[Basic procedure]

1. Scan generator → Aztec

    ✓ Now the STEM images cannot be seen on GMS

2. Use the Aztec PC and run Aztec

    ✓ Running 'Tidy Up' first recommended
    ✓ Cool down the EDX detector and insert it

3. Open a new project in AZTEC on a local drive and save it

    ✓ Now whether AZTEC is running or not does not matter

4. Run Anaconda prompt, type 'conda activate vjem38' and 'spyder'

5. Run the acquisition program ('merlin_acquisition_pyJEM_AZTEC_EDX.py')

    ✓ The Merlin acquisition software on the Merlin PC must be running

6. Input the acquisition parameters on the GUI (Please see below for the details)

    ✓ If 'Simultaneous EDX' is unchecked, it will work just like the normal Merlin acquisition program
    ✓ In this case, the scan generator should be JEOL scan generator

7. Scan

[GUI input parameters]

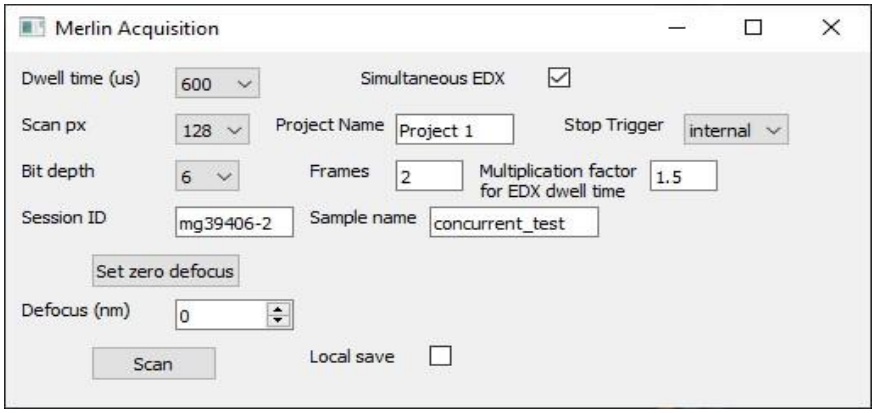


Figure 1 Acquisition program

1. Simultaneous EDX:

    If checked, 4DSTEM and EDX will be obtained simultaneously for the same scan area

2. Project Name:

    It must be the same as the name specified previously in Aztec

3. Stop Trigger:

Stop Trigger

Internal – The frame or sequence will stop when it reaches the frame time set on the main panel.

Rising/Falling Edge (LVDS) – The frame or sequence will stop when a rising or falling edge is detected on the selected line (TTL In, or LVDS In).

If the stop trigger is 'internal', the dwell time for EDX must be larger than that for Merlin. In other words, 'Multiplication factor for EDX dwell time' should be larger than 1 (≧1.5 recommended). Also, 'Scan px' is recommended to be only 128. If 'Scan px' is larger than 128, the scan result will be as shown in Figure 2.

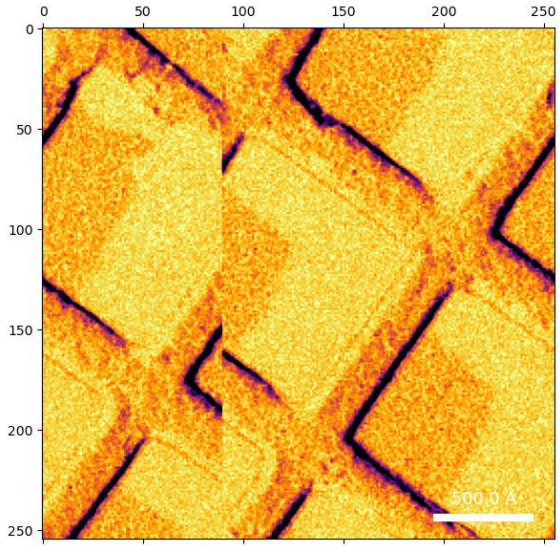


Figure 2 Unexpectable scan behaviour when 'Stop Trigger' is 'internal' and 'Scan px' is 256

If the stop trigger is 'rising edge', the dwell times for Merlin and EDX must be the same. In other words, 'Multiplication factor for EDX dwell time' must be 1. In this case, the last column of the 2D scan shape must be removed by post-processing the data (Figure 3).

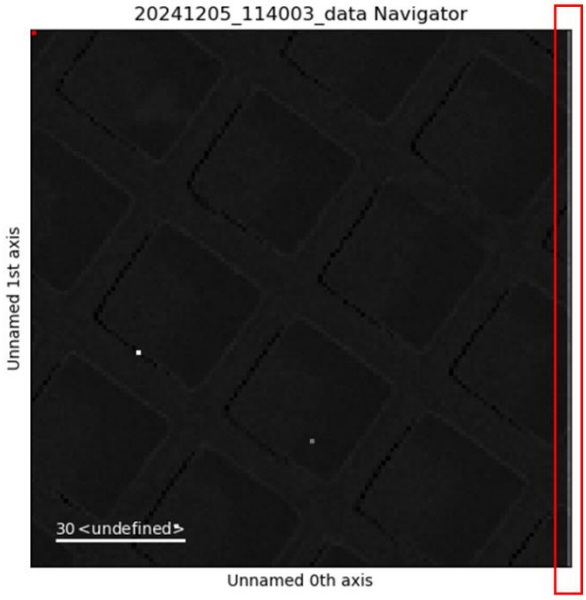


Figure 3 Weird last column (flyback) when 'Stop Trigger' is 'rising edge'

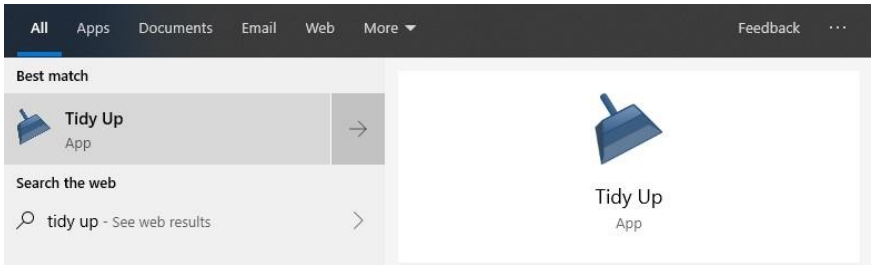
4. Frames:

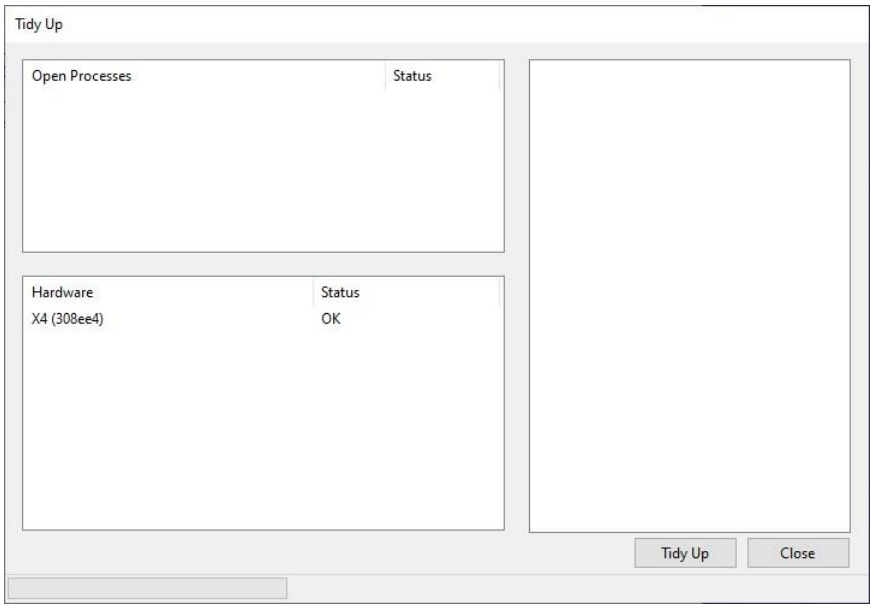
If greater than 1, the acquisition will be repeated for the number of frames, and the 4DSTEM and EDX data will be saved individually for each frame.

[Important Note]

0. Troubleshooting

When the acquisition is not working properly, it is recommended rebooting Merlin software on the Merlin PC or running 'Tidy Up' on the Aztec PC. 'Tidy up' will make the EDX system the default. Therefore, the EDX detector must be cooled down and inserted again.





1. MIB conversion

When converting the MIB files obtained concurrently with EDX, 'flyback' option cannot be used. Therefore, 'Auto reshape' option is recommended. Or the exact scan shape must be specified by the user ('Known_shape'), and the possible ['Scan_X', 'Scan_Y'] options are [128, 127] and [256, 255].

2. Example acquisition parameters

Please note that the acquisition of 256×256 scan shape data is unstable and may result in

disconnection from Aztec or Merlin. This is under investigation.

bit	start trigger	stop trigger	dwell time for Merlin	dwell time for AZTec	scan px
6	rising	rising	t	t	128
6	rising	rising	t	t	256
6	rising	internal	t	1.5 * t	128
6	rising	internal	t	2.0 * t	128

3. Export the EDX files

Many EDX map data can be exported using ‘Batch Export’ (by right-clicking on any data name). If EDX map data is saved as a ‘raw’ file (‘Raw Smart Map’), it can be read using ‘HyperSpy’ in Python. If you want to export a lot of map data, the 'Name' field in the 'Batch Export' window must be empty.