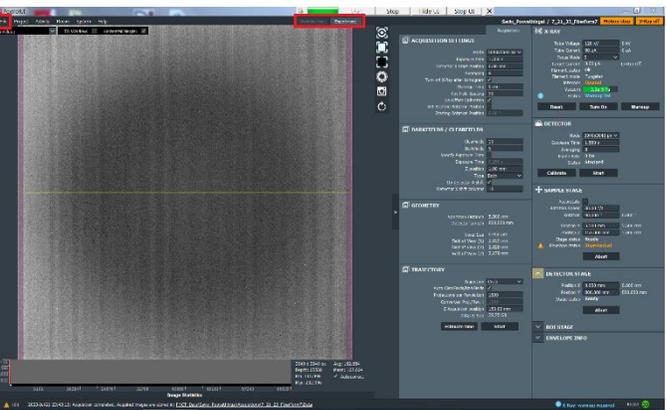
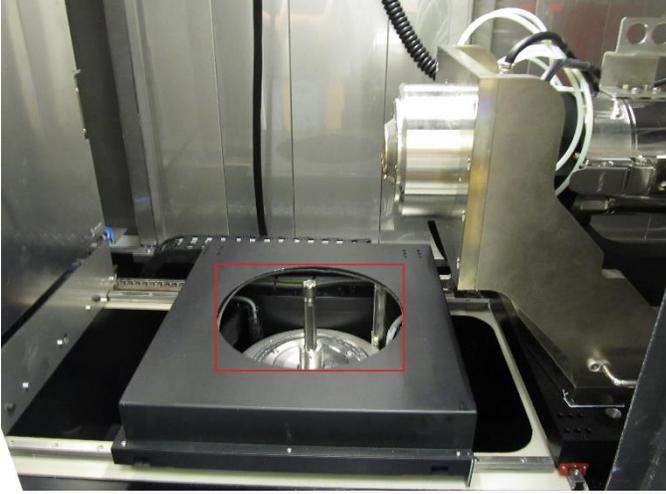


	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

<p><b>Purpose:</b> Basic operation of the Thermo Scientific Heliscan Mk2 micro-CT</p>	
<p><b>Required PPE:</b></p> <div style="text-align: center;">  <p>Nitrile or Latex Gloves</p> </div> <p>Requires the completion of UK's <a href="#">Basic Radiation Safety training</a></p>	
<p><b>Heliscan Mk2 micro-CT</b></p>	
<p><b>Potential Hazards:</b></p> <div style="display: flex; align-items: center;">  <p>This instrument generates x-ray radiation when the X-ray beam is ON.</p> </div>	
<p><b>Reference Documents:</b></p> <ul style="list-style-type: none"> <li>• Owner's manual for the Thermo Scientific Heliscan Mk2 micro-CT</li> </ul>	
<p><b>Required Equipment &amp; Materials:</b></p> <ul style="list-style-type: none"> <li>• Gloves</li> <li>• Sample Mounting Accessories and Consumables</li> </ul>	

	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

Steps	Key Points
<p>1. Create project/acquisition</p> <ul style="list-style-type: none"> <li>Switch to Expert mode if software is in Workflow mode</li> <li>Create a new acquisition (or a new project if you are a new user)</li> <li>Fill out the experimental details, in particular the sample ID and the filters used (you can edit later if not sure)</li> </ul>	
<p>2. Mount sample</p> <ul style="list-style-type: none"> <li>Mount your sample onto an appropriate mount. An appropriate mount: <ul style="list-style-type: none"> <li>Is substantially more transparent to x-rays than your sample</li> <li>Stops any sample movement</li> </ul> </li> <li>Mounting accessories and consumables are available at the lab bench opposite the Heliscan. If you are unsure how to mount your sample, ask EMC staff.</li> </ul>	
<p>3. Sample loading</p> <ul style="list-style-type: none"> <li>Make sure the stage rotation is at 0° and that the ROI (region of interest) X and Y are at 0</li> <li>Adjust the height of the stage post (loosen the 3 mm hex screw) so that the sample will be able to travel across the source during the experiment</li> <li>Determine and insert the appropriate collet size in the chuck. Mount onto the stage post.</li> <li>Insert your sample and tighten the chuck to secure your sample.</li> <li>Make sure that your sample will not collide with the source when the stage is raised.</li> </ul>	

	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot



4. Close the chamber door

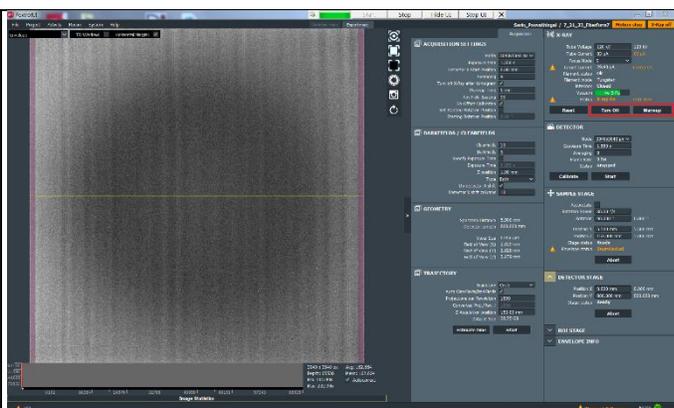
- Slide the chamber door closed, if necessary close the door on the opposite side as well.
- Engage the door-locking interlock with the white button (the door can be unlocked with the black button).
- Confirm that the orange light is on



	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

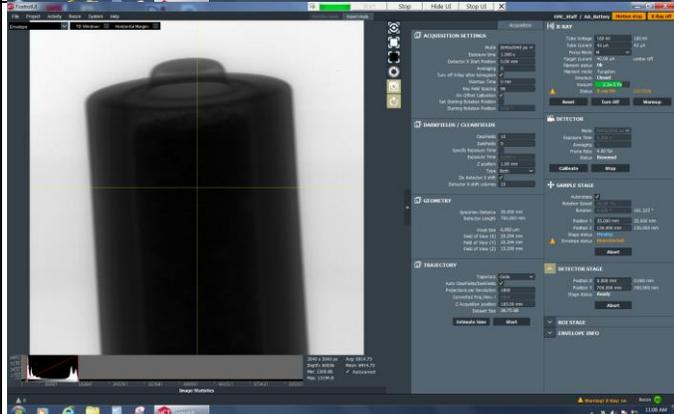
5. Turn the beam on

- Press the “Warmup” button in the “X-RAY” settings to begin warming up the beam, if necessary.
- Once the beam has finished warming up, press the “Turn On” button.



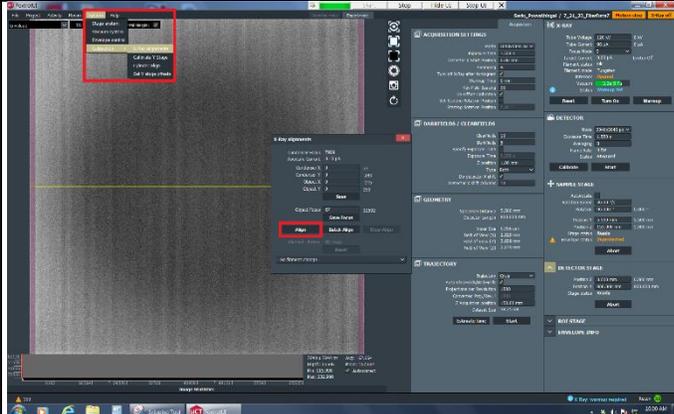
6. Adjust sample to be centered around the axis of rotation

- Raise your sample up so that it fully comes into view of the electron beam. Adjust the detector position so that your sample projection is contained within the screen
- Do not move the Sample stage Y axis blindly! Open the chamber door before any movement towards the source
- Place your region of interest at the center of rotation, by adjusting the ROI stage position (refer to your individual training)



7. X-ray alignment

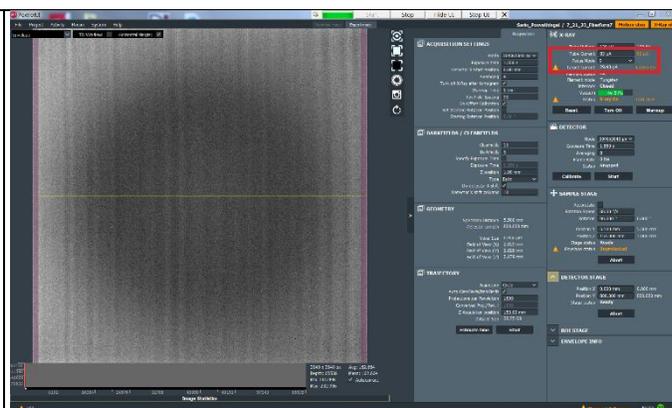
- Determine the beam energy (voltage) you would like to use and select it
- Select System>Calibration>X-Ray Alignments on the toolbar
- Select “Align” in the pop-up window
- Wait until the alignment is completed before resuming the experiment setup



	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

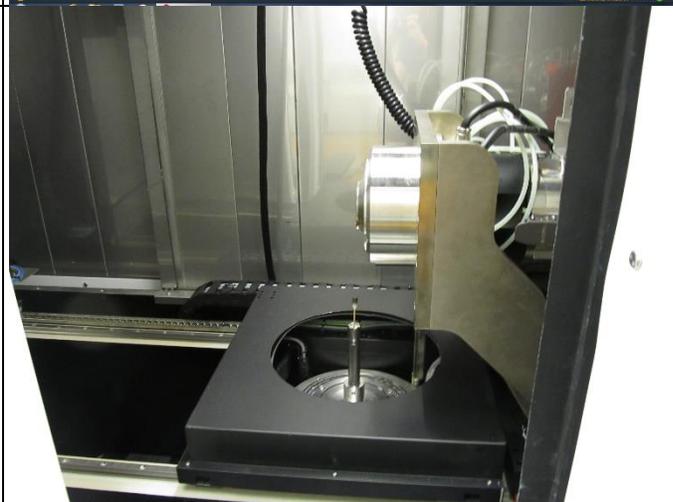
8. Maximize target current

- Maximize the target current by adjusting the tube current. The tube current does not necessarily increase with increasing target current.
- The smaller the spot size, the better the imaging resolution, but the lower the allowable target current. The limiter will activate at a certain current threshold to prevent source damage.



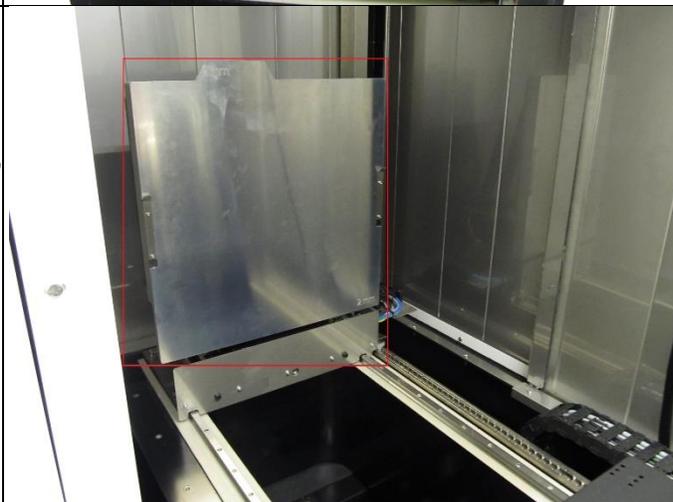
9. Move sample as close as possible to source

- Turn off the beam, disengage the door interlock (press the black button), and open the chamber door so that you can view your sample.
- Use the sample stage to move your sample as close as possible to the beam source without causing it to collide with anything as it rotates. **Make sure to account for vertical movement during the scan!**



10. Filter selection

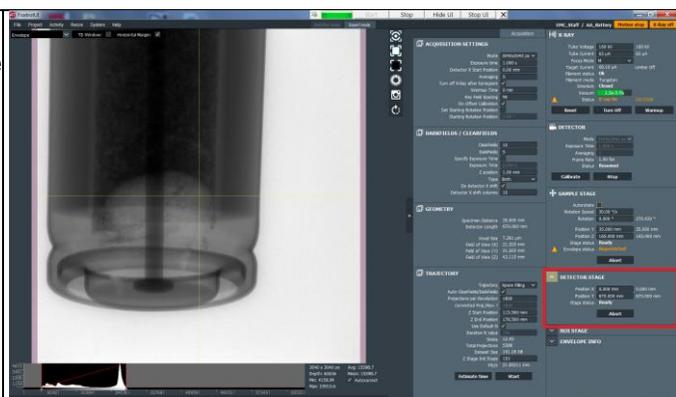
- Select the thickest filter that still gives you an acceptable x-ray count rate. The thicker the filter, the fewer artifacts that will be present after reconstruction, but the higher the required exposure time.



	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

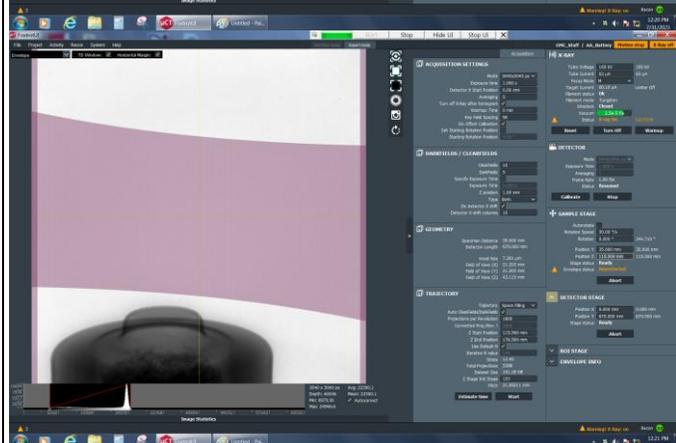
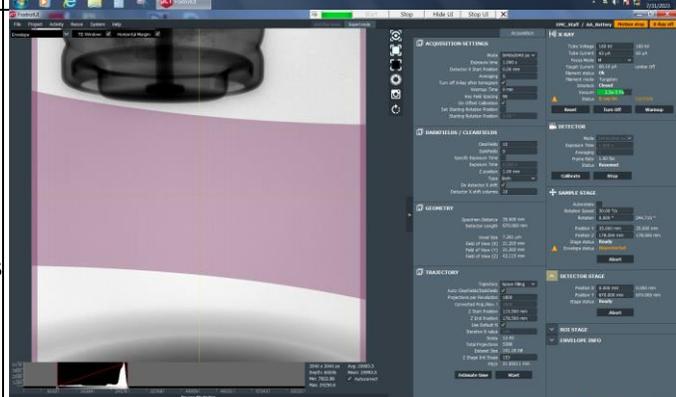
11. Position detector to fill screen with sample

- Close the chamber door, re-engage the door interlock, and turn the beam back on.
- Position the detector stage so that your sample's projection is fully contained within the purple margins as you rotate it (refer to your individual training).



12. Set trajectory / start and end position

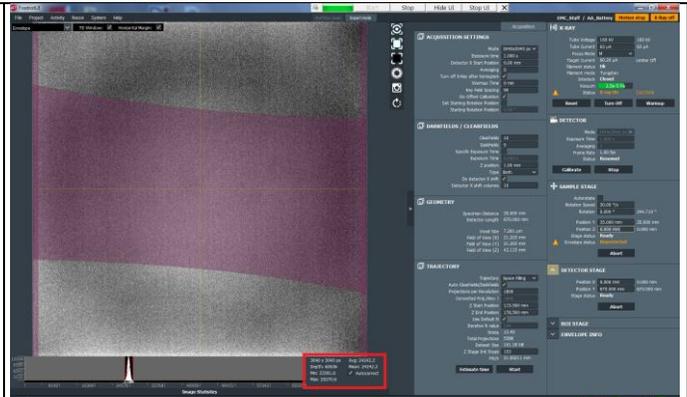
- Depending on your sample geometry and imaging goals, select the appropriate trajectory
- Set the Z position (or the start and end Z position) in the "Trajectory" settings.
- For Space filling and Double helix trajectories, make sure your scan starts with your sample below the purple region and ends after fully exiting this region at the top.



	<b>Operational SOP</b>	Date	7/31/2023
	<b>Heliscan Mk2 micro-CT</b>	Revision	1.0
		Equipment Manager	Nicolas Briot

**13. Adjust the exposure time**

- Move the sample stage Z to 0 and verify that your sample is not visible anymore (clearfield).
- Adjust the exposure time so that the image's grayscale maximum does not exceed ~ 40,000
- Move the sample back in front of the source and verify that you can still see through



**14. Populate/Verify the acquisition settings**

- Make sure the exposure time and image resolution match your settings
- Determine an appropriate number of frame average (refer to your individual training)
- Verify that all other settings match your scan needs (refer to your individual training)
- Check that there is enough data storage available for your acquisition.
- Start your scan by pressing the “Start” button in “Trajectory.”

