

ZEISS Xradia 5xx Versa

Scout-and-Scan™ Control System Quick Reference Guide

For use by operators who have completed basic training



Basic Steps

- Sample - Set the Sample's directory and data folder. Open existing or create new recipe for ROI(s).
- Load - Load the Sample and roughly align the ROI using the Visual Light Camera.
- Scout - Scout the Sample to find the desired ROI and determine imaging parameters using X-ray images.
- Scan - Set up 3D scan parameters for the recipe.
- Run - Run the recipe and acquire the tomographies.

Detailed Steps

(Assume no Sample or Filter currently in System)

1. Open Scout-and-Scan™ Control System.
2. Select the directory where data will be saved and input a Sample name. Select an existing recipe or add a new recipe. Click the  button to go to the Load step.
3. Move the Source and Detector away from the Sample Stage by clicking  (safe zone for typical sized samples).
4. Set Sample Stage to X=0, Y=0, Z=0, $\theta=0^\circ$.
5. Load Sample and position roughly with the red crosshairs of the integrated Visual Light Camera (VLC), using the Sample Controls, both at 0° and -90° . Close enclosure door. Click  to go to the Scout step.
6. Under the Acquisition tab, set Source to 80kV/7W or 140kV/10W (depending on Sample)¹, exposure (sec) = 1, binning = 2, objective = low resolution (0.39X or 4X to match Sample size) and click Apply.
7. Use  to turn the Sample to $\theta=0^\circ$ and start the continuous imaging using  button
8. Use the mouse, double click to position ROI to center of screen. ROI is roughly centered for Sample X and Sample Y axes. Stop continuous scan.
9. Rotate Sample to -90° by clicking on  and then start the continuous imaging.
10. Double click along horizontal line to position ROI to center of screen. ROI is now roughly centered for Sample Z axis.
11. Switch to desired objective. If 20X or 40X², switch to binning = 4 to get a more clear image.
12. Fine tune ROI position at 0° and 90° (repeat steps 7 to 10 as necessary)

For steps 13-17 please use the VLC to verify Sample, Source, and Detector positions. Collision detection may be enabled on your system; however it is still important to observe the relative positions of these components throughout tomography set-up.

13. Rotate Sample between -180° and $+180^\circ$ to find the angle where Sample is closest to Detector.
14. Position Detector as close as possible to the Sample at the angle determined in step 12.
15. Rotate Sample between -180° and $+180^\circ$ to find the angle where Sample is closest to the Source.
16. Position Source at a collision free distance, to achieve the required Pixel resolution.
17. Rotate Sample between -180° and $+180^\circ$ to verify collision free rotation.
18. Determine Filter and kV. (see reverse side for Filter Selection Quick Guide).
19. Determine single image acquisition time using the  button and adjusting exposure time accordingly. Best image quality obtained with counts >5000. (Counts scale linearly with exposure time). Click  to go to Scan step.
20. Change the number of projections to 1601 for Samples fitting in the FOV, for high image quality. For interior tomographies, use >2001. Use default values for the other parameters.
21. Click  to go to Run step.
22. Click on the Start button to start the tomography.

¹For thin or low density Samples start with 80kV, for thick or high density Samples start with 140kV.

²40X if present.

ZEISS Xradia 5xx Versa

Scout-and-Scan™ Control System Quick Reference Guide

For use by operators who have completed basic training



Filter Selection Quick Guide

(Detailed instructions can be found in the user's manual)

1. Take an image of the Sample with a long enough exposure time to obtain at least 5000 counts.
2. Make sure the reference is collected on air. If the Sample is too tall go to the "Reference for Scouts" tab and change the Reference Axis to -X and try again.
3. Select a Filter based on the transmission values from the newly created image with the help of the correct Filter tab.
4. With the Filter in place, adjust kV to obtain an ideal transmission in the range of 20% - 35%. If no Filter is used, let the transmission value be at least 15% - 20%.

Depending on the Sample material and size, ideal transmission may not be obtainable. If this is the case, please image using a transmission closest to the ideal range.

Table1: Macro and 4X Filter Selection

Transmission (%) @ 80 kV For Thin Samples and/or Low Z Materials ³	Transmission (%) @ 140kV For Thick Samples and/or High Z Materials ⁴	Filter
>74	Re-Check at 80 kV	No Filter
74 - 58		LE #1
58 - 46		LE #2
46 - 36		LE #3
36 - 28		LE #4
28 - 20		LE #5
20 - 12		LE #6
Re-Check at 140 kV (if possible)	32 - 20	HE #1
	20 - 12	HE #2
	12 - 8	HE #3
	8 - 5	HE #4
	5 - 3	HE #5
	< 3	HE #6

Table 2: 20X/40X⁵ Filter Selection

Transmission (%) @ 80 kV For Thin Samples and/or Low Z Materials ³	Transmission (%) @ 140kV For Thick Samples and/or High Z Materials ⁴	Filter
>63	Re-Check at 80 kV	No Filter
63 - 44		LE #1
44 - 34		LE #2
34 - 28		LE #3
28 - 21		LE #4 ^d
21 - 14		LE #5
14 - 8		LE #6
Re-Check at 140 kV (if possible)	30 - 18	HE #1
	18 - 8	HE #2
	8 - 6	HE #3
	6 - 4	HE #4
	4 - 3	HE #5
	<3	HE #6

³ Low Z Samples are typically biological or polymeric.

⁴ High Z Samples are typically metallic or contain metallic structures (i.e. Semiconductor Samples).

⁵ FOR 40X ONLY—If the required Filter is LE#4 or higher (>LE#4) the sample should be scanned with the 20X instead. This indicates a relatively high absorption for the Sample and the 40X will not provide any better resolution than the 20X.

Confidential Carl ZEISS X-Ray Microscopy, Inc