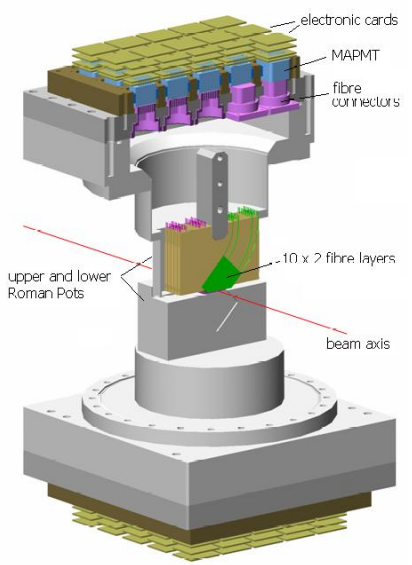
ALFA metrology and test-beam analysis

Adrian Driewer

September 10^{th} 2009

Luminosity measurements

2 detectors that measure the luminosity for ATLAS:
ALFA (Absolute Luminostiy for ATLAS)



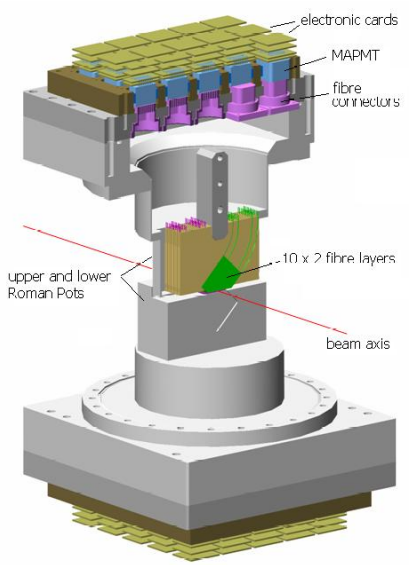
Luminosity measurements

2 detectors that measure the luminosity for ATLAS:

ALFA (Absolute Luminostiy for ATLAS)

&

LUCID (Luminosity measurement using Cherenkov Integrating Detector)



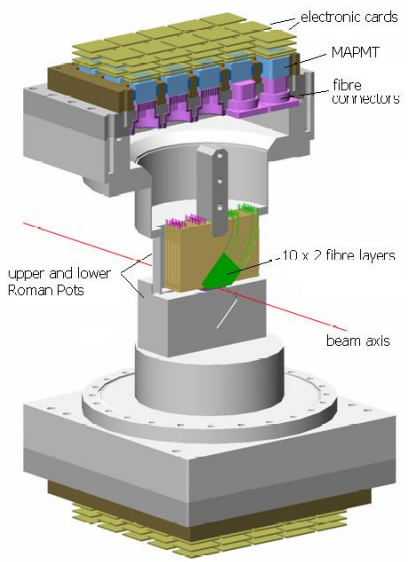
Luminosity measurements

2 detectors that measure the luminosity for ATLAS:

ALFA (Absolute Luminostiy for ATLAS)

&

LUCID (Luminosity measurement using Cherenkov Integrating Detector)



+ Absolute measurement
- Luminosity $< 10^{27} cm^{-1} s^{-1}$

+ Luminosity up to $10^{34} cm^{-1} s^{-1}$
- relative measurement

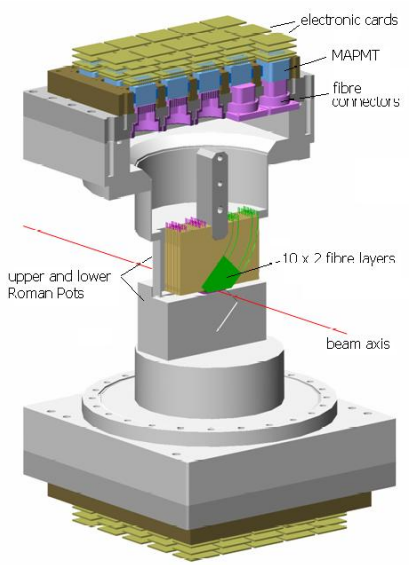
Luminosity measurements

2 detectors that measure the luminosity for ATLAS:

ALFA (Absolute Luminostiy for ATLAS)

&

LUCID (Luminosity measurement using Cherenkov Integrating Detector)



\+ Absolute measurement

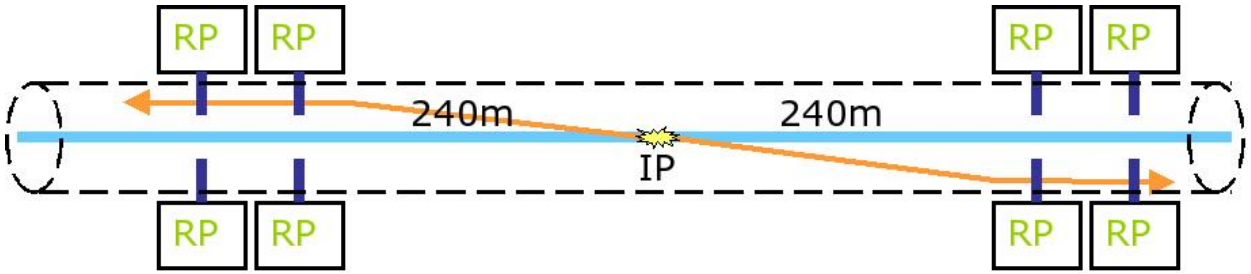
\- Luminosity $< 10^{27} cm^{-1} s^{-1}$

\+ Luminosity up to $10^{34} cm^{-1} s^{-1}$

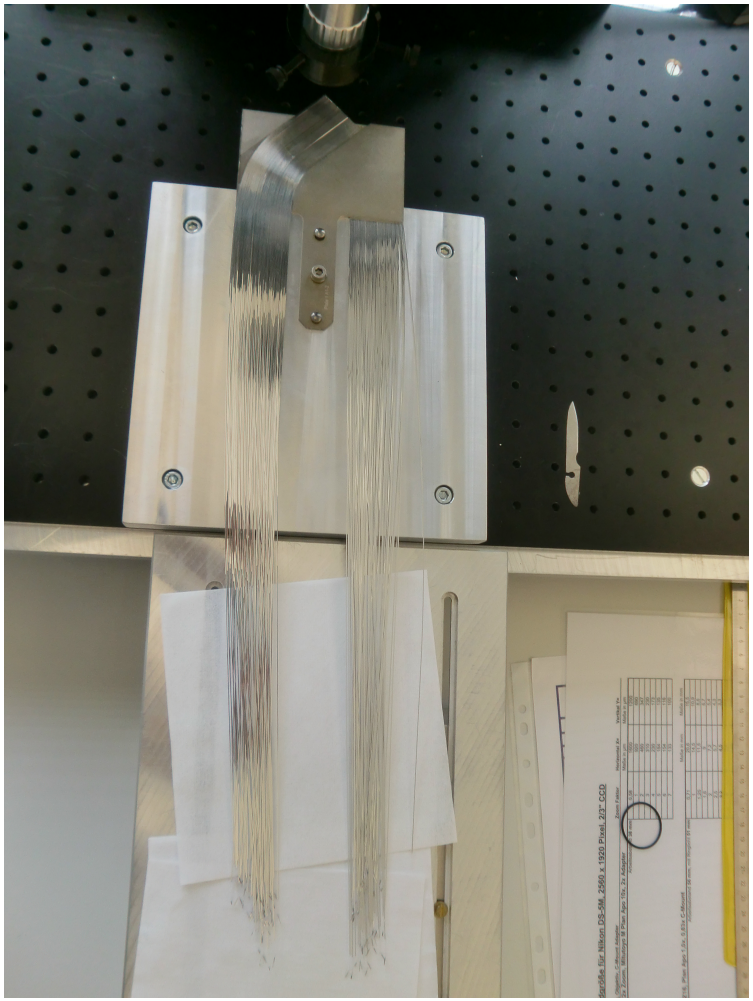
\- relative measurement

$\Rightarrow$ Calibrate LUCID with ALFA at low luminosity runs

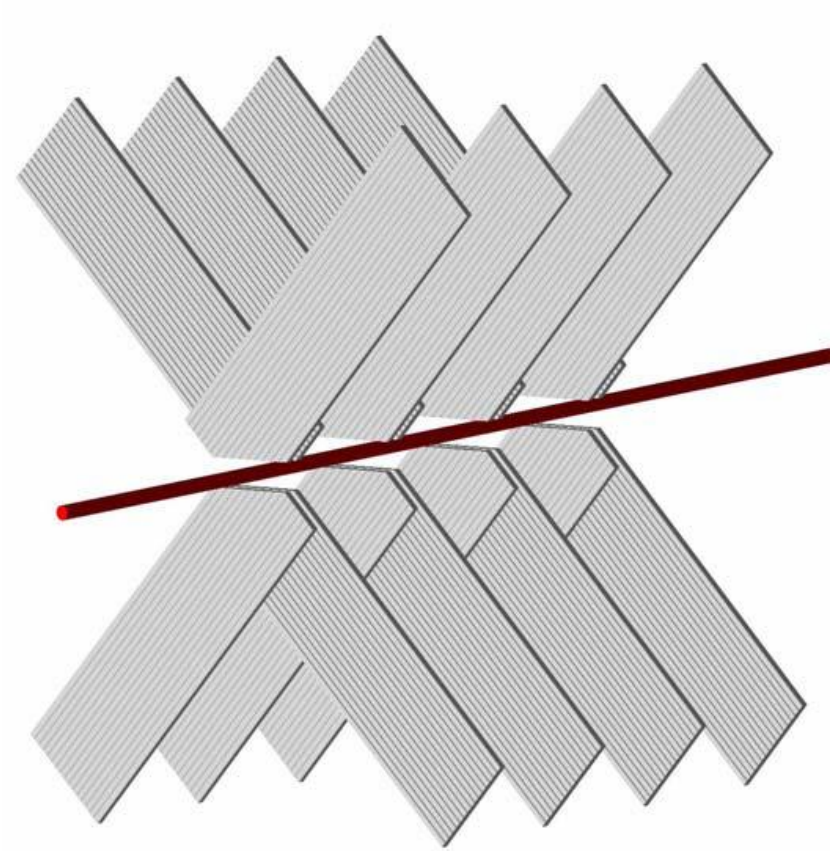
Where to find the ALFA detector



The detector

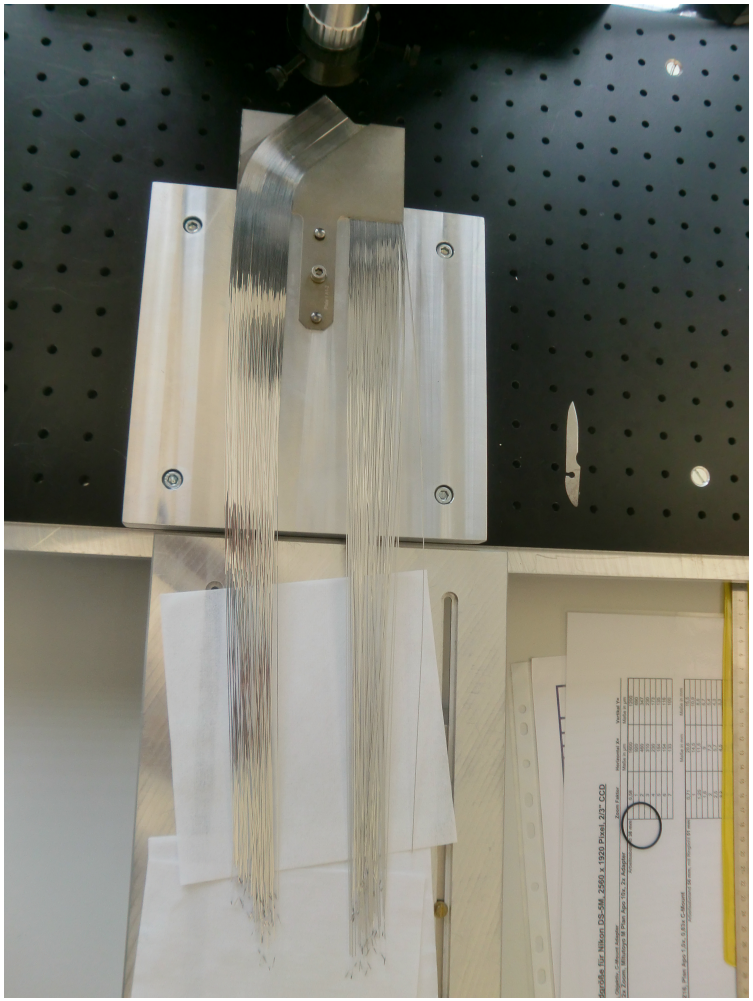


A detector on the measuring setup

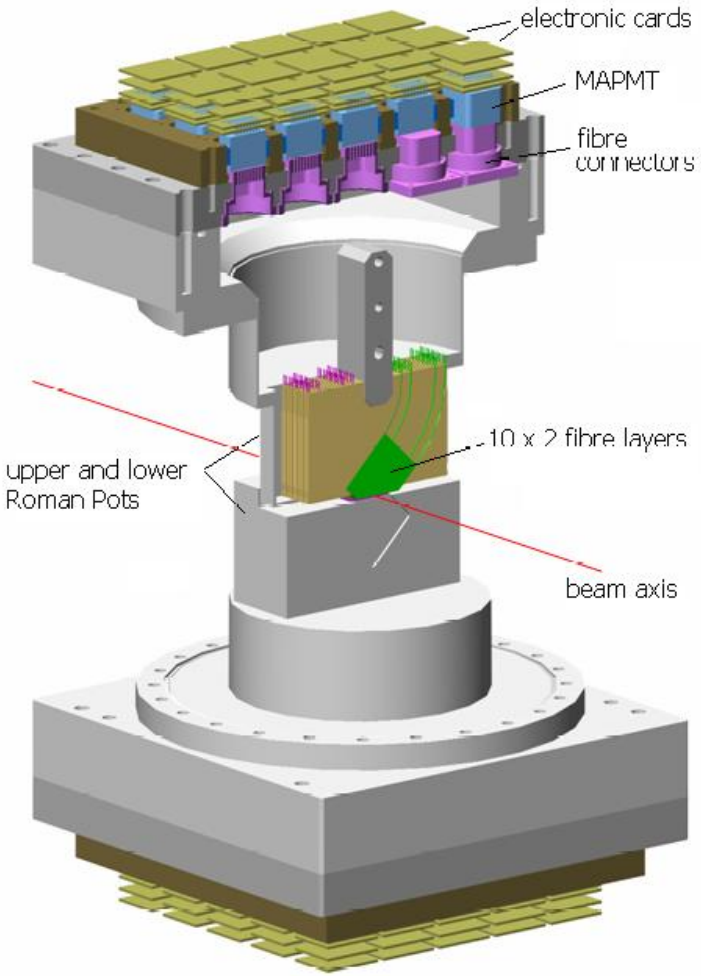


4 detectors in a row

The detector

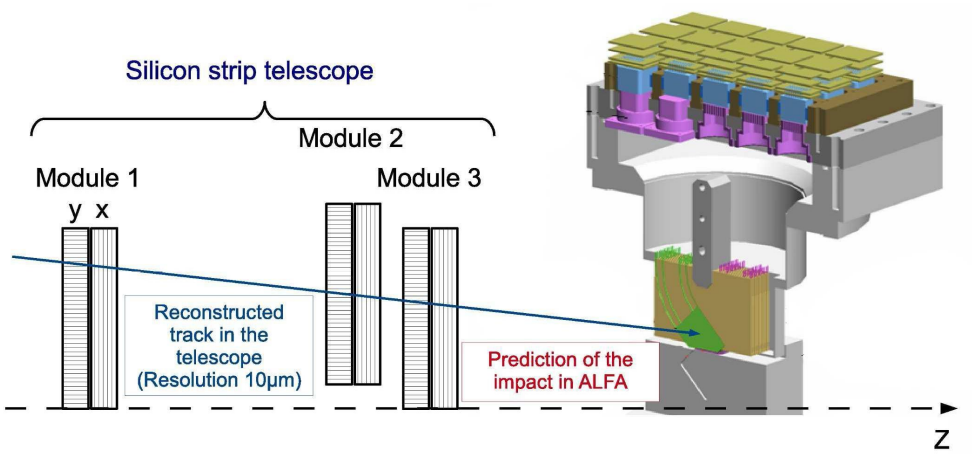


A detector on the measuring setup



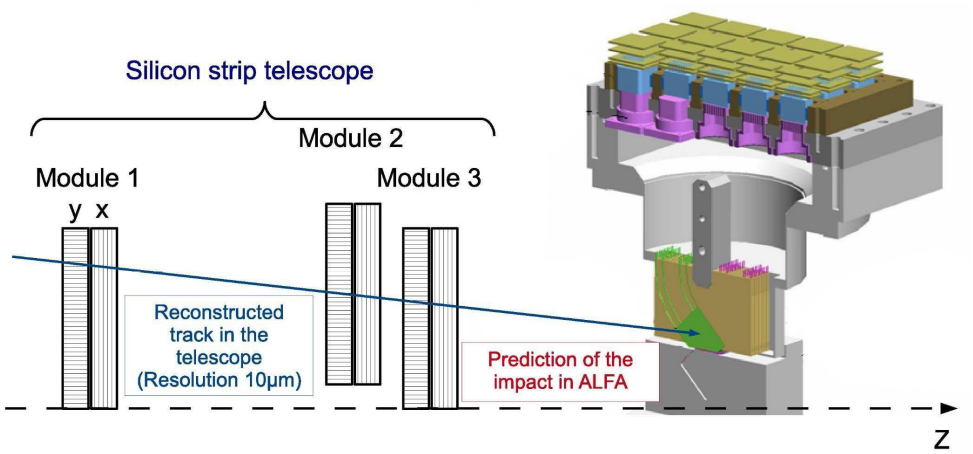
Detectors installed in a roman pot

Test-beam setup

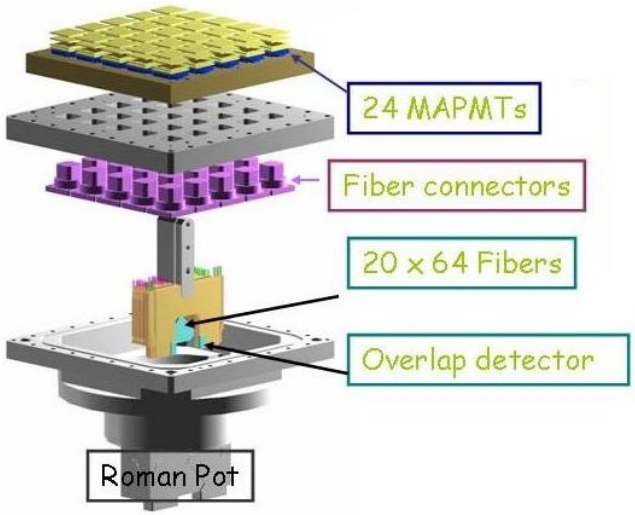


Scheme of the prototype-2 roman pot in the SPS test beam line with a silicon strip telescope

Test-beam setup



Scheme of the prototype-2 roman pot in the SPS test beam line with a silicon strip telescope



Schematic view how the detectors are connected to the read out electronics

Layer configurations

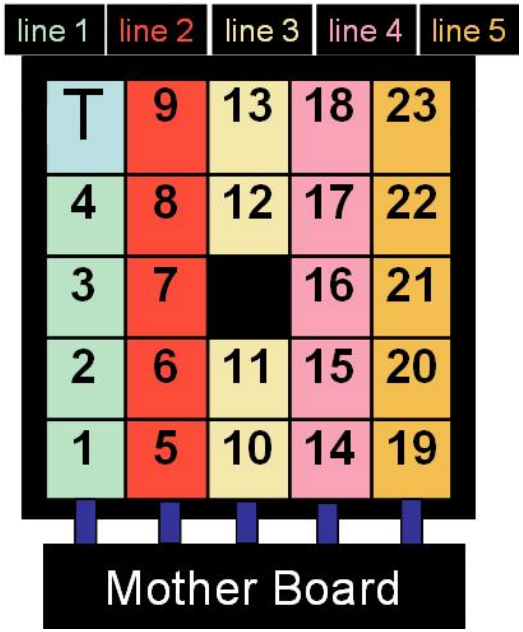
two different readout systems

- test board from LAL Orsay:
  able to read out two rows of 5 PMTs
- motherboard made in Lund as a version of the final ALFA electronics:
  read out of all 23 PMTs

Layer configurations

two different readout systems

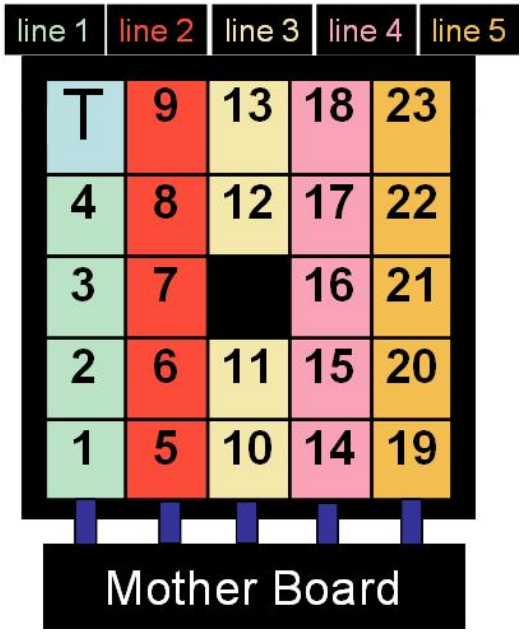
- test board from LAL Orsay:
  able to read out two rows of 5 PMTs
- motherboard made in Lund as a version of the final ALFA electronics:
  read out of all 23 PMTs



Layer configurations

two different readout systems

- test board from LAL Orsay:
  able to read out two rows of 5 PMTs
- motherboard made in Lund as a version of the final ALFA electronics:
  read out of all 23 PMTs



measured lines

1&2 4&5, 3&5, 2&4, 2&5, 1&5

Used configurations

several threshold cuts to generate digital signals (DAC)

1000, 1500, 2000, 2500, 3000

Used configurations

several threshold cuts to generate digital signals (DAC)

1000, 1500, 2000, 2500, 3000

different voltage for the PMTs (HV)

800, 850, 900, 950 V

Used configurations

several threshold cuts to generate digital signals (DAC)

1000, 1500, 2000, 2500, 3000

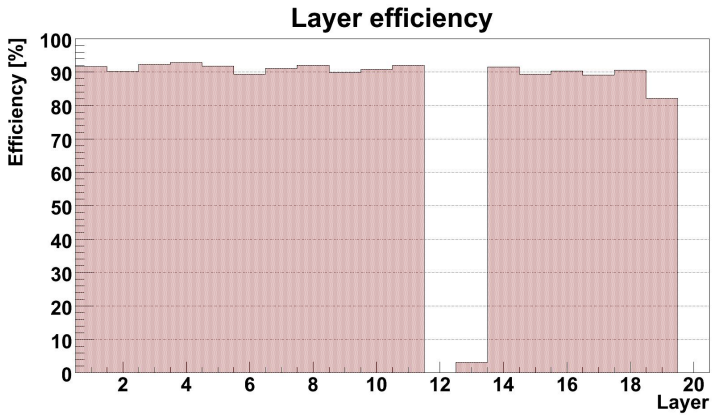
different voltage for the PMTs (HV)

800, 850, 900, 950 V

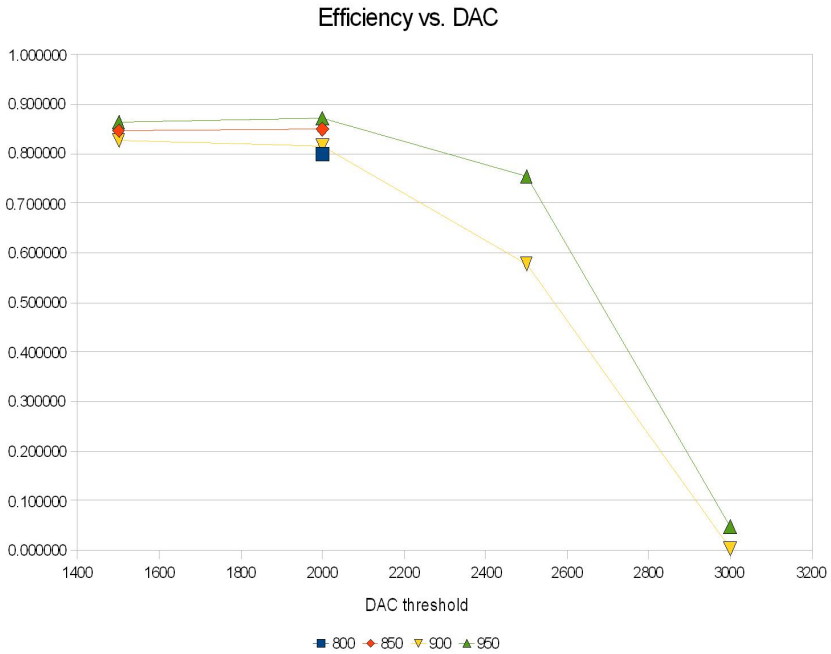
some overall gain factors for all channels (GAIN)

8, 16, 24, 30

Layer efficiency

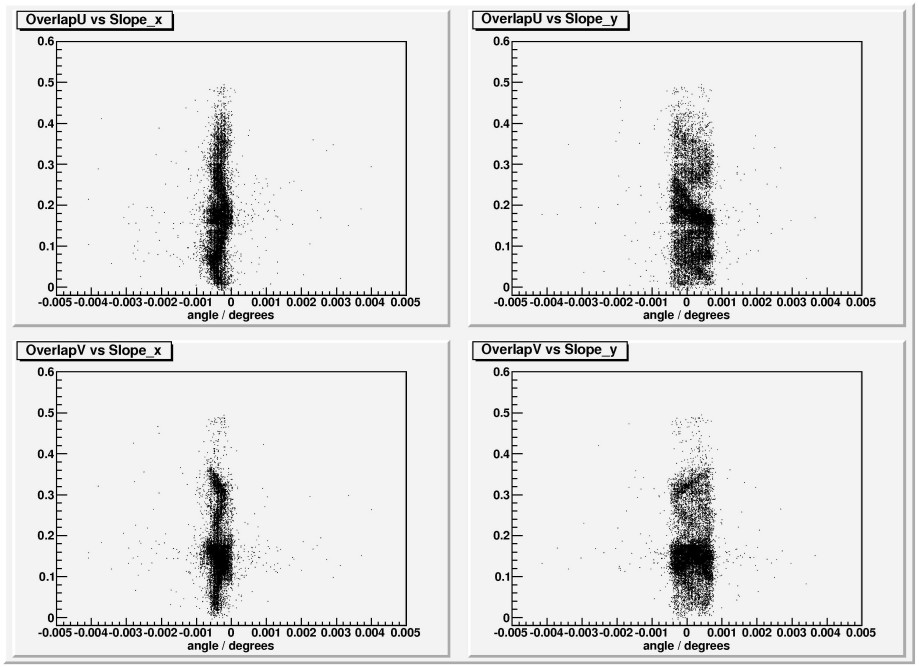


Layer efficiency for basic sample: HV=900V, DAC=2000, Gain=16



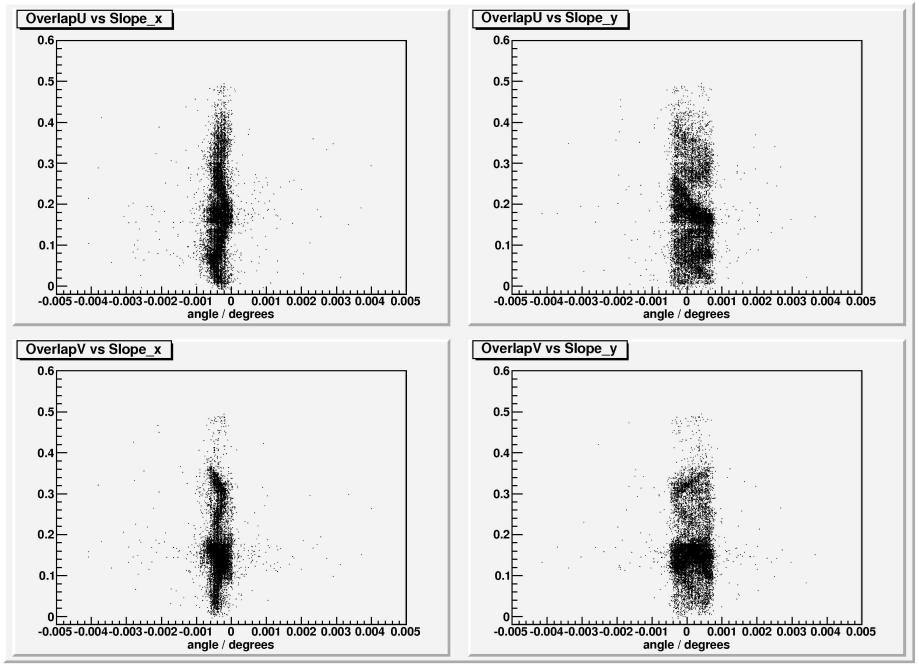
Layer efficiency dependence on the threshold and high voltage

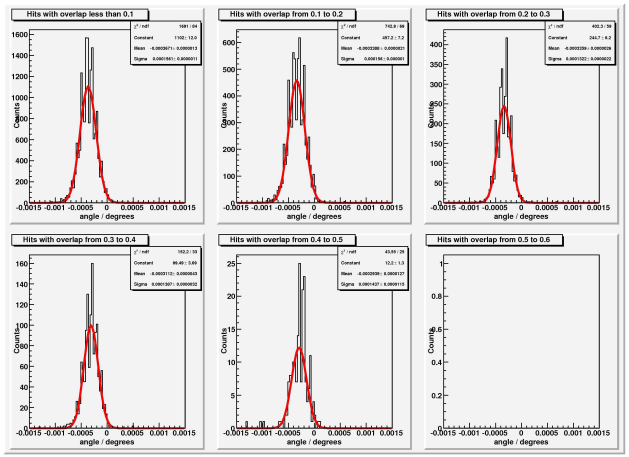
Angle dependency

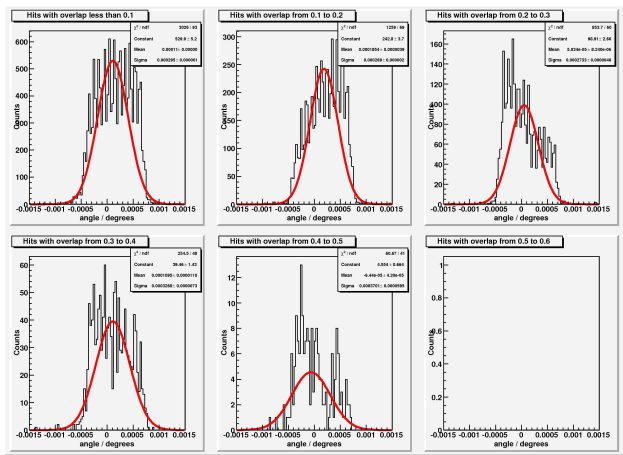


The angle dependency of the size of the overlap region

Angle dependency

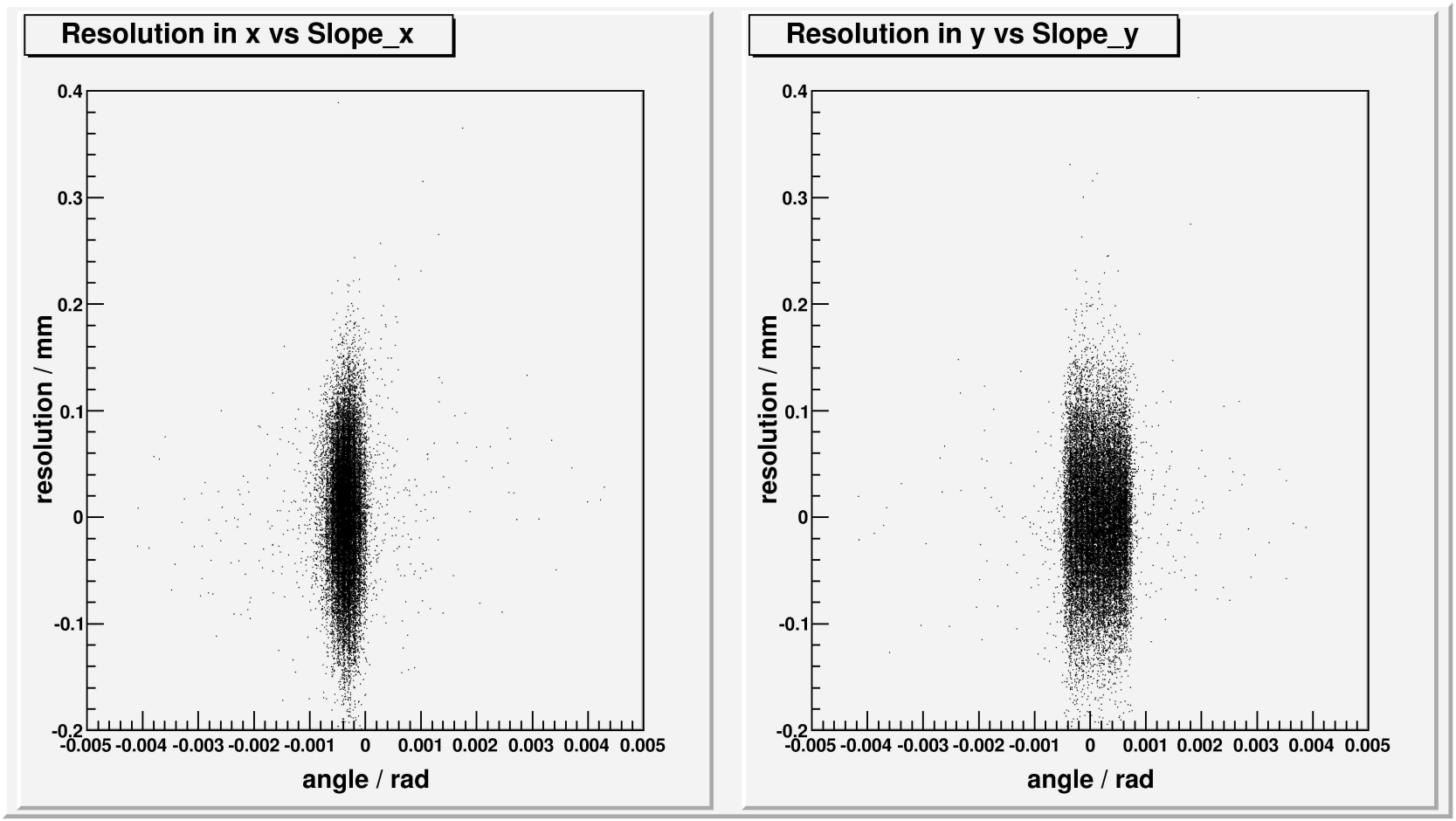






The angle dependency of the size of the overlap region

Angle dependency



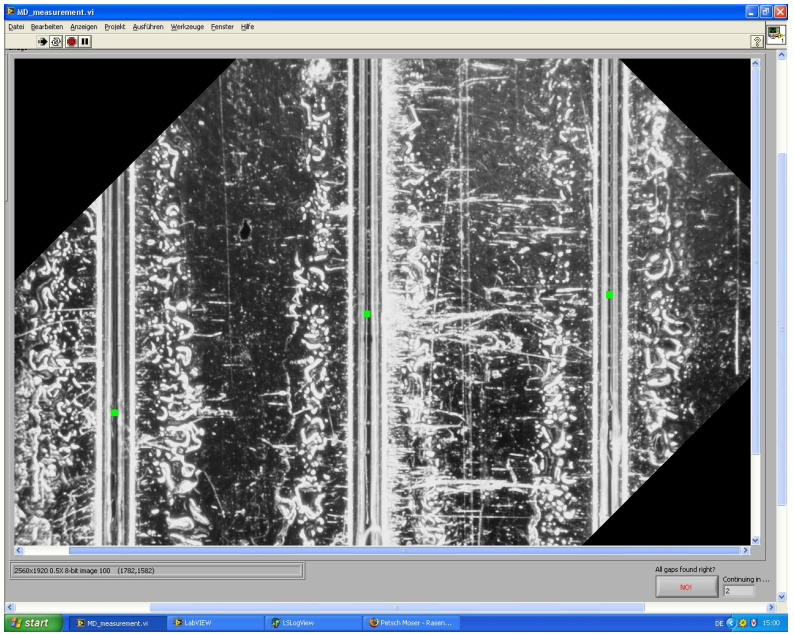
The angle dependency of the resolution

The measuring setup

The measuring setup

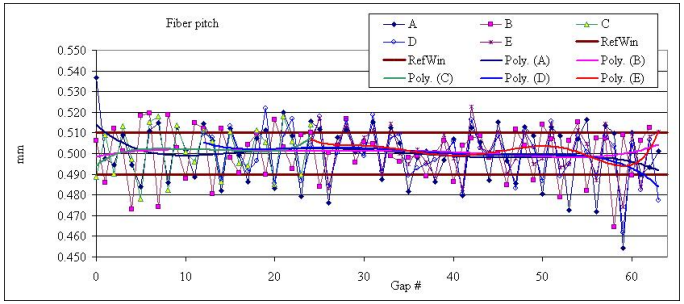
The measuring setup

The measuring setup



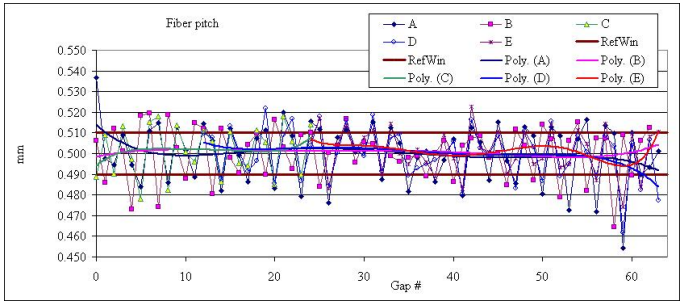
Screenshot during the measurement

Example of a measured metrology

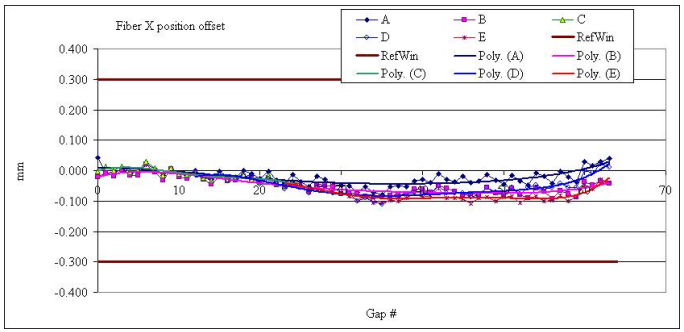


- The pitch between two gaps
- Reference: $500\mu m$

Example of a measured metrology

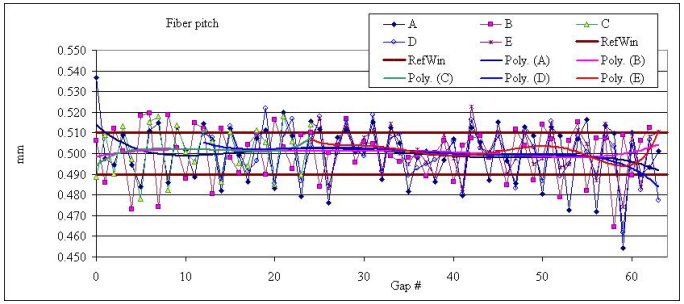


- The pitch between two gaps
- Reference: $500\mu m$

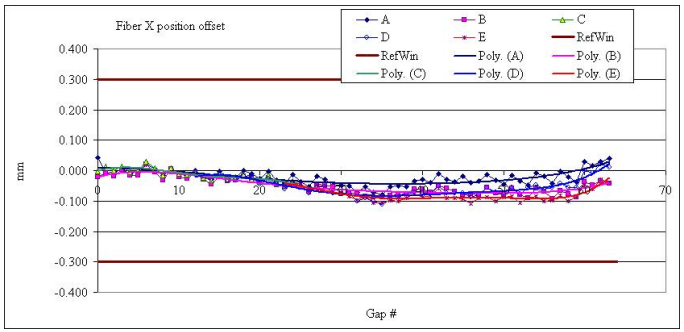


- Offset of the measured value from the reference

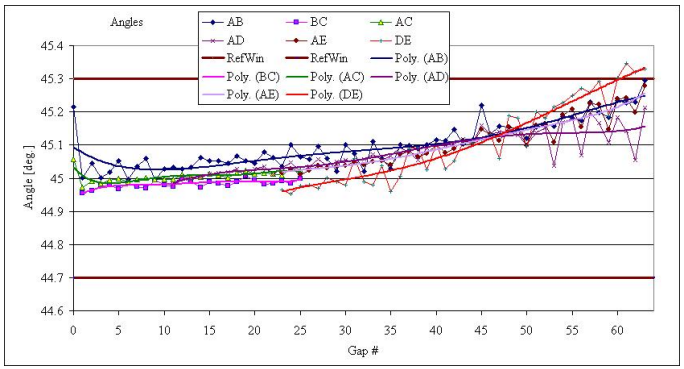
Example of a measured metrology



- The pitch between two gaps
- Reference: $500\mu m$

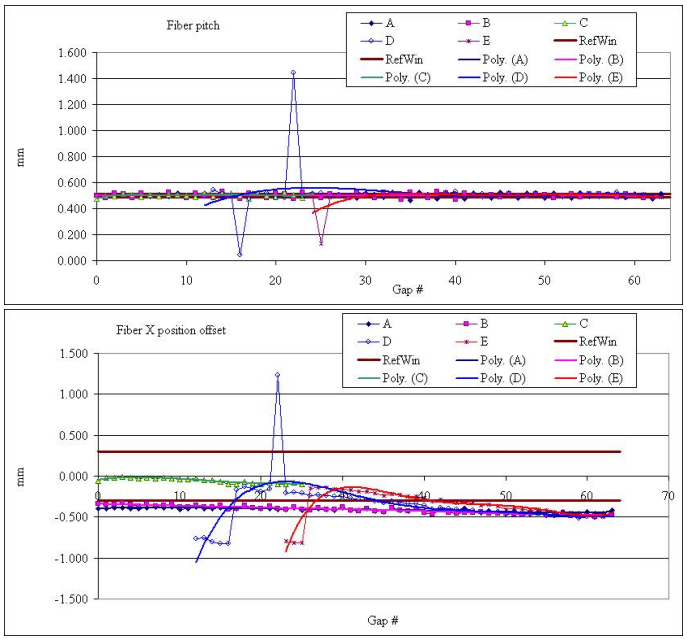


- Offset of the measured value from the reference



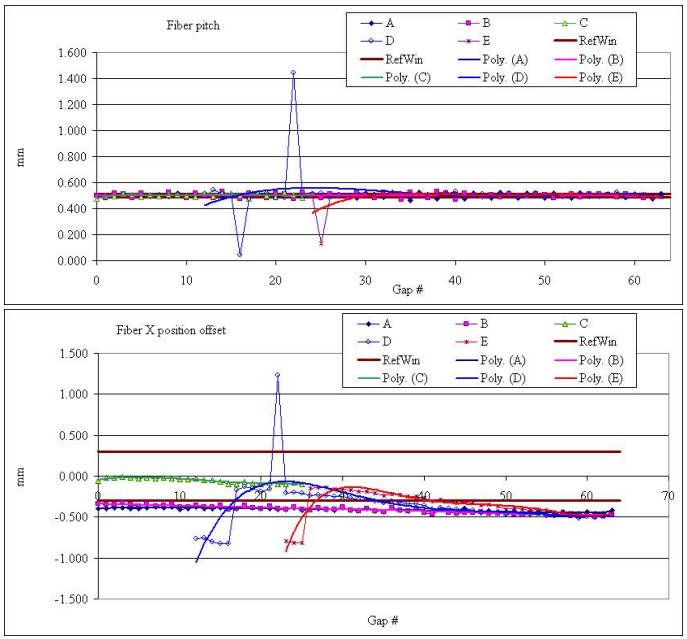
- Angle of the gaps
- Reference: $45°$

Bad plate: A2-2 Pl.4

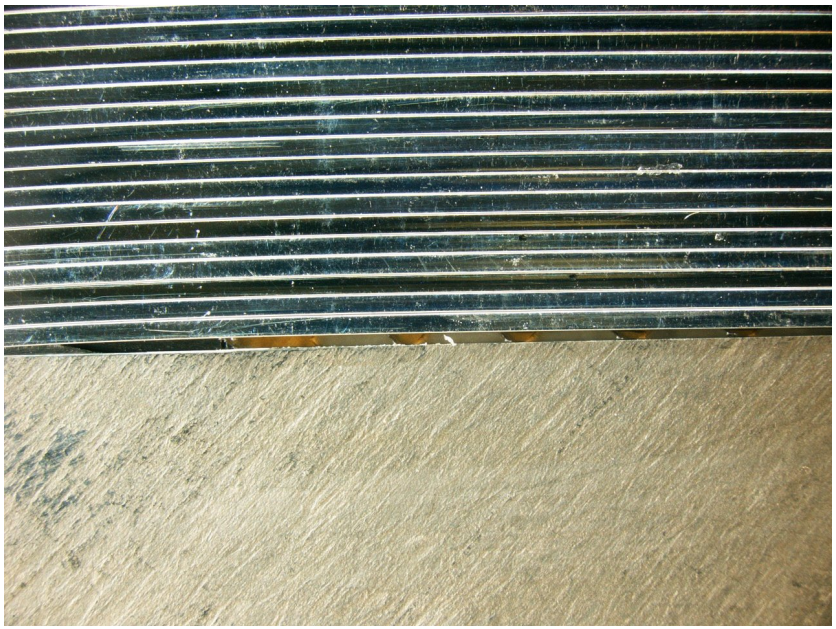


Apparently something went wrong

Bad plate: A2-2 Pl.4

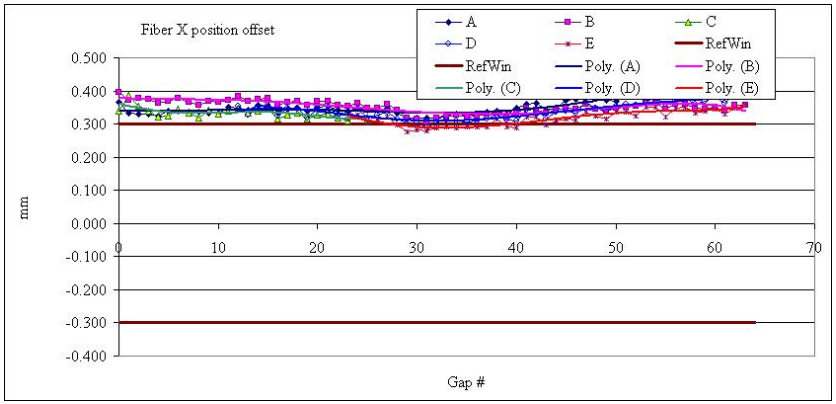


Apparently something went wrong

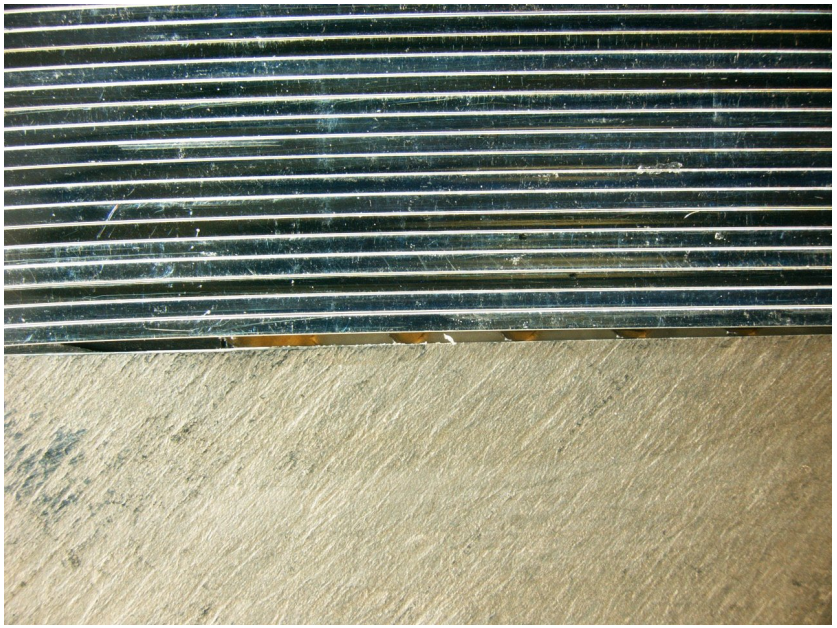


$\longrightarrow$ a $\sim 300 \mu m$ gap!

Bad plate: A2-2 Pl.4

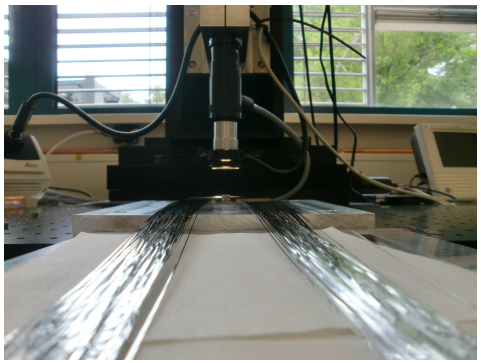


Manual measuring proved the size of the gap



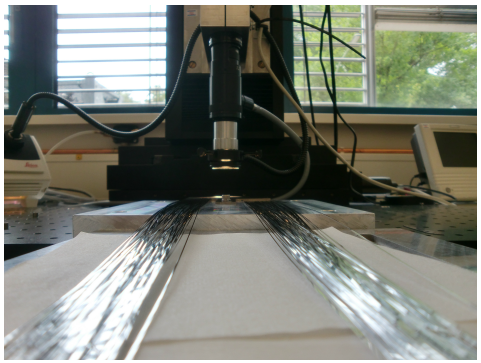
Picture of the $\sim 300 \mu m$ gap

Summary



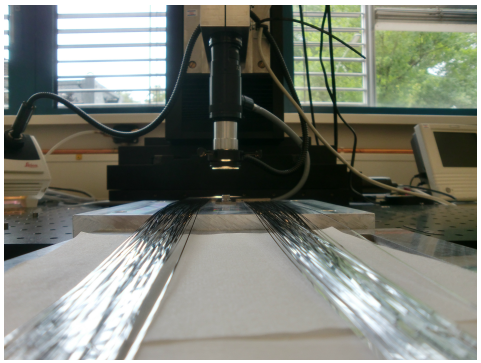
- The metrology of 20 ALFA detectors was measured.

Summary



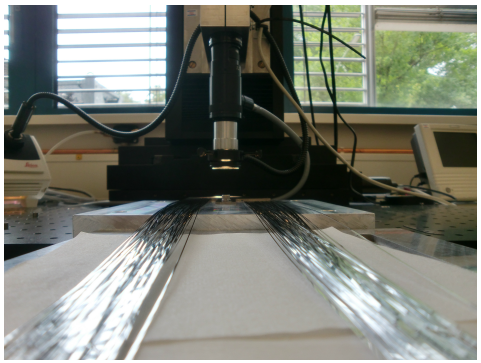
- The metrology of 20 ALFA detectors was measured.
- The quality of one plate is so bad that it cannot be used.

Summary



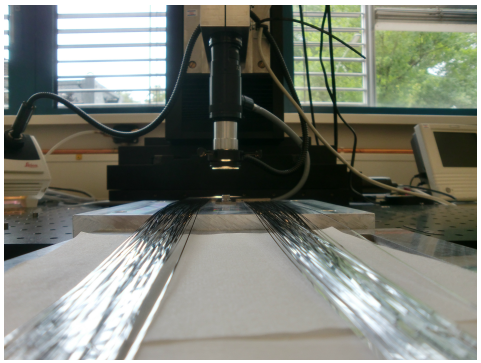
- The metrology of 20 ALFA detectors was measured.
- The quality of one plate is so bad that it cannot be used.
- The analysis of the layer efficiency dependence on the threshold shows that a DAC>2000 impairs the efficiency.

Summary



- The metrology of 20 ALFA detectors was measured.
- The quality of one plate is so bad that it cannot be used.
- The analysis of the layer efficiency dependence on the threshold shows that a DAC>2000 impairs the efficiency.
- A closer look to the angle dependency proved that there is none.

Summary



- The metrology of 20 ALFA detectors was measured.
- The quality of one plate is so bad that it cannot be used.
- The analysis of the layer efficiency dependence on the threshold shows that a DAC>2000 impairs the efficiency.
- A closer look to the angle dependency proved that there is none.

Thank you for your attention!