# Entwicklung eines Strahlkamerasystems zur Analyse von lonenstrahlen

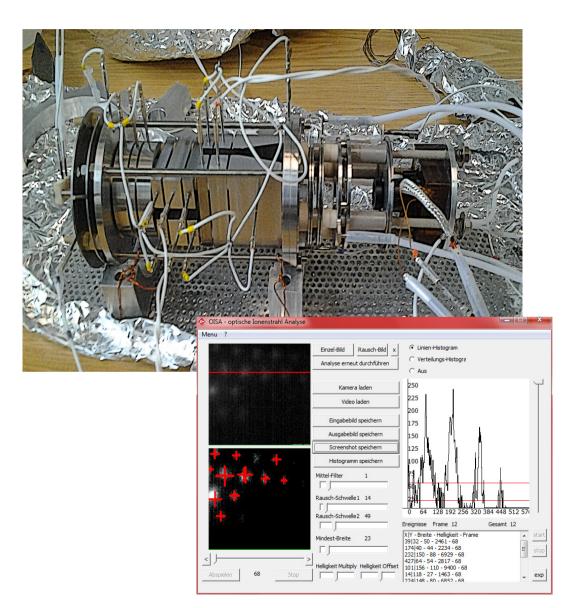
Development of a Beam Camera System for the Analysis of Ion Beams

#### What has been done

Within the Ion Beam Camera a new digital camera sensor has been bought and integrated.

A software to control the camera and analyze its output has been developed.

The System has been tested within a vacuum for Ion Beam and Single Ion detection.



### Benefits of the new camera sensor

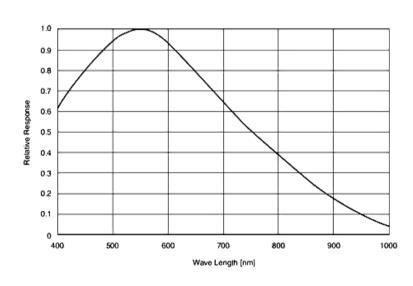
The new sensor has a luminosity of 0.005 lux

The signal is transported digital now → less noise

The camera's settings are changeable while it is working within the vacuum (Shutter speed, Gain)

The Sensor uses only 1.3 W and is powered and controlled via USB2 (5V)

It was possible to get a higher vacuum (2.2e-8 mbar instaed or 3e-8 mbar )

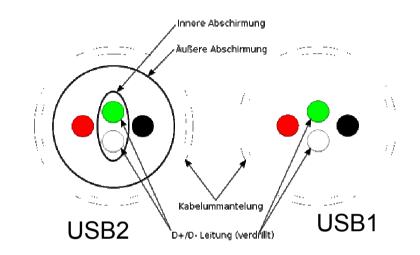


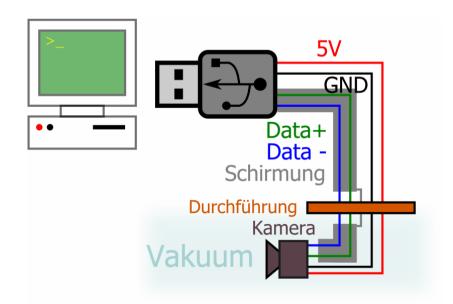
### Modifications made on the new camera sensor

Embedding the sensor within a plastic-block onto a aluminum-plate

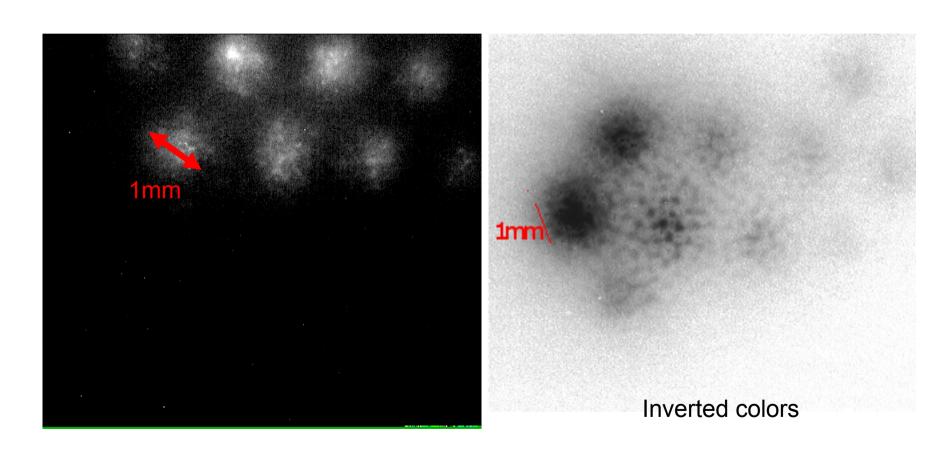
Soldering cables onto the sensors electric contacts

Shielding the cables to ensure USB2 speed

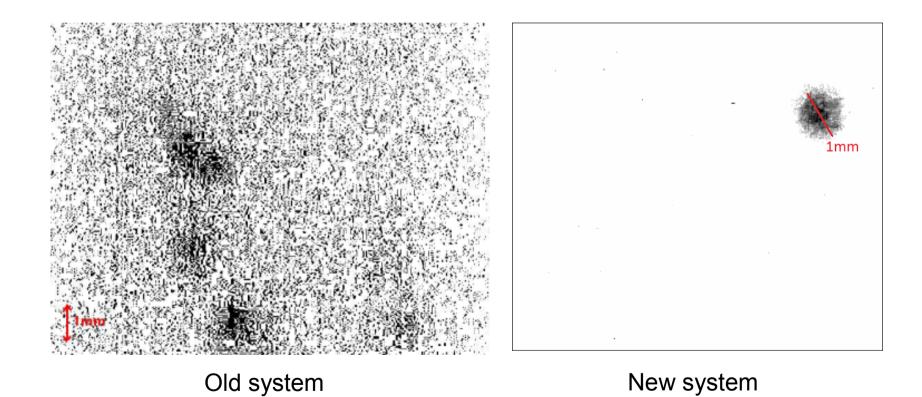




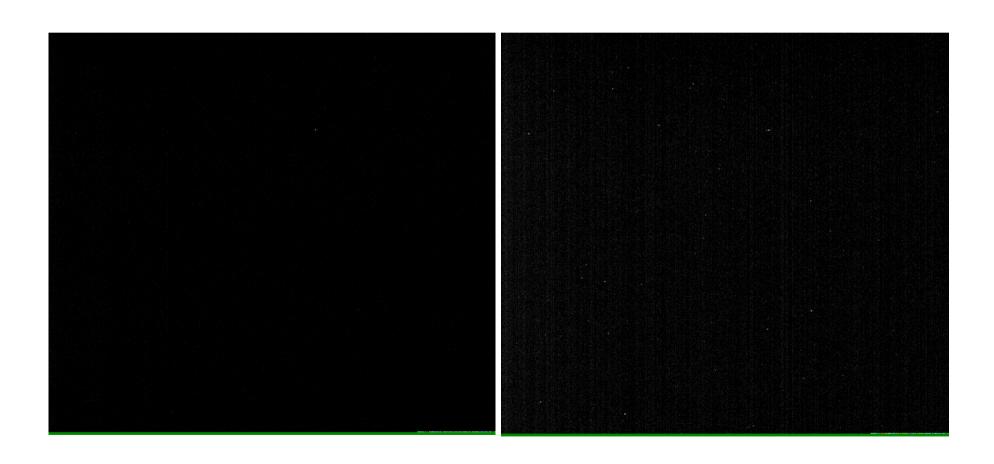
Pictures of the new beam camera system of a ion beam coming through a 1 mm grate



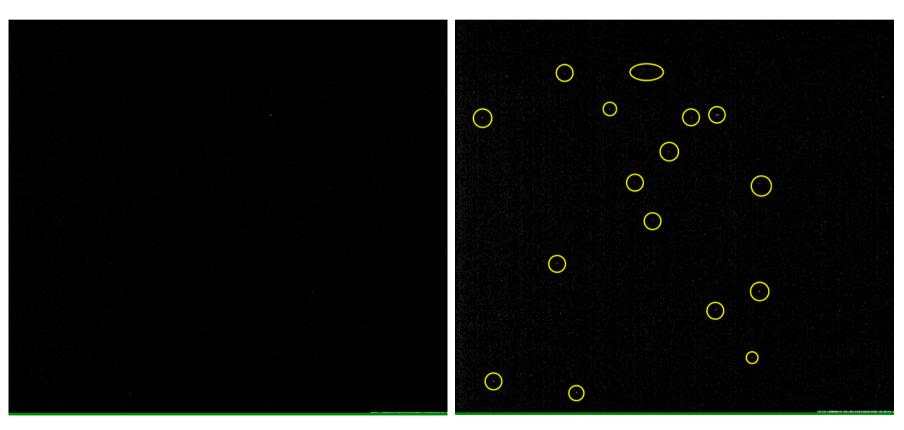
Comparison with the old beam camera system (single ion detection, inverted colors)



After using the system for an hour slowly faint vertical lines appears. After disconnecting the sensor for 5 minutes they disappeared again



Depending on shutter speed, single bright pixel showed up

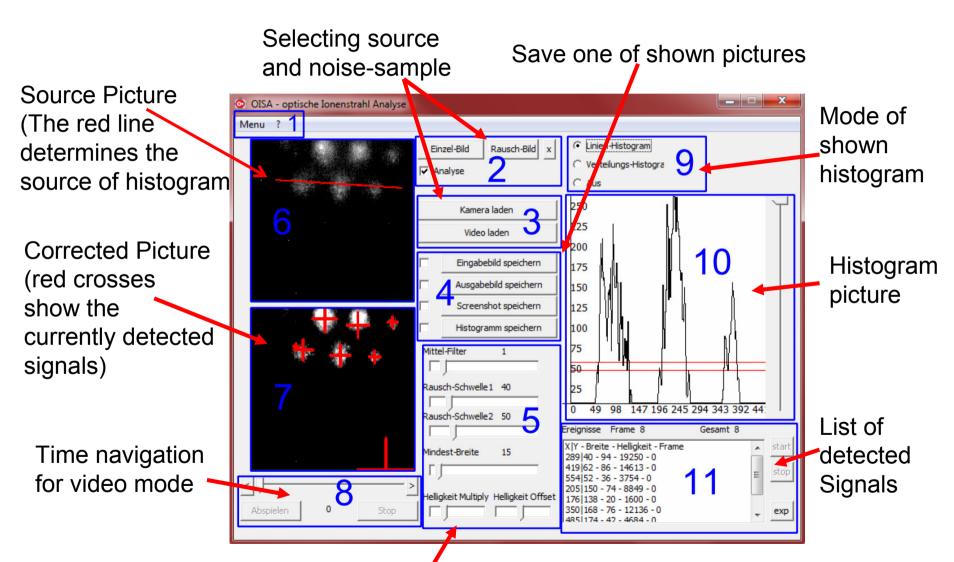


Shutter speed 1/500s

Shutter speed 4/25s

#### Software OISA

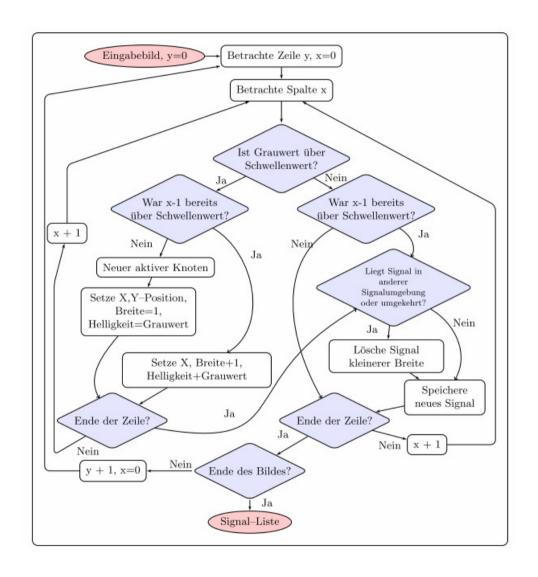
Optische Ionen-Strahl Analyse



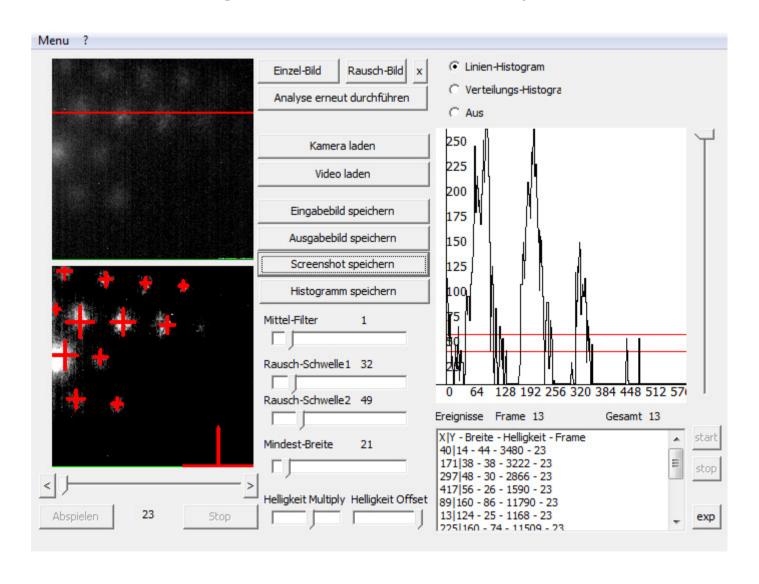
Picture correction and analysis settings

## Software OISA – Signal detection

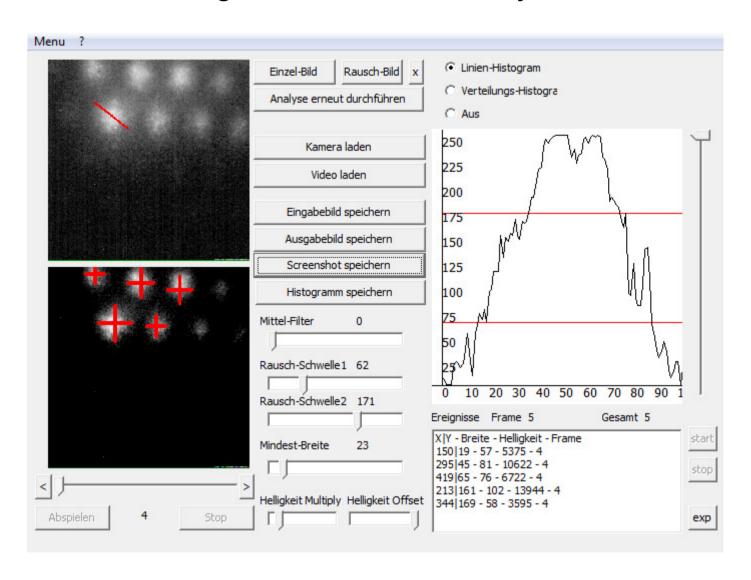
- 1. Scan every line for brightness over a certain constant
- 2. If it is over, uncrease a counter for the length/width of signal
- 3. Sum up the brightness of the pixel for signal-brightness
- 4. If the brightness is under the set constant, "finish" the signal and save its properties
- 5. Search for already finished signals that are within the signal's area
- 6. If one is found, the current detected line is part of this signal. Delete the saved signal with smaller width then



## Using the beam camera system



# Using the beam camera system



## Tasks and future applications

Currently the system is able to...

- detect a signal and show its position, size and brightness
- use videos or a camera as source
- save pictures automatically to hard disk
- show histograms for a custom defined range
- generate a list of signals detected within a custom time

Later it is planned to be connected to a peltier-cooling and integrated into the Ambiprobe-MR-TOF-MS to enhance the ion beam guiding and a better phase advancing.