

# Comparison of camera calibration procedures

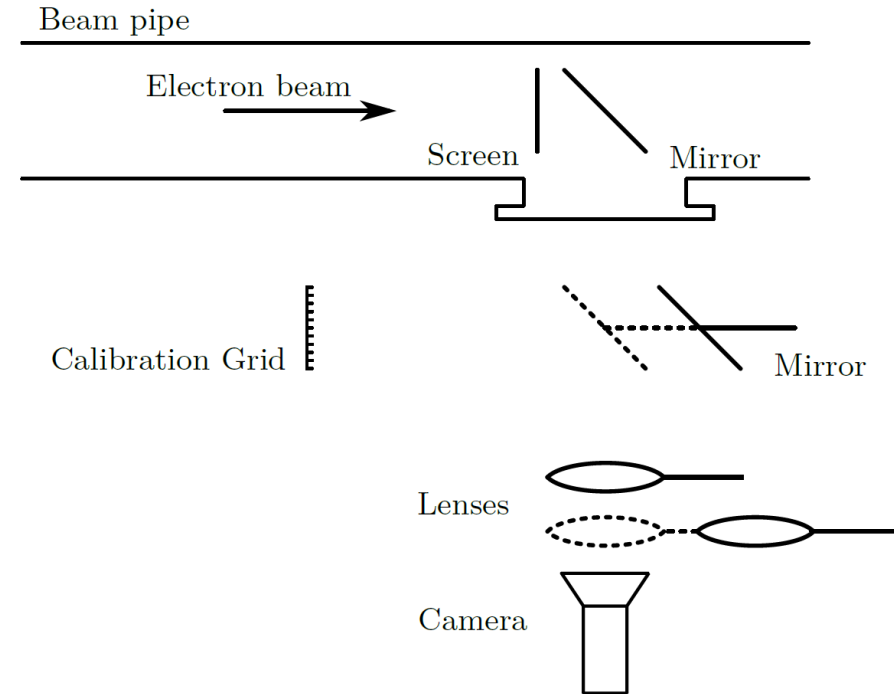
Raffael Niemczyk, Zeuthen, July 11<sup>th</sup> 2019

# 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)



# 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)  
*****  
]
```



25.05.2019 15:54 G. Vashchenko, H. Shaker Calibration for PST.Scr1\_bottom  
movable lenses are removed from the system, telescope is set

Terminal

Grid Auto-calibration

Corner-Definition by User Exit

2 Line number from center 0.43 Threshold 329 MaxX 179 MinX 435 MaxY 265 MinY Use user boundary

100 Optimization Steps Size Optimization Center->x Optimization Center->y Optimization Angle Optimization

Parameter Control 57.4 Pattern Size 255.2 Center->x 340.7 Center->y 0.8 Rotated Angle 5.0 Width of Pattern

PSTscr1btm\_gridImage.imc

Bi-Valued Graphic	
Entries	348160
Mean x	255.50
Mean y	357.50
RMS x	38.69
RMS y	48.02

Finally, rotated angle:0.8, Calibration factor: 52.2648 um/pixel  
Center: (255.2,340.7)

# Camera calibration from screen edges

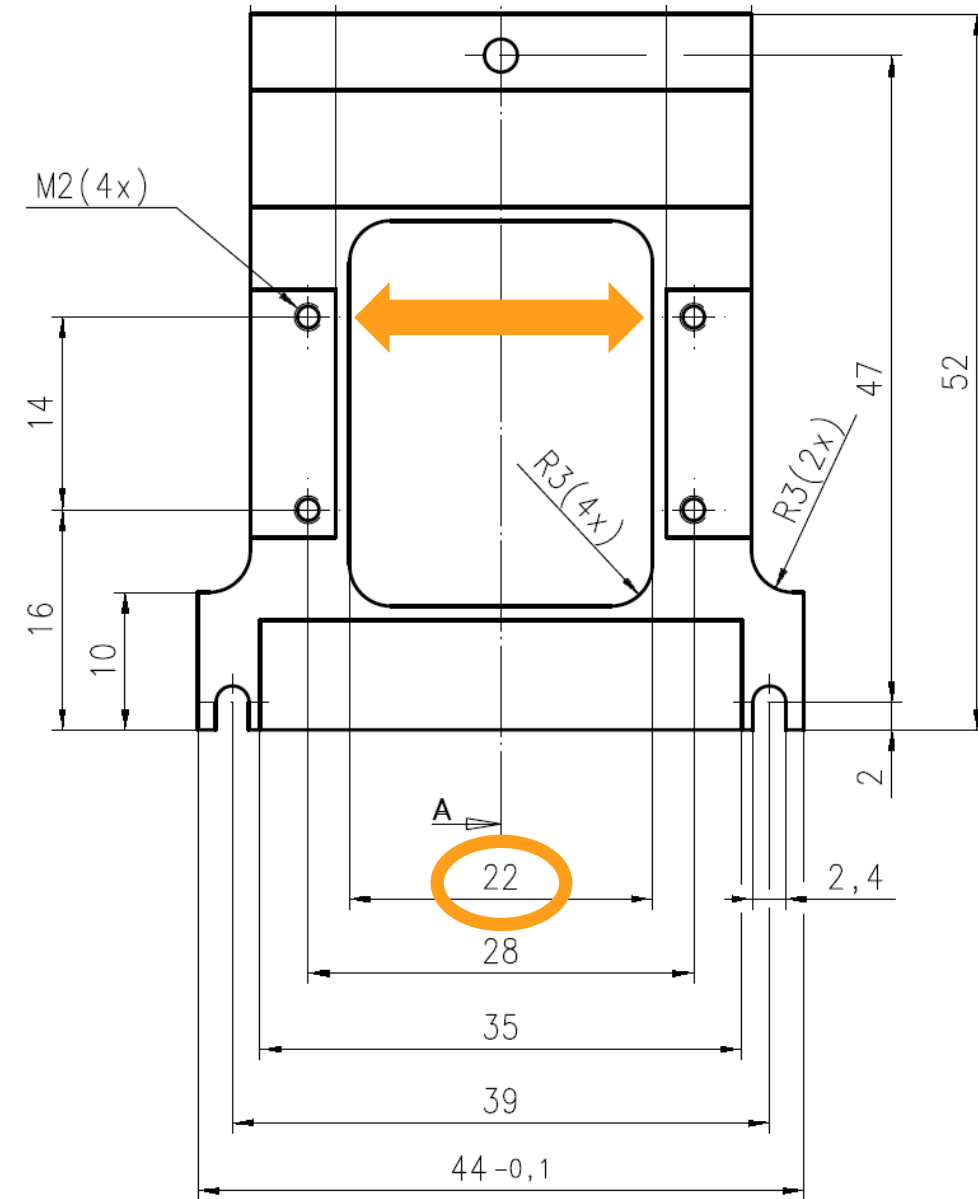
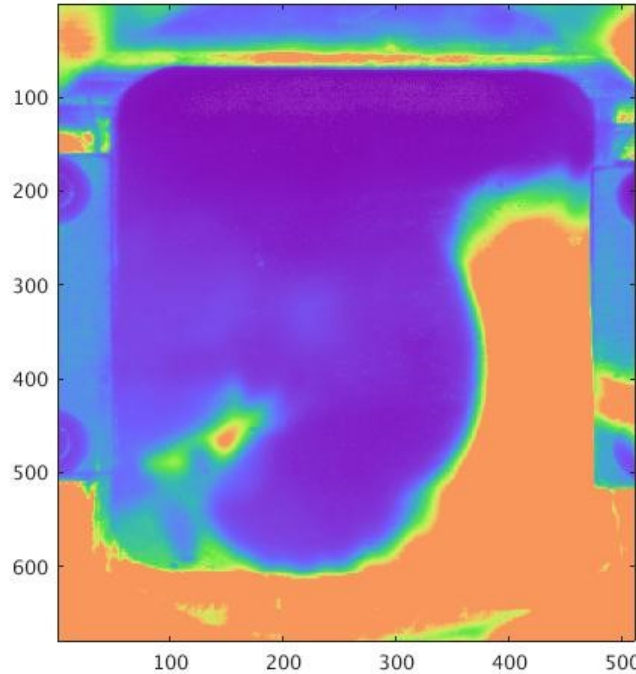
Tested at PST.Scr1btm (LYSO)

## > 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)