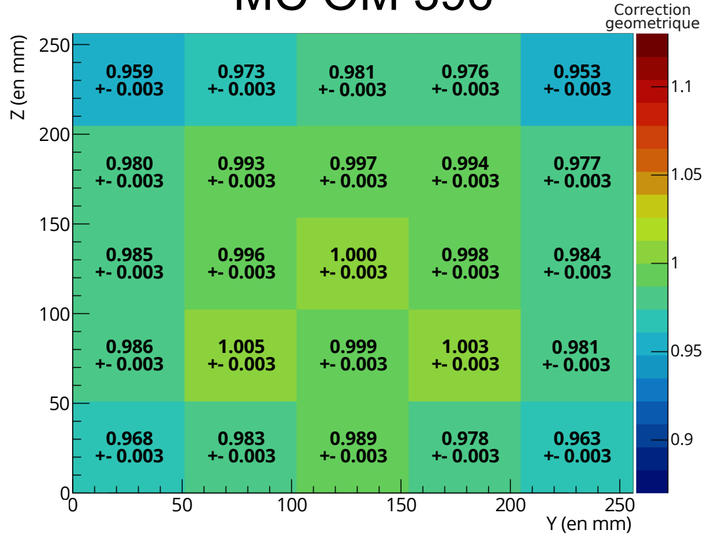
Geometrical correction comparison

Compare geometrical correction MC/data

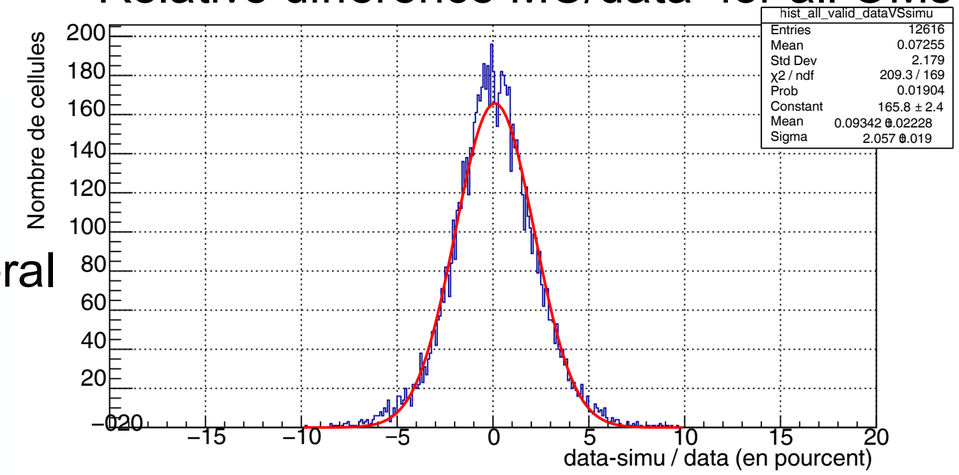
Data OM 396



MC OM 396



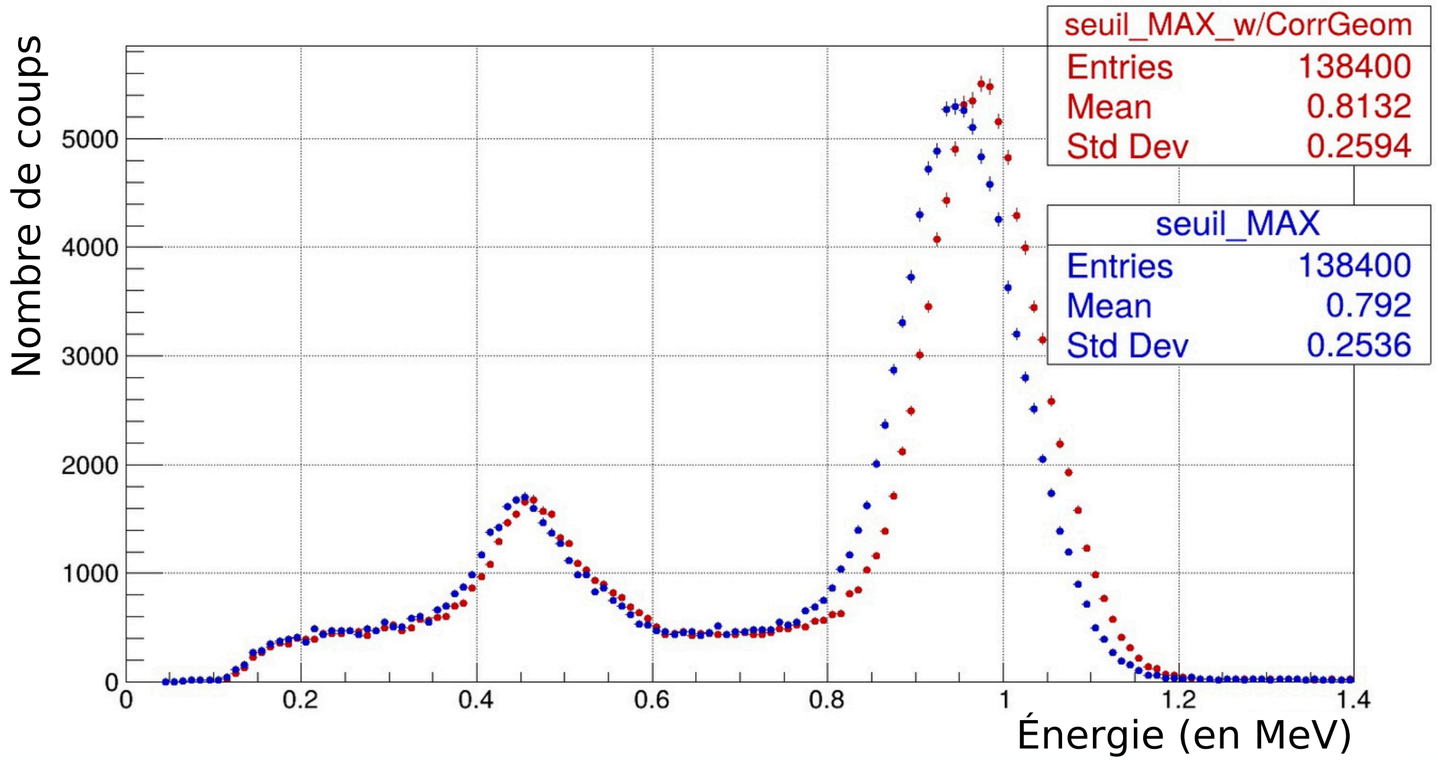
Relative difference MC/data for all OMs



- Good agreement MC/Data in general
- Some OMs on the edges of the detector have high discrepancies

Geometrical correction applied

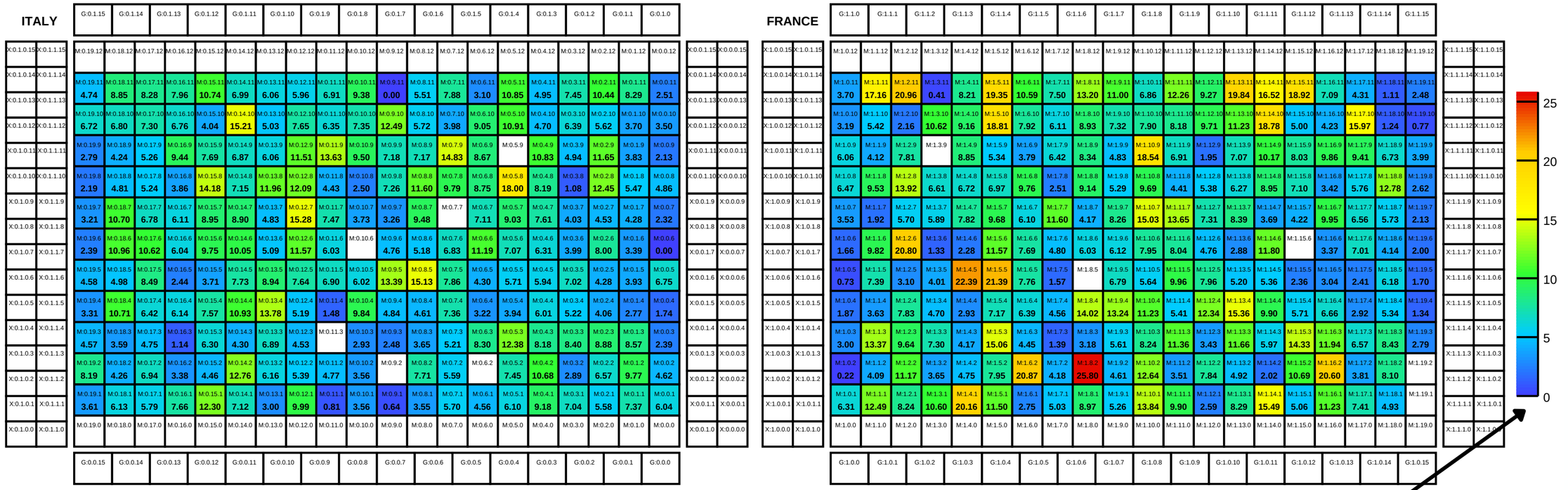
General ^{207}Bi electron energy spectra with and without geometrical correction



- Better energy resolution with geometrical correction

Geometrical correction applied

Map of relative FWHM differences before/after geometrical correction



- General good agreement between MC/Data
- Some OMs needs measured data corrections
- Problem of Z reconstruction influence edges measurement?

$$100 * \frac{FWHM_{before} - FWHM_{after}}{FWHM_{before}}$$

Implementation in falaise

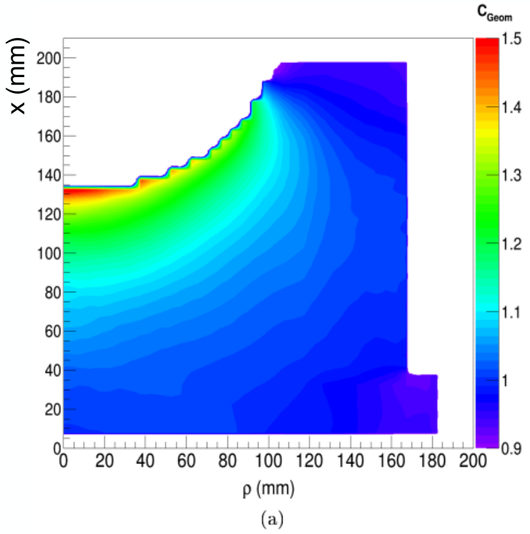
2 ways for implementing it in falaise

As it is front face data measurement → what do we want for implementation?

Put a hard-coded value:

if depth < value → use measured correction

else → use simulation value



Depth optical correction

$$corr(x,y,z) = u_{data}(x_{front},y,z) \times \frac{u_{sim}(x,y,z)}{u_{sim}(x_{front},y,z)}$$

Measured correction

Next steps calibrations precisions

First measurement of the geometrical non-uniformity effect using ^{207}Bi electron energy spectra

- Good overall agreement between MC and data
- Remaining large discrepancies for a few OMs highlight the need for dedicated measurements
- Improved FWHM after applying the geometrical correction

Next steps

- Implement geometrical corrections measured in Falaise
- Use more statistics to divide OM in more pixels

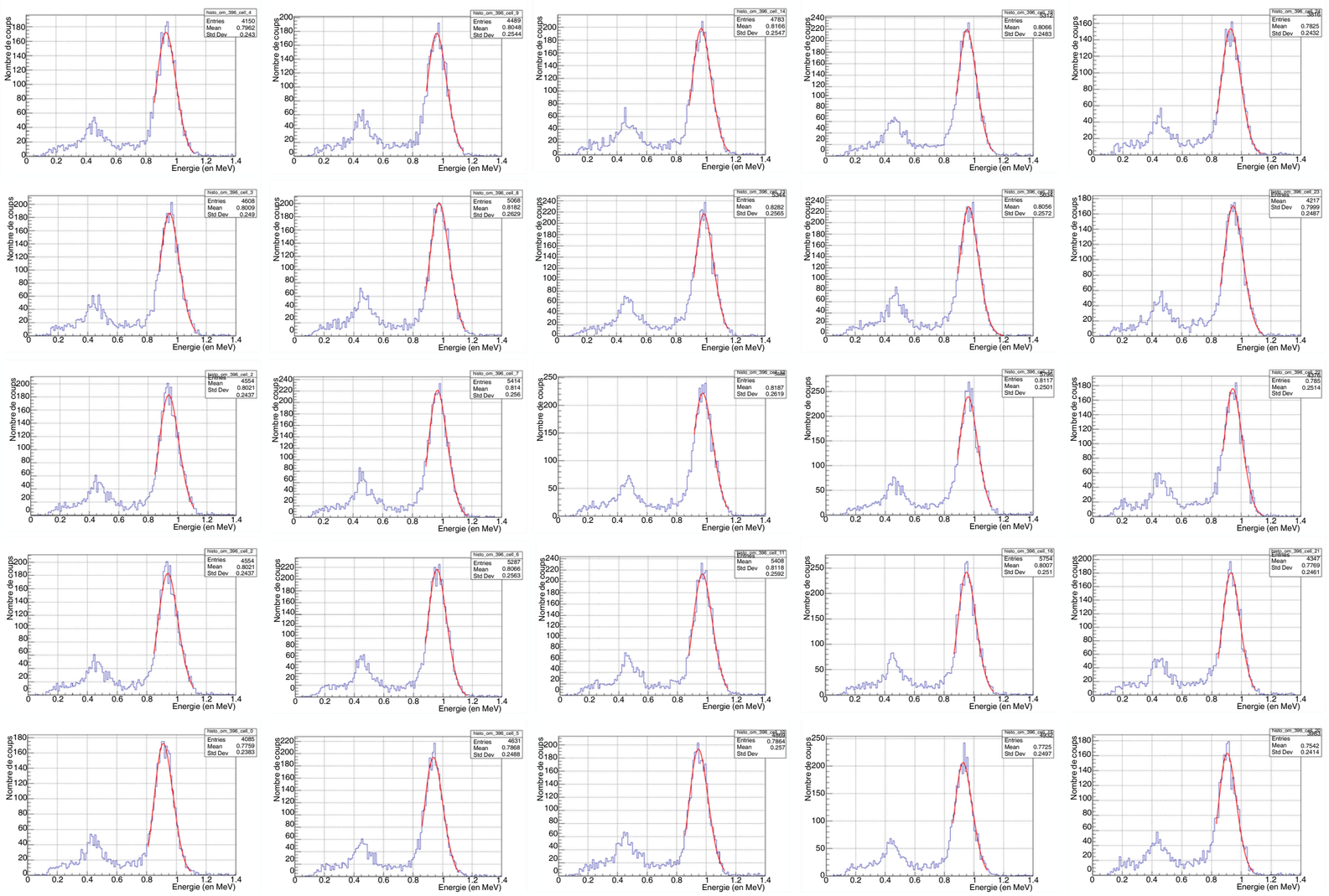
Backup

Thanks for listening

Btw this is not my work but the one from M2 internship Raphaël Margnes

Congratulation and thanks to him

Backup



Energy spectra per OM pixel in data