



**HELMHOLTZ  
ZENTRUM BERLIN**  
für Materialien und Energie

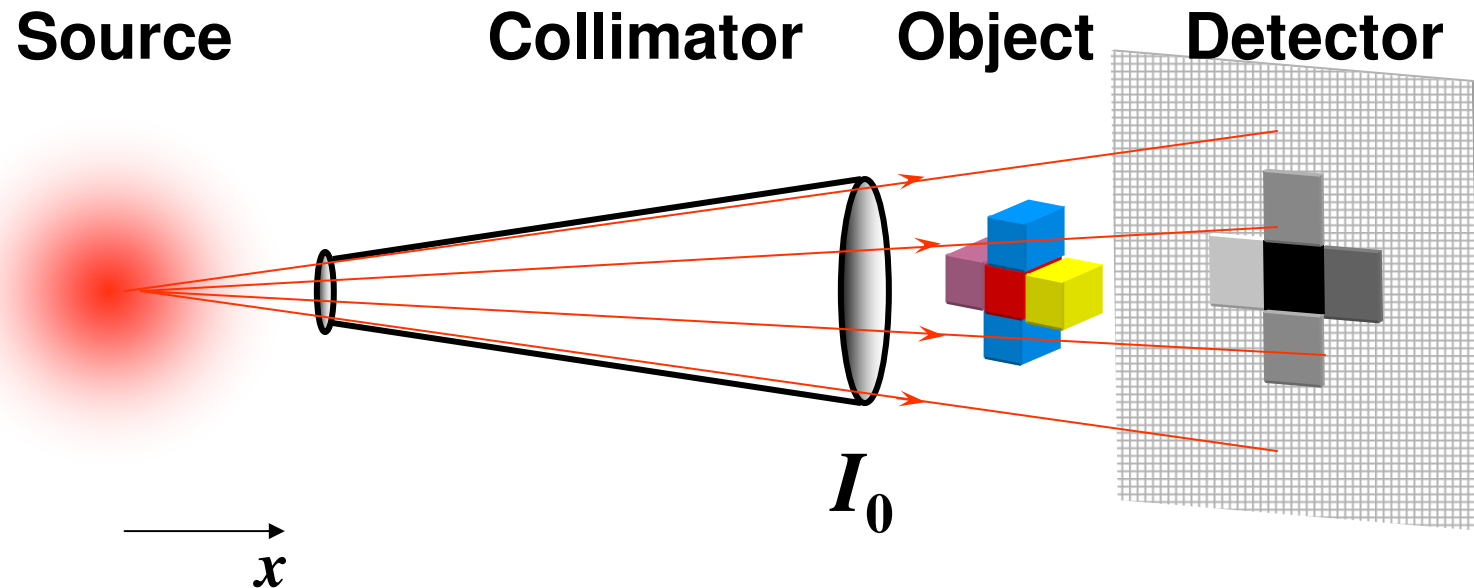
vormals Hahn-Meitner-Institut

# High-resolution imaging using reflective optics

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## Beam optimisation



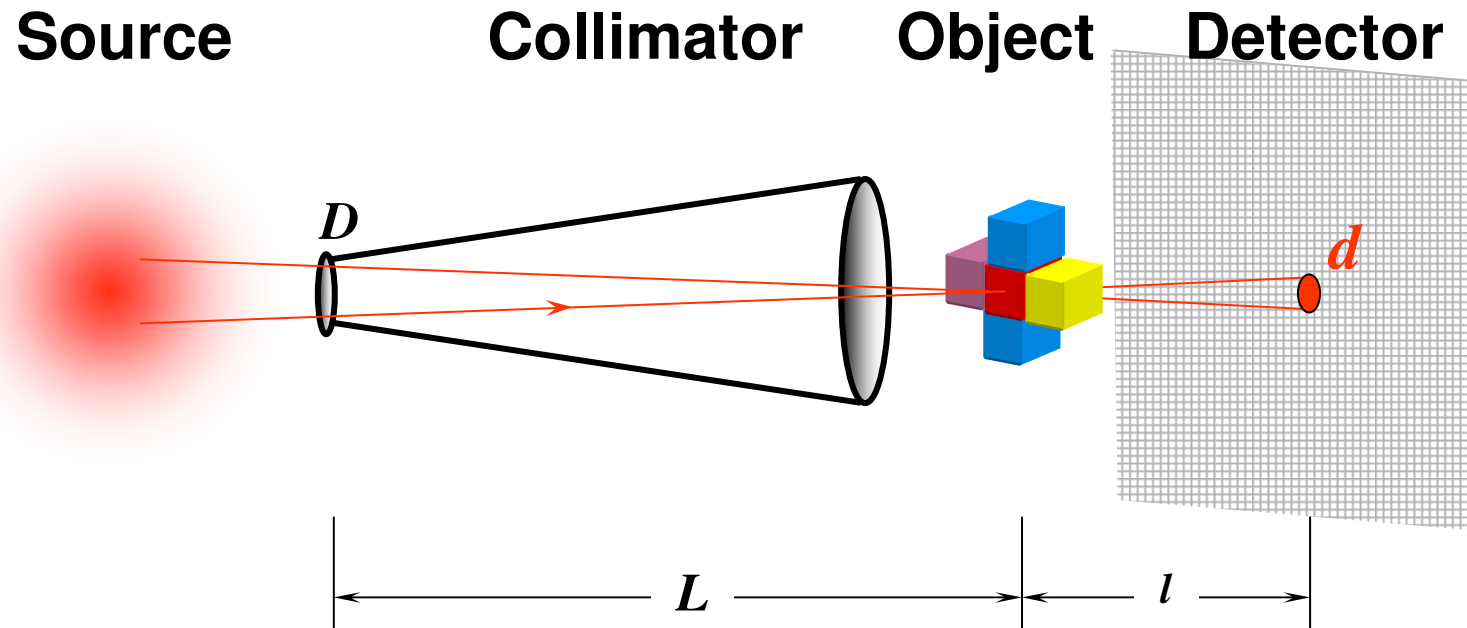
$$\sim I_0 e^{-\int \Sigma(x) dx}$$

$x$  – propagation direction

$I_0$  – primary beam

$\Sigma(x)$  – attenuation coefficient

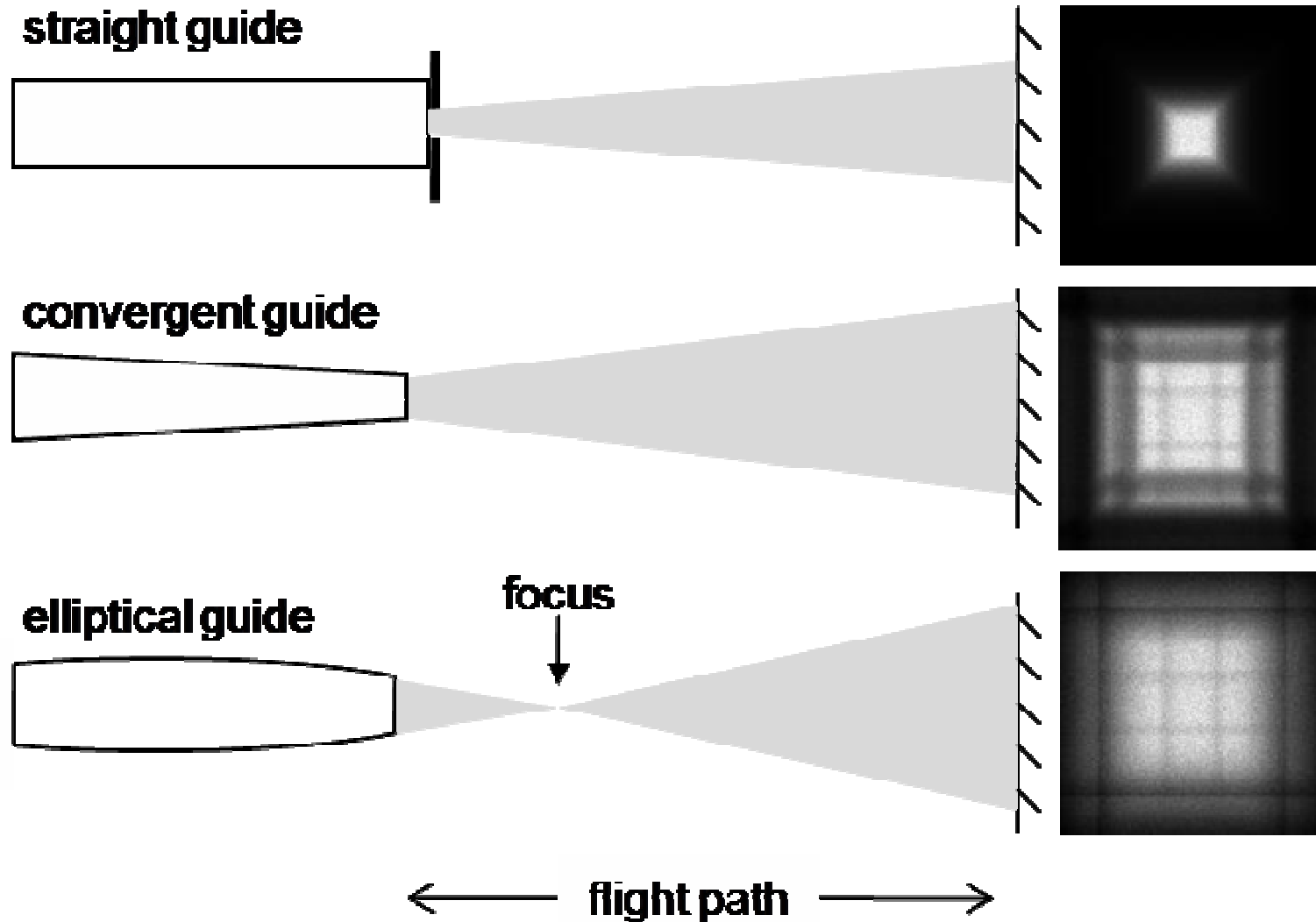
## Beam optimisation



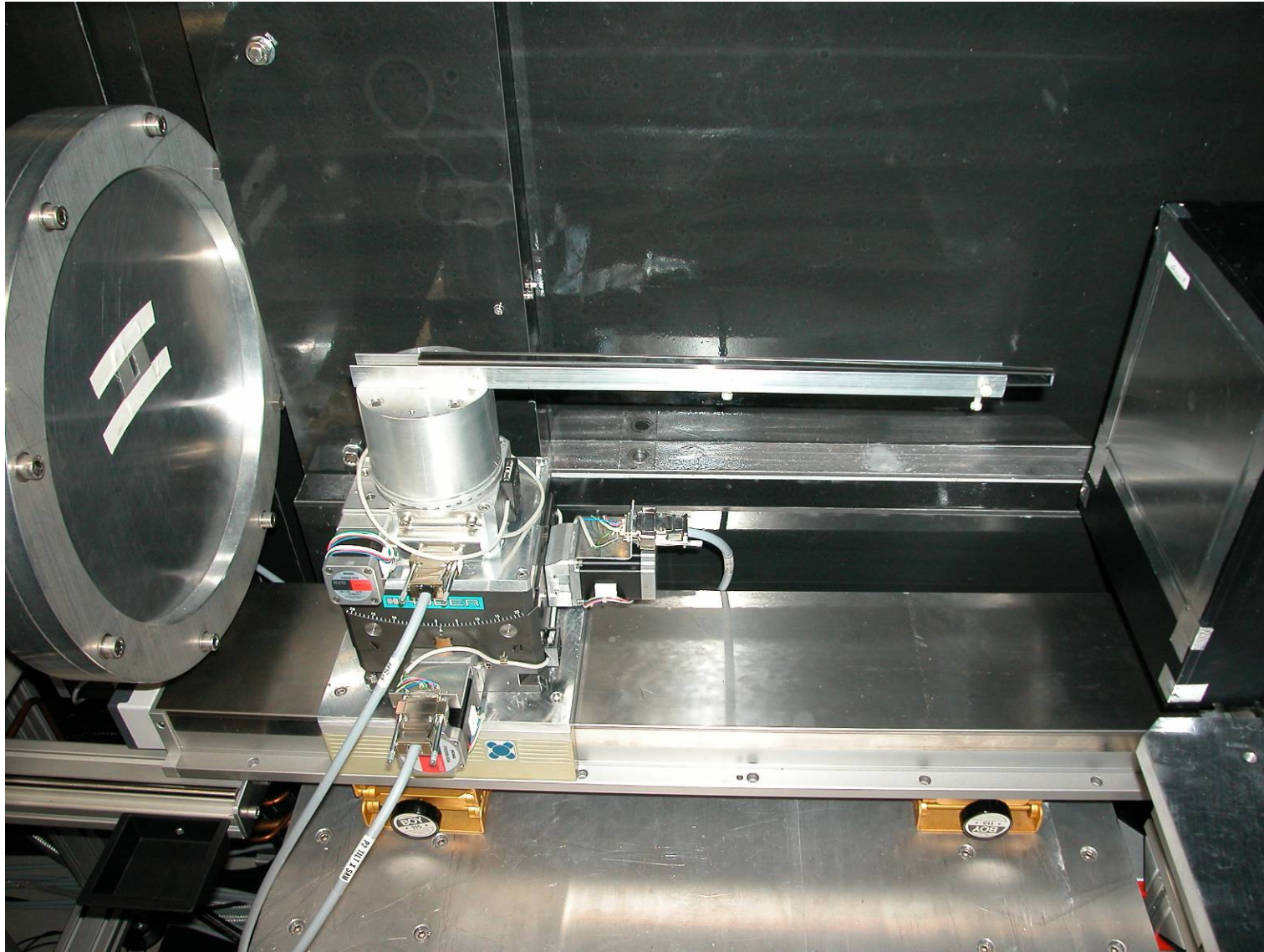
$D$  – Collimator aperture  
 $L$  – Distance Collimator-Object  
 $l$  – Distance Object-Detector

$$d = \frac{l}{L/D}$$

## Simulations

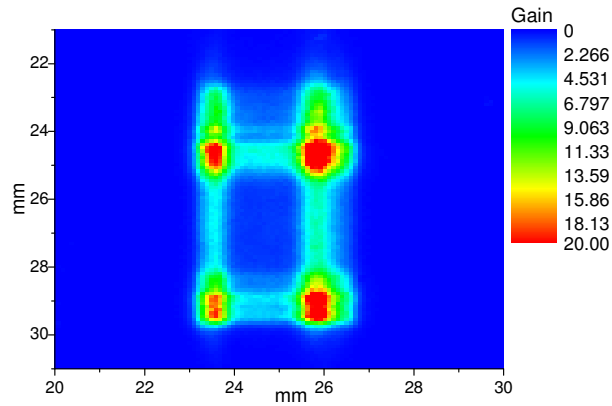


# High-resolution imaging using reflective optics

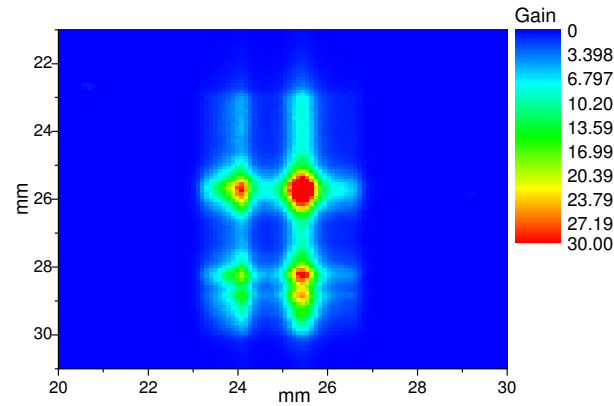


## Gain

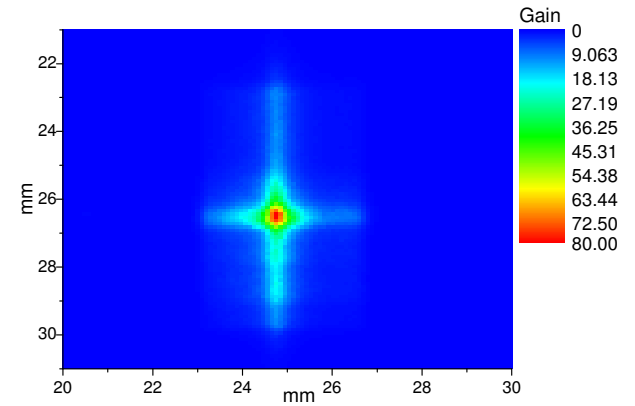
### Polychromatic beam



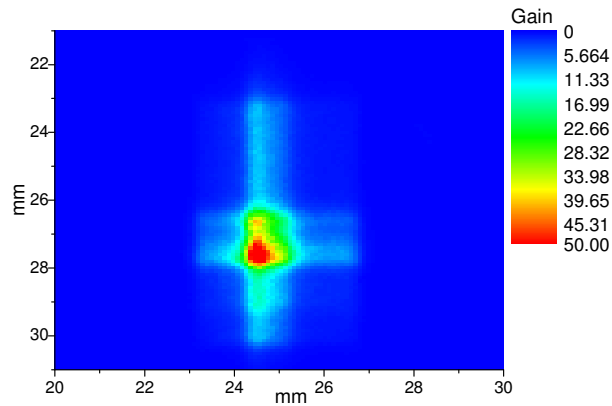
Distance: 0 mm



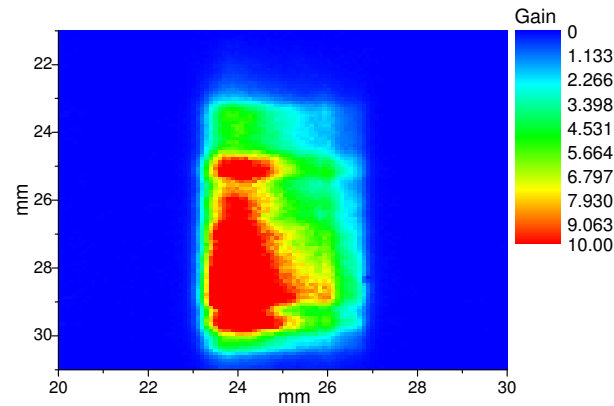
40 mm



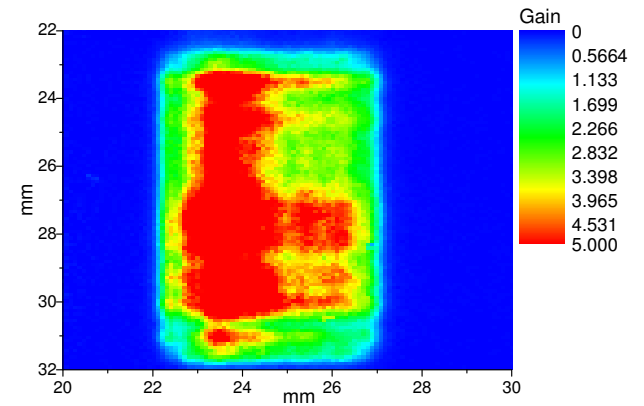
80 mm



Distance: 100 mm

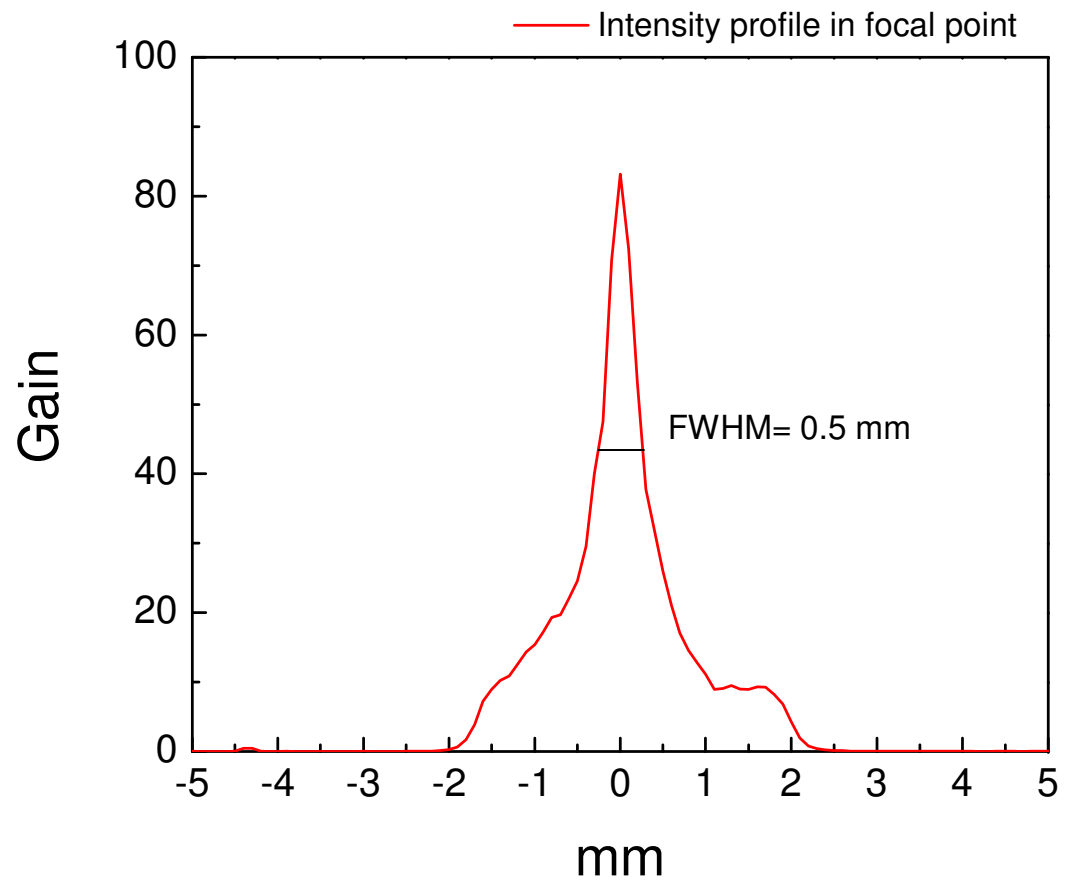
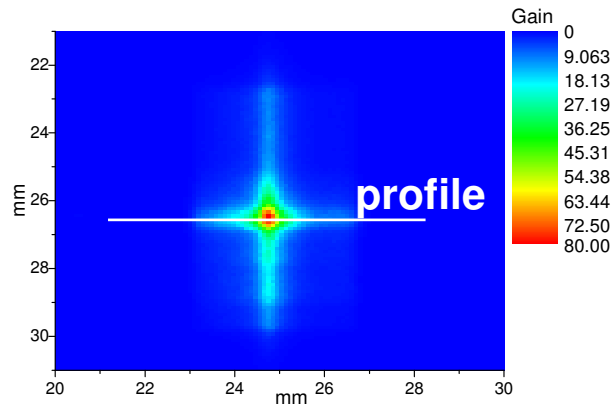


150 mm



200 mm

## Focus



## Cone-beam

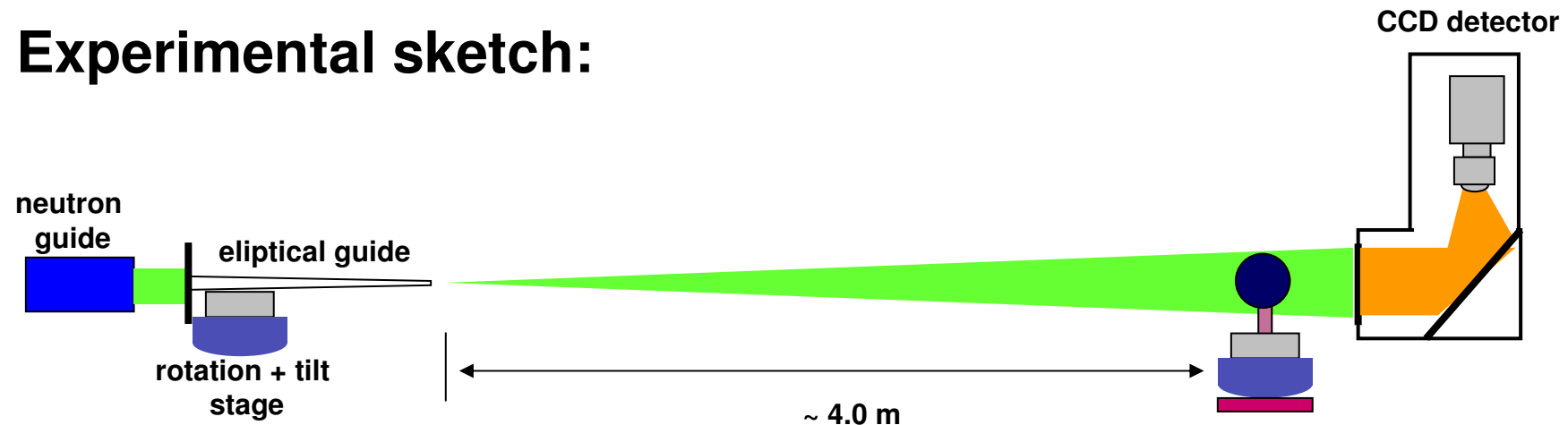
**Elliptical guide: 500 mm length, 10x20 mm to 3x4 mm**

**Focal point: 80 mm behind the guide**

**Distance focal point-detector: 4.5 m**

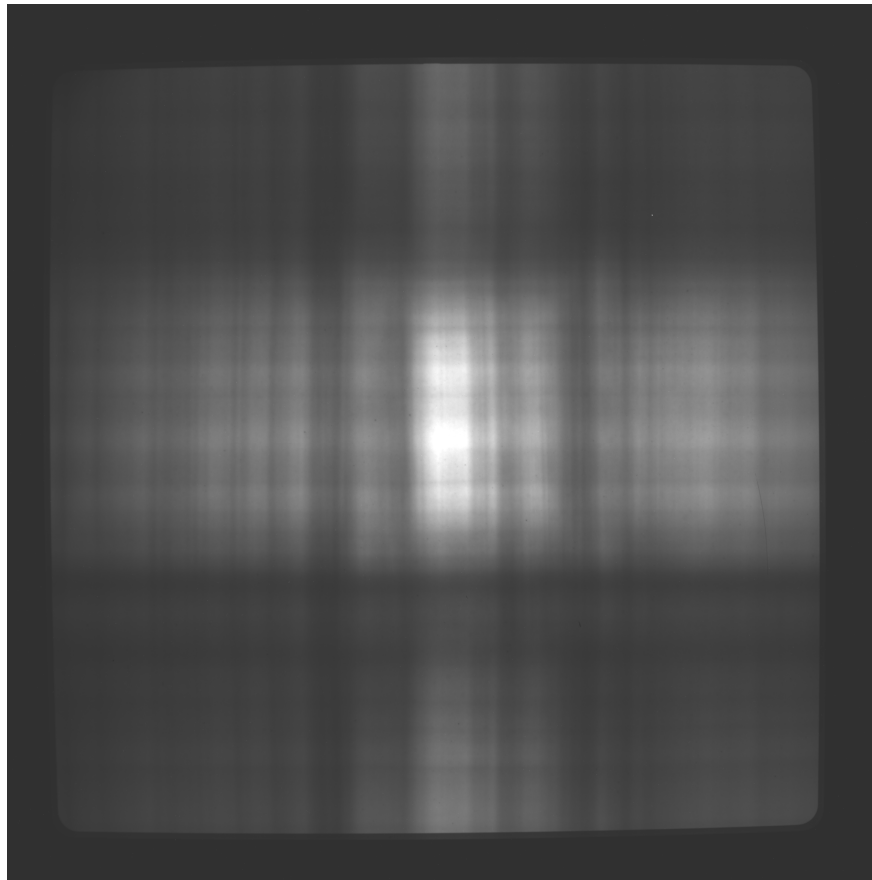
**Polychromatic beam**

## Experimental sketch:



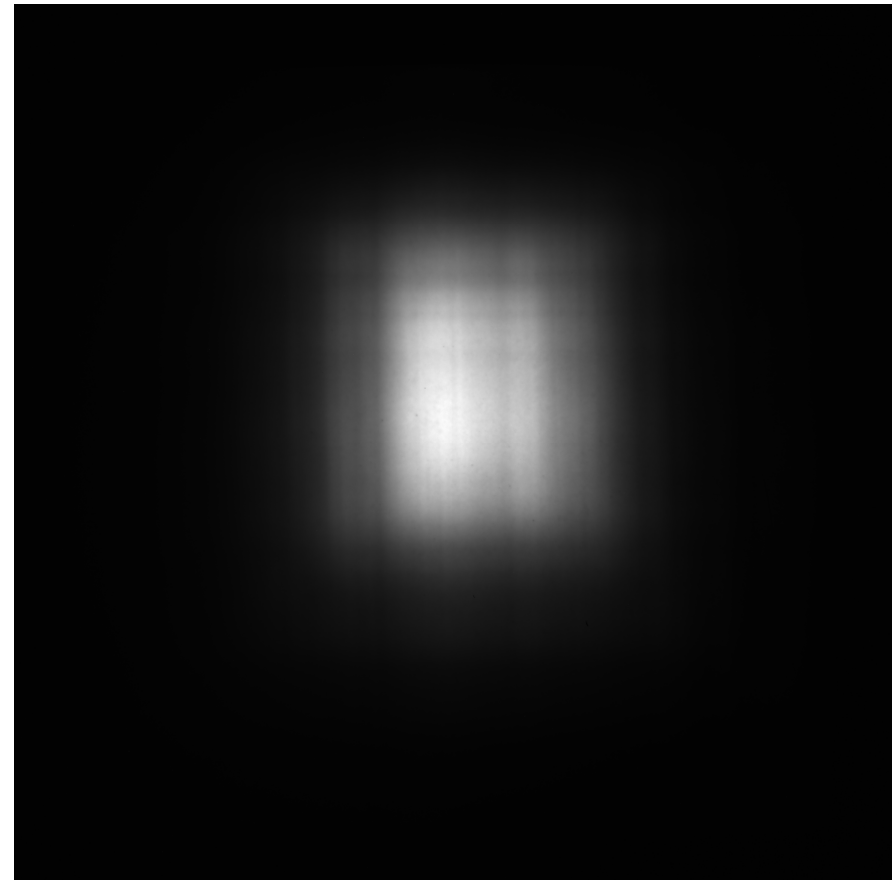


**Elliptical focusing guide**  
**Distance: 4.5 m**



← 20 cm →

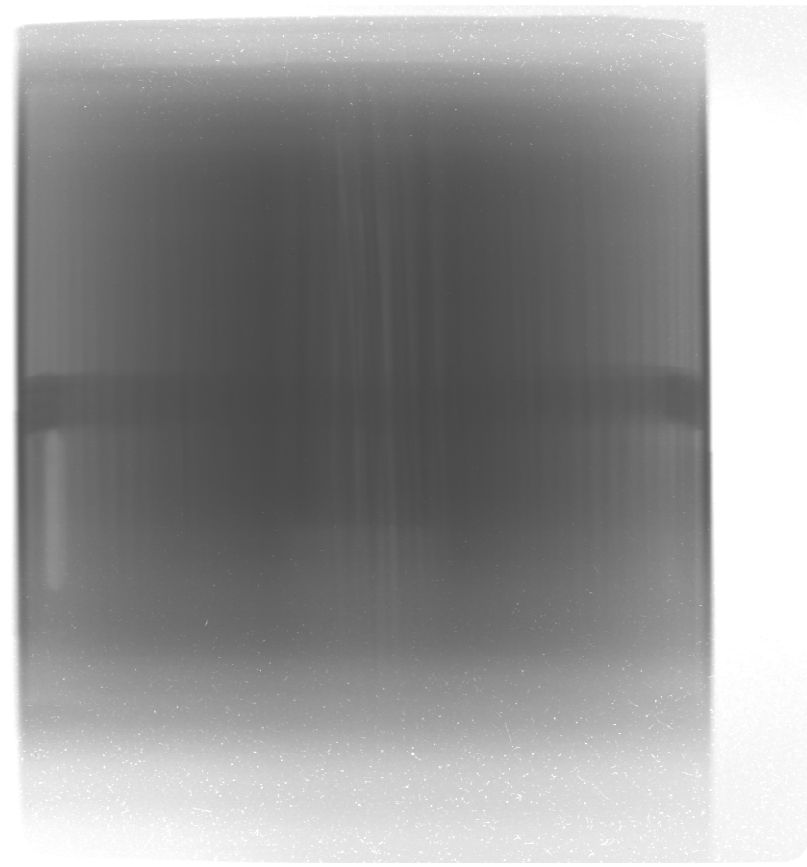
**Pinhole geometry (D= 2 cm)**  
**Distance: 5.0 m**



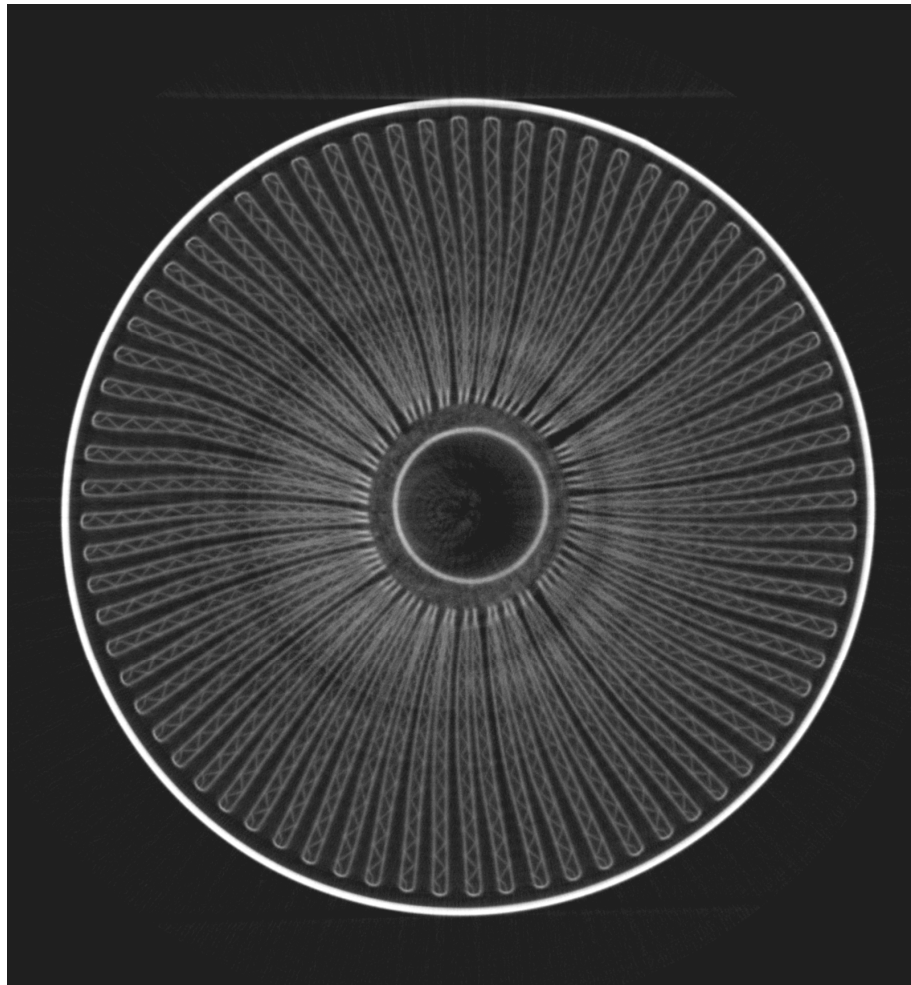
**Elliptical focusing guide**  
**Distance: 4.5 m**



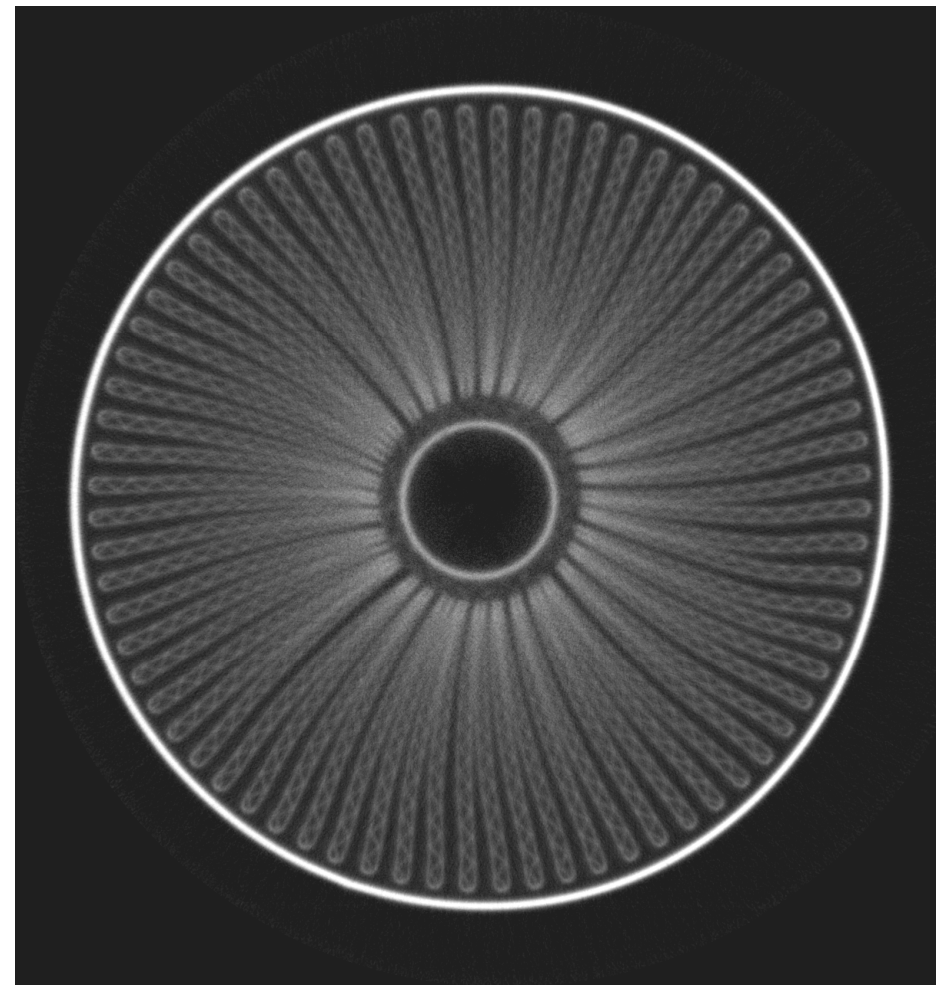
**Pinhole geometry (D= 2 cm)**  
**Scan option**



**Elliptical focusing guide**  
**Distance: 4.5 m**



**Pinhole geometry (D= 2 cm)**  
**Scan option**



## Outlook

- **Optimised guides for imaging**
- **Cone-beam geometry**
- **Sample magnification**
- **Compact imaging facilities**