Comparison of camera calibration procedures

Raffael Niemczyk, Zeuthen, July 11th 2019

Camera scaling factor (mm/px)

How is the spacial resolution of the screen onto the camera chip?

> **Screen stations at PITZ (right image)**

- Scintillator screen: Most perpendicular to beam, some tilted (45 deg)

- Lenses: One to three lenses for imaging installed

    - Only one used at a time

    - Allow for different magnifications (zooms), to measure weak beams as well

    - Sometimes telescope instead of lenses (fixed magnification then)

- Calibration Grid: Outside beamline at virtual screen position

    - Grid size known -> Camera pixel calibration can be determined (figure next page)

Beam pipe
Electron beam
Screen   Mirror
Calibration Grid   Mirror
Lenses
Camera
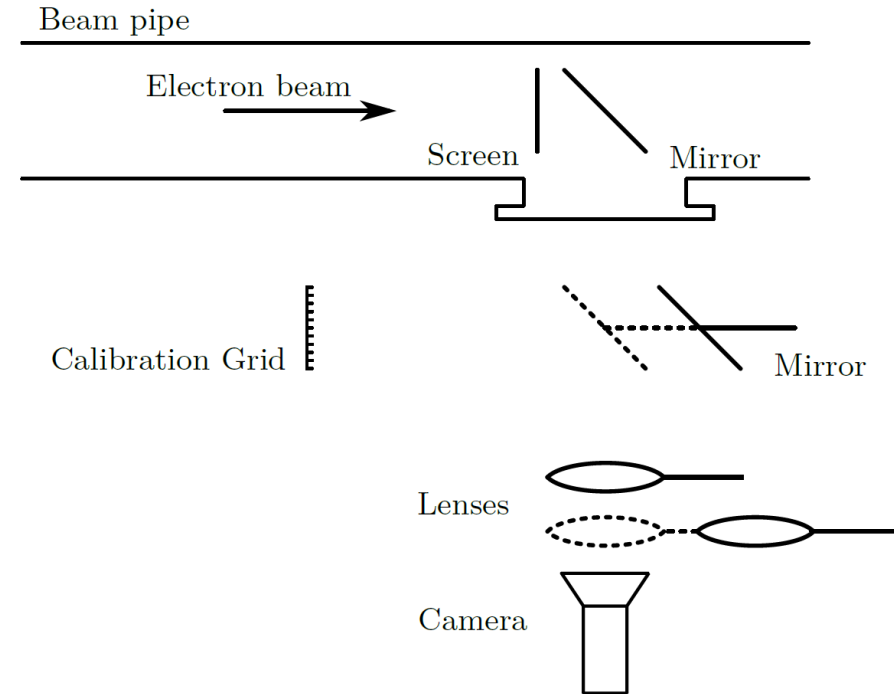
Camera calibration with calibration grid

Using the program ResoluMeter

> **ResoluMeter**

- Fitting boxes to grid image, yielding scaling factor (see picture)

- In this example: Calibration factor is 52.2648 mm/px

> **Problem: What if we don't have a grid?**

- E.g., no space for grid (as now @ EMSY1)

- Maybe we want to get rid of (some) grids? (It has to be aligned to, i.e. work load could be reduced)

→ Idea: Get calibration factor from screen image


```
**************************************************
**************************************************
Finally, rotated angle:0.8, Calibration factor: 52.2648 um/pixel
Center:(255.2,340.7)
**************************************************
```
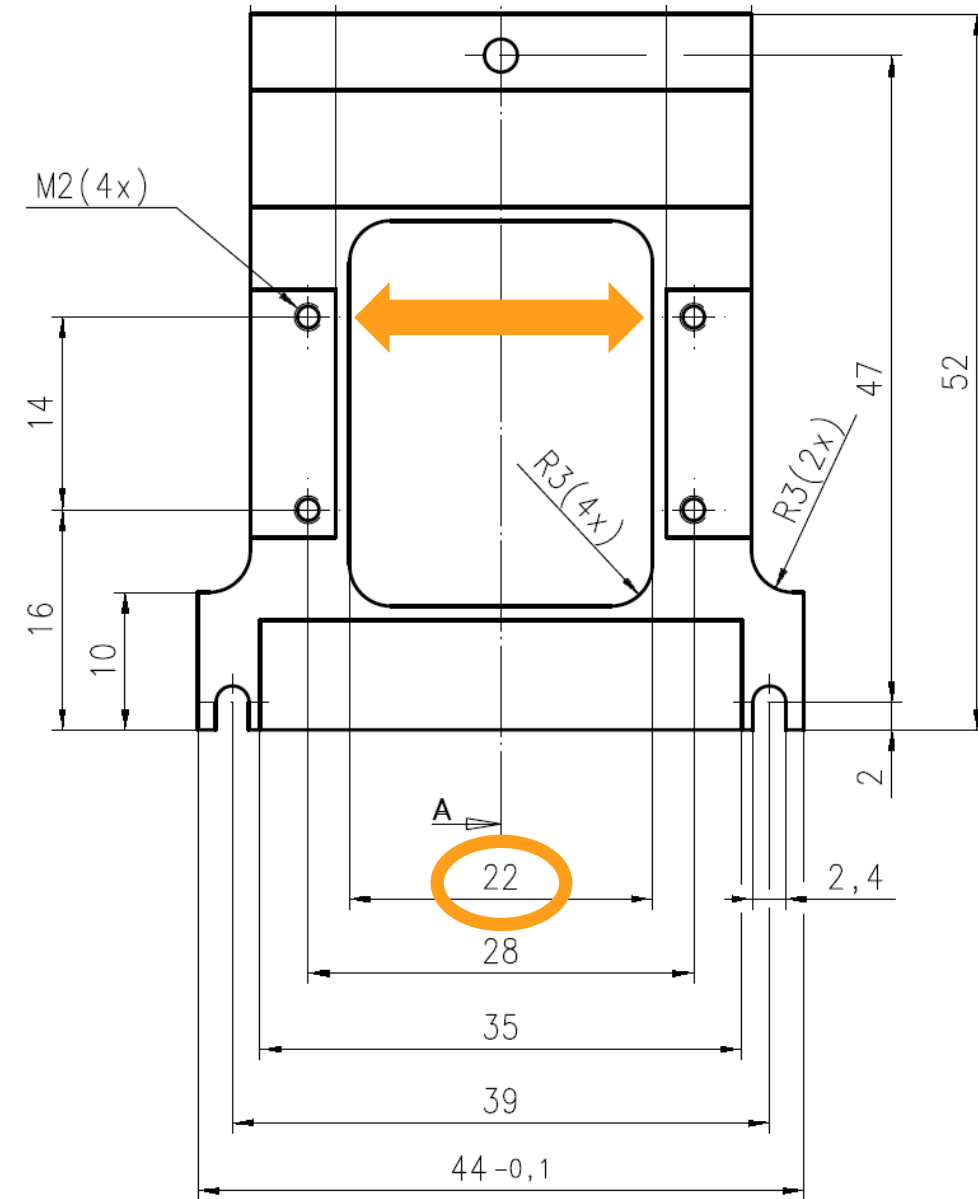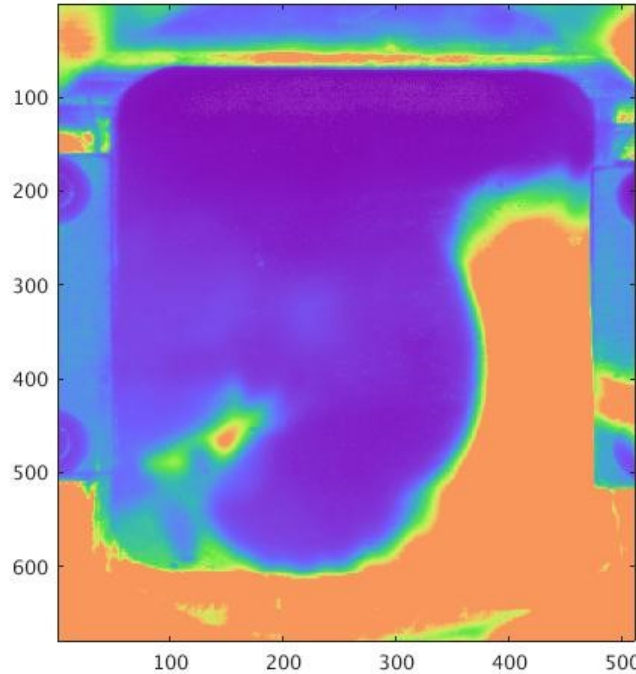
Camera calibration from screen edges

Tested at PST.Scr1btm (LYSO)

> **Searching for screen edges in figure**

- Width of screen in pixel is 423 px here

- Screen width is 22 mm here

-> Calibration factor is 52.009 mm/px

Calibration Factor from grid: 52.2648 mm/px

-> Relative difference < 1 %

Summary

Comparison of methods to calibrate camera scaling factors

> **Two methods existing**

- ResoluMeter (using alignment grid)

- From screen edges

> **Both yield comparable values**

> **Can we get rid of grids we don't crucially need?**

- Where screen edges are visible

- Seems rather in use at other facilities

- Would reduce alignment work

- More freedom in screen station design would arise (less space needed)