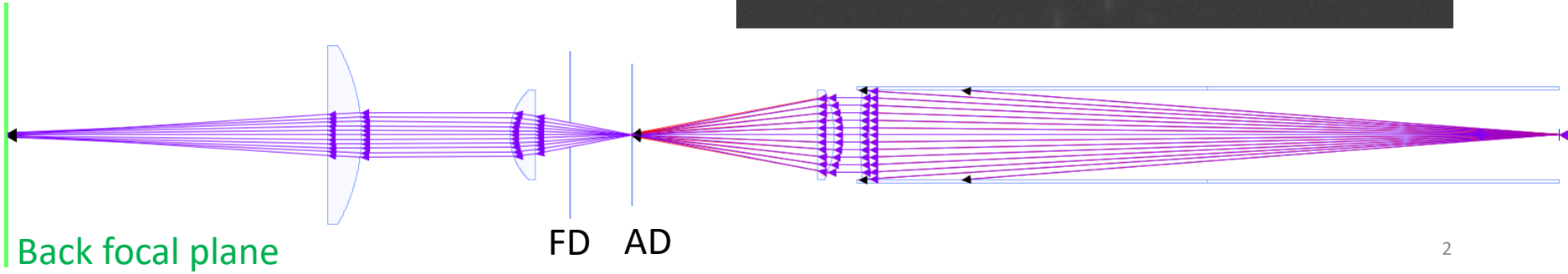
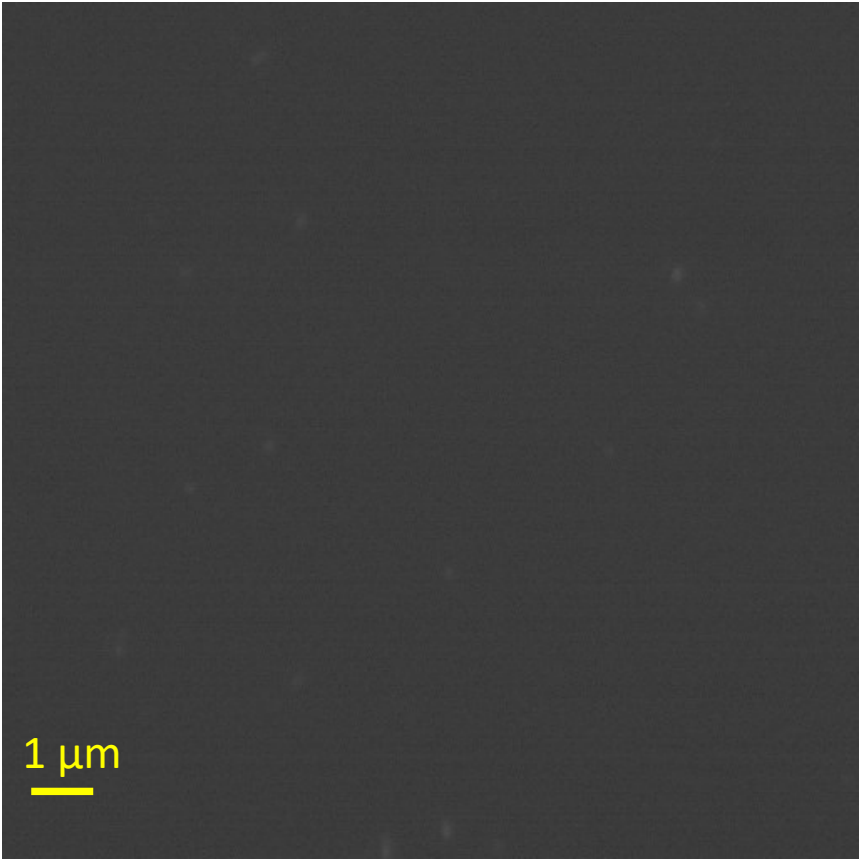
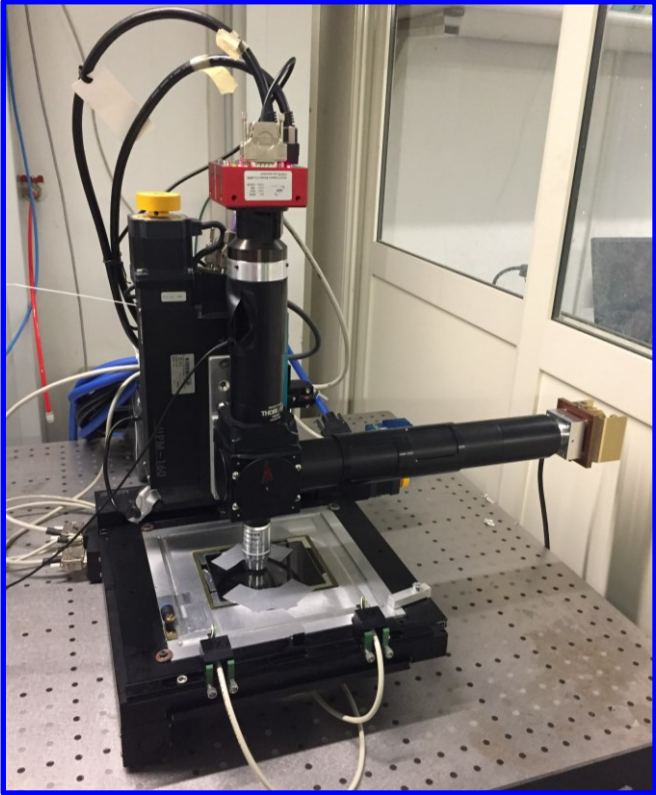


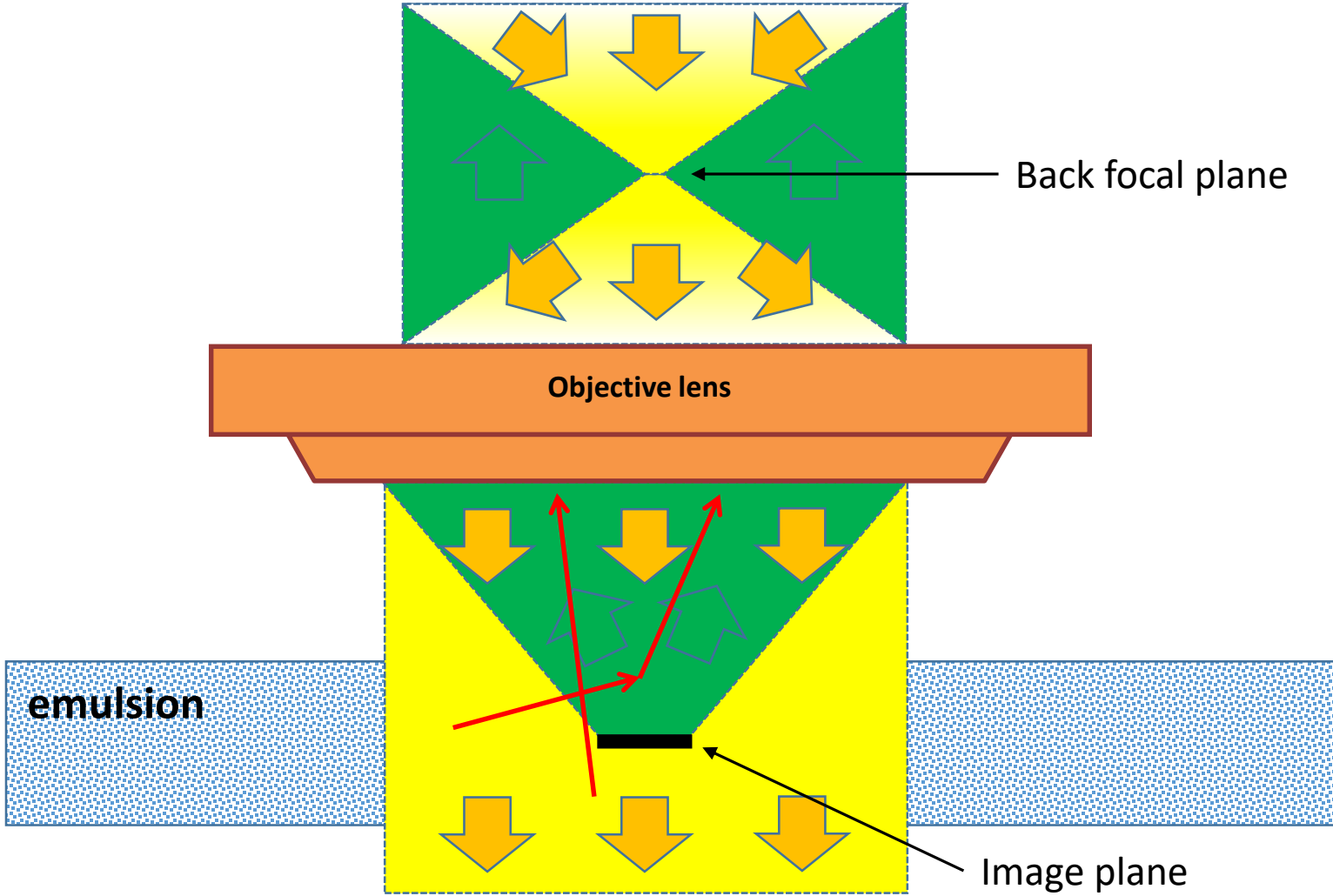
# New Illumination System Test

Andrey Alexandrov

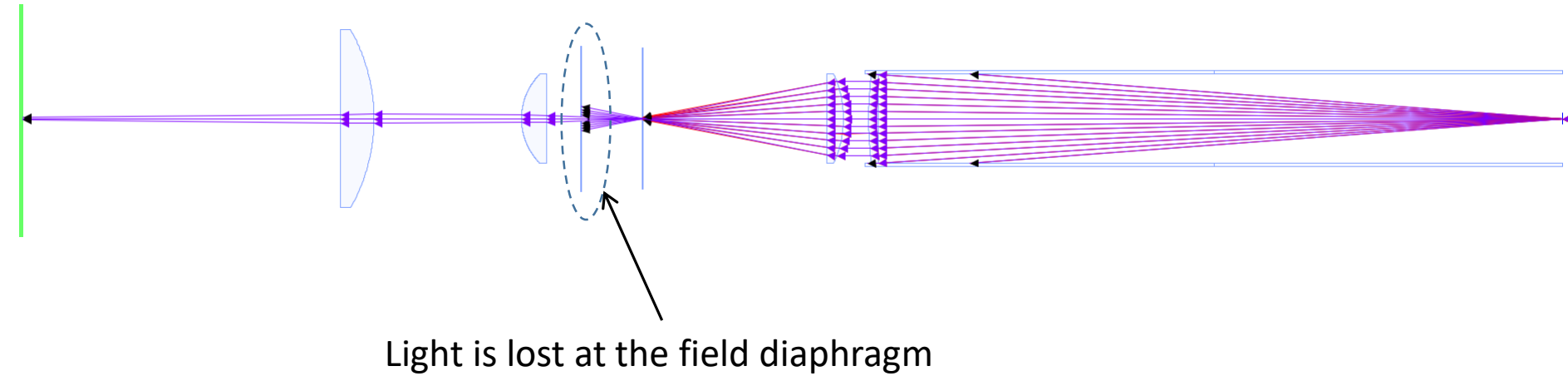
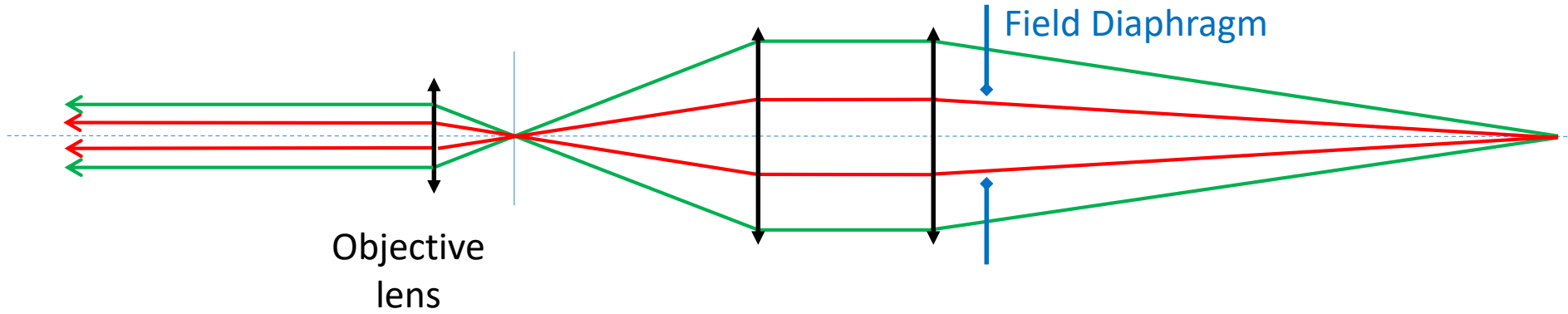
# Current production microscope



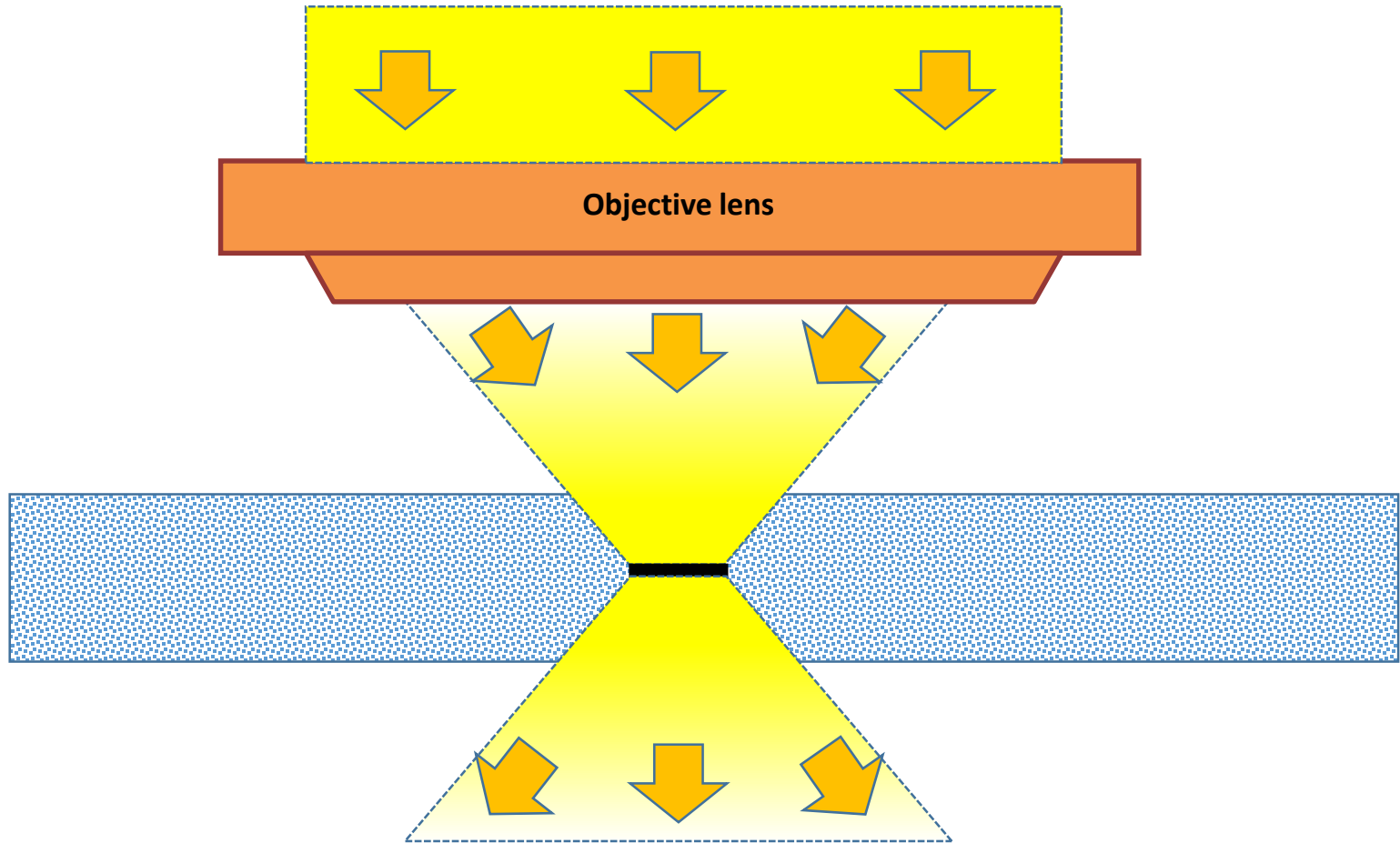
# Current illumination scheme



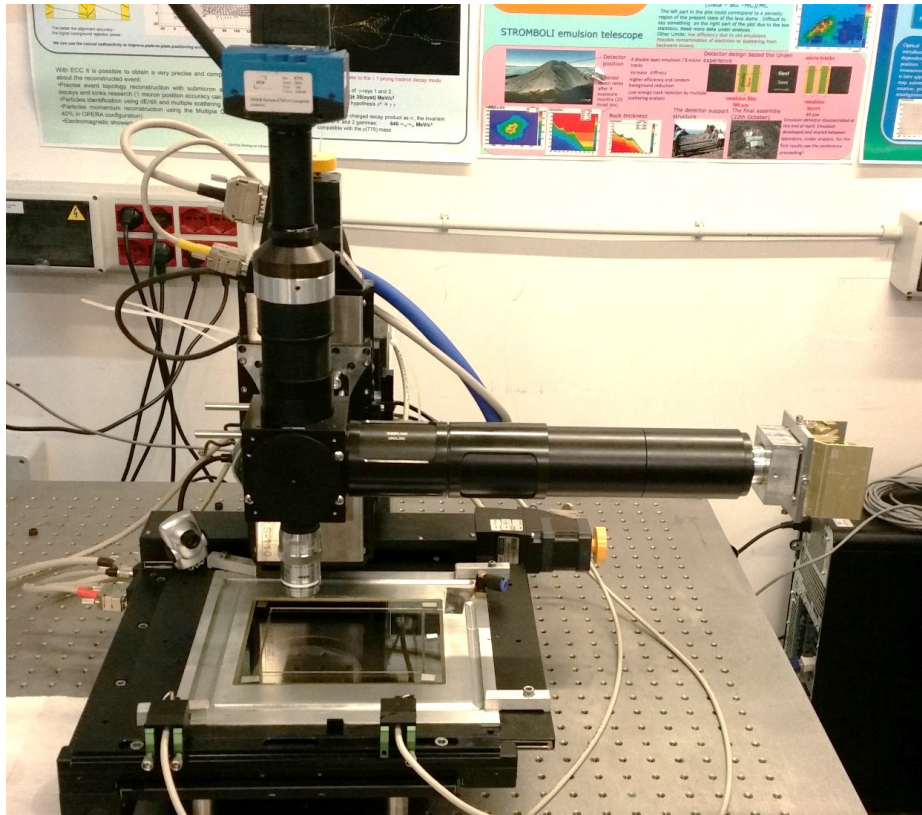
# Field Diaphragm



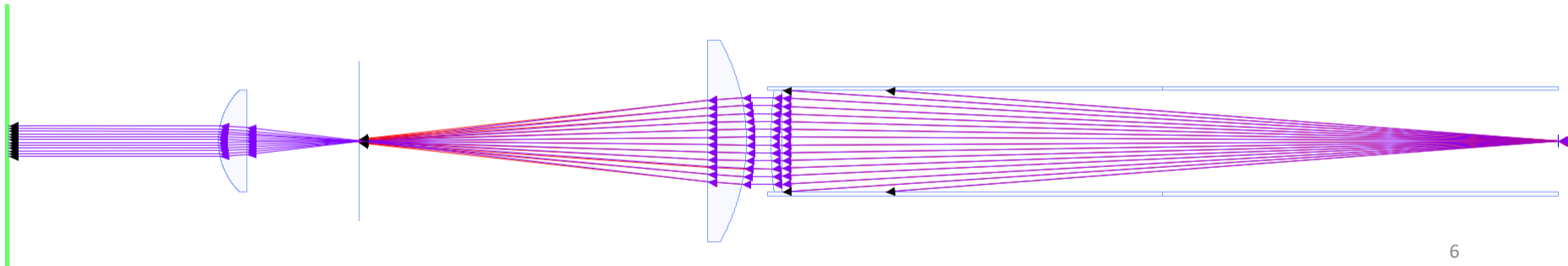
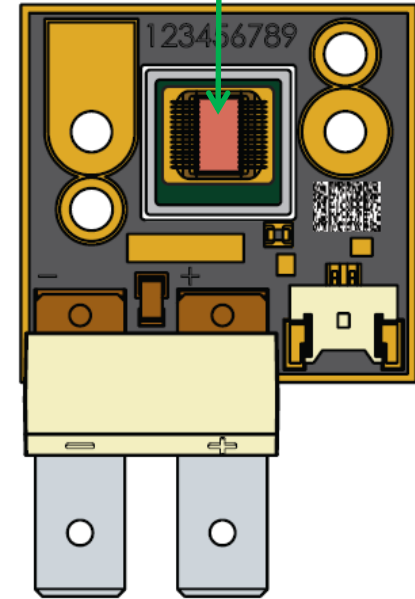
# New illumination scheme



# New Illumination System



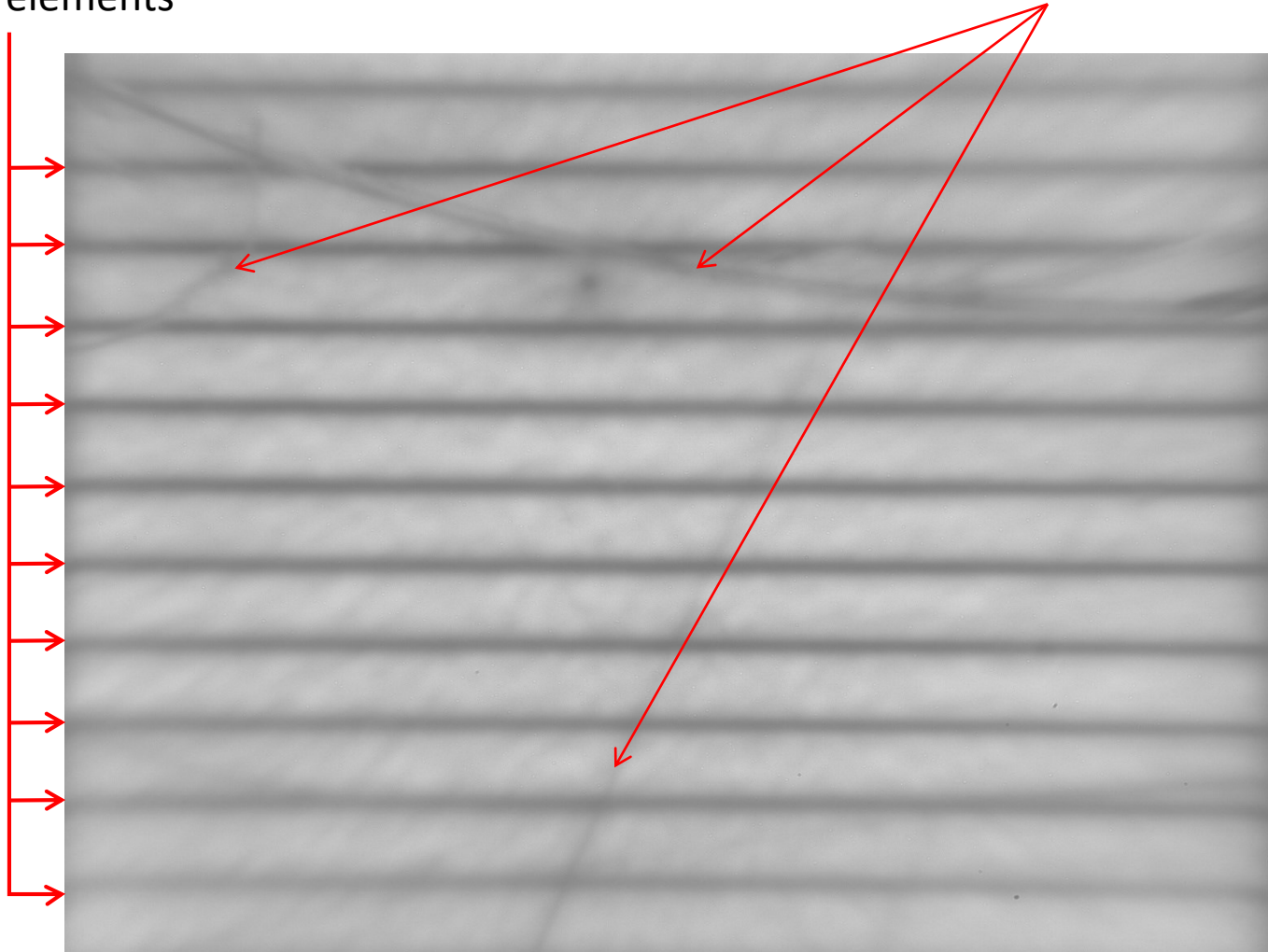
LED chip surface



# LED source image

Spaces between  
LED chip elements

Cracks in the LED  
protection glass

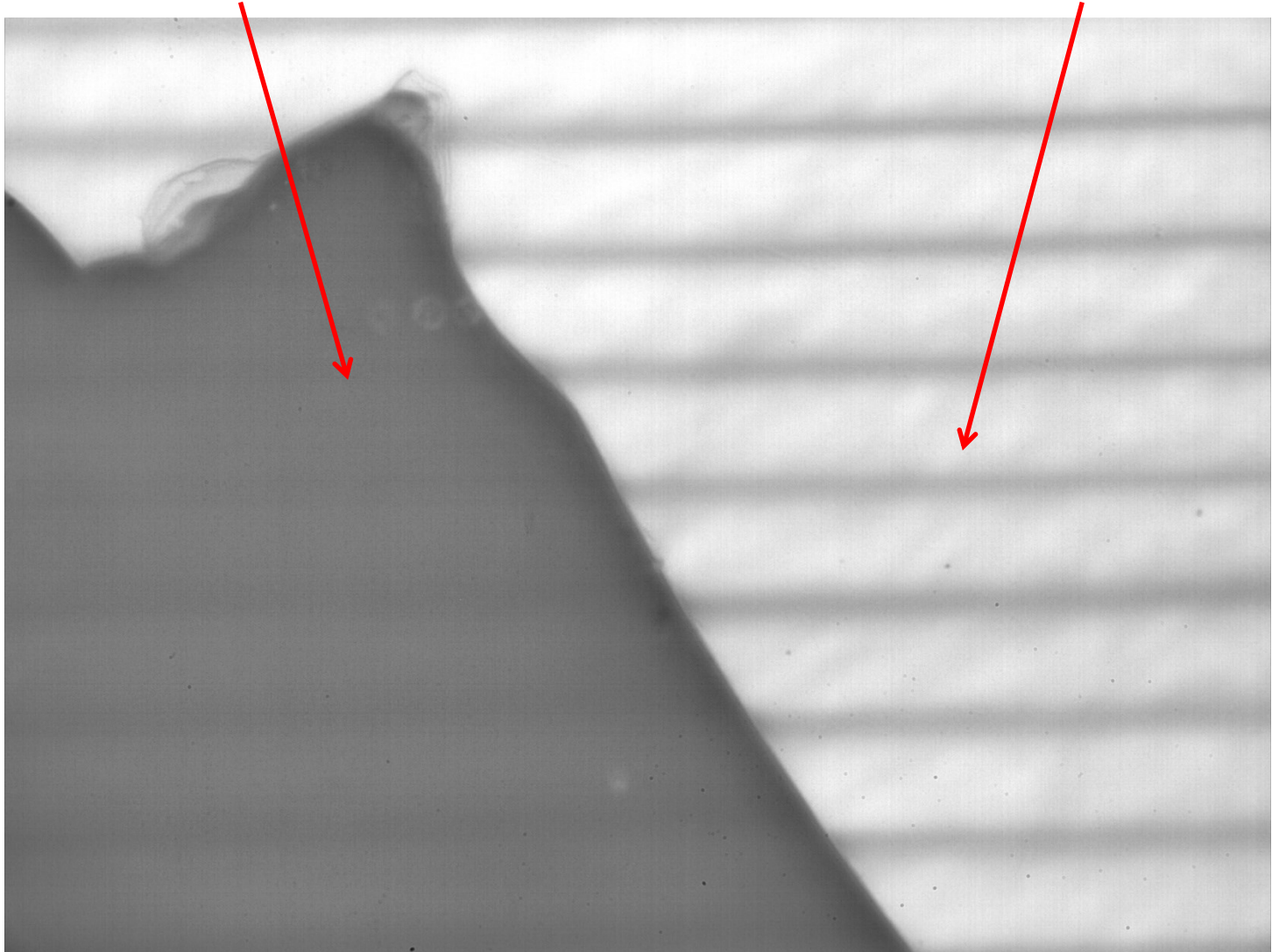




# Alignment with the camera

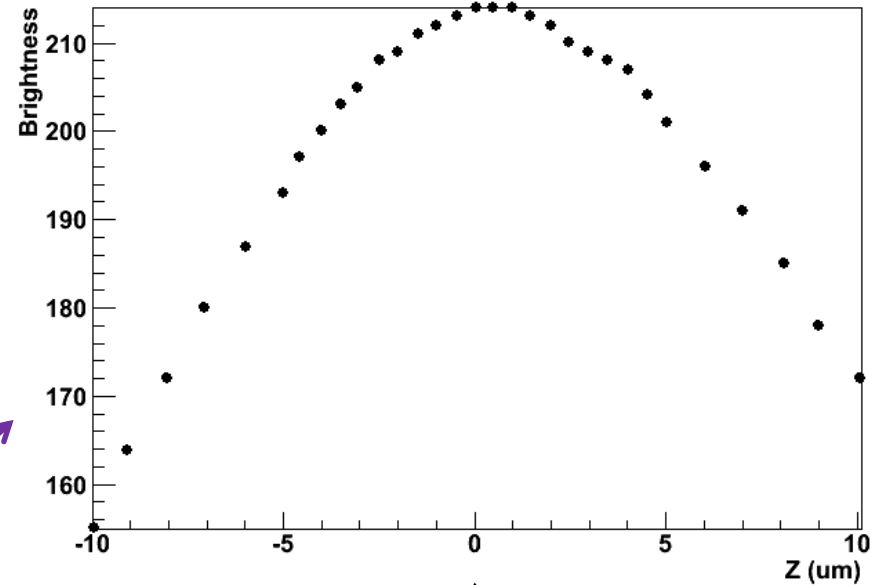
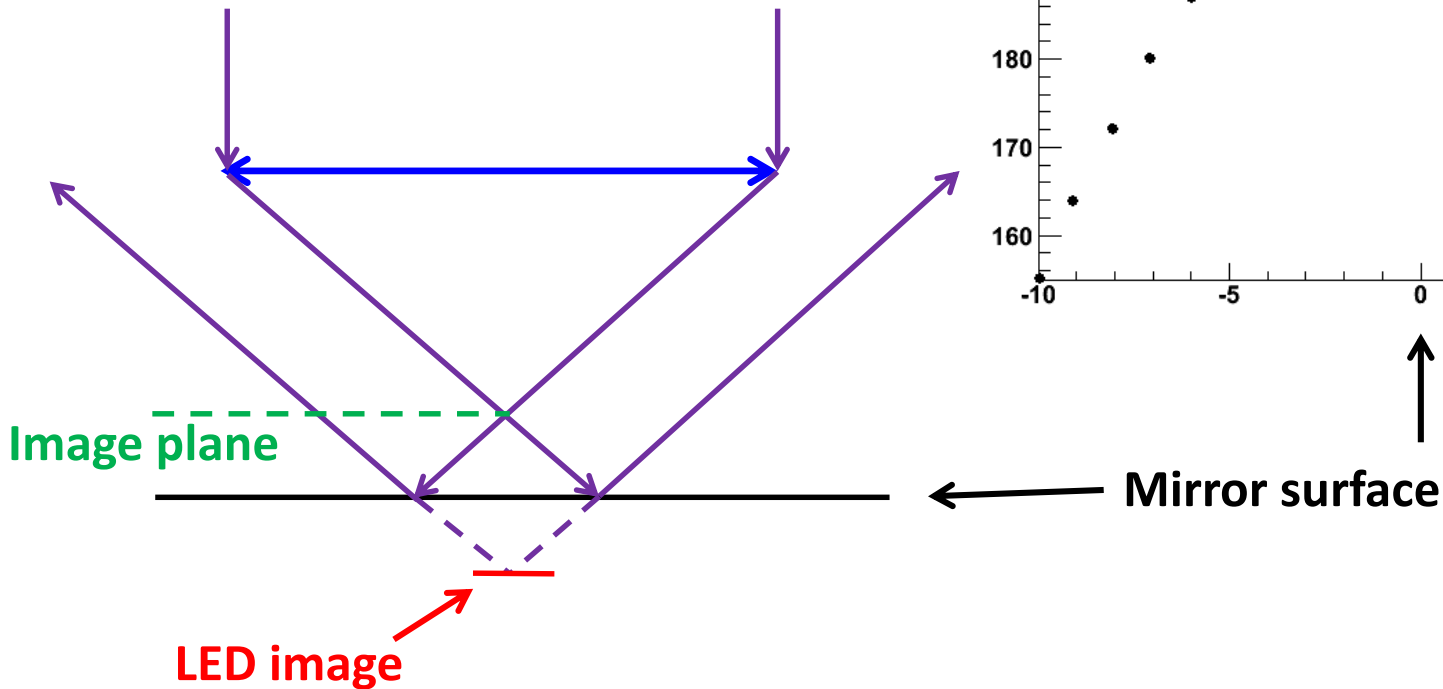
**Damaged mirror surface**

**LED image**

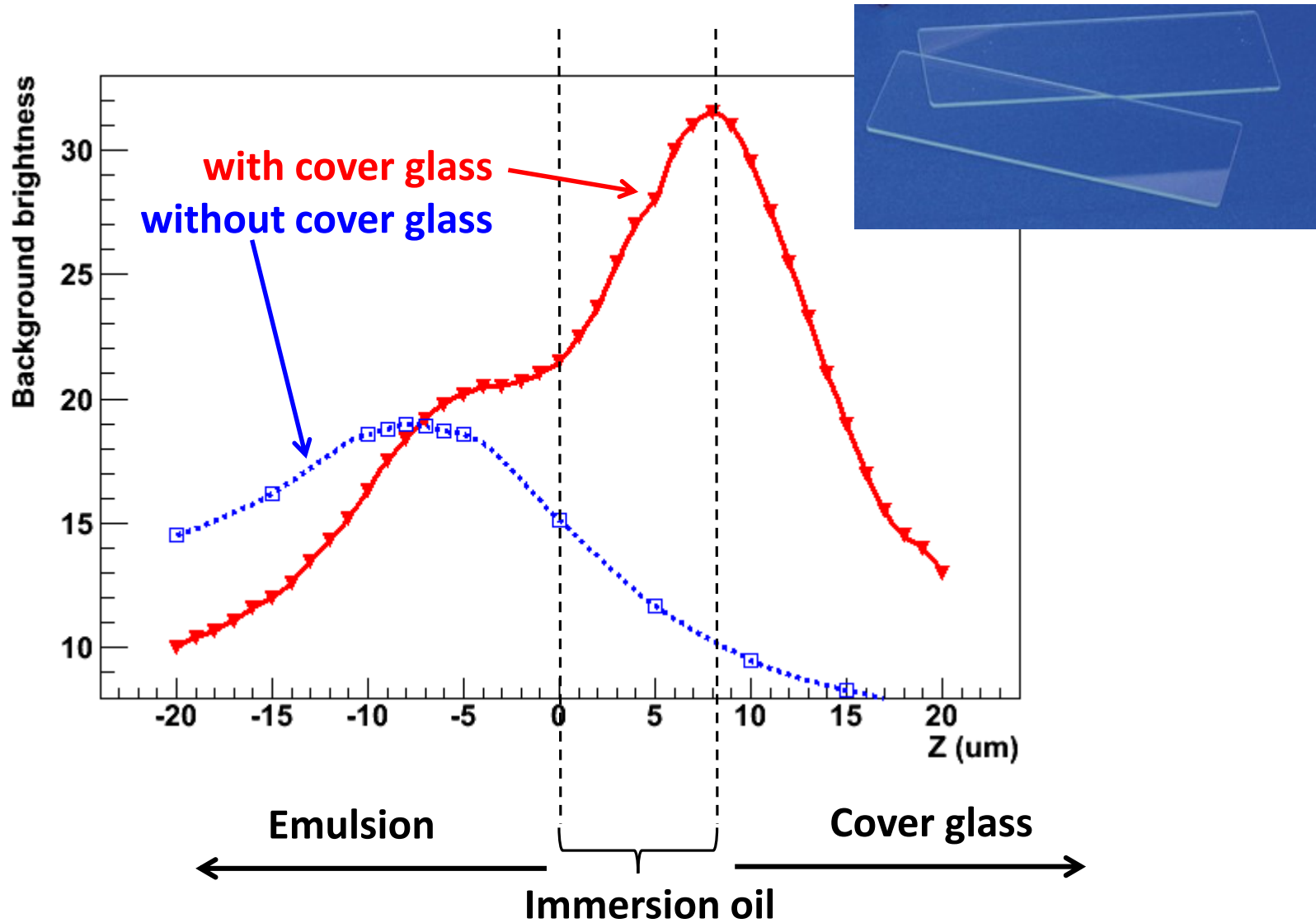




# Brightness dependency on depth

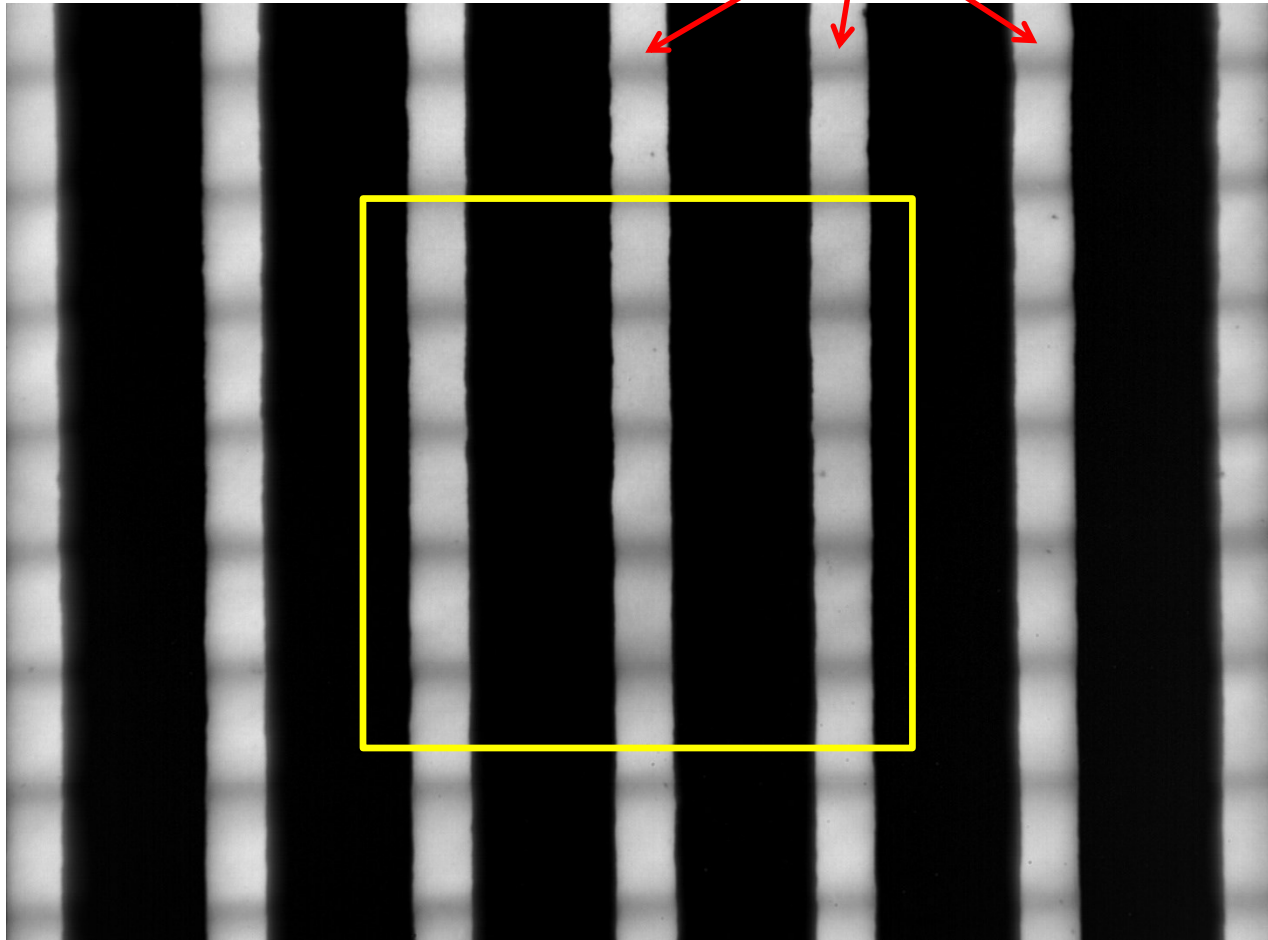


# Reflection from cover glass surface



Optical resolution

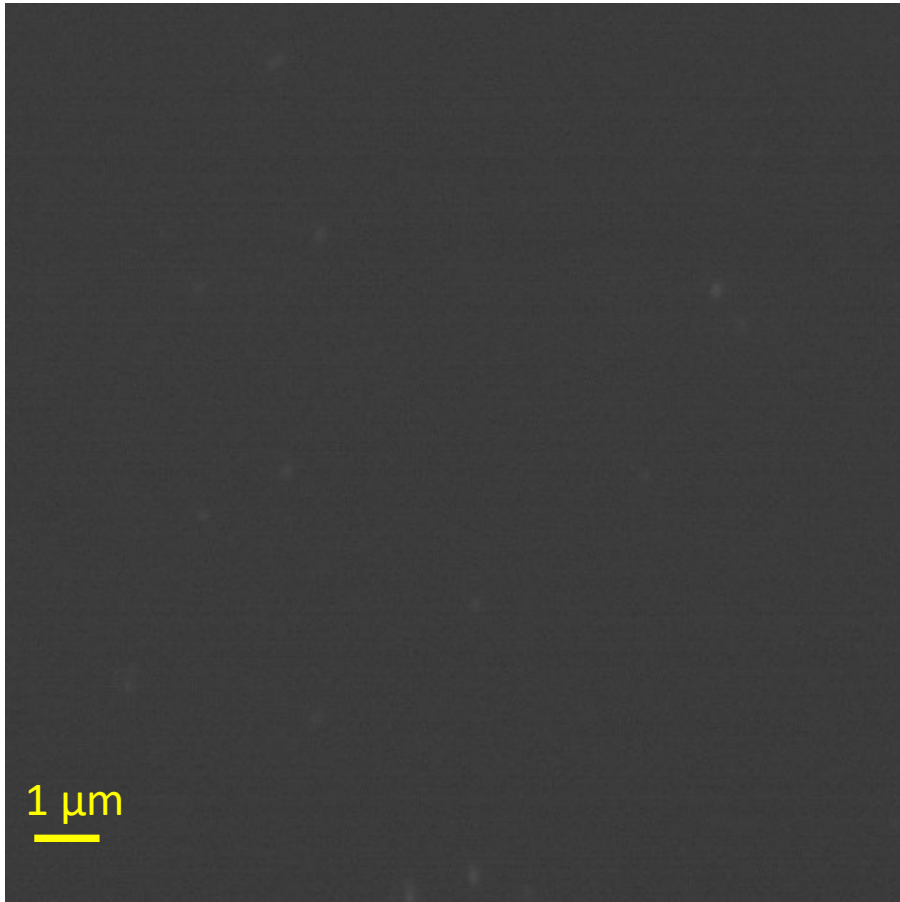
Micrometer ticks



**Average resolution = 200 nm**  
**Resolution in the central region = 190 nm**

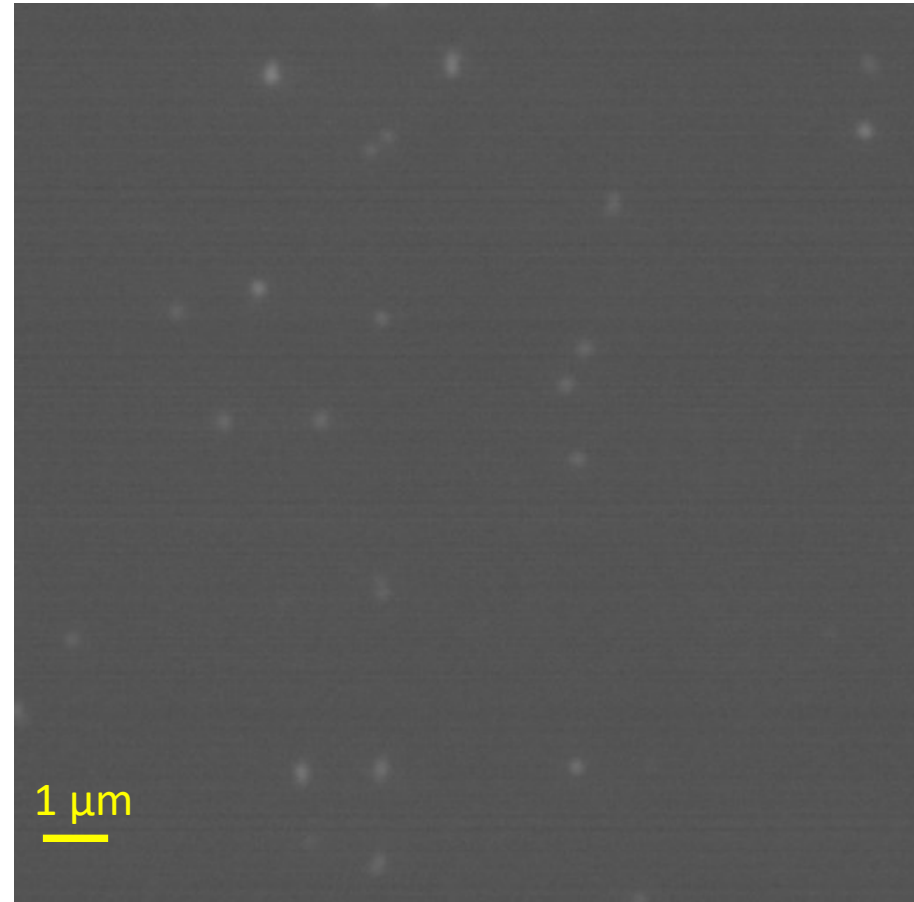
# Test with 100keV C-ions

**Old illuminator:**



**Background = 13.5**  
**Noise level = 1.0**

**New illuminator:**

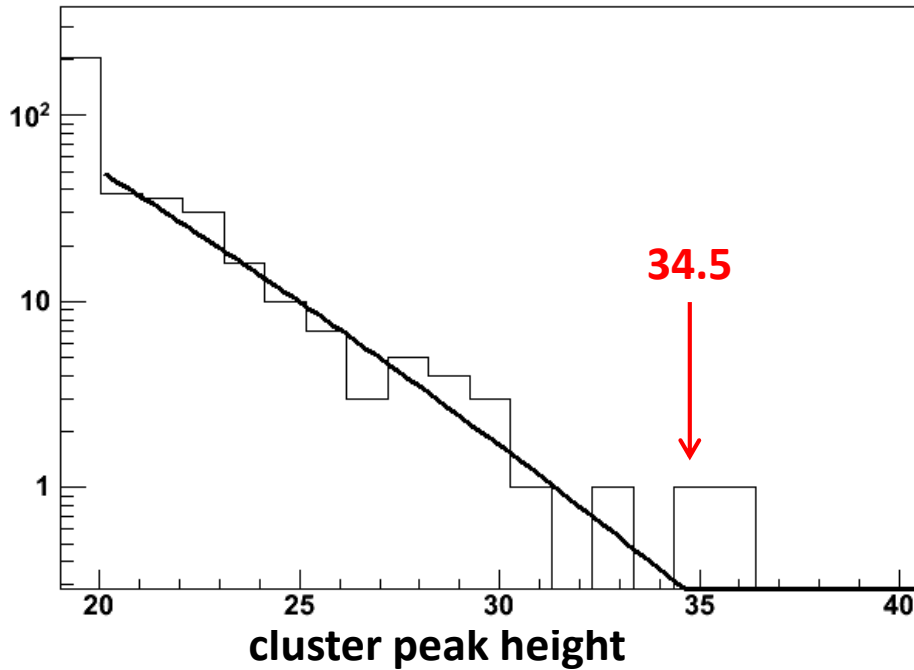


**Background = 28.5**  
**Noise level = 1.5**

**Identical conditions (except for cameras)**

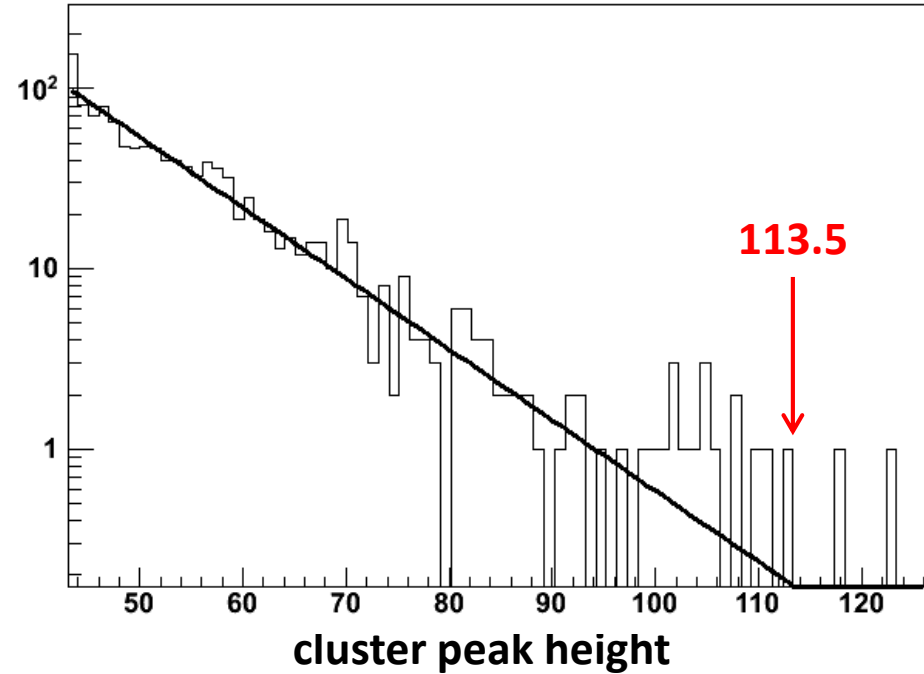
# Test with 100keV Carbon ions

**Old illuminator:**



**Signal range = 34.5 - 13.5 = 21**  
**SNR = 21/1 = 21**

**New illuminator:**



**Signal range = 113.5 - 28.5 = 85**  
**SNR = 85/1.5 = 57**

**4x increase in the signal range**  
**3x increase in the SNR**

# Summary

- New illumination system was tested
- Optical resolution  $\sim 200$  nm (190 in the center)
- Strong reflection from cover glass surface was observed
- 4x increase in the signal range was observed
- 3x gain in the SNR was observed

## Next steps:

- Test performance in automatic scanning
- Test performance with liquid crystal
- Assemble and test an achromatic version for white light