

IMAGING WITH OPTICAL SCINTILLATION LIGHT READOUT

RD51 MPGD SCHOOL

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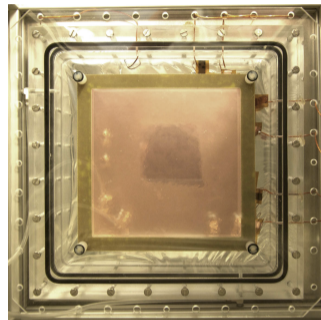
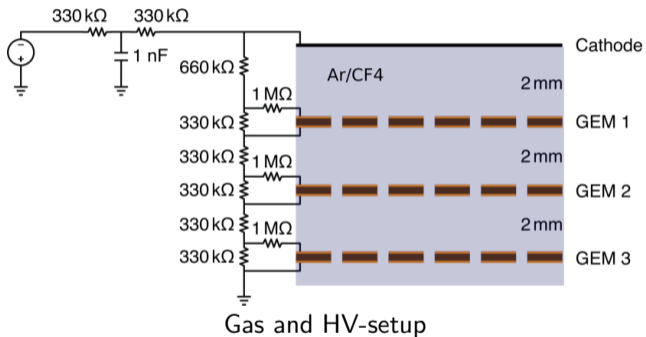
Helmholtz-Institut für Strahlen- und Kernphysik der Universität Bonn

8th December 2023



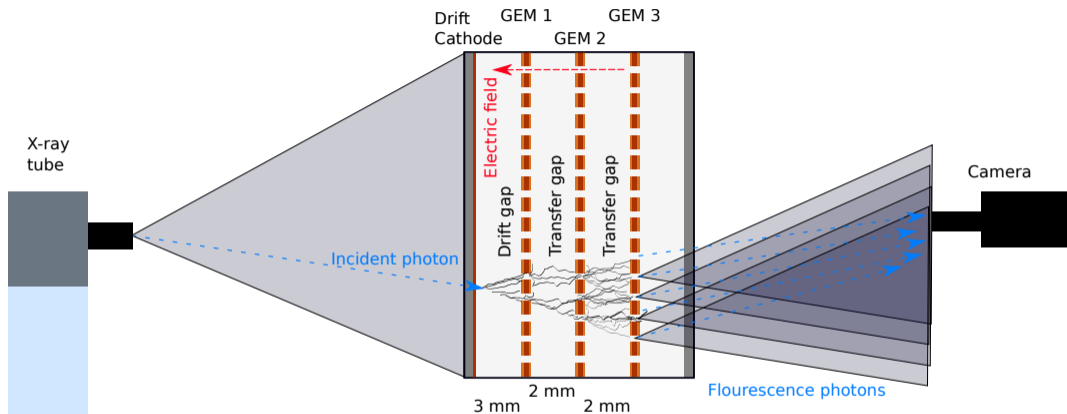
- Experimental setup
- Measurements with low energy X-rays
- X-ray imaging

EXPERIMENTAL SETUP



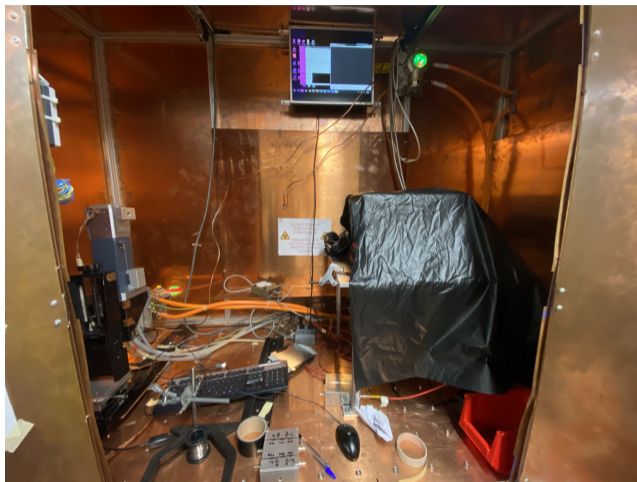
Transparent window for observation of fluorescence photons

EXPERIMENTAL SETUP



Full setup

EXPERIMENTAL SETUP

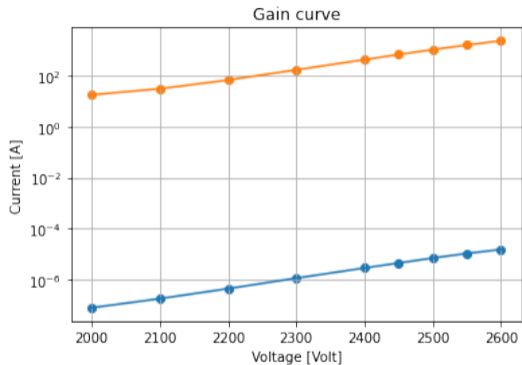


Full setup

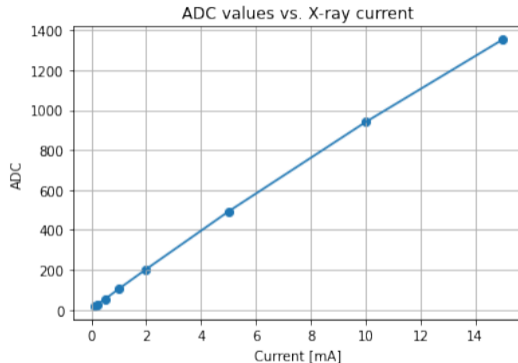
- Fe55 source for first observations of detector signal
- Tweak the HV-settings to have a fully satisfying picture
- Observe some nice physics !

- Use a more flexible and powerfull X-ray source
- Determine a Gain curve with optical readout
 - Any effects which are noticeable ?
- Take some pictures
- Determine the spatial resolution

X-RAY MEASUREMENTS

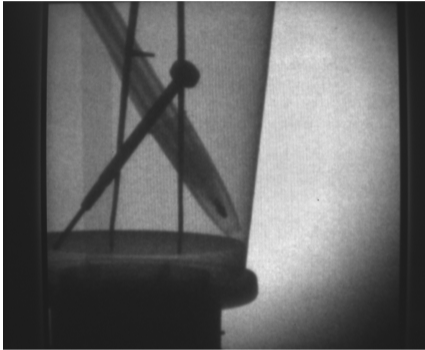


Gain curve for the readout current and the ADC values of every pixel



Saturation curve for different X-ray currents

TAKE SOME PICTURES



Mysterious instruments

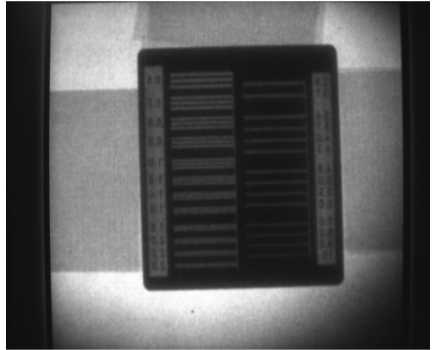
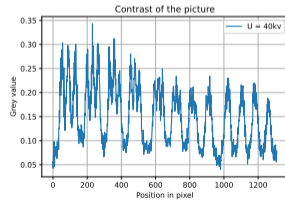
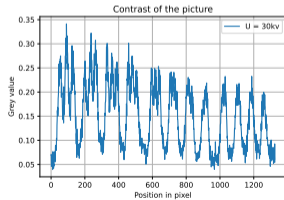
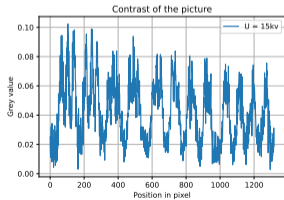
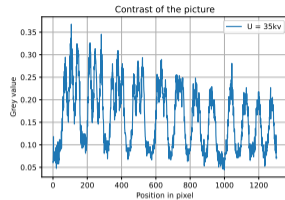
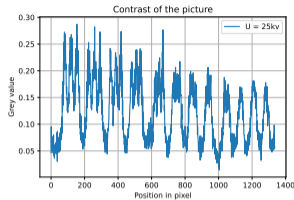
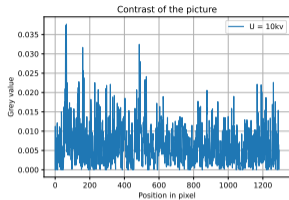
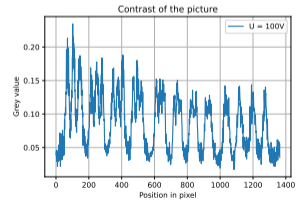
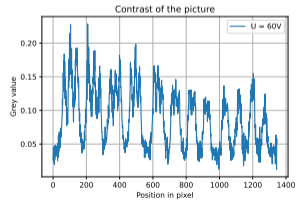
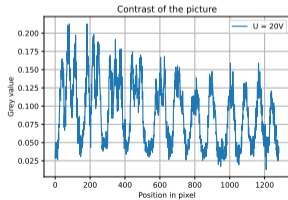
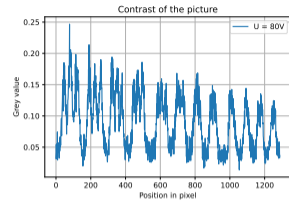
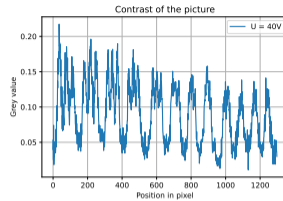
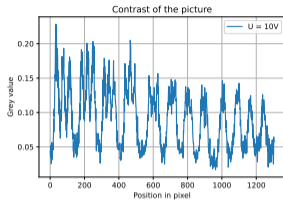


Plate with line pairs

SPATIAL RESOLUTION X-RAY VOLTAGE

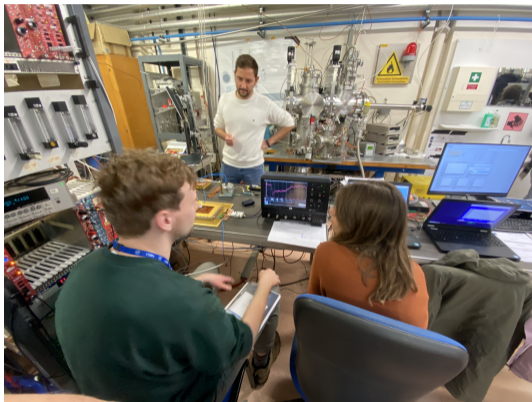
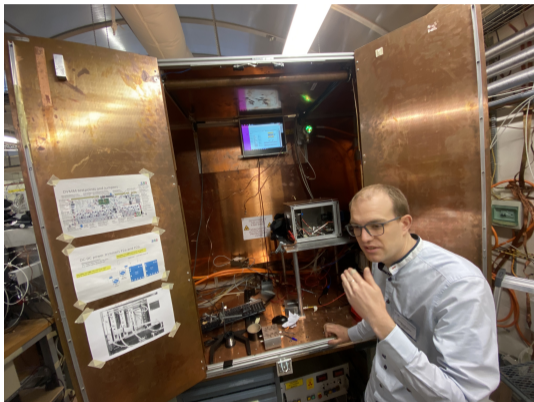


SPATIAL RESOLUTION DRIFT VOLTAGE



- Operated a triple GEM detector with an optical readout
 - Saw very interesting physics events
 - Managed to take a gain curve for current and light
 - Analyzed objects with the X-ray tube
- How to determine the spatial resolution from our measurements ?
 - MTF: $C = I_{min.} - \frac{I_{min.}}{I_{min.} + I_{max.}} \approx 10\%$
 - What are the limits of spatial resolution with this setup ?
 - GEM parameters seem to be still limiting the spatial resolution here

THANKS FOR YOUR ATTENTION



Backup

REFERENCES