



***EDAX Genesis
Training Notebook***

***The Center for Nanotechnology
User Facility Laboratory
August 2008***

EDAX Operation Procedure

- I. Position the sample
- II. EDAX Hardware Settings
- III. Initiate Genesis Software
- IV. SEM Settings
- V. Image
- VI. Spectrum
- VII. Line Scan
- VII. Mapping
- VIII. Saving & Transferring Data
- IX. Shutdown

I. Position the sample

- ☞ Complete steps I-IV of the **SEM Operation Procedure**
 - I.** Initiate XL Microscope Control
 - II.** Load Sample
 - III.** Use default beam settings, 5kV & spot 3
 - IV.** Calibrate Stage Height
- ☞ Bring sample to final working distance of 5mm for EDAX.
- ☞ Find an area of interest on the sample with the stage tracking mode.

II. EDX Hardware Settings

EDX Hardware Setup:

1. Computer monitor setting: 1
2. Switch Box setting: A



3. Connect EDX cable bundle
4. Turn off CCD camera & monitor

III. Initiate Genesis Software

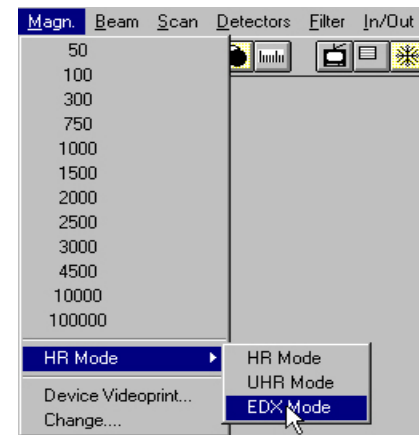
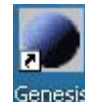
XL Microscope Control

- Enter EDX mode using:
Magn. > HR mode > EDX mode

EDAX Computer

Login: ntufuser
Password: ntuf

- Open Genesis software.

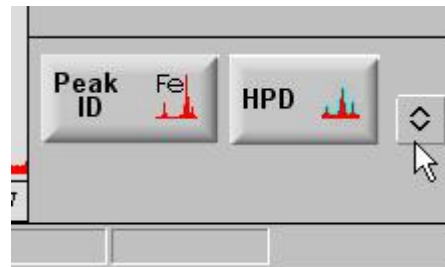


- Select the appropriate tab for a Spectrum, Image (with spectrum), or Maps/Line you want to collect.



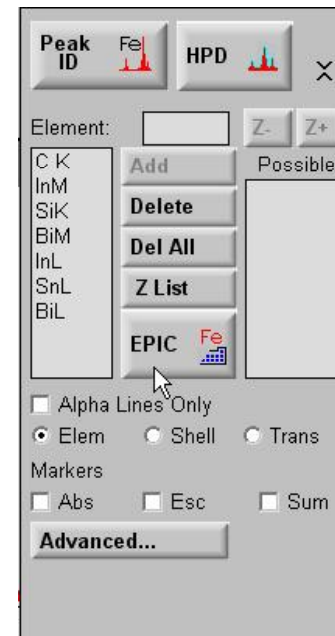
III. Initiate Genesis Software

- Expand the Peak Identification Panel



- Open EPIC Table

- Select the heaviest element and highest energy transition to be identified in the spectrum.



IV. SEM Settings

Optimal accelerating voltage for the analysis is 2-3x the highest expected energy measured.

Transition

Au - 79 Gold
Wt: 196.97 Eng: 9.712
Oxd: 1.5 Abs: 12.515
Line: K L M

EDS Energy Table

B	C	N	O	F	He												
Al	Si	P	S	Cl	Ar												
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lw	

Total Ka

For Example: AuL Energy = 9.712keV
Select 20kV beam for this analysis

IV. SEM Settings

Adjust beam spot size to achieve sufficient **CPS > 1000**.

4.00	8.00	12.00	16.00	20.00	24.00
CPS:1157	DT%:36	Lsec:164	Cnts:0	keV:20.000	FS:9487

CPS	Amp (μ s)
1000	100
2000	50
3000	35
5000	17
10000	10
15000	6
20000	4
25000	2.5

Based upon current **CPS** reading, adjust **Amp Time** to achieve Dead Time (**DT%**) in the range of 20-40%.

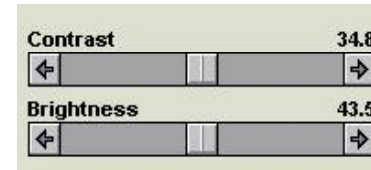
XL Microscope Control

Optimize the image as outlined in section V (Beam Optimization) of the **SEM Operation Procedure**.

V. Image

XL Microscope Control

☞ Manually increase the contrast until small areas of the image are bright white (nearly saturated).



☞ Change Scan to External using:

Scan > External XY

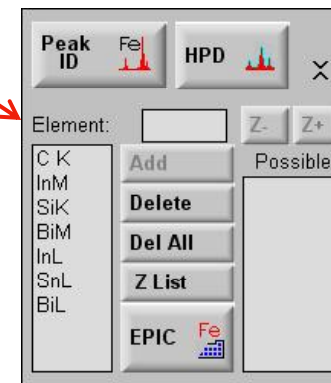
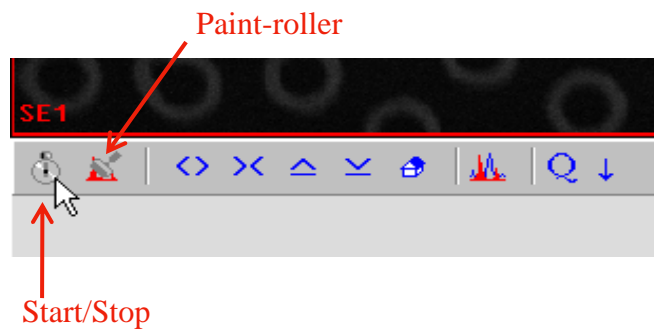
Genesis

☞ Collect the electron image by selecting **Collect Image e-** button.



VI. Spectrum

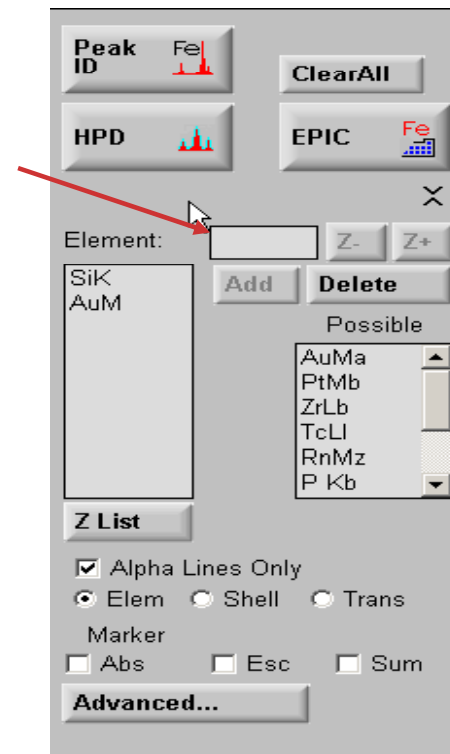
- ☞ Select **Preset** time desired for spectrum acquisition.
- ☞ Erase old spectrum data with the paint-roller icon.
- ☞ Delete the prior Element List.



- ☞ Begin spectrum acquisition by clicking on start/stop button.

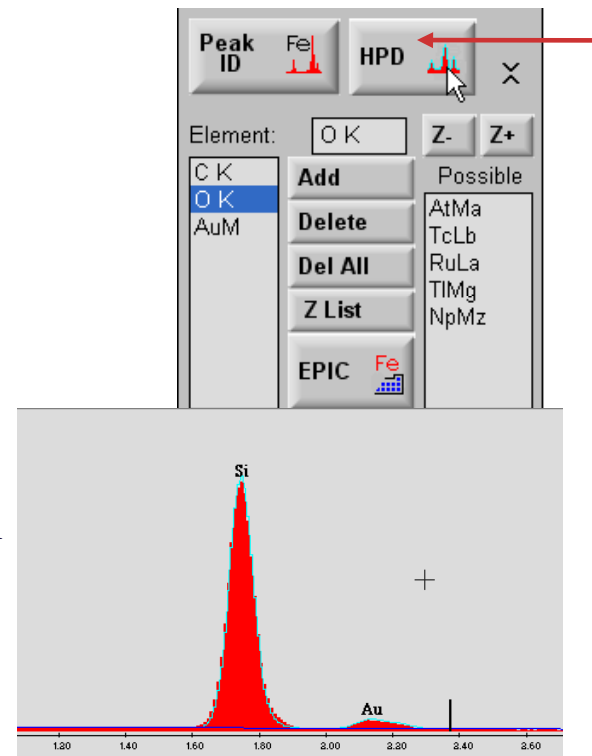
VI. Spectrum

- ☞ Select **Peak ID** to apply most probable elements to spectrum.
- ☞ Type in desired element into **Element** field if it is not labeled on spectrum.
- ☞ A reference mark will be posted on spectrum indicating where element occurs.
- ☞ Click **Add** to apply the element to spectrum.
- ☞ Double check spectrum to make sure data/element definitions are accurate.



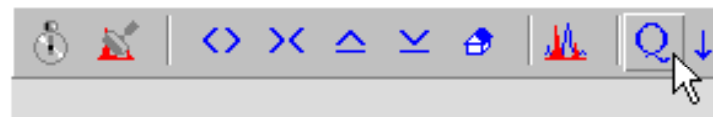
VI. Spectrum

- Use **HPD** command to plot the count histogram.
- Make sure a specific elemental spectrum peak is contained under blue histogram plot.
- If all spectrum data is not contained, additional elemental analysis need to be performed.



VI. Spectrum

Click **Q** to perform quantitative analysis of labeled elements.



A list of the labeled elements with the **Atomic %** and **Weight %** will be displayed in upper right data box.

Element	Wt%	At%
SiK	79.89	96.54
AuM	20.11	3.46

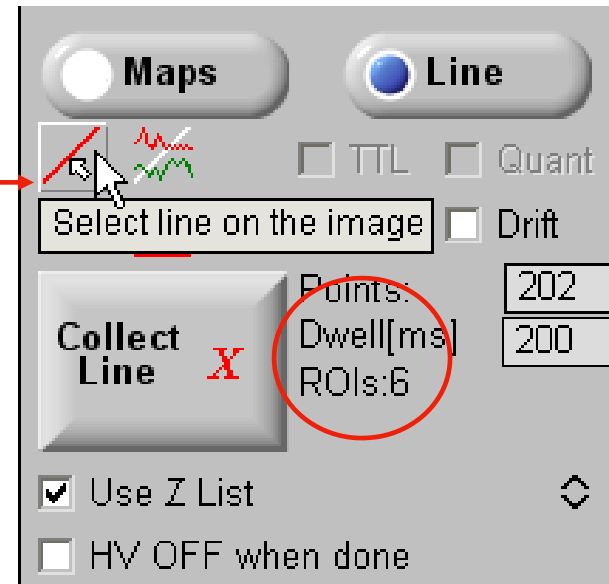
VII. Line Scan

Click on **Line** option to reveal Line Scan parameters.

Line Scan Tool →

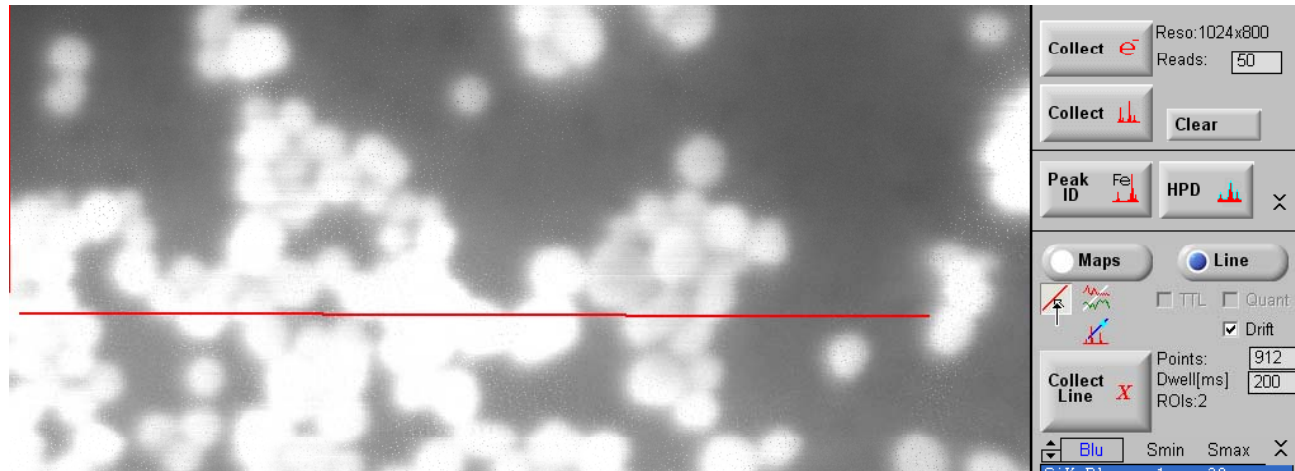
Select dwell time (**Dwell**) for each point to be measured.

Make sure correct **ROIs** to be measured are reflected in the line scan parameters.



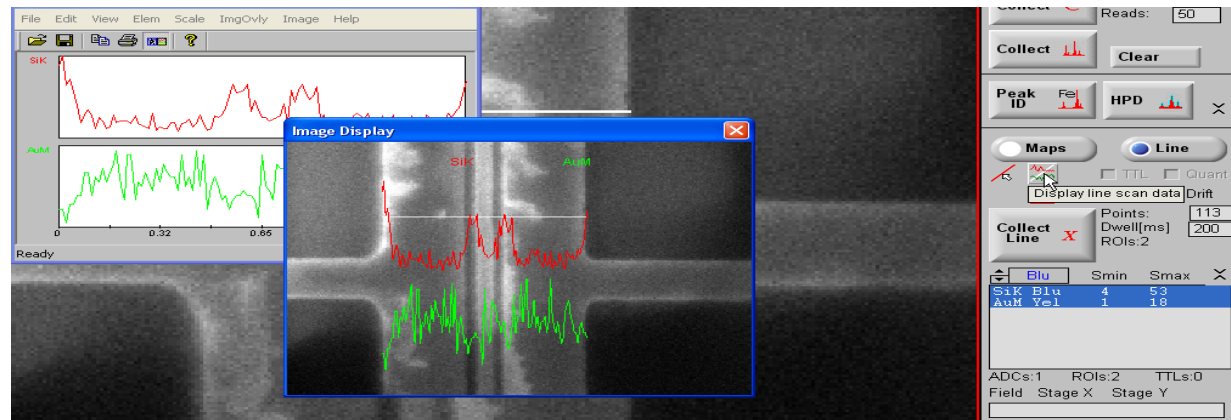
VII. Line Scan

- Click on **Line Scan Tool** and draw line across SE image where the scan will occur.
- Click **Collect Line X** to begin data acquisition.



VII. Line Scan

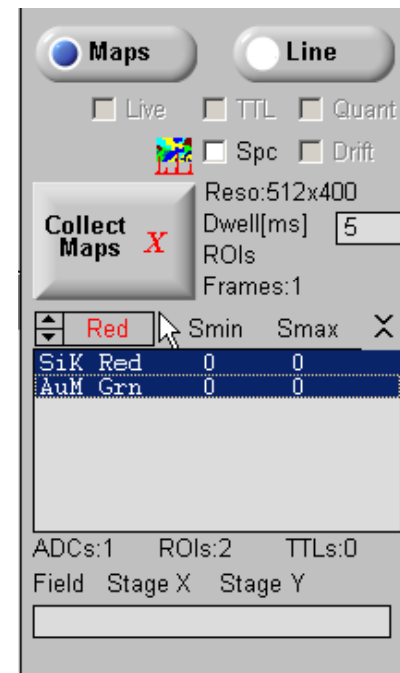
- Click **Display Line Scan Data** to project acquired data onto SE background image.
- Line scan data will be saved automatically as a **.csv** file which can be imported into secondary spreadsheet program for further analysis.



VIII. Mapping

Parameters

- Make sure correct **ROIs** are selected before collecting X-ray map to ensure they will be included in the data acquisition.
- Select **Element** to apply the desired **Color** pixel representation.



VIII. Mapping

Resolution

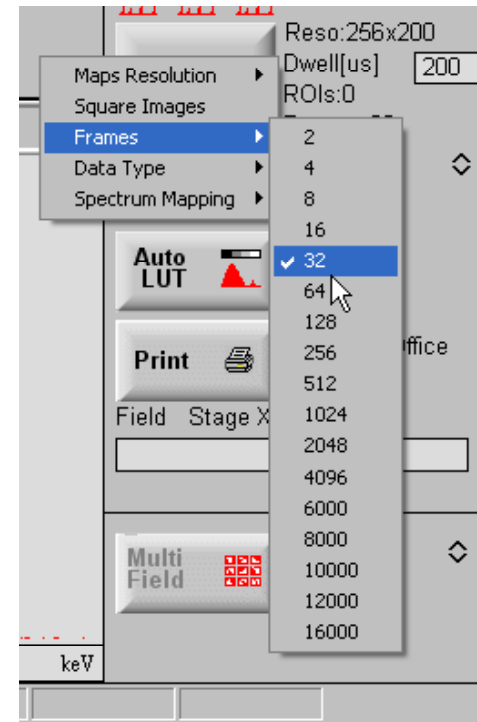
- Right-Click to adjust **Reso** and **Frames** settings to determine map/pixel resolution

Frames: One frame represents one X-ray count of entire microscope field

Reso: Pixel resolution of each frame

- Select Dwell Time (**Dwell**) for each frame.

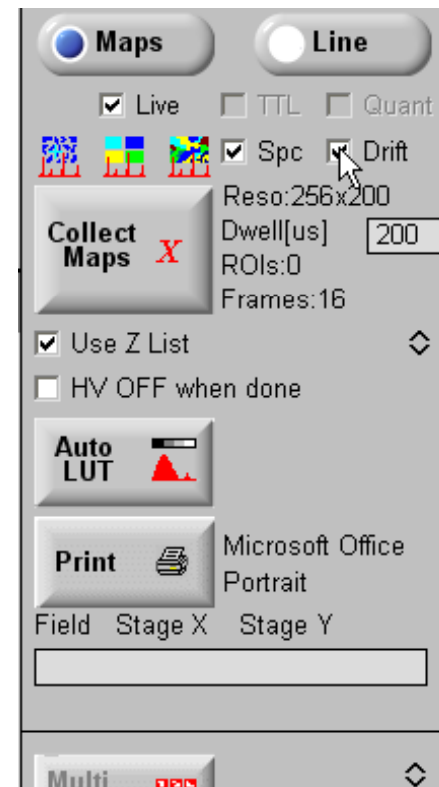
Dwell Time: acquisition time for each X-ray frame (us).



VIII. Mapping

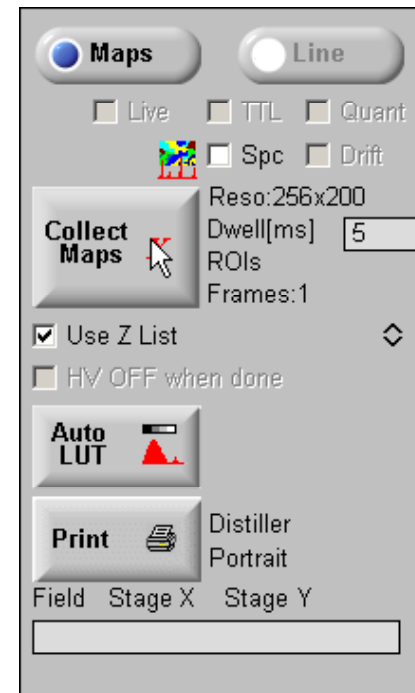
Drift Correction

- To initiate image Drift Correction, check the **Drift** box.
- The Drift Correction data window will run in the background during X-map collection.



VIII. Mapping

- ☞ Select **Collect Maps X** icon to begin map acquisition.
- ☞ Select a directory/file name and file type to save the map. EDX will save the SE background and each individual elemental count image.
- ☞ EDX begins by taking a background SE image followed by the elemental counts. The software takes one frame at a time and overlays each subsequent layer to produce a full count map.
- ☞ Mapping will stop automatically once final count frame has been acquired.

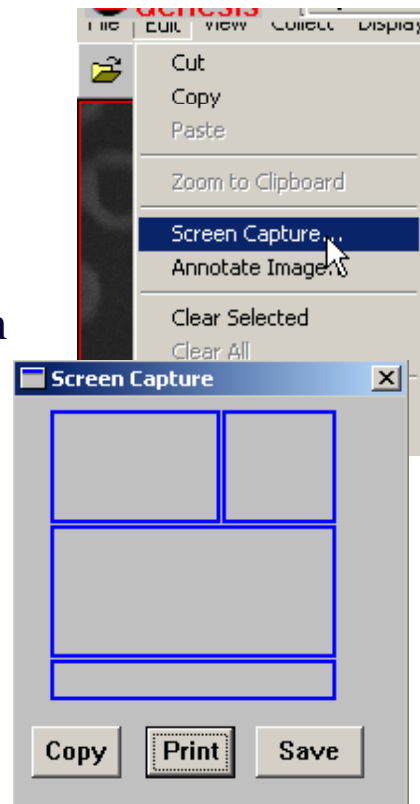


IX. Saving and Transferring Data

Screen Capture

Captures the SE image, Quant data, and spectrum as a JPEG for viewing.

- 📄 Select **Edit > Screen Capture**
- 📄 Highlight all four areas of the screen in blue.
- 📄 Save to your EDAX folder.



IX. Saving and Transferring Data

Genesis File (.spc)

Saves all spectral data and images an .spc file to be opened by EDAX Genesis.

☰ Select **Files** > **Save As**

☰ Select option **.spc/.bmp**

☰ Save to your EDAX folder.

IX. Saving and Transferring Data

Spreadsheet File

Saves spectral data as a file that can be imported into an external spreadsheet program for further analysis.

☞ Select the **Spectrum** Tab in Genesis

☞ Select **File > Import Spectrum > from Image** or **Maps/Line**

☞ Select **File > Save As**

☞ Pick option **.csv**

☞ Save to your EDAX folder.