

### Quick summary

#### Start

- Login
- Vent the chamber, then load your samples (tallest on the right)
- Pump the chamber + Assure the door is tightly closed / Lean against the chamber door
- Home the stage during pumping

#### Beam

- Switch on the beams
- Choose a proper HV setting / Beam intensity
- go to minimum magnification (< 100X), find your sample
- Focus and link your image

#### Sample

- Eucentric height: decrease the Z position iteratively until Z=7mm. CTRL+F
- Perform beam coincidence point: go in steps to 52°. Use MMB to shift the Z position
- Match e-beam and ion beam using Shift + LMB. Use ion beam shift.

#### Data

- Define image scanning properties
- Record your data
- Save data on D:/sharedData

#### End

- Secure your data through the support PC
- Remove your samples and pump the chamber + + Assure the door is tightly closed / Lean against the chamber door
- Switch off the e beam and the ion beam and Log out



**adolphe merkle institute** | UNIVERSITY OF FRIBOURG SWITZERLAND  
excellence in pure and applied nanoscience



**adolphe merkle institute** | UNIVERSITY OF FRIBOURG SWITZERLAND  
excellence in pure and applied nanoscience

## Focused ion beam

### Introduction

Version 7 – May 2023



**Notes:**

### Demonstration: saving data in Maps 3.3

#### Prerequisites:

- Sample loaded
- Sample at eucentric height
- Electron beam on
- Maps software started

#### Saving images

After a tile scan was recorded, it can be saved.

#### Experiment: save tile scan

Click the 'Save image to file button'



Select the region you want to export

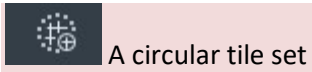
## *Universal rules*

**Rule 1: don't touch a control if you are not sure of the outcome of that action**

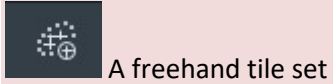
**Rule 2: never, ever force anything beyond finger strength**

**Rule 3: wear gloves when touching anything that goes into the chamber**

**Rule 4: if in doubt, ask for help**

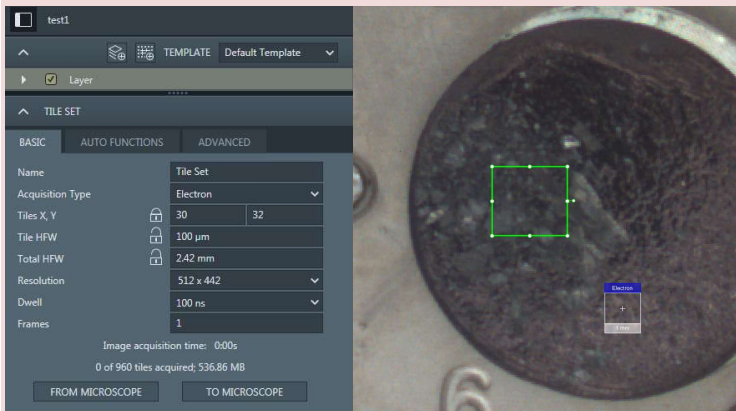


A circular tile set

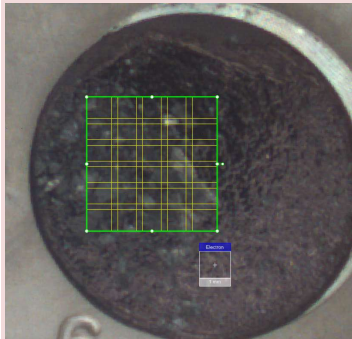


A freehand tile set

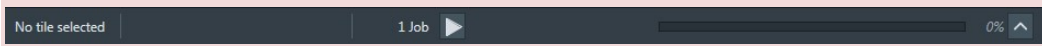
Use the appropriate pattern and draw on the region of interest. Then, from the left menu, click **'From microscope'**



This reads the settings of the microscope and calculates the number of tiles that are required. The image is updated:



Run the tile scan by clicking the run icon at the bottom (1 job waiting):



- Demonstration: xT microscope server.....6
- Demonstration: Login onto the FIB software .....7
- Demonstration: System status .....8
- Demonstration: Loading a sample.....9
- Demonstration: Beam control .....12
- Demonstration: The inside of the e-beam.....14
- Demonstration: First glimpse of your sample .....18
- Demonstration: Eucentric height.....19
- Demonstration: Nav Cam photo.....20
- Demonstration: Basic SEM imaging.....21
- Demonstration: Beam and lens parameters.....23
- Demonstration: Imaging settings .....24
- Demonstration: Image presets .....26
- Demonstration: Align Feature / scan rotation.....27
- Demonstration: Column cases.....28
- Demonstration: Detectors .....30
- Demonstration: Beam deceleration .....33
- Demonstration: correlative microscopy (Maps 3.3).....35
- Demonstration: saving data in Maps 3.3.....37

### Demonstration: correlative microscopy (Maps 3.3)

#### Prerequisites:

- Sample loaded
- Sample at eucentric height
- Electron beam on

Start the Maps 3.3 software



Select Maps 3.3 from the top left FEI menu:



Or double click the icon on the left screen:

The software will open and request to open an existing project, or start a new project. Note: each project's name must be unique. Make sure you save on the support PC!

**Experiment: import the nav-cam picture**



on the top right, click this button to load the nav-cam picture from the Xt software.

Note: the precision of this image is not very great. Expect mismatches of several mm.

**Experiment: create a tile-scan**

**Step 1:** setup a single image in the Xt software (see above)  
Calculate the resolution =  $HF\!W / \text{pixels along the x axis}$

**Step 2:** Click the tile scan icon in Maps  
There are 3 types of tile scans:



A square tile set

### Demonstration: xT microscope server

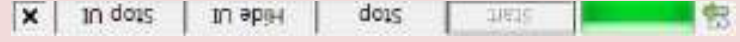
#### Prerequisites:

- MPC (microscope PC) and SPC (support PC) switched on
- Login: User (password: user)

Start the server

**Experiment**

Find the tiny view server bar at the top right of the central screen:



The xT server must run in order to use any FIB function. It runs when you arrive at the

FIB.

**YOU NEVER LOG OUT, YOU NEVER SWITCH OFF THE PC'S**

Start not enabled = server is running

Stop enables = server is running

Hide UI hides the user interface (will become start UI when switched off)

Stop UI closes the user interface

If the user interface is not active, start it by clicking "Start UI"

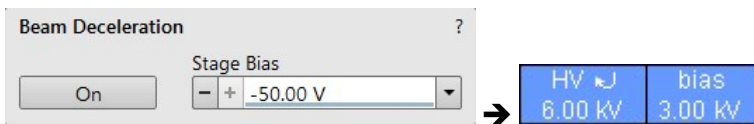
Notes:

Conversely the BSE heading nearly parallel to a surface (which normally cannot be detected) are driven to a detector.

By changing the Stage Bias an output angle of electrons leaving a surface can be changed.

OptiPlan and OptiTilt mode will apply a stage bias.

The stage bias, typically 20V, will push the escaping electrons back up. This increases the electron yield on the in-beam detectors T1 and T2. When active, note the small arrow after the KV value. The beam deceleration accelerates the beam in the column by 8 kV (this reduces chromatic aberration in the lenses) and decelerated before the beam exits the pole piece.



## Demonstration: Login onto the FIB software

### Prerequisites:

Running xT server  
Running UI

### Action:

Login using your FIB account

## Load the personal settings and history of the user

## Experiment

After startup of the User interface (UI), a username and password are requested.



Username: your last name, no capitals, no accents, umlauts, etc.

Password: your first name (no capitals, accents, umlauts, etc.)

Click logon

For the training:

Username: Training, Password: training

**Demonstration: System status**

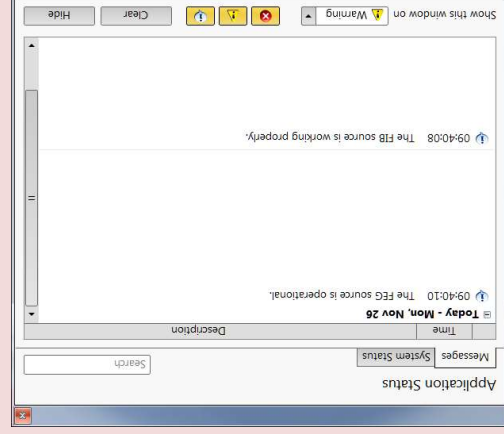
**Prerequisites:**

Running xT server  
Running UI and successfully logged on

Notice the application status

**Experiment**

A separate window will appear (usually on the rightmost screen: the application status, which will contain messages from the system. These will contain any errors that occurred.



You can close the application status window. You will see new messages in the bottom bar of the UI. Clicking the message button will reopen the application status window.

**Demonstration: Beam deceleration**

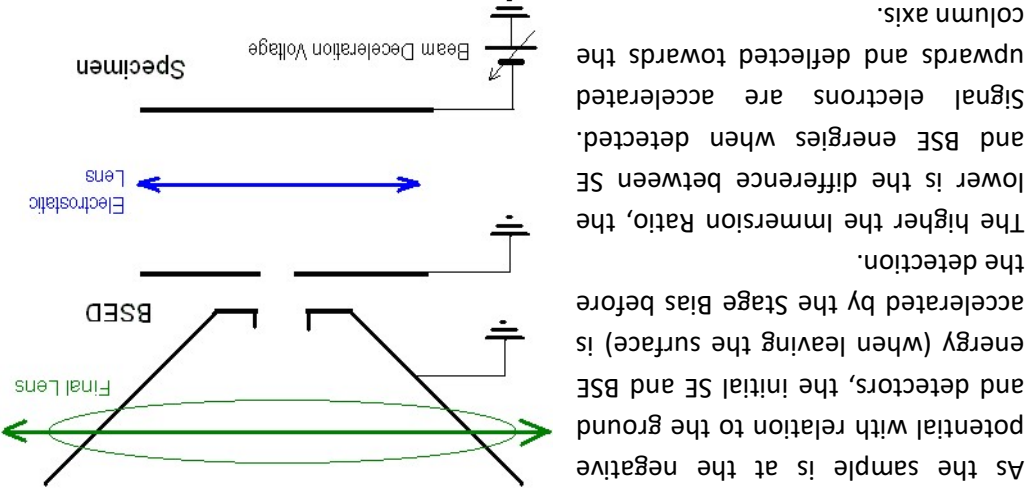
**Prerequisites:**

Imaging of samples

Learn about beam deceleration

The Beam Deceleration (BD) mode is based on a negative voltage (bias) applied to a stage (i.e. a sample). The electrical field between the sample and the nearest surface over (a column bottom or a detector) is formed, acting as the additional electrostatic lens. Its power is described by the Immersion Ratio parameter:

$$ImRatio = \frac{HV}{HV + Bias}$$



As the sample is at the negative potential with relation to the ground and detectors, the initial SE and BSE energy (when leaving the surface) is accelerated by the Stage Bias before the detection. The higher the Immersion Ratio, the lower is the difference between SE and BSE energies when detected. Signal electrons are accelerated upwards and deflected towards the column axis.

**The secondary electrons**

The SE's have a low initial speed and they are usually absorbed into the detector central hole, continue through and can be detected by in-column detectors (T2). Equally like the BSE heading upright.

**The back scattered electrons**

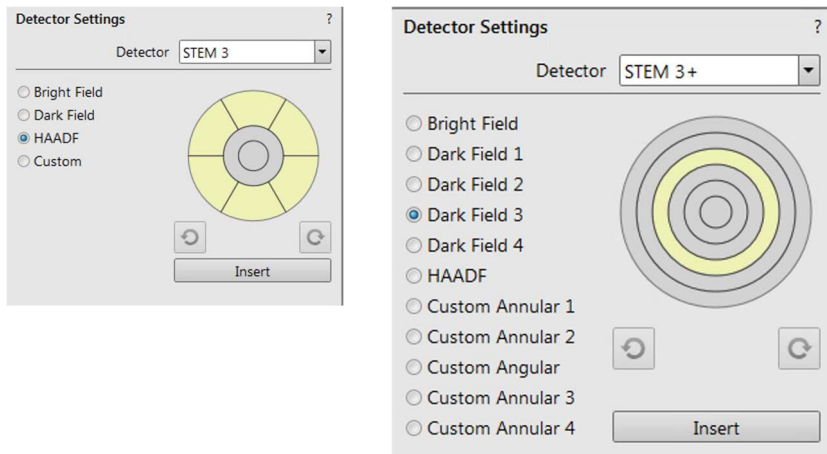


lens collision when tilting large samples!

Select the CBS or ABS from the Detector Settings module > Detector list box. Choose the required diode segment(s) by selecting the relevant radio button. The Custom mode is used to define the segments to be used for detecting. Clicking on the + / - sign in particular segment activates it to add (yellow background) / subtract (blue background) the segment signal. By double-clicking on the segment its background turns grey and it is switched off. The Contrast button equalizes signals (contrast) from different segments not to override one another. Distribution of electrons collected by detector segments changes with setting of working distance, lens mode and Beam Deceleration mode. It is also possible to set different concentric segments in particular displays and thereafter to use the Enhanced Image module / Mix 3 or Mix 4 tab to mix color coded signals to create color images.

**SCANNING TRANSMISSION ELECTRON MICROSCOPY: STEM and STEM+ detector**

This detector is retractable and is mounted below the sample. It is only useable in conjunction with the rowbars. The detector has selectable segments that allow to operate the diode in Bright Field, Dark field and High Angle Annular Dark Field mode. The resolution of the STEM is 0.9 nm maximum.



**EDX DETECTOR: analytics**

Not part of this introduction.

**Demonstration: Loading a sample**

**Prerequisites:**


- Running xT server
- Running UI and successfully logged on

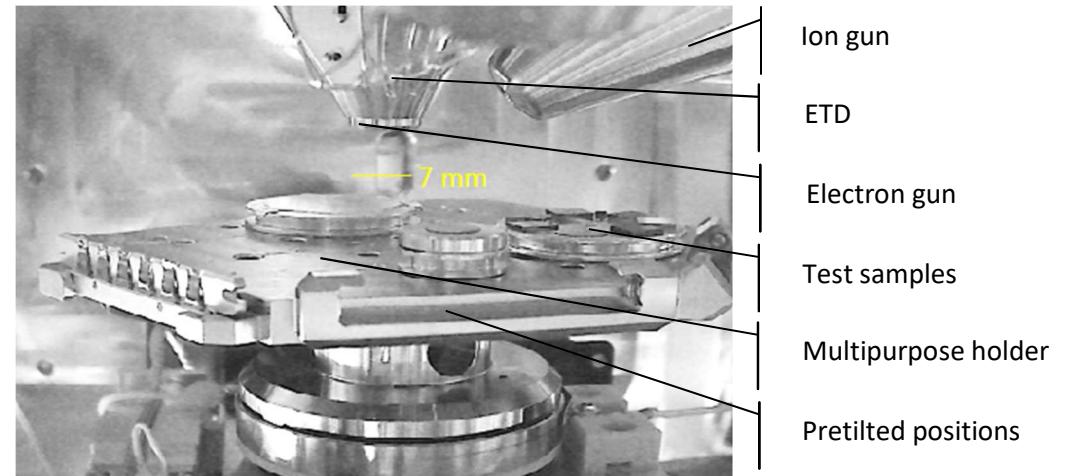
**Action:**

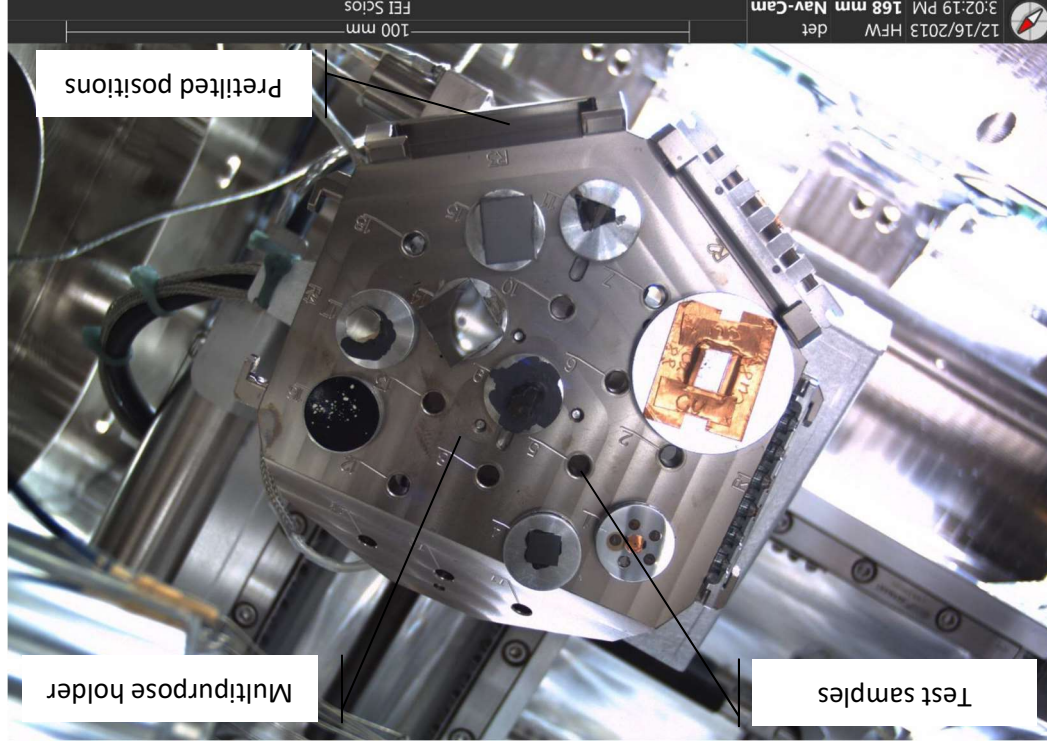
- Load samples

**Vent the chamber. Understand the height prerequisites of the load samples**

**Experiment**

Click the sample exchange button  on the top left of the central screen. The Sample exchange window appears. Under Chamber, click vent. A venting confirmation will ask you to confirm the 3 minutes venting cycle. Click vent and wait 3 minutes (the green bar at the bottom shows the progress).



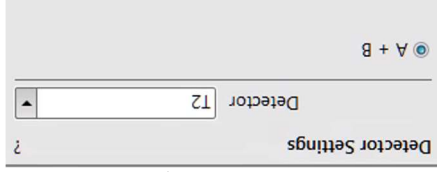


- Experiment: mounting the samples**
- Gently open the stage
  - Place the stubs in an empty slot on the multipurpose holder.
  - Make sure that you place:
    - the tallest samples on the left,
    - the lowest on the right (this avoids pole touches while tilting).
  - Gently close the chamber. There is no lock.

In the Standard column Use case, the T1 provides strong BSE contrast at accelerating voltages of 5 kV and higher. The active detector area is split into two halves and the detector can be operated in four modes. Apart from the composite mode A + B the detector can be operated in the topographical mode A - B, where a pseudo-topographical imaging with suppressed atomic number contrast and maximum topographical contrast is obtained. Signal from each half can be also collected separately in mode Segment A / B.

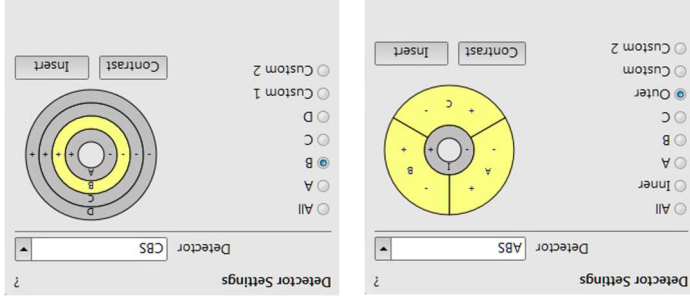
### IN LENS SE DETECTOR: Trinity 2

The T2 detector is primarily designed to collect secondary electrons (SE) and provides information of the sample topography in the OptiTilt and OptiPlan column Use cases. It can be operated in Standard column Use case as well. In this case, backscattered electrons are collected, but the accelerating voltage must be 5 kV at least. The intensity of the signal in the Standard column Use case is dependent on the beam current and working distance – the higher the beam current and shorter the WD the higher the T2 signal. There are no options to select.



### RETRACTABLE BSE DETECTORS: CBS and ABS<sup>3</sup> detector

The CBS uses concentric segmentation of the detector diode to distinguish between backscattered electrons scattered close to the beam axis – inner segment (preferentially composite contrast) and electrons scattered far from the beam axis – outer segment (more topographical signal). **Do not use the detector with high ion beam currents** (the solid state diode can degrade). When working with ion beam for longer time, retract the detector! Be aware of sample and final



### Concentric and Annular backscattered electron detector

## Demonstration: Detectors

### Prerequisites:

Imaging of samples

## Overview of all installed detectors

The system has 8 detectors installed.

### STANDARD DETECTOR: ETD (=Everhart Thornley detector = standard SE detector)

Detects low energy (=secondary electrons) electrons generated by the primary beam interaction with the specimen surface. It is permanently mounted in the chamber over and to one side of the sample.

**Mode:** keep this the Secondary electrons  
**Grid voltage:** Bias applied by the collector. The higher, the stronger SE (and noise) are attracted. Sweet spot at +250 V. Negative voltage repels SE from the ETD detector and only BSE are detected.

### IN LENS BSE DETECTOR: Trinity 1

Electrons generated by a primary beam can be collected by the in-lens Trinity detectors T1 and T2, which are located inside the final lens. Whenever the T1 or T2 is selected, the

CCD camera infra-red LED's are switched off not to emit the photons. The T1 detector is primarily designed to **collect backscattered electrons (BSE)** and provides composite sample contrast. In the OptiTilt and OptiPlan column Use cases, it detects backscattered electrons through the whole range of accelerating voltages.

## Experiment: pump the chamber

- In the sample exchange window:
  - Sample cleaning (optional)
  - Do **not** select 'Take Nav-cam Photo',
  - Do not change the root folder settings.
  - Make sure multipurpose holder is selected
- Switch to the vacuum tab and locate the TMP1 reading (bottom right, under 'Gauges'). It should have the value 0%.

**Keep the door firmly closed by leaning against the chamber door closed with your arm. This is extremely important!<sup>1</sup>**

- Click the Pump button in the exchange window.
- Keep leaning against the door / holding it tight until you see the TMP1 value increasing (about until you stop hearing the rotation pump in the back). Usually, this is about 5% of the TMP1

While waiting for the vacuum, you can home the stage: **Stage > home stage.**

After pumping, you should reach a chamber pressure of about  $1 \cdot 10^{-2}$  Pa. This is not sufficient for a focused ion beam yet ( $1 \cdot 10^{-4}$  Pa is needed), but it allows e-beam imaging. Pumping will go on in the back.

<sup>1</sup> If the door is not properly sealed, an overheat safety will halt the pump. The pump (and the system) can only be reset by a technician. Hence, not sealing the door will mean the end of your session and about 1 week of downtime for all other users.

**Demonstration: Beam control**

**Prerequisites:**

Sample loaded  
Pressure at  $1 \cdot 10^{-2}$  Pa or lower

**Starting the e beam**

On the right side of the central screen, an icon based menu is available. Some of these icons may be available:

← **Beam control**

Navigation

Detectors

Patterning

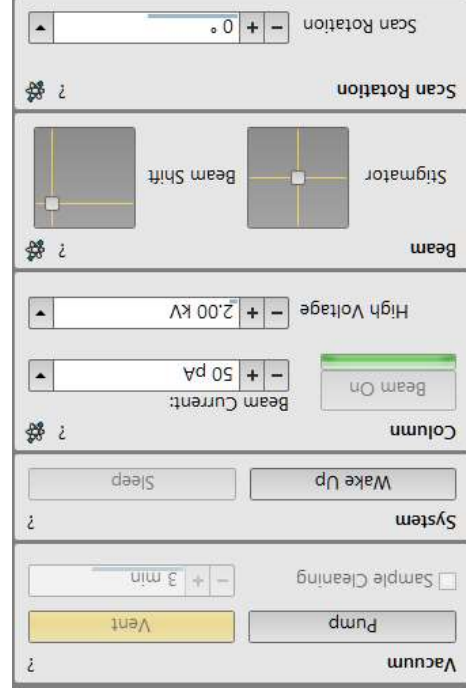
EasyLift

Direct adjustments

Sample preparation

Column presets

Alignments



Beam control

This is the survey and TEM sample preparation mode. It is ideal for navigating and reviewing sites at lower magnifications. Maximum beam current is limited to 13 nA. --

- A-tube: no current

- Typical detector: ETD

- Advantage: largest field of view, all currents available

- Disadvantage: not suitable for high resolution (no beam deceleration)

**OptiPlan mode**

This mode is used for ultrahigh resolution electron imaging at 0° of the sample at short working distances (1 – 2 mm. Exceptionally not at 7 mm). The A-tube is at the highest potential and the T1 and T2 detectors should be used. Full range of the Beam

Deceleration mode (see below) is available.

Typical detector: T1 & T2 (note that the ETD detector signal will drop)

WD can be set to < 5 mm (you anyway will not tilt, it is only useful at 0°)

Advantage: high resolution, more signal

Disadvantage: smaller field of view, not all currents available

**OptiTit mode**

The OptiTit Use Case is optimized for operation at eucentric working distance (i.e. 7 mm, 52° tilt). It is ideal for FIB cross section preparation and subsequent ultra-high resolution electron imaging at low accelerating voltages. The A-Tube is on the high potential, the T2 or ETD detectors are used to obtain topographical images and T1 to gain the composite information. A small positive stage bias (see below) to improve the image quality is applied automatically when the stage is tilted.

Typical detector: T1 & T2 (note that the ETD detector signal will drop)

WD should be at 7 mm (or about there, depending on BCP)

Advantage: high resolution at 52°

Disadvantage: smaller field of view, not all currents available

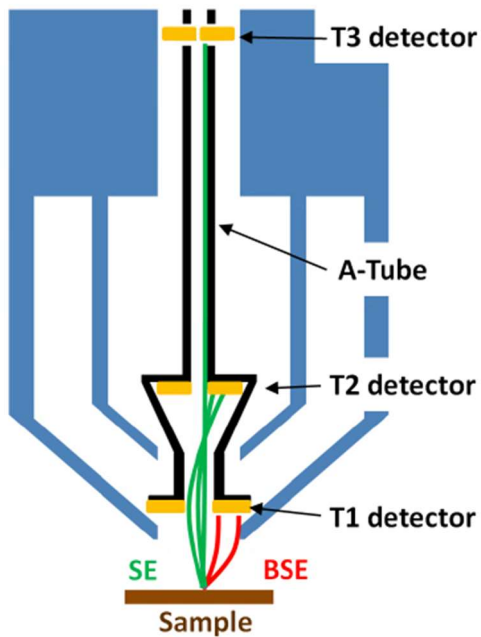
**Demonstration: Column cases**

**Prerequisites:**

- Eucentric height
- Nav cam recorded
- Image parameters sets

**Learn about the three column cases: Standard, OptiPlan, OptiTilt**

The electron column can be operated in different Use Cases optimized for specific applications: Standard, OptiTilt and OptiPlan.



In the OptiTilt and OptiPlan Use Cases primary electrons are accelerated by the potential of the Acceleration tube (A-Tube) and pass through the column at high energy (i.e. reducing aberrations). They are decelerated between the T1 detector and the sample. Secondary as well as backscattered electrons are also collimated into the final lens by the A-Tube electrostatic field and detected by detectors T1 and T2.

Standard mode

**Experiment**

Click in the top left quadrant (the SEM window). Then click the top icon (Beam control)  
 - Click Wake up  
 - Click beam on  
 Under the **column tab**, click **beam on**. You should hear a click from the back.

**Stage navigation**

- Goto / stop button stage movement
- Stage position in X,Y, Z, tilt angle and rotation
- Saved positions
- Stage view from Nav Cam

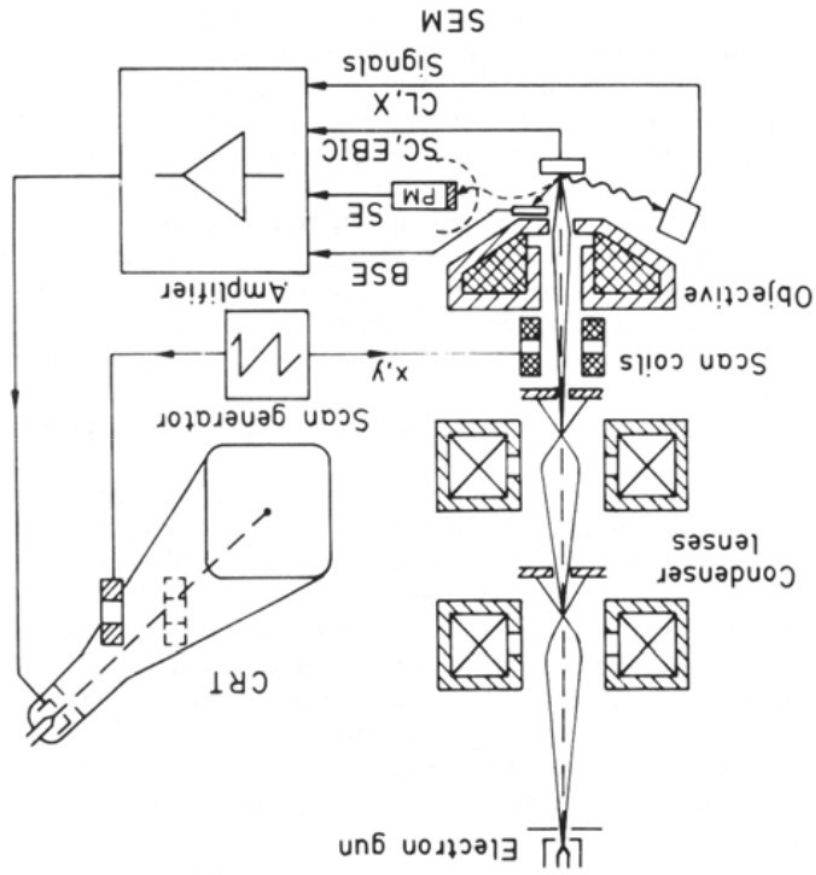
**Demonstration: The inside of the e-beam**

Prerequisites:

- Sample loaded
- Electron beam on

Learn about the SEM basics

- Basic scheme of the SEM



**Demonstration: Align Feature / scan rotation**

Prerequisites:

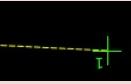
- Eucentric height
- Nav cam recorded
- Image parameters sets

Rotate the scan angle and align your sample of interest

The scan rotation can be adjusted to align the image with possible objects.

**Experiment: scan rotation**

Click the Align feature button in the top row.

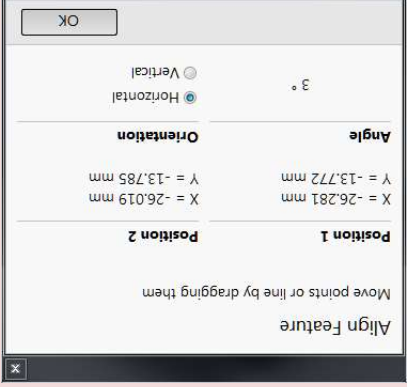


A window will appear:  
- You can now by LMB click and draw a yellow dotted line in the electron beam quadrant.  
The angle of the line will be shown.

You can now choose to:

- Rotate the stage
- Rotate the scan

Click OK: the image will rotate (either by scan or stage) to align the feature



**Demonstration: Image presets**

**Prerequisites:**

- Eucentric height
- Nav cam recorded
- Image parameters sets

**Scanning presets simplify switching imaging conditions**

By default, there are 6 factory toolbar Scanning presets (labelled s#) for each beam. Clicking on any one starts image acquiring with corresponding parameters.

**Scanning presets (s1 – s6)** s1 s2 s3 s4 s5 s6

At the top right, 6 scanning presets can be chosen and edited.

Actions:

Select a preset: LMB

Edit a preset: RMB > edit... (click apply to save)

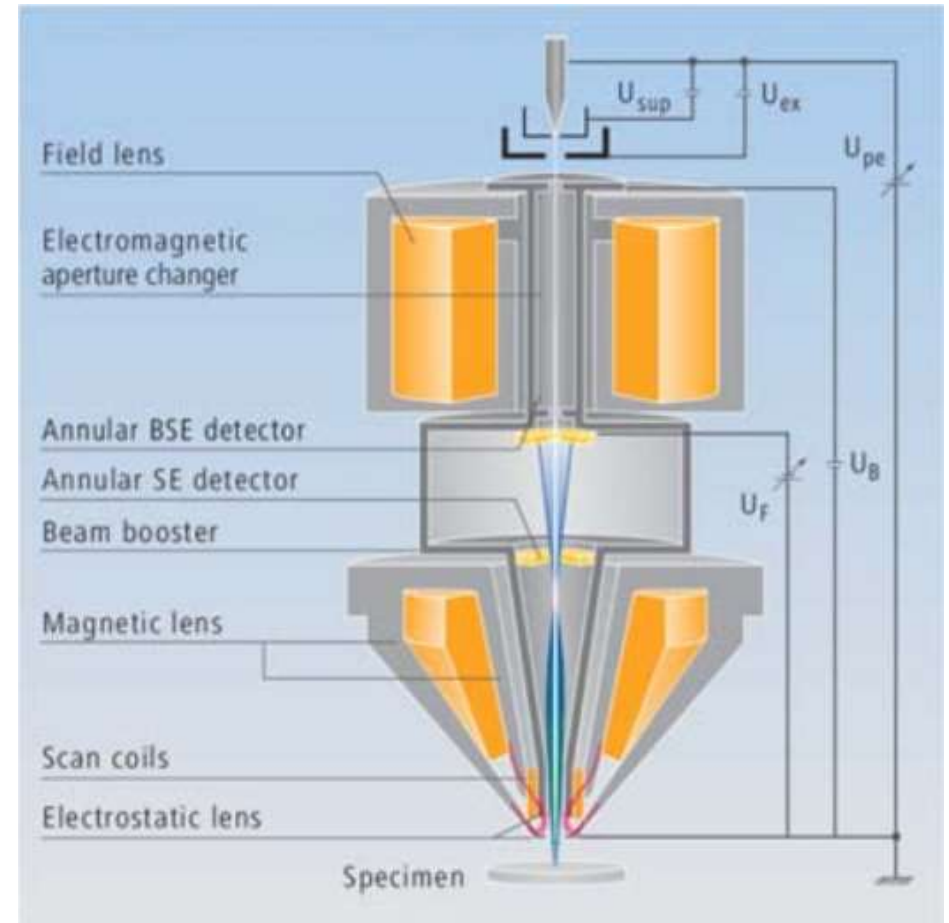
Activate	Click
Multiple Activate	Shift + Click
Snapshot	Ctrl + Click
Multiple Snapshot	Ctrl + Shift + Click
☆ Update with Current Settings	
Edit...	
Import Scanning Presets...	
Export Scanning Presets...	
Reset to Default	

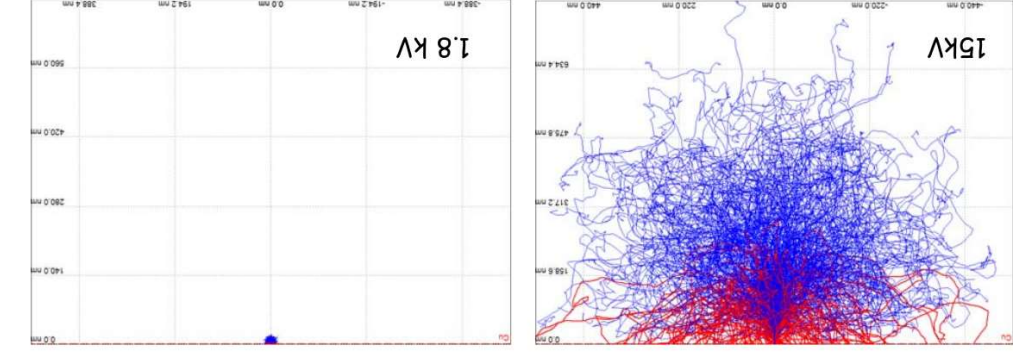
  

Scanning presets	
<b>Basic Setup</b>	
Name	LiSlowScan_001
Resolution	768 × 512
Dwell Time	300 ns
Bit Depth	8 bit
<b>Filter Setup</b>	
Scan Interface	1
Line Integration	1
Frame Average	8
Frame Time	121 ms
<b>Image Acquisition</b>	
Integrate	1
Drift Correction	No
Continuous Scan	No
Action	Save As
Acquisition Time	968 ms
<b>Shared Settings</b>	
Mains Lock	No
Start scan on left click	Yes

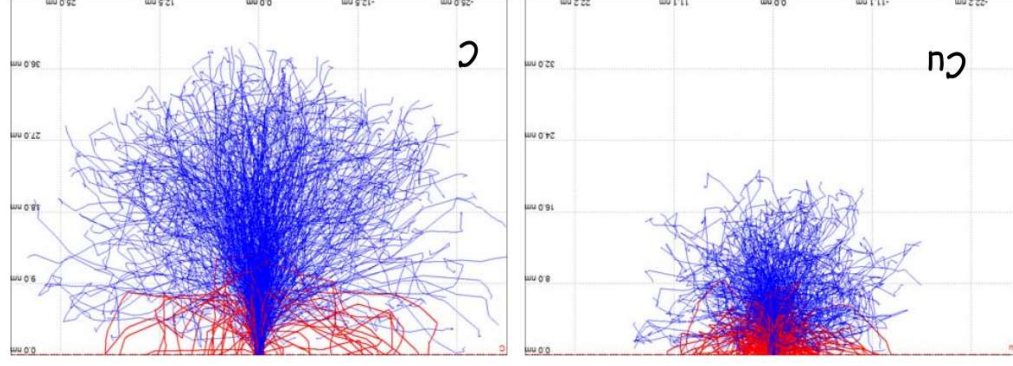
**Mains Lock** When ticked, the scanning (line sawtooth signal) is synchronized with the mains AC oscillation. This greatly diminishes blurring and jittering of the electron imaging resulting in smooth image edges at higher magnifications.

- Modern in-beam (in-lens) detectors





Scatter range in Nb<sub>3</sub>Sn:  
Monte-Carlo Simulation of electron trajectories  
backscattered electrons



Monte-Carlo Simulation of electron trajectories in Cu and C  
backscattered electrons



**Integrate.** Collects n images and integrates (=sums) them. Not compatible with live imaging.

### Snapshots

A snapshot (**CTRL+F4**) is a quick recording using preset choices. The preset can be changed in the top menu or changed ad hoc using the dropdown menu. The settings for the shortcut can be set in the preferences:

*Click the topleft quadrant (SEM) → Menu Tools > preferences > Scanning*

768 × 512	300 ns	1	768 × 512
1536 × 1024	300 ns	1	1536 × 1024
3072 × 2048	300 ns	1	3072 × 2048
6144 × 4096	300 ns	1	6144 × 4096
512 × 442	300 ns	1	512 × 442
1024 × 884	300 ns	1	1024 × 884
2048 × 1768	300 ns	1	2048 × 1768
4096 × 3536	300 ns	1	4096 × 3536

### Photo

The presets allow to set 8 bit (**don'ti**) / 16 bit (**don't**) settings, and the proceeding function, e.g. Save as (with a file name) or Save (with a generic name).

A photo is a high quality, slow recording using preset values. The preset can be setup as explained above for the acquisition of a photo (**F2**). There is no *ad hoc* change of dwell times / image sizes.



**Demonstration: Imaging settings**

Prerequisites:

- Eucentric height
- Nav cam recorded

Save optimization and image settings

Image setup and filters

The image scan is a combination of:

Image size (in pixels). The larger, the longer scan will take.

Dwell time the amount of time each pixel is scanned.

Scan interlacing Splits an imaging area into n number of blocks. The first line of each block is scanned followed by the second one etc. This imaging method significantly **reduces sample charging**. Abbreviation: SI

Line integration Each line scan is repeated n times. Data are integrated. This imaging method reduces sample charging and improves overall image quality. Abbreviation: LI

Frame average See below




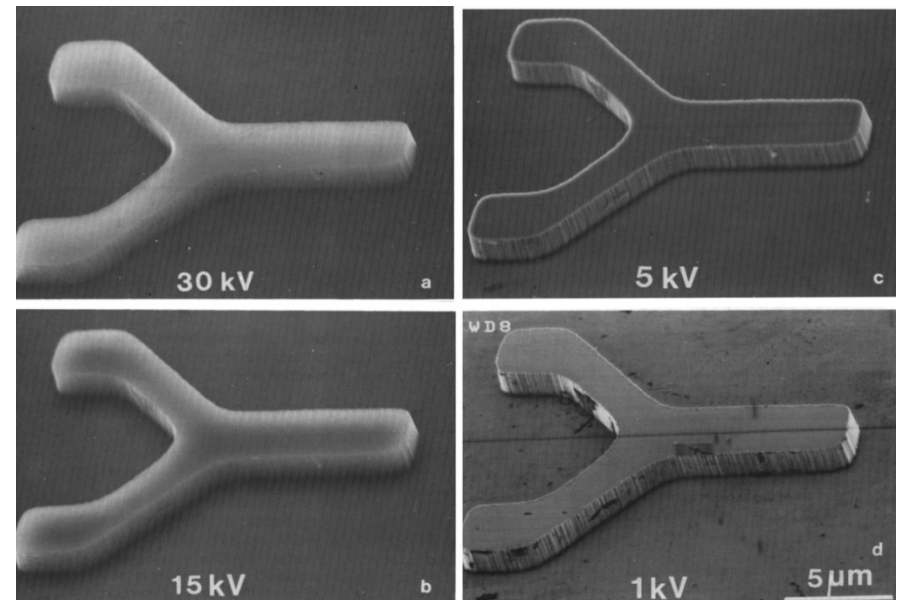
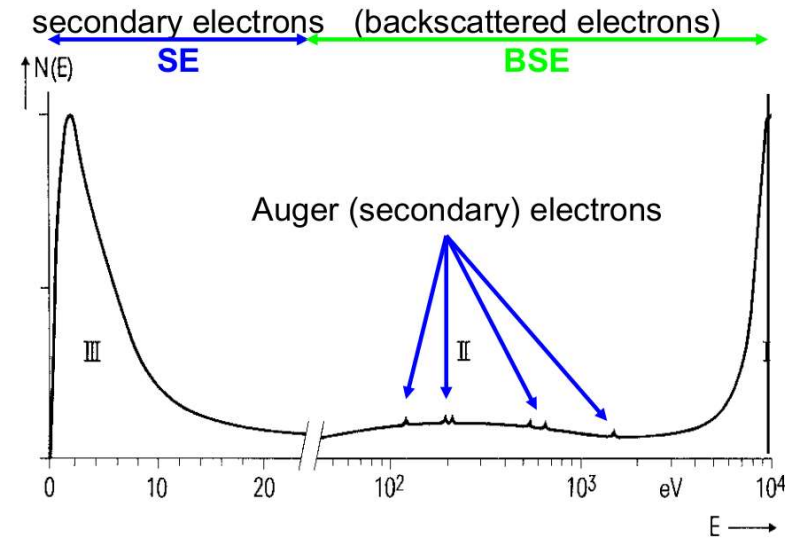
The use of these tools is visible in the dwell time adjuster: 

Image averaging

Three settings are possible:

-  **Live.** The default mode. One frame follows the other.
-  **Average.** Continuously averages n images to improve the signal to noise. Setting n > 4 will create difficulties to operate a live image (focusing, moving, ...).



### Demonstration: First glimpse of your sample

Prerequisites:

Sample loaded

Electron beam on

Learn about the working distance

In the top menu:

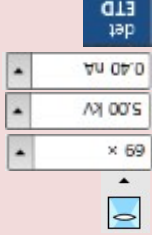
1. Select the Standard case

2. Set magnification: low (< 100)

3. Acceleration voltage: 2-5 kV

4. Beam size: 100pA – 800pA

5. Select the ETD detector in the topleft quadrant



### Experiment: Setup lens & detector

These settings are generic and not perfect yet. Unpause the e-beam image (click the green pause button in the image or **F6**). Click *Tools* > auto contrast / brightness (or **F9**)

### Experiment: Focus your image

If this is the first image: use e.g. the slots in the multisample holder to find an edge to focus. You can focus the image using:

- The coarse / fine buttons on the right of the panel

- OR Click + hold RMB in the ebeam image and move the mouse right and left



Important: after focussing, click the **LINK button** in the top row.

This allows the system to estimate the distance between the pole piece and the stage. You will end up (after homing) with a working distance around 60 mm (Z value in Navigation > < > stage).

### Demonstration: Beam and lens parameters

Prerequisites:

Eucentric height

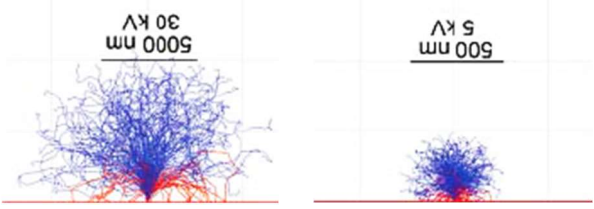
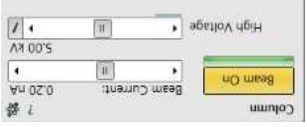
Nav cam recorded

Set magnification, high voltage and beam current

Sets the magnification for the SEM image in the upper left quadrant

High voltage (=acceleration voltage, =high tension)

Defines the interaction volume: Higher kV = less surface information, better resolution




Beam current (=probe current)

Is the flux of electrons in the beam (electrons per second per area).

Higher beam current = better signal, more beam damage, lower resolution. Unlike the Tescan SEM, the beam current at the FIB SEM is calibrated (units in pA to nA).

## Lens alignment

**What is it?** Lens alignment assures that the beam is concentric around the optic axis. A wrong lens alignment will be apparent at high magnifications: the object will shift with change of focus.

- Lens alignment is needed at magnifications > 2000X. It assures that there is no beam shift during focusing.
- Select a reduced area, preferable with sufficient contrast (press F9)
- Exposure time < 500 ns
- Column: standard, 2-5kV, 0.40 nA.
- From the top menu: Start the lens alignment. The goal is minimal movement of the object in the reduced area
- Grab the green cross that appears in the center 
- Move the cross with the LMB until the movement of the object is minimal
- A slight rotation is not problematic. Unclick Lens alignment, reduced area

## Astigmatism

To correct for astigmatism (typically at magnifications > 10 000X):

- Find an object, preferably round
- Make a reduced area
- Use the X and Y under stigmator on the panel OR Shift + RMB and hold. Move left right / up down to correct
- AutoStigmator. First make a reduced area, then use the auto stigmator
- Switch to FFT to manually correct the astigmatism.

## Videoscope

This is a tool that helps to correct the correct contrast / brightness.

## Demonstration: Eucentric height



### Prerequisites:

- Focused imaged
- Magnification: 200-500X


## Learn about the Eucentric height


**This is one of the two key alignments<sup>2</sup>. Every sample on every session on the FIB-SEM must be aligned to eucentric height. Failing to do so will damage the instrument.**

## Experiment: Eucentric height

1. Assuming you homed the stage during pumping
2. Assuming you focused the sample or stage and the stage is linked 
2. Get a live view of the chamber view: 5KV, Mag about 500-1000X, 0.4 nA
3. Click the navigation button on the right side of the screen 

### Procedure: decrease Z → adjust focus → link stage

- Usually, Z will be somewhere 60-90 mm in a homed stage. Go in steps towards 20 mm
- E.g. 60mm → Focus image, link stage. 30 mm → Focus, link, 20 mm → Focus, link
- The exact starting height is dependent on the height of your sample. The values here are for a flat ½ inch stub.
- Be conservative! **Assure you are not touching the polepiece!!!**
- When moving, Keep the mouse pointer on the stop button ( > stage) and make sure the chamber view is live.
- Clicking the Link stage button updates the working distance.

- When the stage height is set to to 7.00 mm:  > Stage > Z=7.00 mm
- **Set the eucentric height: press CTRL + f**
- Optional: Double click LMB in the chamber view to update the marker.

<sup>2</sup> The other one being the beam coincidence point

### Demonstration: Nav Cam photo

#### Prerequisites:

Focused imaged  
Eucentric height set

Learn about the the Navigation camera

#### Experiment: Take Nav Cam Photo

A Nav Cam photo must be taken after proper eucentric height setup because the NavCam has a focal point that is reached when the stage is linked and in eucentric height.

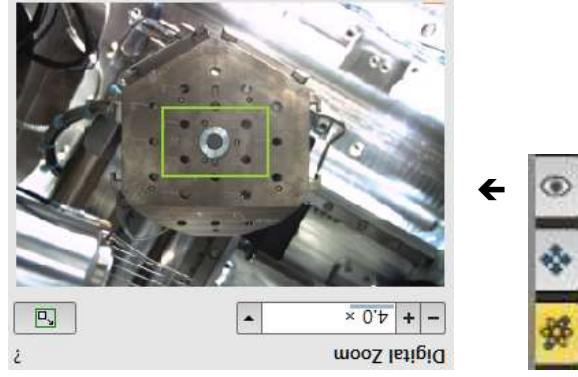
Stage > take Nav Cam Photo

The procedure takes about 1 minute

#### Nav Cam

The navigation camera will show the stage from a bird's eye perspective. It is linked to the positions and can be moved by double clicking. CTRL + / - will digitally zoom in / out.

Moving around in a digitally zoomed nav cam picture:



### Demonstration: Basic SEM imaging

#### Prerequisites:

Eucentric height  
Nav cam recorded

Lens alignment, Beam shift reset, astigmatism, Videoscope, ...

#### Experiment: Moving around in X and Y

LMB double click in the e-beam image will move the stage.

LMB double click in the Nav Cam image will move the stage.

→, ←, ... will move the stage roughly 1/2 field of view.

#### Experiment: Reduced area (F7)



**What is it?** Reduced area allows to set and select a sub-area in the image. This assures a faster refreshing rate and is useful to focus, stigmatize, ...

In case of electron sensitive samples, alignments can be made in the reduced area, away from the region of interest.

#### Experiment: Reset beam shift

**What is it?** Beam shift is often needed for fine alignments: it allows to move the image very precisely (much more precise than a piezo stage would do). Resetting the beam shift at the start of your session is a good idea to have the full range of the beam shift available.

Beam control > Beam > RBM click > Zero

