

# PITZ Physics Seminar

Measurement of spatial resolution of a screen station

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# Screen stations

## Beam profile measurements via imaging

- > Beam profile measurements important (beam size, emittance, LPS)
- > Spatial resolution = signal size limitation
  - > As small (= good) as possible
  - > Has to be known to verify correct application

> Screen station resolution = camera resolution x optics resolution x screen resolution



# Determine resolution

## Beam profile measurements via imaging

> Detailed optics information needed for adequate zeemax simulation to determine resolution

> This we don't have

> Idea: Measure the resolution!

> Structure on screen must be known (e.g. edge)

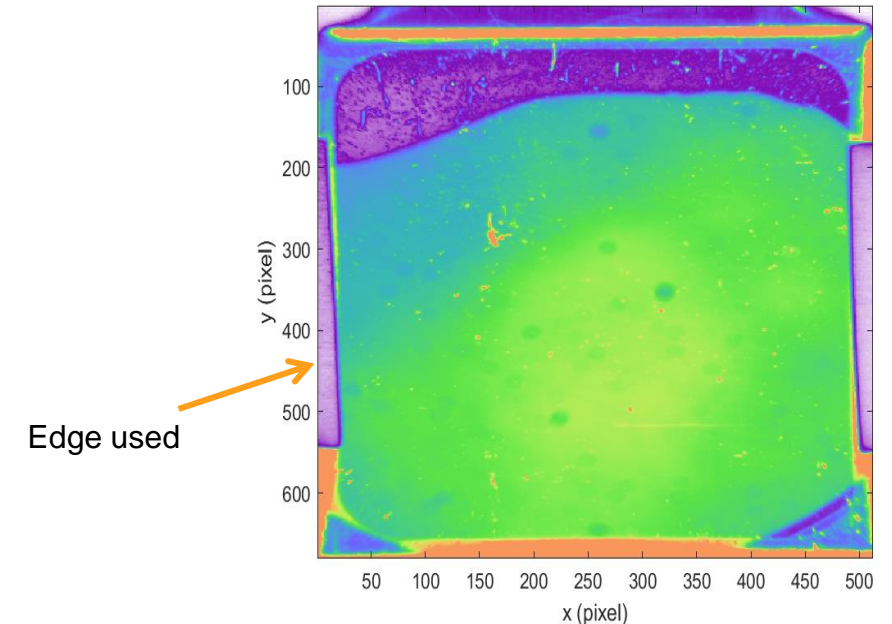
> Calc. intensity profile by convolution

> Fit intensity profile (ESF) to measured profile

$$f(x) = \begin{cases} A & x \geq \mu \\ B & x < \mu, \end{cases}$$

$$\text{ESF}(x) = (A - B) \cdot \left( \frac{1}{2} \left( 1 + \text{erf} \left[ \frac{x - \mu}{\sigma} \right] \right) \right) + B$$

$$\text{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x \exp(-t^2) dt.$$



# Measurement results

## Intensity profiles and fitted curves

> Resolution:

>  $\sigma = (2.20 \pm 0.07) \text{ pixel} = (101 \pm 3) \text{ um}$



pixel size = 46 um/pixel

> Is this right? Comments?

