



ZEISS Xradia 520 Versa Scout-and-Scan™ Control System Quick Reference Guide

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-Rays.
- 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 by clicking the  button. Click  and 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 the  button and 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 = 0.39X or 4X to match sample size and click Apply.
7. Use  to turn the sample to $\theta=0^\circ$ and click on the  button to start the continuous imaging.
8. Using 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 click the  button to 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 source.
14. Position source as close as possible to the sample at the angle determined in step 13.
15. Position detector at a collision free distance, to achieve the required voxel resolution.
16. Rotate sample between -180° and $+180^\circ$ to verify collision free rotation.
17. Determine filter and kV. (see reverse side for filter selection quick guide)
18. Determine image acquisition time using the  button. Best image quality obtained with counts >5000. (Counts scale linearly with exposure time). Click the  button and go to *Scan* step.
19. 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.
20. Click the  button and go to the *Run* step. Click on the *Start* button to start the tomography.

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

² 40X if present

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; 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.

Filter Selection Quick Guide

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

1. Take an image of the sample by clicking  button using exposure (sec) = 1.
2. Click on the reference  button. 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: 0.4X 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

Emergency Information:

Medical Emergencies: Contact 911 and Public Safety (609) 258-1000

Room / facility emergencies: Contact Public Safety (609) 258-1000

Issues related to the instrument:

1. Contact IAC Staff.
2. Leave system as is.
3. Try to shut down the X-ray source.

Audible/Siren Emergency Alerts:

Follow previous steps 2 & 3 and leave the building.

Emergency Contact Information:

Nan Yao: Office (609)258-6394; Cell (908) 922-2236 Email: nyao@princeton.edu

John Schreiber: Office (609)258-0034; Cell (215) 431-4670 Email: js51@princeton.edu

Paul Shao: Office (609)258-3851; Cell (847) 721-086 Email: pshao@princeton.edu