# SEM General Operating Procedures

This guide is intended for the remote use of the JSM-5900 scanning electron microscope in the FCAEM at FIU. These procedures are intended to help new users learn and experienced users "remember" how to operate the basic controls on the SEM. These procedures assume the user has already remotely connected to the SEM and the instrument is on and running. If not please refer to the "SEM Startup Procedures" document to get started.

Image Adjustment Procedures

- Once your samples are loaded into the SEM and the startup procedures are fulfilled, make sure you start out at the lowest magnification (25x to 50x) which can be adjusted by clicking on the "Mag-"and "Mag+" buttons on the main SEM GUI (shown below with the black arrow). To know your current magnification and other system information look at the bottom of the GIU screen (shown by the gray arrow below).
- We also recommend using the scanning speed 2 by clicking on the "Scan 2" button (circled below in blue) which is the T.V rate scanning speed ideal for navigation.
- Click on the "ACB" button (circled in red below). The "ACB" stands for automatic contrast and brightness.
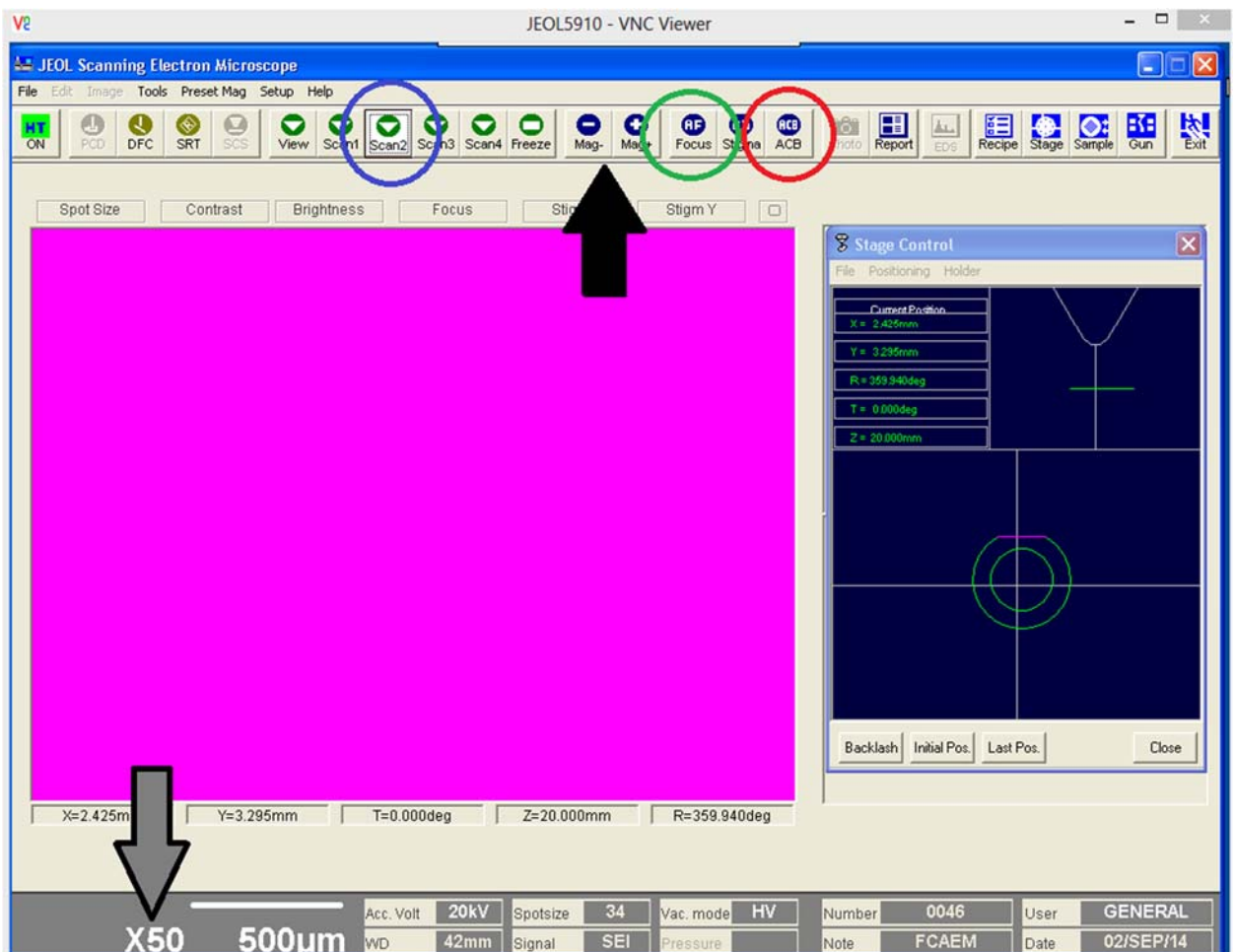
- Next click on the "HF-Focus" button (circled in green above). At this point you should be able to see and image in your "Axis 2400 Video Server" internet browser.
- You may need to fine tune the image contrast, brightness or focus. To do this manually, use your mouse to hover over the "Contrast", "Brightness", and "Focus" buttons (see in image below) and you will notice a hand icon appear over the buttons. To make **fine** scale changes; click and hold the **left** clicker on the mouse over the button and a box "**fine**" should appear. While holding down the left clicker, move the mouse up or down to adjust the focus or contrast or brightness. To make **course** scale changes; click and hold the **right** click button on the mouse and a "coarse" box should appear, then move the mouse up or down to make coarse changes to the focus or contrast or brightness.

- If you have a difficult time finding the appropriate settings for optimal viewing or accidentally make drastic adjustments and can't get it back into focus, click on the "ACB" and "HF Focus" buttons.
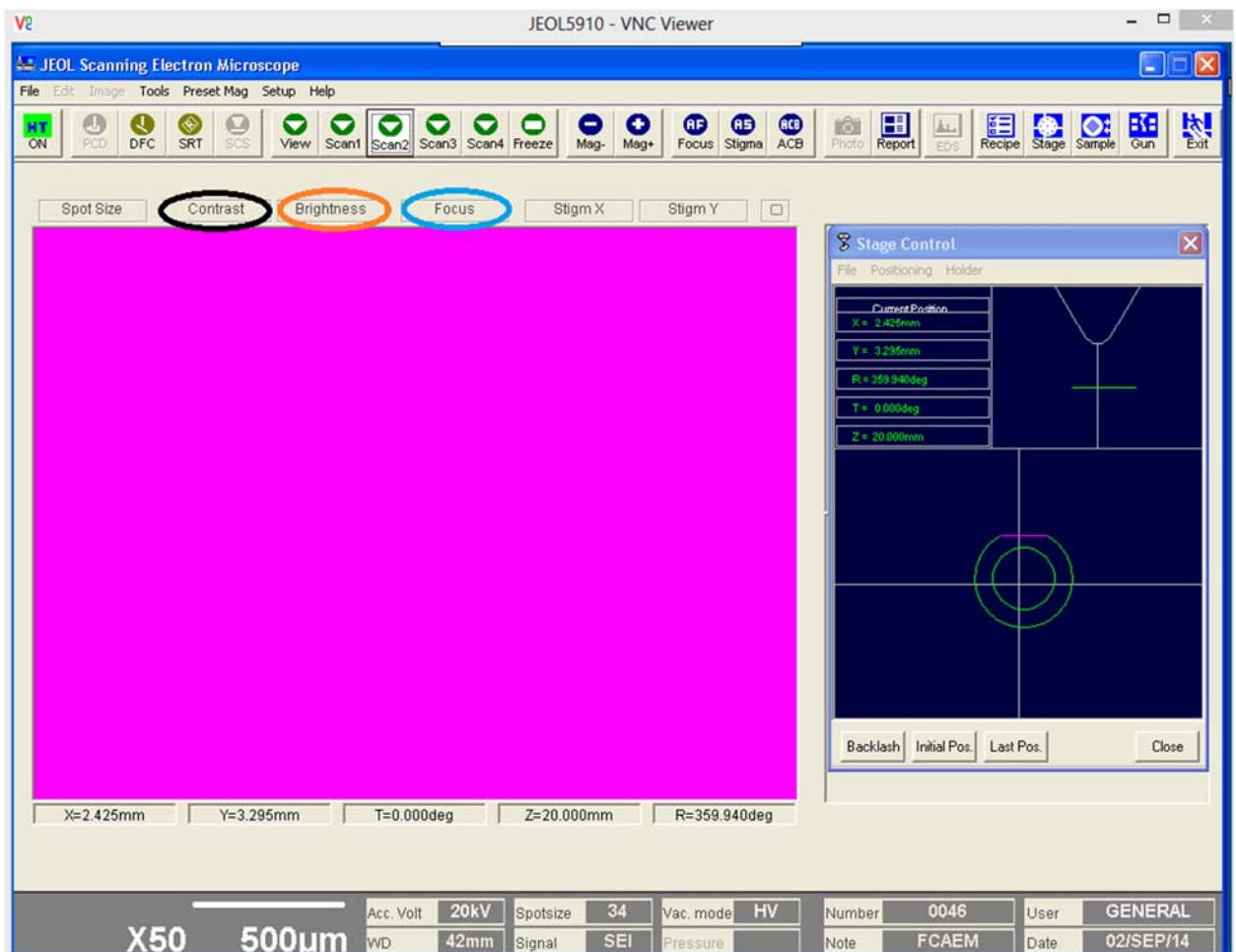
- If you continue to have image adjustment problems please contact the available staff at FACEM because we may have to shift the gun alignment or correct for astigmatism.

Stage Navigation

- Moving the stage on the SEM to find your samples is a straight forward process and is done on the main JEOL5910 GUI. On the main GUI screen (pictured below) you can move the stage to find your sample or spot for image and/or analysis by moving you mouse towards the sides of the GUI pink screen until a triangular white cursor shows up. When the cursor appears click down on the mouse and the stage will move and you can see this on the AXIS 2400 Video Server. At the corners of the pink screen you can also move the stage in both X and Y directions simultaneously.
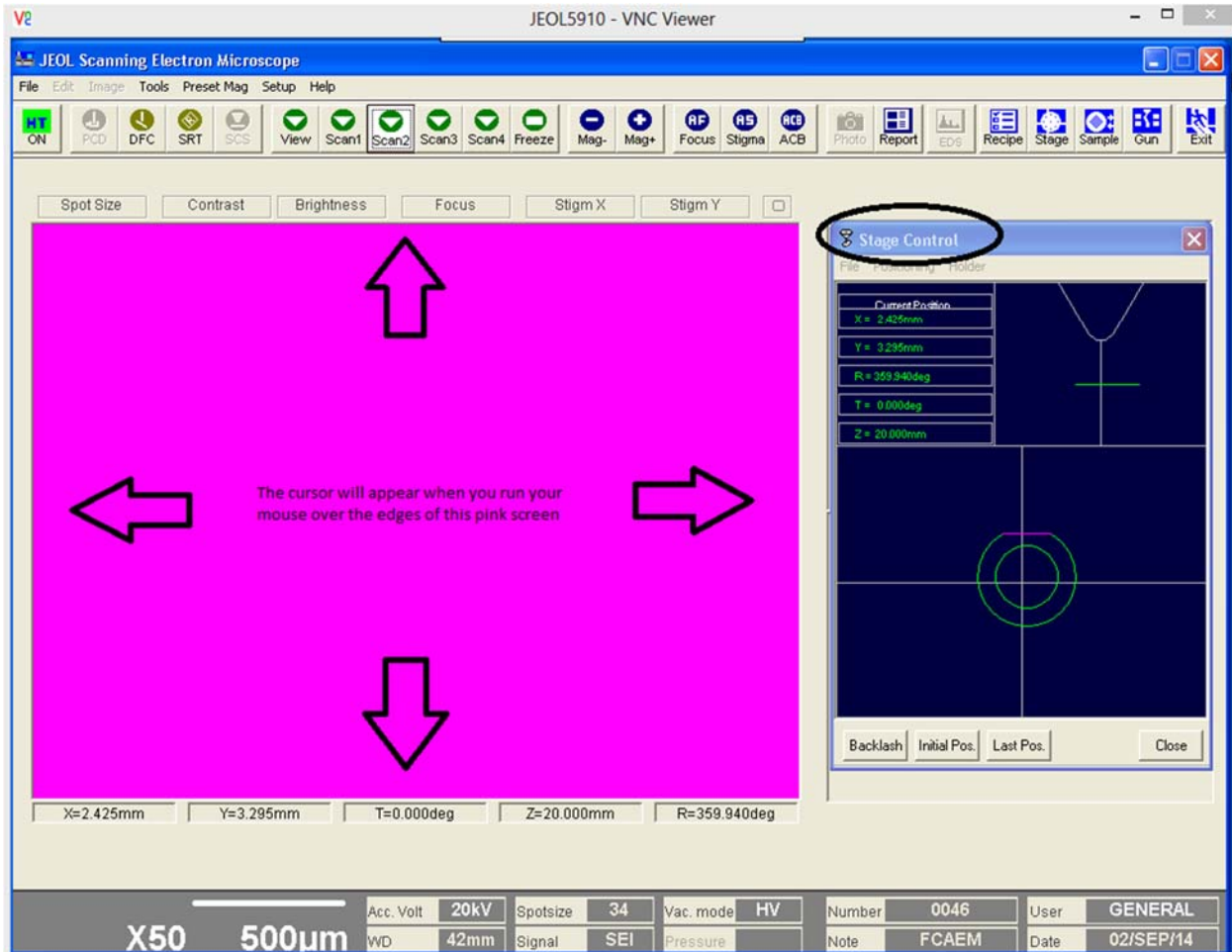
- You can also quickly move the stage to a specific spot by using the "stage control" side menu circled in the image above. This menu gives you a zoomed out view of the holder with cross hairs; double click on a location on the holder and select "Go" and the stage will move to your selected location. If the stage control window is closed, click on the "Stage" button on the top right corner of the GUI window.
- In some cases the sample holder seen in the stage control may not be the sample holder you are using; in this case you can change the preset sample holder by clicking on the "holder" button in the stage control menu. An additional window will open with images of sample holder options. Double click on the sample holder you are using.

Image Acquisition

- Once you have found your sample and have adjusted the image to your viewing preference (focus, contrast and brightness) there are a few simple ways of acquiring an image of your sample.
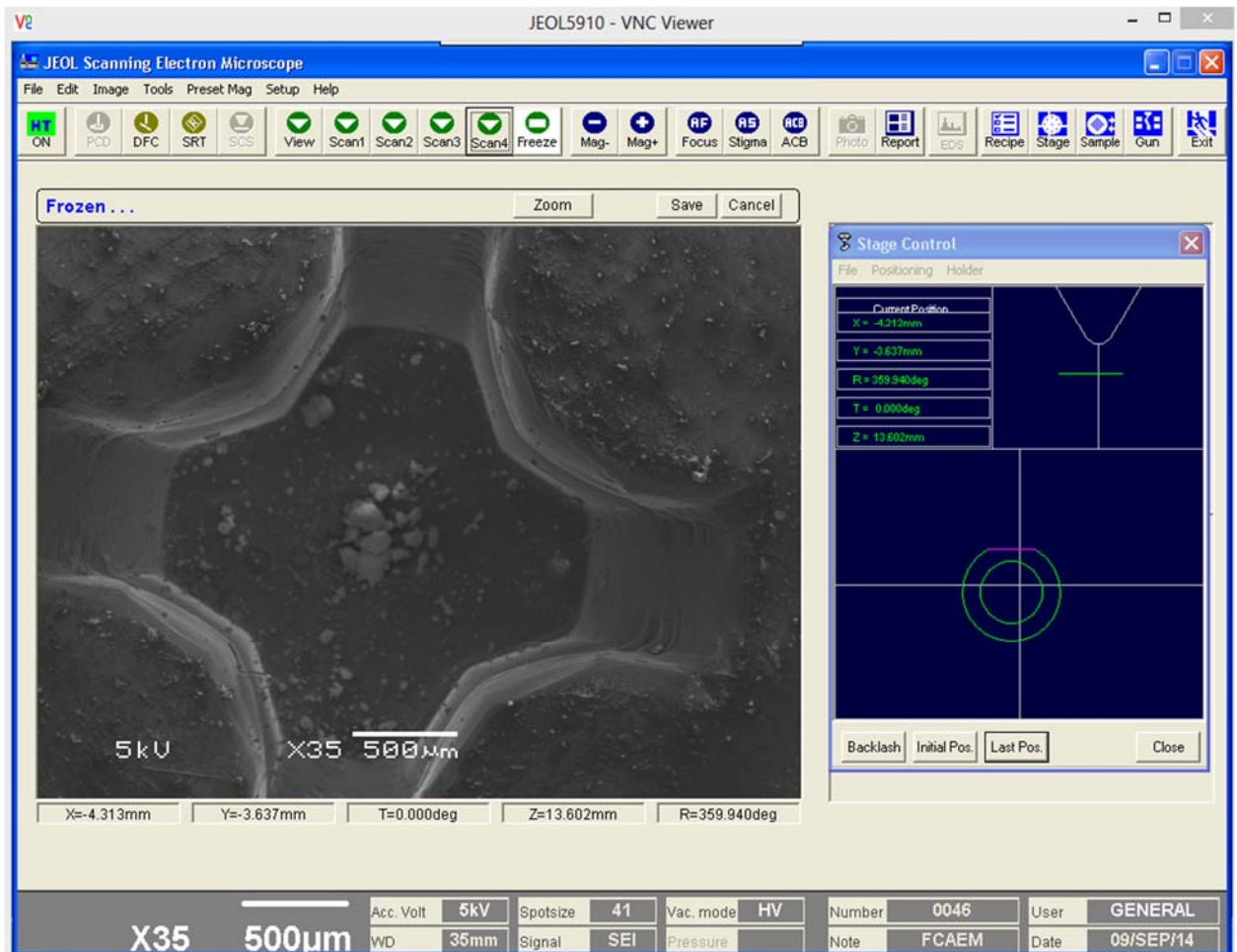

- You have been most likely navigating in the "Scan 2" t.v rate on the SEM. Once you have framed your image in Scan 2 click on the "Scan 3" button. You will notice on your Axis 2400 video internet browser window that the image will begin to change (higher pixel density) from the top to bottom. In Scan 3 mode the beam is slower moving across the sample providing you with better picture quality than the Scan 2 TV rate.
- To acquire and image simply click on the "Freeze" button on the main GUI window and an image should appear instead of the pink navigation screen in the main GUI (pictured above). Notice the image will have analytical information at the bottom of the image like magnification and a scale bar.
- You can also acquire a higher quality image (higher pixel density) by using the slower scan mode (Scan 4) by clicking on the "Scan 4" button. Once you're in the Scan 4 viewing mode your video viewer's image will slowly change. Please wait until the beam

has scanned your entire viewing area. Once finished, a high quality image should appear on the main GIU screen instead of the pink screen.

Saving your Image

- In either scan rate "Scan 3" or "Scan 4", you can save your image by clicking on the "file" button in the main GIU window (pictured below)
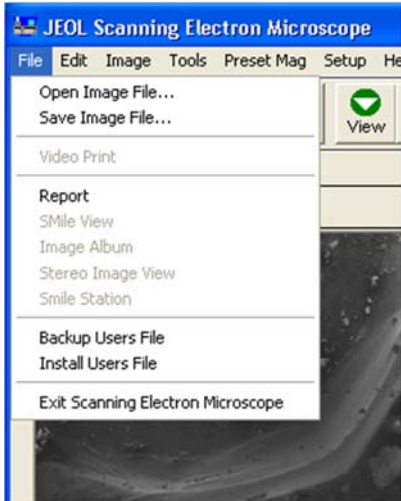
- The click on "Save Image File". Now you have the options on where you would like to save the image file, the file name, and the choice of image file type (see below). Create a folder either on the desktop or the My Documents folder and save your image in your preferred file type.


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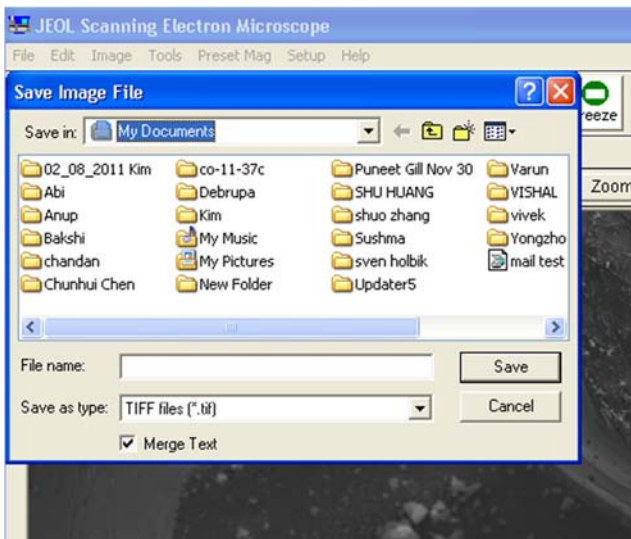
- Please contact the FACEM (305-348-2714) staff if you would like to obtain your image file. We can either e-mail the file/s to you or use a file sharing service.

Basic EDS Operations

These procedures cover the basic operation of the EDAX Genesis EDS software on the SEM to collect and image and select points on a sample to analyze qualitatively.

- Navigate the SEM to the area on the sample that you want to image/analyze. Make sure you have the EDAX VNC viewer open (pictured below). Refer to the startup procedures if not.
- The EDAX program will initialize in the Spectrum mode, select the Image tab at the top of the screen (circled in black).
- Collect an image and adjust the image for contrast and brightness by selecting the "Collect Image" circled in red.
- Once the image is collected and showing on the main EDAX window you have the option to select point or an area for analysis (options circled in green). Choose one of these options and click on the image area for the portion of the sample you would like to analyze. Pont analysis is denoted by red colored cross hairs and an area analysis can be either square/rectangle or custom shape.
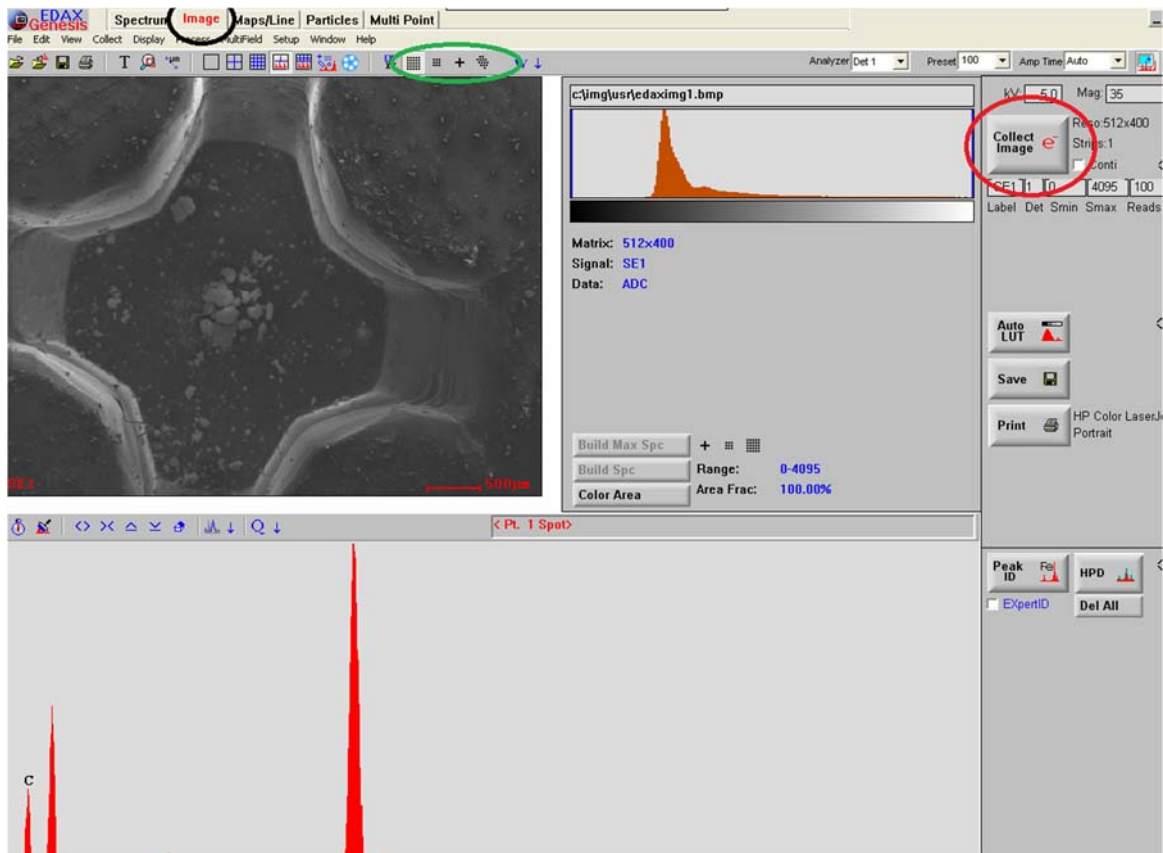
- When you have selected a point or an area for analysis click on the "acquire" button located on the leftmost corner above the active spectrum plot (within the orange square below). This will initiate collection of the dispersive x-ray analysis. If you mouse over the spectrum plot area you can click and change the plot x and y scales in order to zoom in and identify energy peaks. If you would like the EDAX program to re-scale the plot area, click on the home button (within orange square pictured below). If you would like to clear spectrum, click on the paint roller button in the same menu or buttons.

- To identify unknown peaks on the spectrum simply use the mouse to click into the center of an unknown peak and then click on the "Peak ID" button (circled in yellow below). The EDAX system will then give you a list of possible elements that match the spectral peak. Click on the appropriate element (the one that best matches peaks) and click on the button "Add". This will add that element to your "Element" list and also show the associated peaks onto your plot.
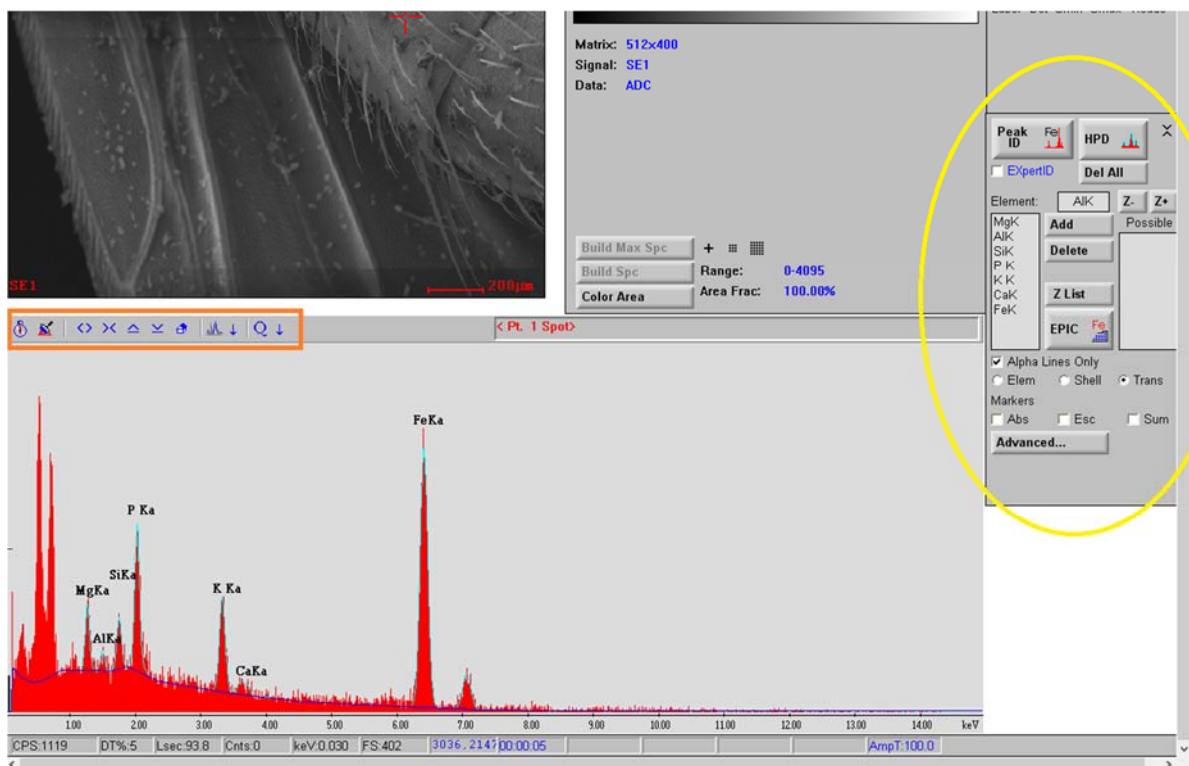

- Once you have identified all of your peaks (elements in sample), you can have the EDAX program calculated the approximate composition of your sample (qualitatively). Remember not to identify the coating material peaks (gold, palladium, or carbon). EDAX will include the coating material in its calculations. Click on the "Q" button (circled in black below) and a separate window will appear with wt % and at % calculations (circled in green). We can improve an EDS analysis by finding a better surface to analyze or increase the collection time.
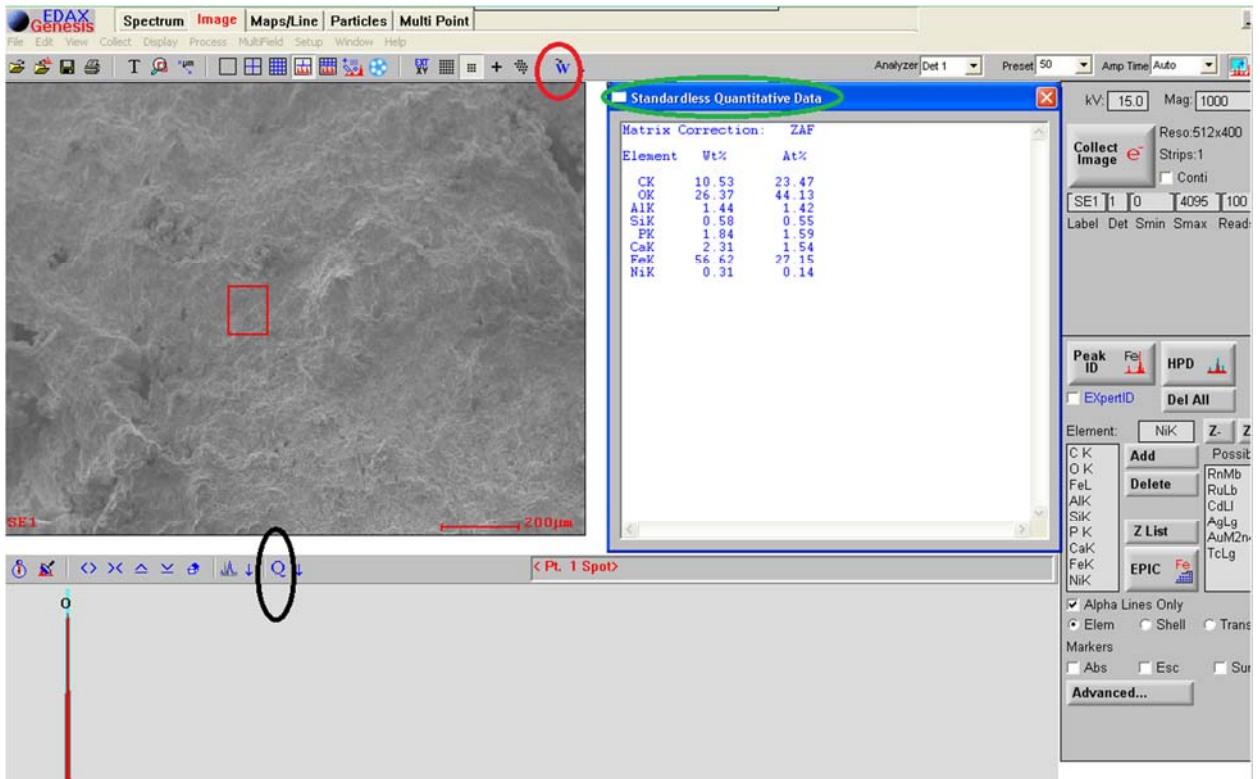
- The EDAX system will also automatically generate a report in the form of a word document by clicking on the "W" button (circled in red above). An image window will pop up after clicking the" W" button, then click the "W" button again on the right side of the image and a report on Microsoft Word should pop up (pictured below).
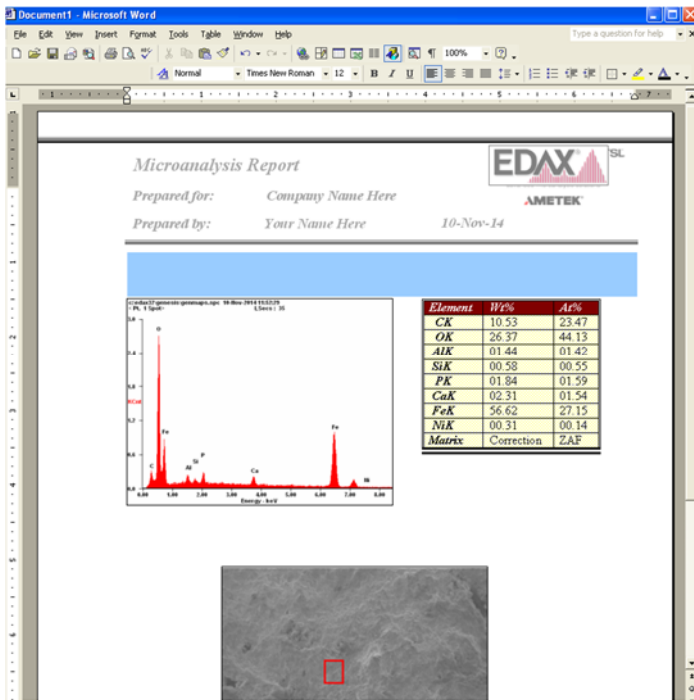
- Once finished with the EDAX system and if you would like to return to the main GUI SEM window, you must click on the "EXT XY" button above the image in the EDAX window (circled in black below). Once you have pressed this button the SEM main GUI screen's buttons will be available for use. Close the EDAX window by clicking on the "X" at the top right corner of the VNC screen.

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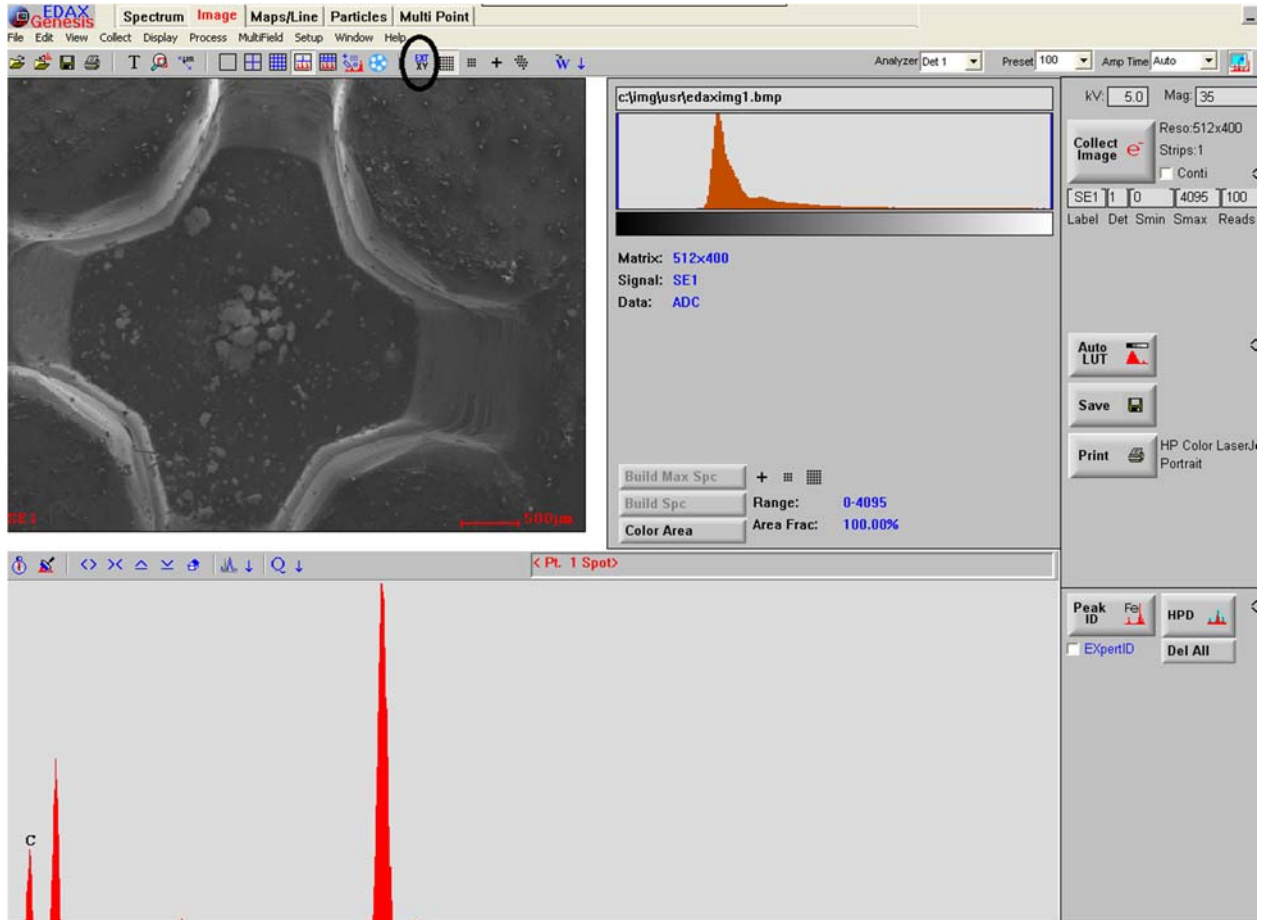
- When finished with the entire event. **Turn off the beam** by clicking on the "HT ON" button then close all VNC windows and internet browser windows.