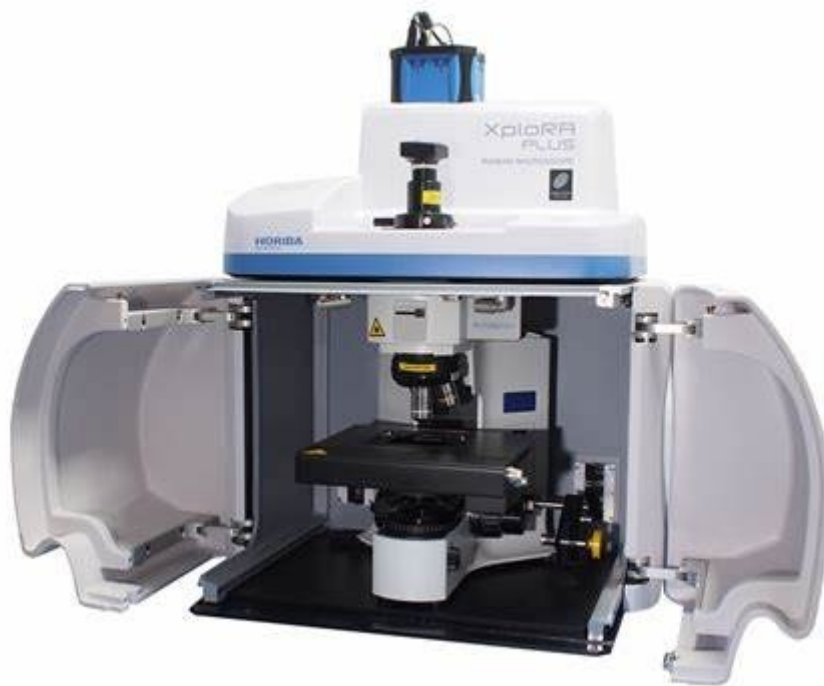


# Einführung

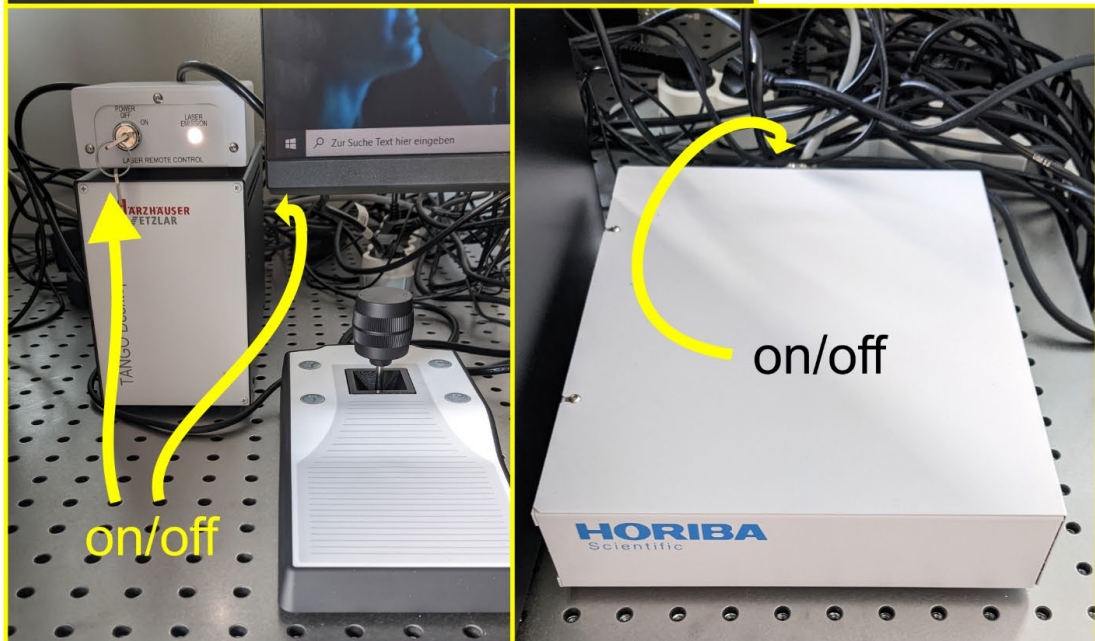
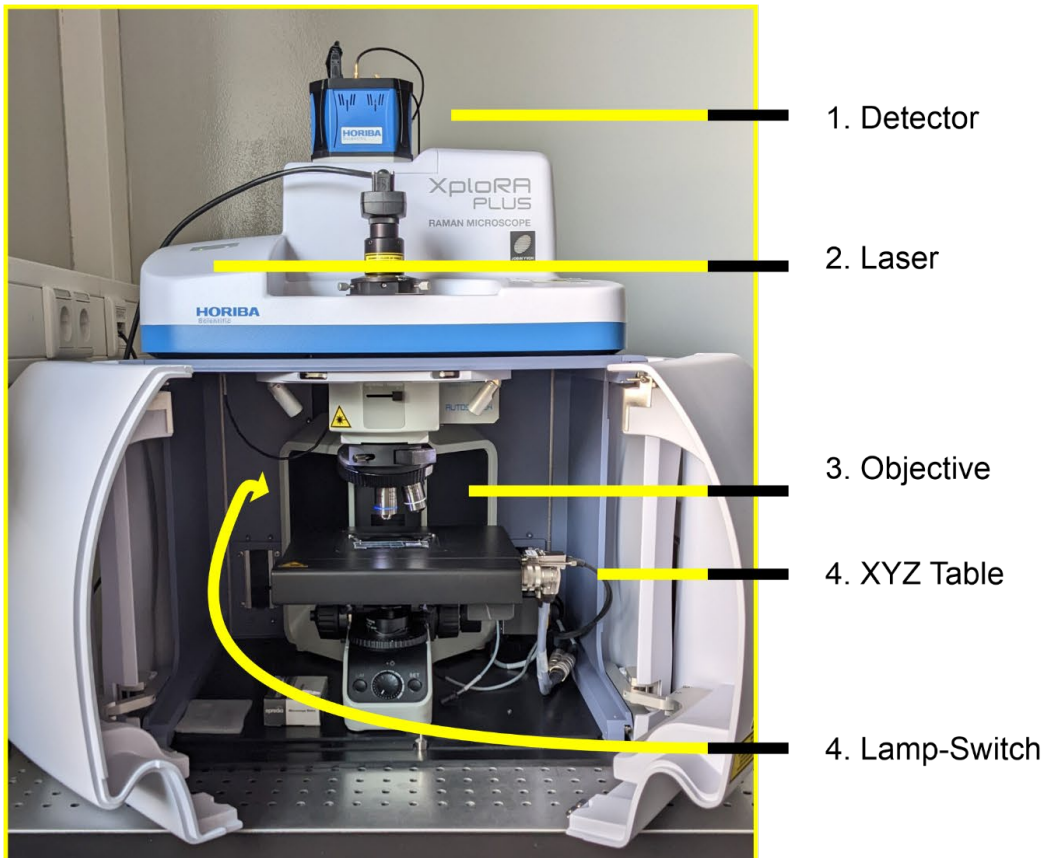
## XPLORA PLUS

FU Berlin  
Suprafab



This book is only a brief guide for instructed users.

## XPlora Plus - Overview



### Approximated spectral range of gratings

600: ~ 5100 cm<sup>-1</sup>; 1200: ~2700 cm<sup>-1</sup>; 1800: 1430 cm<sup>-1</sup>; 2400: 800 cm<sup>-1</sup>

## Starting the Machine

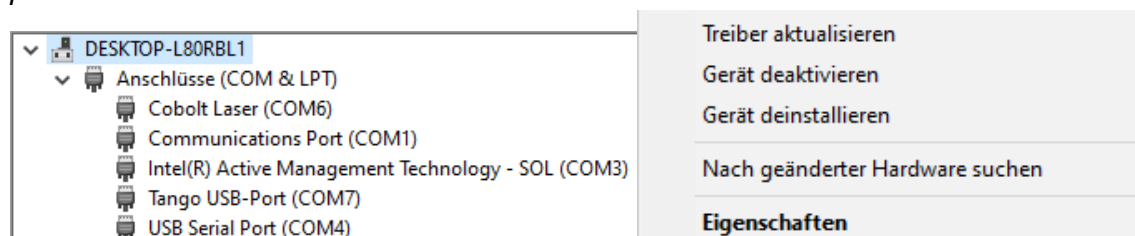
- Pre-Status: Microscope, Controller, Laser and PC turned off. Detector (1) is permanently running.
  1. Start the Machine...
    - a. Light source for *transmission if you need* (4)
    - b. Unlock the laser (5)
    - c. Marzhäuser stage (6)
    - d. Controller (7)
  2. Wait some minutes, **THEN** start the PC....
  3. Start LabSpec6 and wait until everything is initialized (2-3 minutes).
    - a. The software typically indicates “ready” in the lower left corner, but in fact the Marzhäuser stage is not yet initialized. It takes a minute until a message will appear to initialise the stage.
    - b. In the lower part - there may be a detector-warning for a short while if the detector was turned off as it has to cool down to -60°C. Just wait 2-3 minutes.
    - c. Usually, a message pops up in the corner that the controller was restarted.

*If the PC and software was started too early, there might be unexpected issues. Furthermore, we frequently observed that the camera and top-light were not initialized properly when everything was started too fast.*

### **How to solve the problem:**

**Slow:** A simple reboot and proper slow initialisation solved the problem.

**Fast:** Close LabSpec6. Go to DeviceManager (Gerätanager). If it does not look like in the image (Tango USB-Port Com7 is present) but an unknown device with yellow icon was found, simply perform a right click on it and deactivate + reactivate it. Start LabSpec6 again and the problem should be resolved.

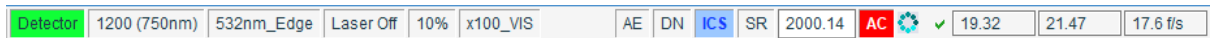


## Turning off the Machine

- Nothing special. Close the software and turn off all above-mentioned devices. If the CCD is needed to be turned off (via removal of the power plug), warm it up in a controlled way via LabSpec6 software before.

# LabSpec6 Software - Overview

## Status Bar (bottom)

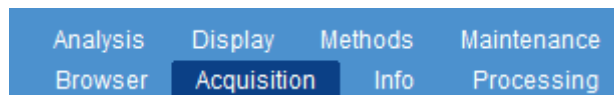


Quick information and access to most important and often needed functionalities, like from left to right ...

- detector status (here **GREEN**)
- grating, laser, filter, objective (also visible in the **ACQUISITION** tab to the right.
  - You can turn the laser on my hand by clicking on “LASER OFF”. It will turn green then.
- additional features from left to right (**BLUE** when activated)
  - auto exposure **AE**
  - denoiser **DN**
  - **ICS** (intensity correction)
  - ... **SR** or if spectral range is activated
  - spectral center
  - validity of auto calibration (**GREEN** if calibrated, **RED** if outdated)
  - system status (circle)
  - current position (x/y)

## Side Menu

Use this side menu to set parameters. Individual settings are outlined below.



If the x or y-axis are changed, you can adjust it in the DISPLAY tab.

You can process your spectra in the PROCESSING tab.

- Denosier
- Baseline correction
- Spike removal
- Integration of signals
- Etc...

## Measuring

Place your sample in the microscope, focus on the point of interest. Set your measurement parameter in the ACQUISITION TAB:

- Acquisition time
- Accumulations
- Grating / Laser / Filter
- Map dimension if you record a map.

## Useful functions

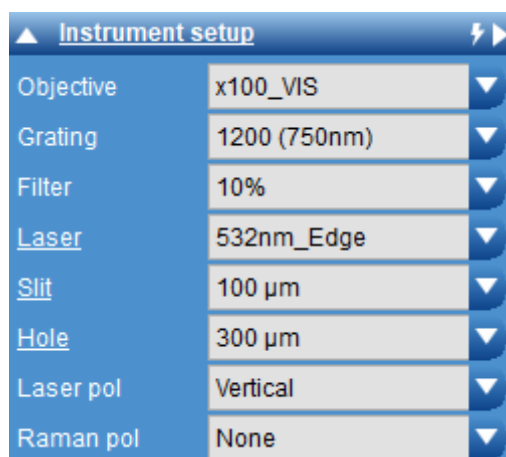
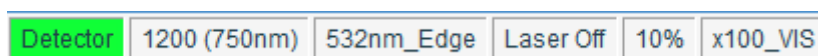
### Autocalibration:

Click on **AC** (autocalibration) in the lower part of LabSpec6 and a menu will pop up. While using the reference silicon wafer at the spectrometer as a reference material, the software can auto-calibrate the grating and offset automatically.



### Objective, Grating, Slit/Hole and the Illumination bar:

You can change the used objective, laser, filter (intensity) and grating in the lower part of LabSpec6 software or in the **acquisition**-menu on the right side. The same parameter and more you can find in the acquisition tab (*i.e.* Slit and Hole, Polarization). The value for illumination in the top right corner of the main window is set for each objective individually.



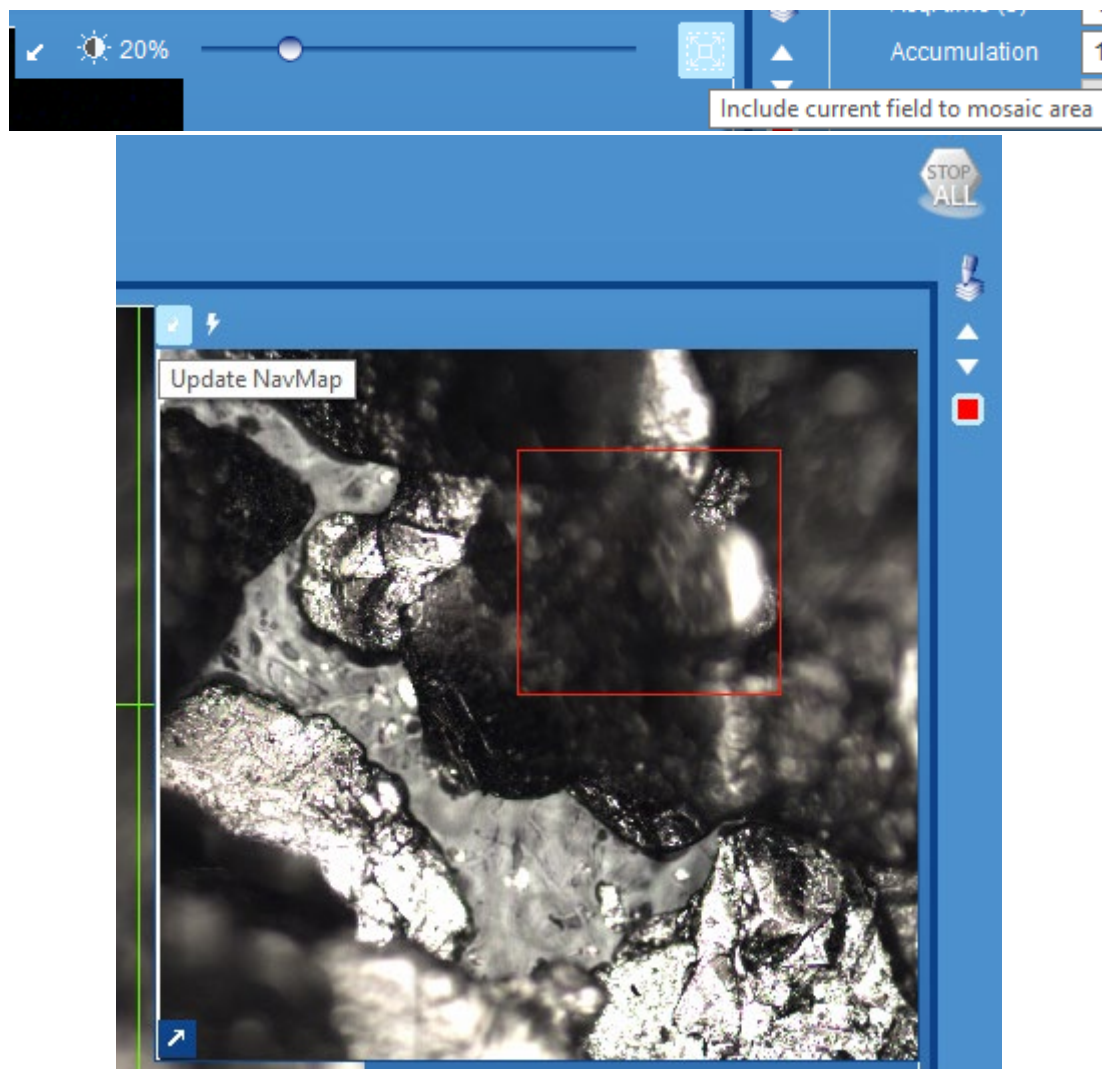
### Slit/Hole:

Using a smaller slit, less light is recorded by the CCD detector, but the spectral precision increases while a larger slit value results in more intense signals. Recommended Standard: 100 μm.

The hole defines the aperture the incident laser light has to pass before hitting the sample. A smaller hole results in a smaller signal, but the depth of focus is larger. With a larger hole, the spatial resolution increases as well as the signal intensity. Recommended Standard: 300  $\mu\text{m}$ .

### Mosaic image:

In the upper right corner of the main window next to the illumination bar you can see a small rectangular image. After clicking, one image is recorded and when you subsequently move the stage to another position, the edges of a rectangular area are defined. Take care that you choose the correct setting for the objective (10x, 100x, ...). When done, point on the mosaic image again and click on the button appearing. LabSpec6 will record a large mosaic image. Finally, click on **update NavMap**. The image is saved and can be used for navigation. Keep in mind that only the 10x and 100x objectives are matched due to technical circumstances!





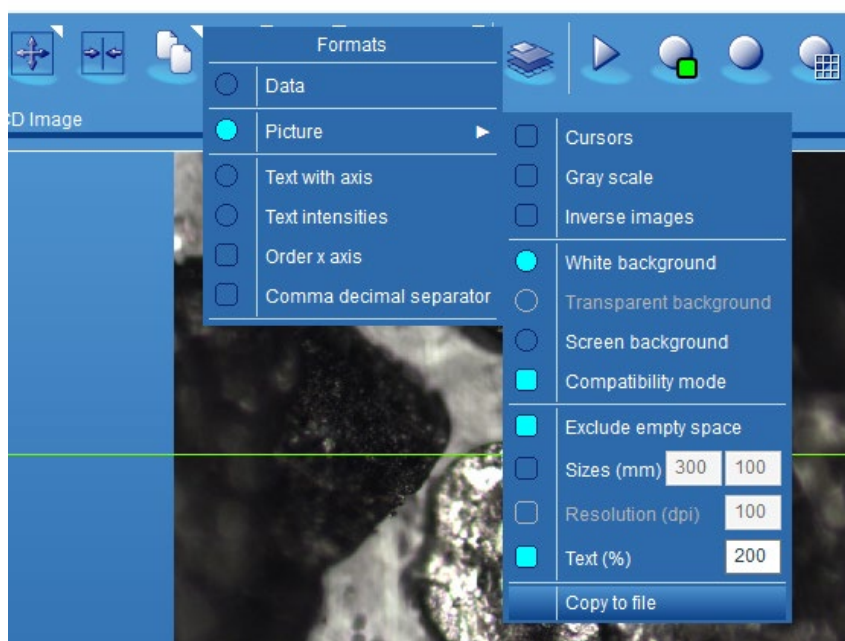
### Flatfield correction:

In a mosaic image you may clearly identify an unequal illumination of the video camera. This shadowing can be corrected by **flat field correction** to obtain nice single/mosaic images. Typically, there is no need to update this option unless you see dark linked in recorded mosaic images.

Should that be the case, use a flat, clean surface (e.g. silicon, silicon dioxide). Navigate out of focus to smoothen minor dirt particles on the surface. Right-click on **flat field correction** and acquire an image. Now, as long as flat-field is turned on, shadowing at the edges of the video image disappears. This process has to be done for every objective individually.

### Export Camera Image:

Go to **Copy** button in the top bar of LabSpec6 and click on the menu **picture**. Here, you can save the image of the video camera. Scale bar, axis etc... can be activated or deactivated via the menu **display** in the right hand menu.

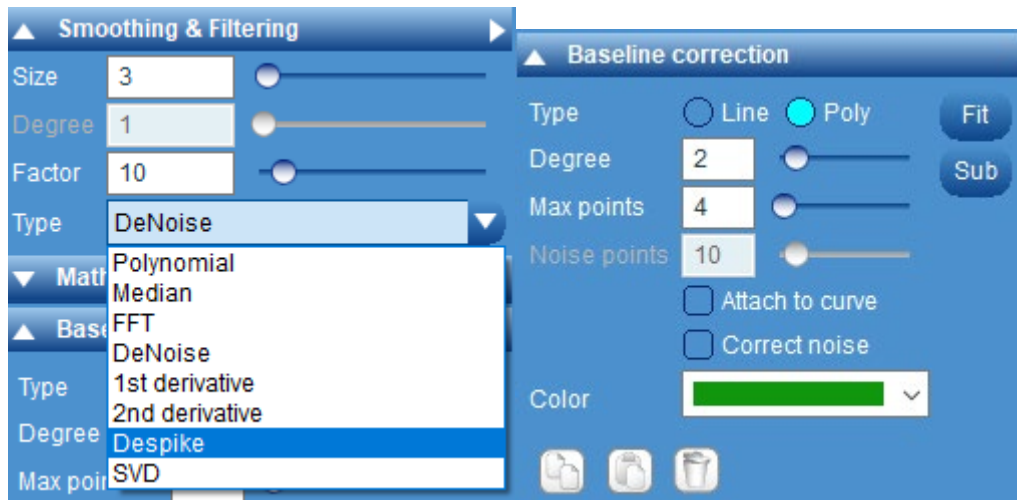


### Intensity Correction:

The detector has different sensitivity for photons with different energy. Especially towards higher wavenumbers, the sensitivity drops significantly. Thus, a calibrated white light source can be used to correct and compensate the detector related deviations.

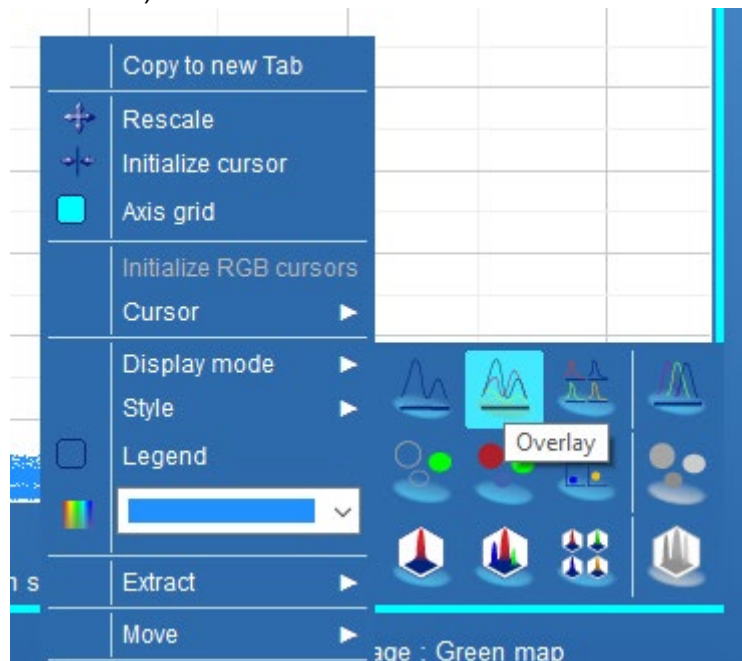
### Processing: Baseline correction, spike filter and denoise.

Here, you can apply baseline correction, or remove spikes and apply other manipulation of the spectra. For baseline correction, use FIT to preview the applied baseline with respect to the chosen parameter. Higher numbers are not always better, and individual spectra/maps may also need different parameters.



### Stacking and Shifting of Multiple Spectra

-> Tab: Spectra, lower left corner: Two bars. Only visible if the program shows multiple spectra (via right-click context menu).

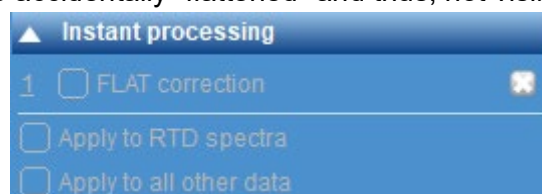


### Internal Camera and Top Camera

Top camera has a filter, but is high-resolution. Switch to the internal camera to see the green laser with certain filter depending intensity.

### FLAT correction

Instantly processes recorded spectra: applies baseline correction. Can be a problematic feature as signals can be accidentally "flattened" and thus, not visible anymore.





## Notes

The 532 nm laser is always off and switched on when the measurement is started. However, as it needs to needs some seconds to stabilize its intensity. Thus, after starting a measurement, there will be a slight delay (typically between 1-3 seconds until the collection of spectra will start. The green light indicates only when spectra are collected, but your sample is already exposed to the laser during this heat-up phase from the moment click on any record button. This time is defined by the administrator of the machine in a hidden menu and can be changed if needed.

If the CCD detector suffers from a memory effect, you can warm up the detector in the software by hand and cool it down again in a controlled manner.

Only the 10x and 100x objectives are matched against each other. XYZ positions may be not the same for other combination of objectives.