# Focussing quality of quartz light guides

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PANDA-DIRC-meeting at GSI

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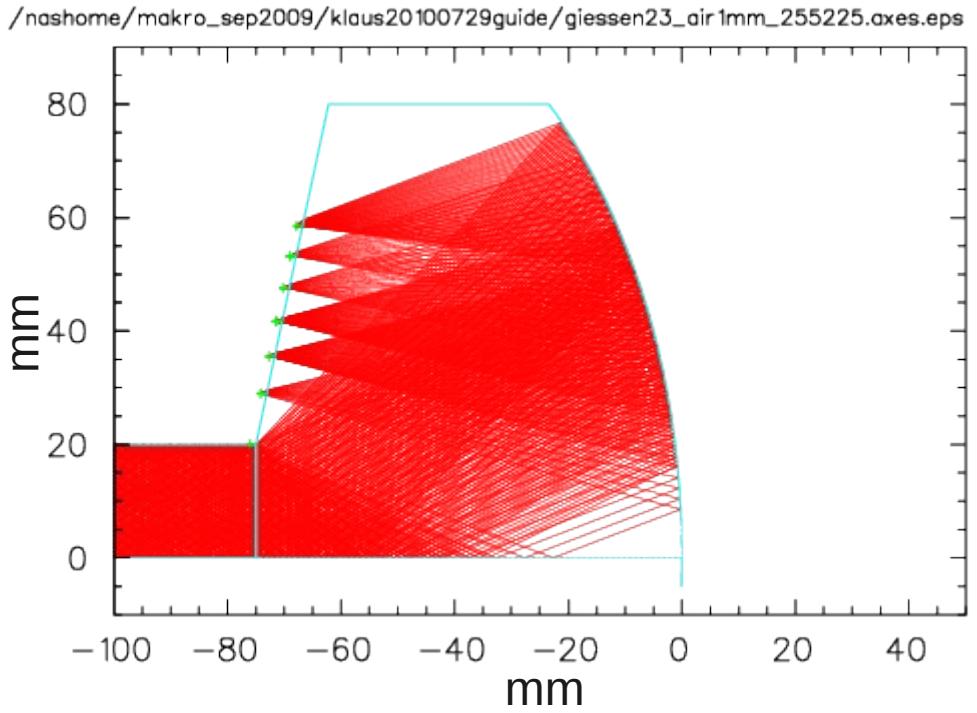
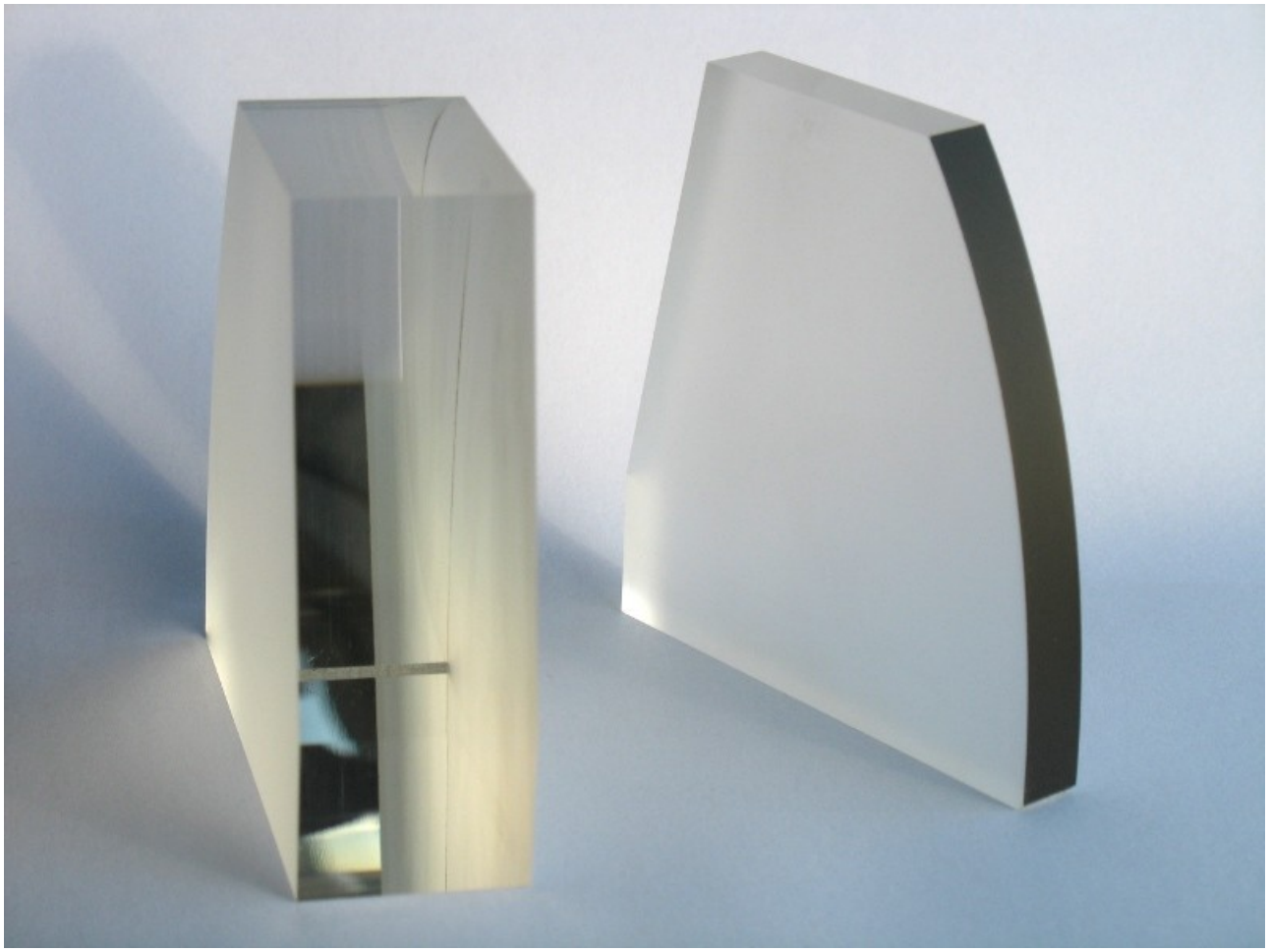
# Focussing Light Guides - Specs




- imaging 25 degrees onto 32mm focal plane length
- foreseen for Philips dSiPM sensors, cooled (~253K)
- 1mm insulating gap between FLG block and sensor

# Focussing Light Guides

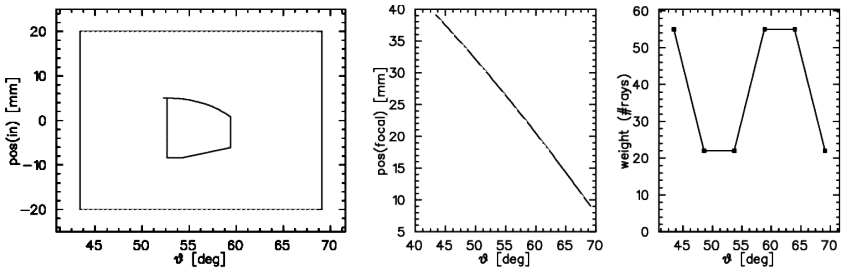


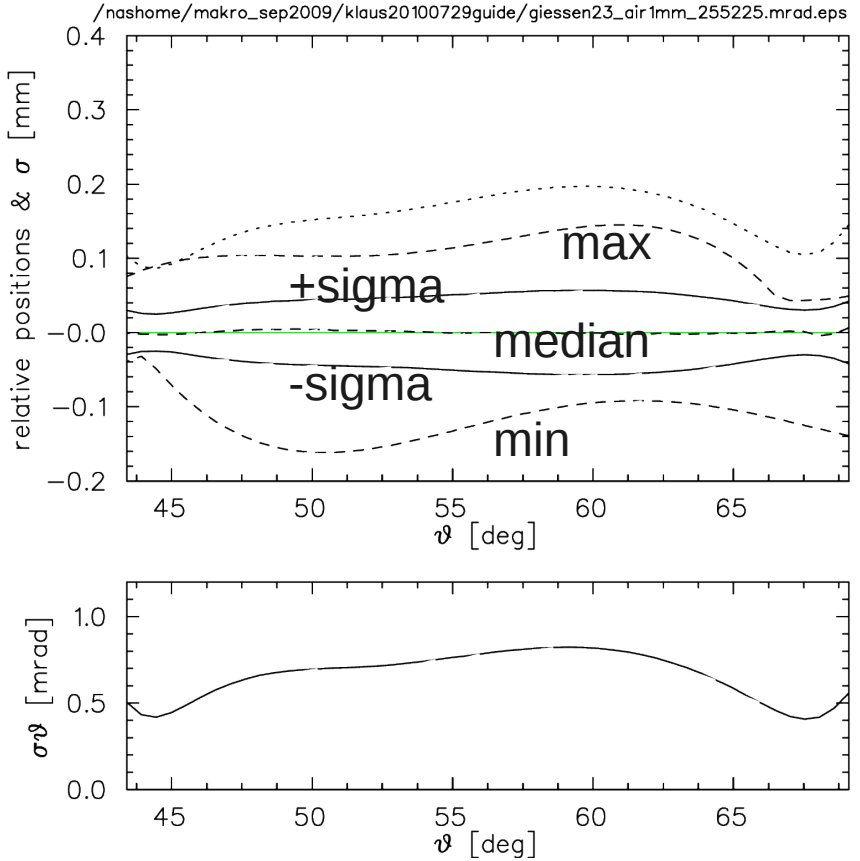
quartz glass

# Focussing Light Guides

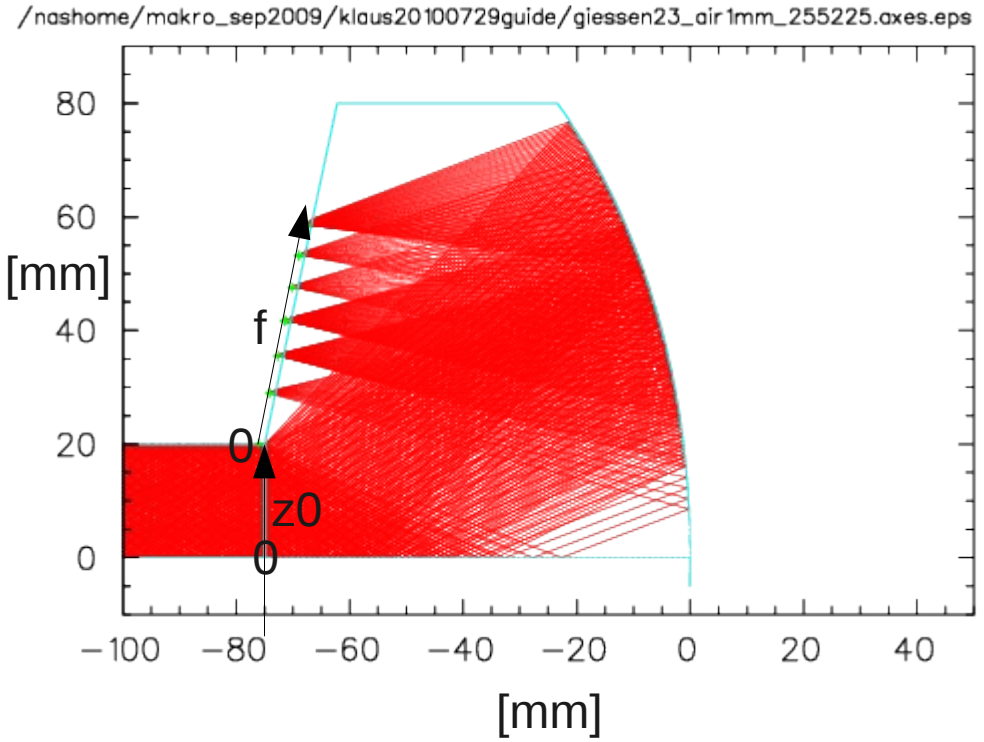
- HERAEUS synthetic fused silica
- 25mm and 9mm thick
- ICOS in Beckenham, UK (South London) shaping and polishing
- evaporated Al reflective coating on curved surface
  - black paint protection on top
- company overlooked specification to polish large side surfaces, will go back to England after initial quality assessment ***“ooops”***

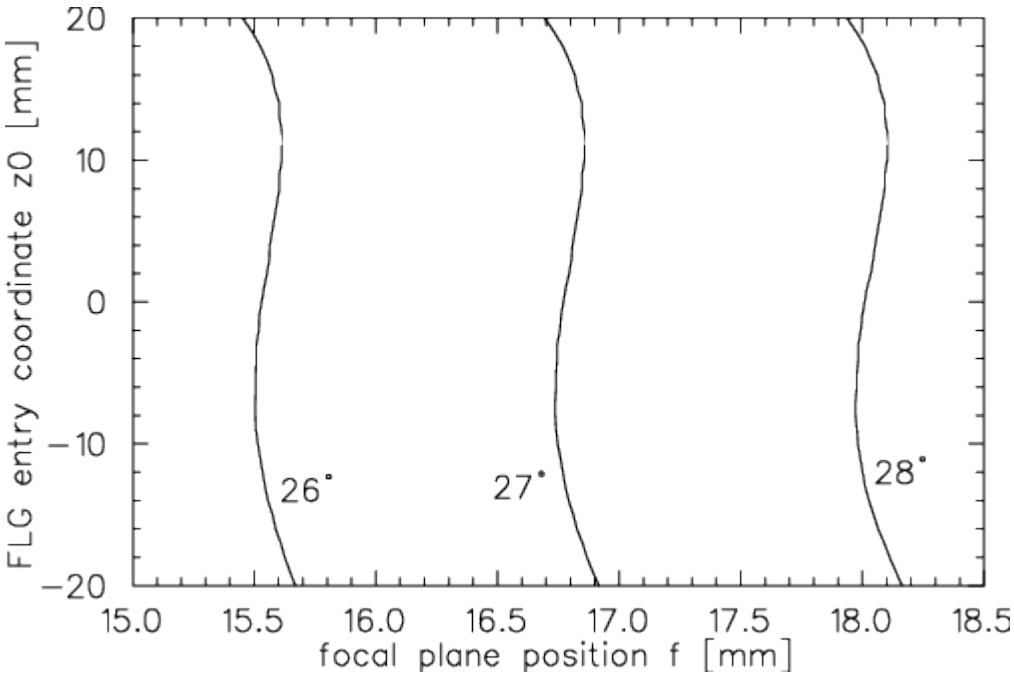
# FLG performance sheet



# Focussing Light Guides

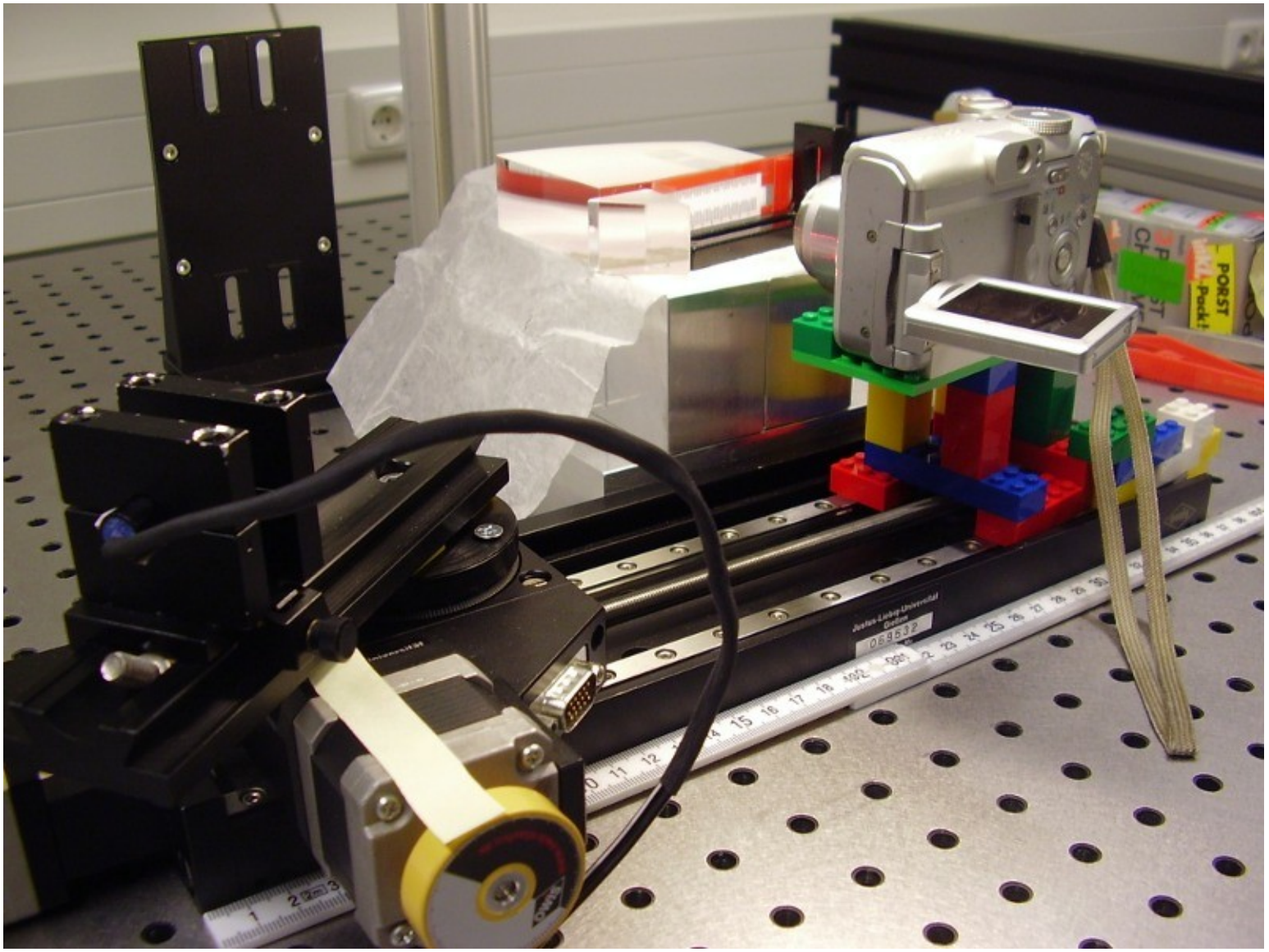



optimising the focussing curvature for an angle range causes aberration in the order of 0.1mm
(tables for curves on the right have been provided to ICOS to allow them checking the correct slope of the right surface)

# Exploratory test setup

prism, focussing light guide

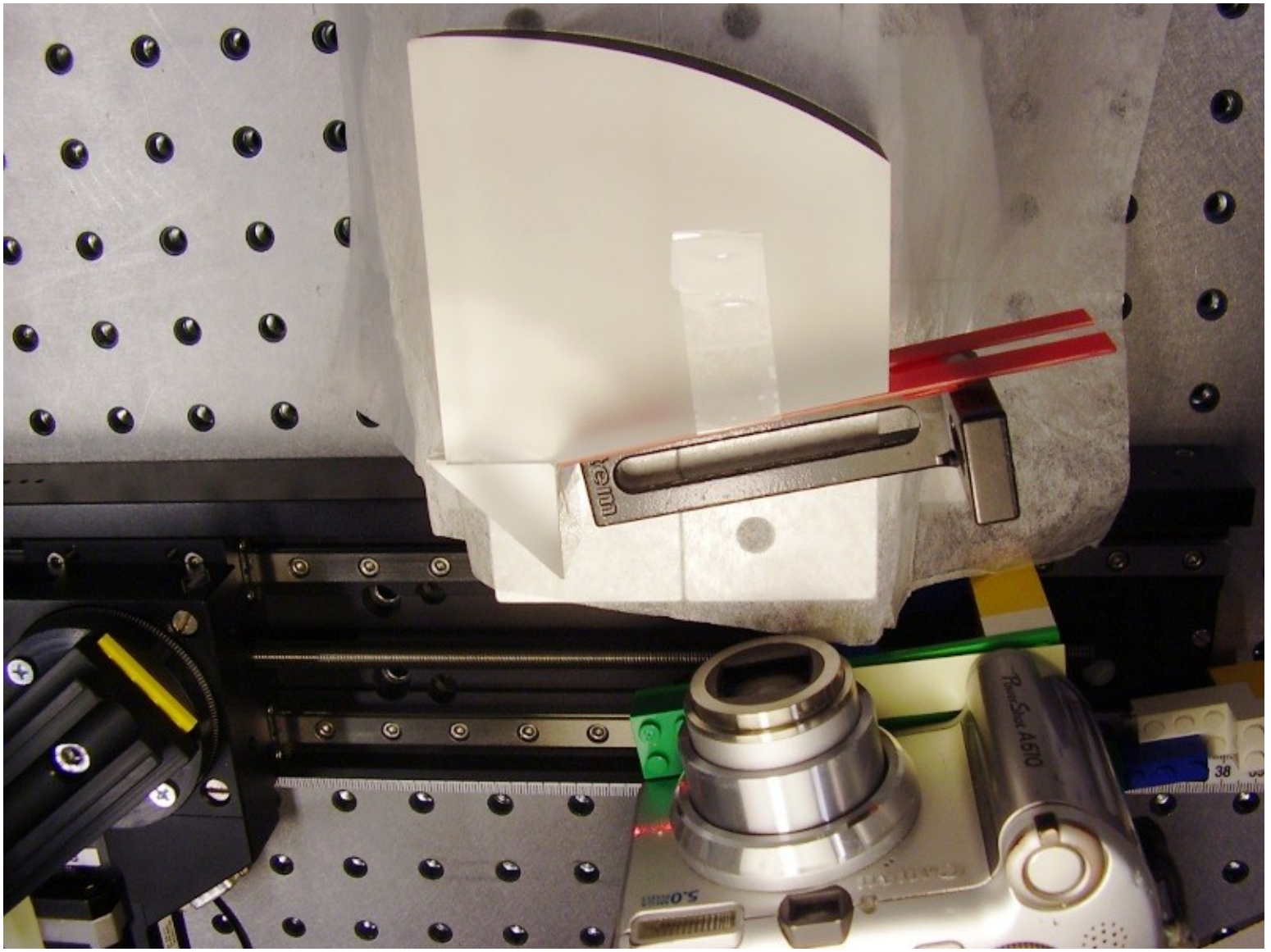


spacer,
Screen
&
camera

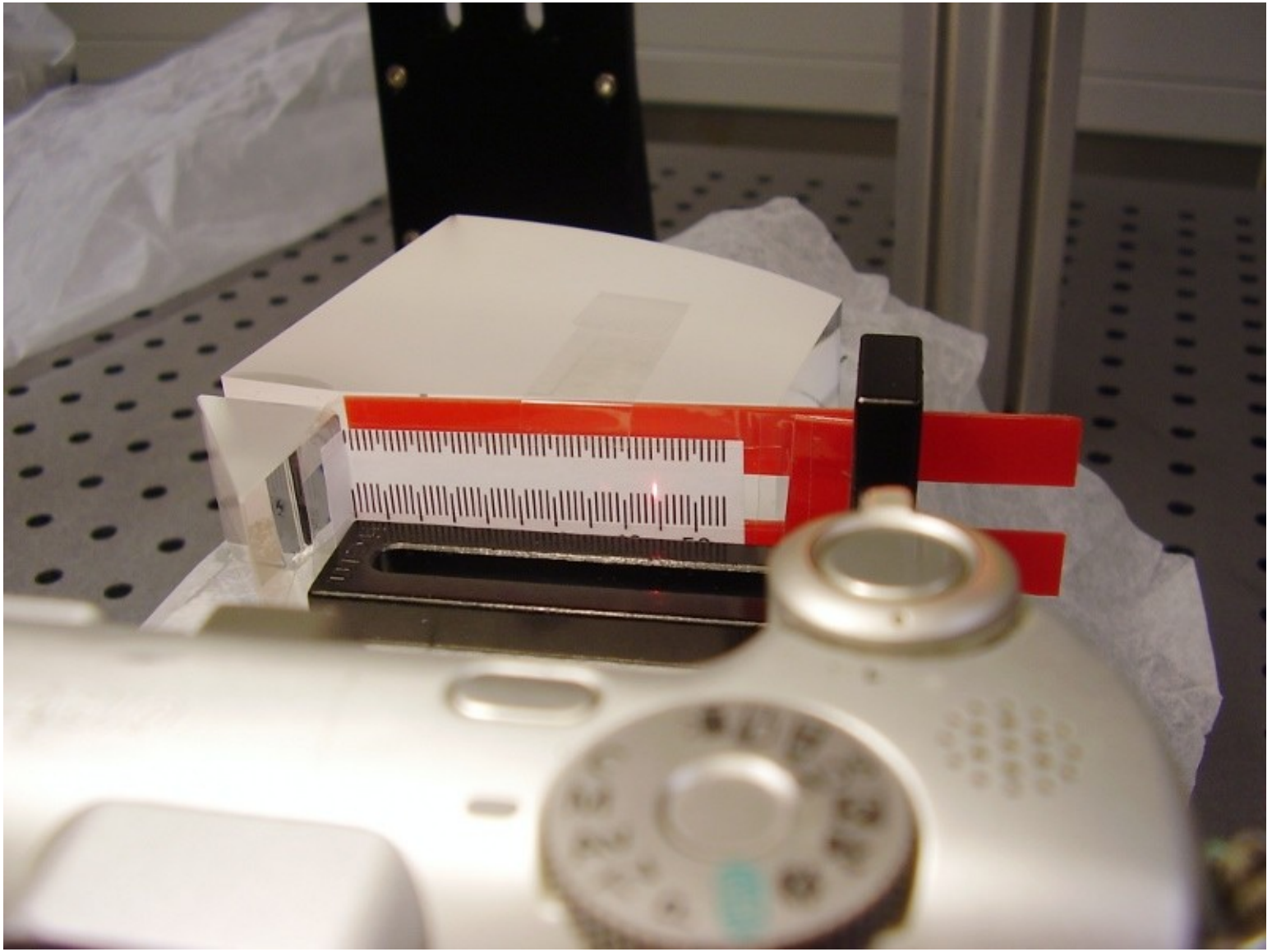
laser

translation&rotation stages

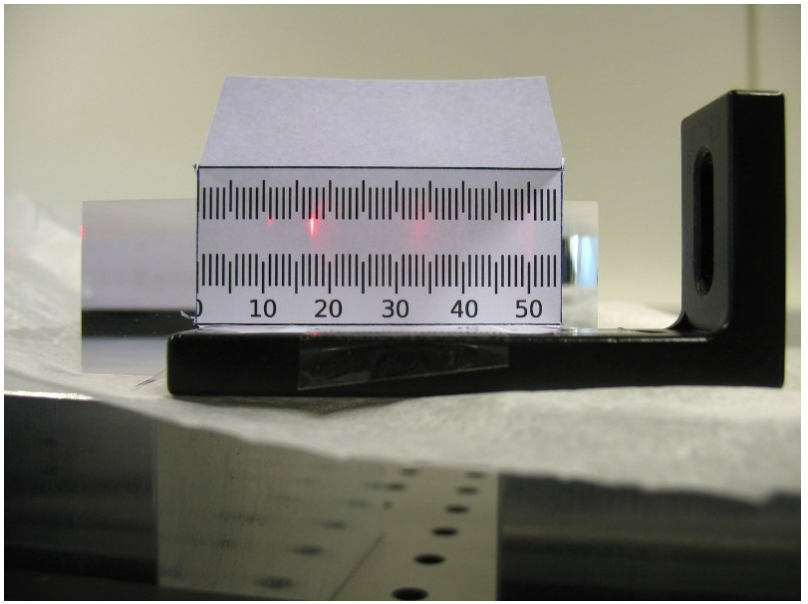
# Exploratory test setup

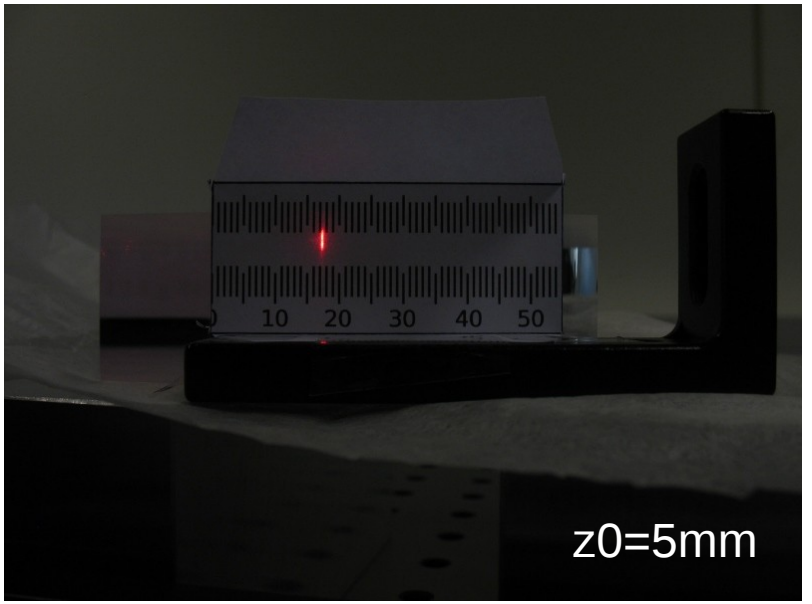


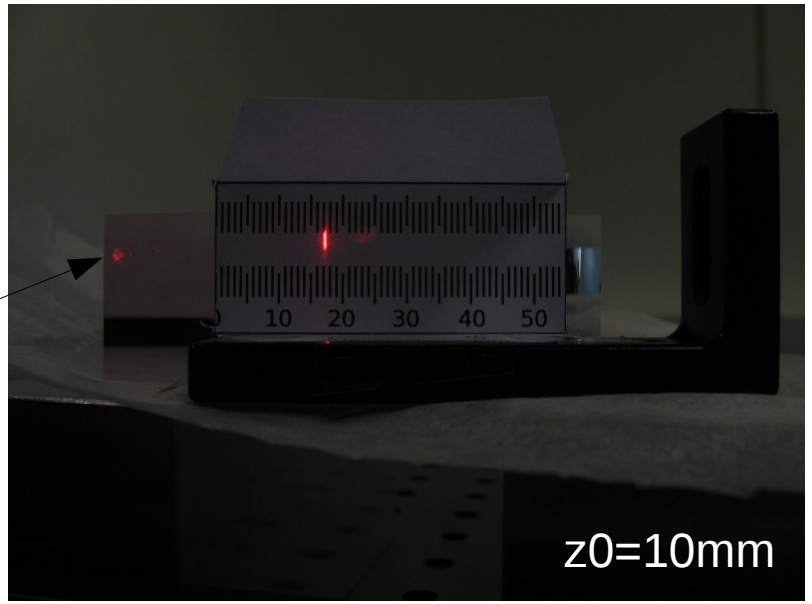
# Exploratory test setup



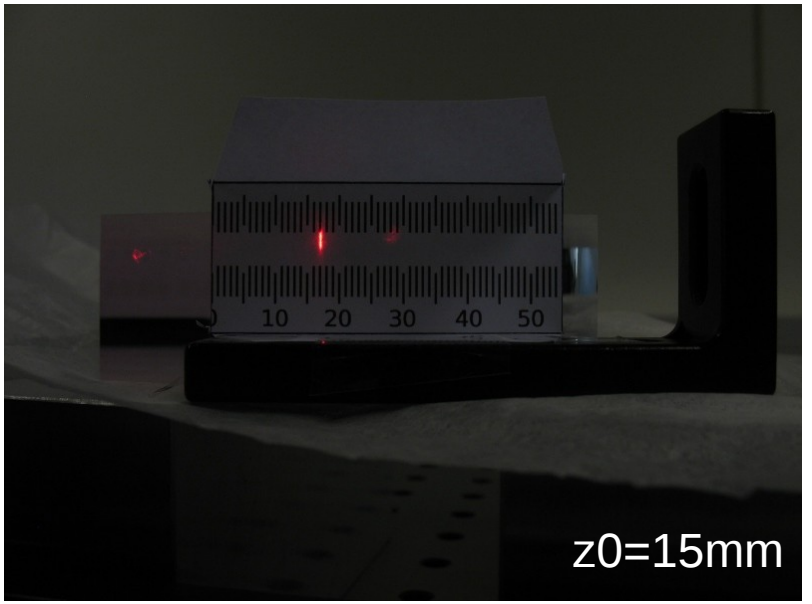
# Measurement Images



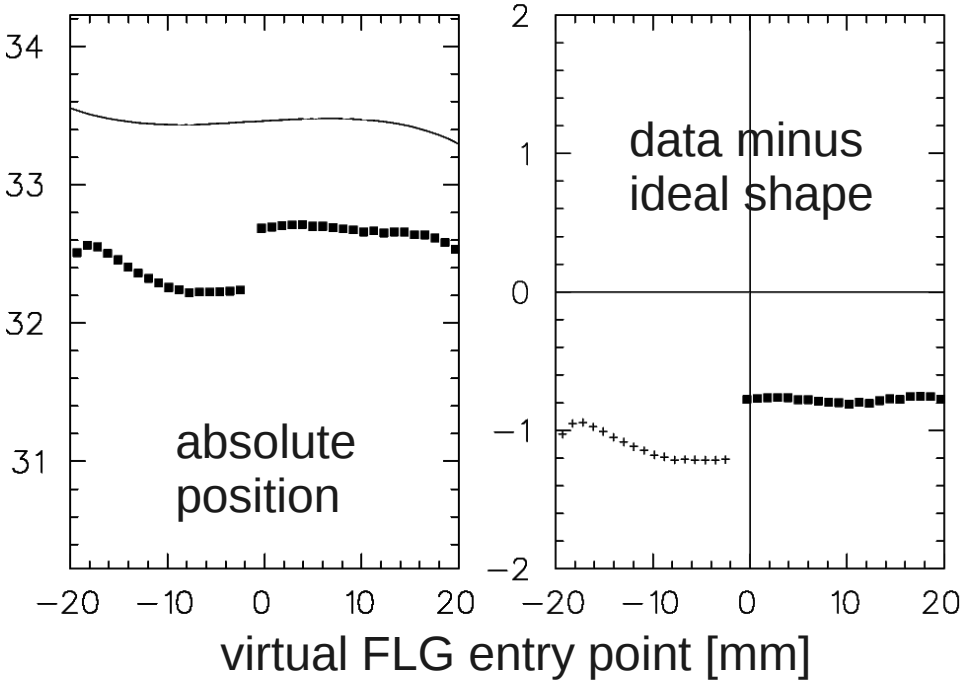

some reflection but not beam entering

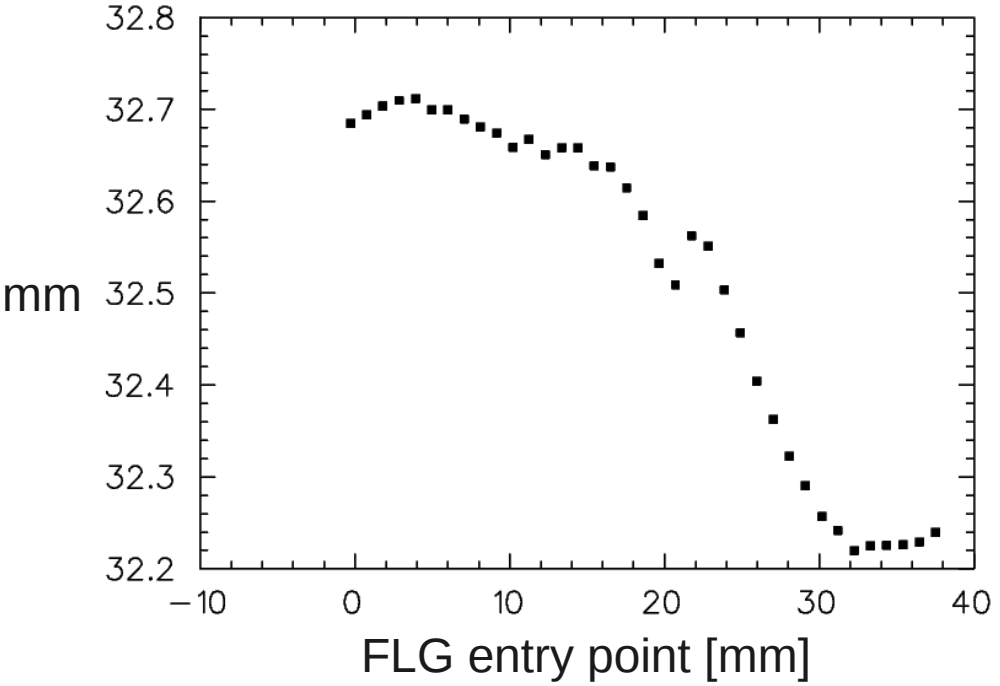


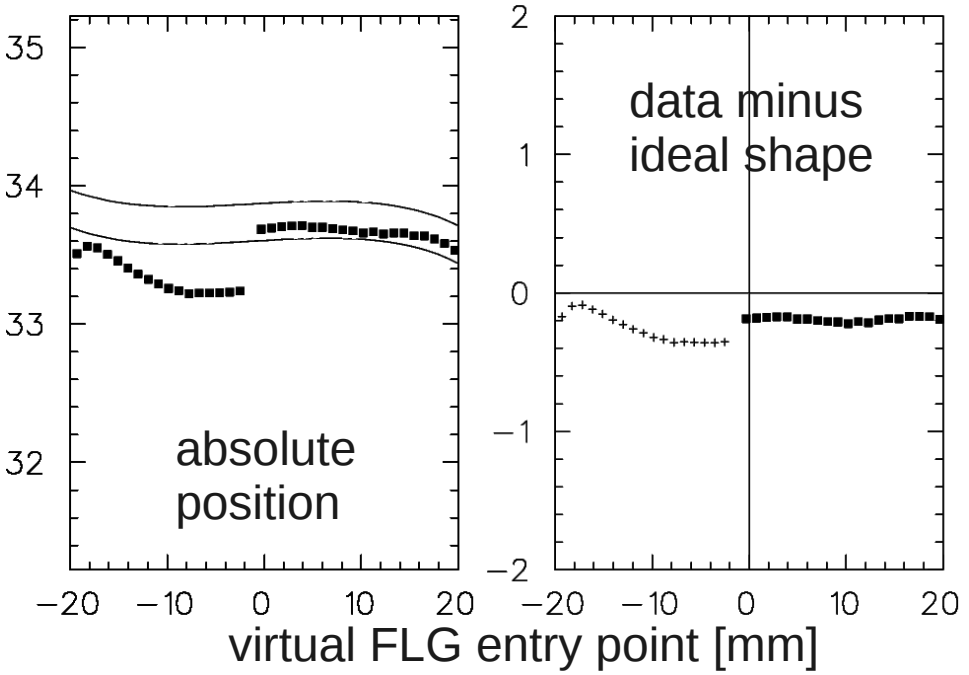
# Focussing Light Guides

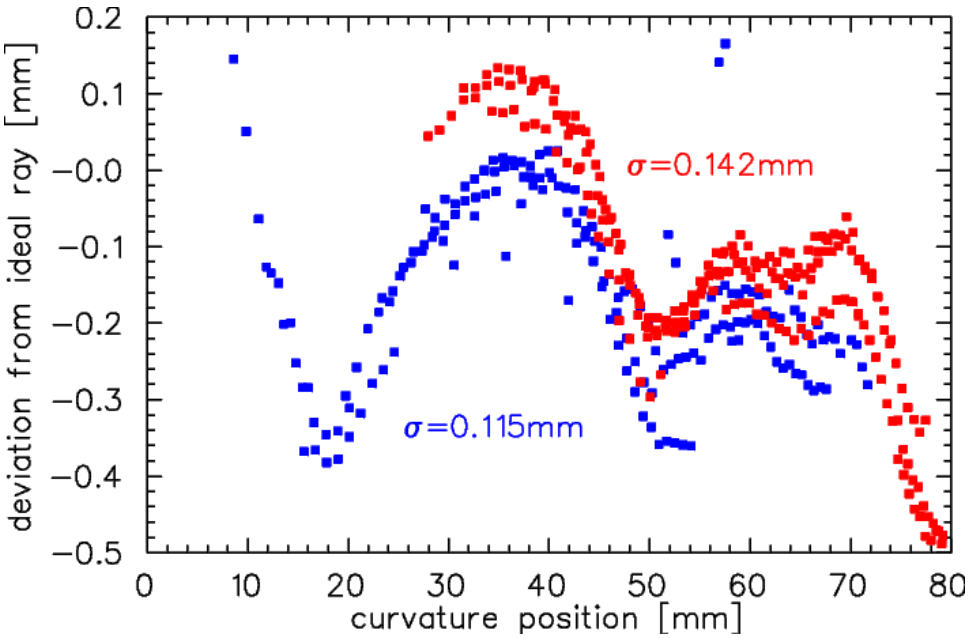
- improvised setup for exploratory measurement
- one laser beam angle, one vertical position
- ~40 horizontal positions, 1mm steps
- 13 angle positions, 4 to 52deg at 4deg increment
- position recorded with digital camera images
- photometric analysis for laser beam spot, *Finetune* feature of *hugin* software used (hugin.sourceforge.net panoramic image stitcher)
- → positions in mm

# 36 degrees laser angle



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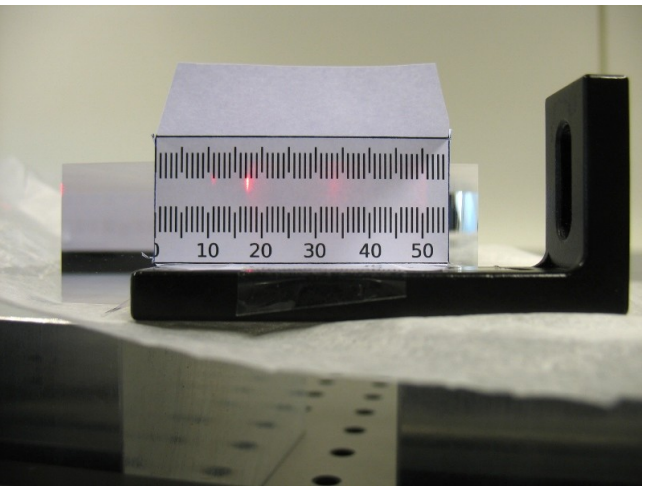
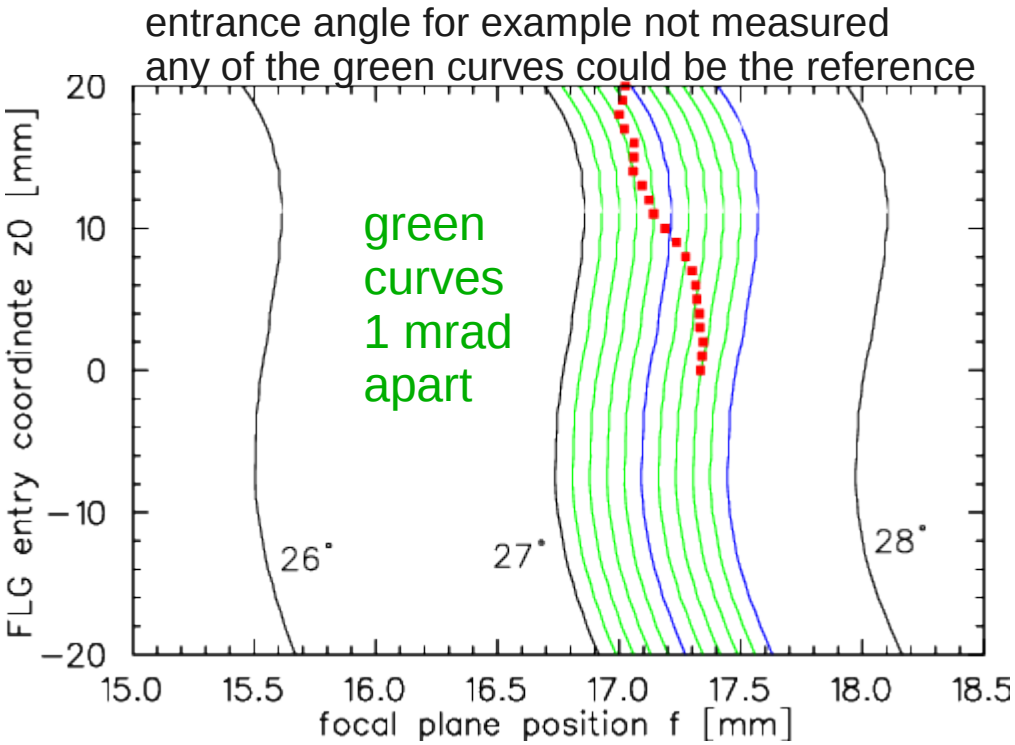



Illustrative figure

- measured curve deviates by 5 mrad (peak to valley) from specified shape (polynomial parametrisation)
- sigma of data points 0.115 mm (Z) / 0.142 mm (direct)
- sigma of manufacturing input ~0.1 mm, allowing additional 0.1 mm sigma manufacturing tolerances

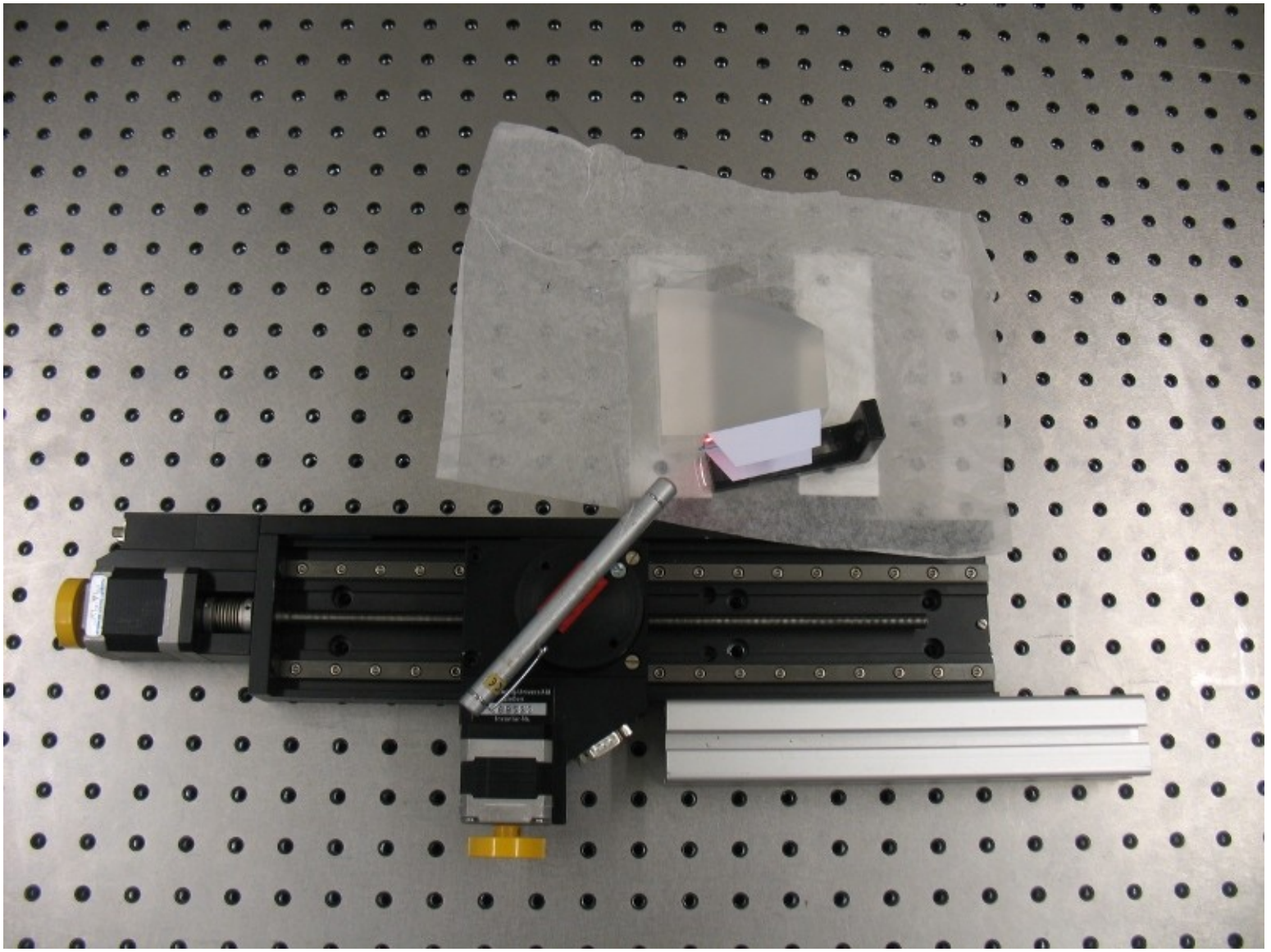
# Quartz FLGs – first conclusions

- two sample pieces have been manufactured
- the challenge of the curves surface is mastered
- very first quality measurement
  - improvised setup
  - analysis chain run through
- for the angles measured just within specifications

- (measure full set of data)
- measure light intensities

# backup slides

# Exploratory test setup



# Exploratory test setup