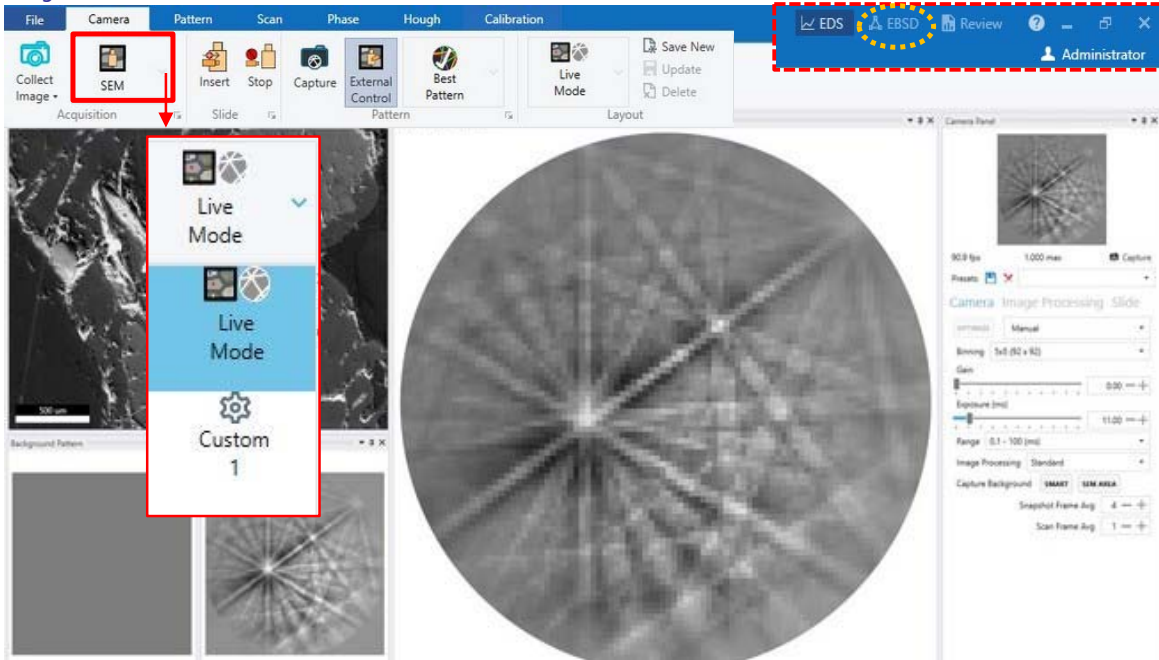


Guide to APEX™ EBSD System


Layout Overview



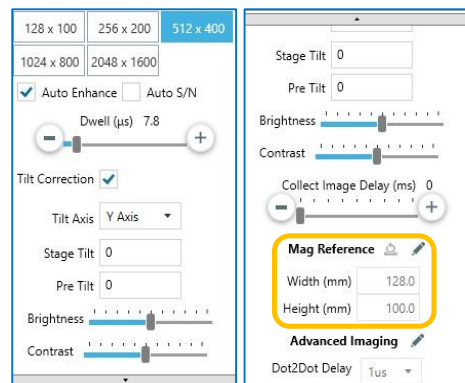
SEM Image

Find an area of interest, link Z to FWD at **18 mm** working distance, select **Z-Y link** option, and then tilt the stage to 60° – 70° (**mount only one (1) sample on stage position #4 or #12**) with stage rotation of 180°.

Reposition the area of interest and adjust Focus, Stigmation, Contrast/Brightness to optimize SEM image at the desired acceleration voltage and beam current/spot size (for example, 20 kV 13 nA).

Insert the EBSD camera by clicking the Slide Insert icon,  (*watch the chamber camera during the insertion process, stop it if a collision may be possible*).

Re-adjust Focus, Stigmation, Contrast/Brightness to optimize SEM image.



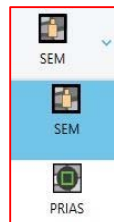
Capturing an Image

From Camera page click the **Collect Image** icon, , to collect the SEM image.

- make sure to check the image settings, such as resolution, brightness, and contrast. **DO NOT ALTER Mag Reference!!**

Image Collection Drop Down Options

Use the drop-down menu to choose the desired image collection type. The options include **SEM** (scanning electron microscope), **FSD** (Forward Scatter Detector), and **PRIAS**.



EBSD Detector

Camera Control Panel

The standard camera control functions are provided via the Camera tab for Binning (image resolution), gain (amplifier), black level (image offset) and exposure time. Any changes to these parameters will be observed immediately in the live image at the top of the console.

Use the Exp Range slide control to set the interval and range required for the exposure slidecontrol (ms-sec).

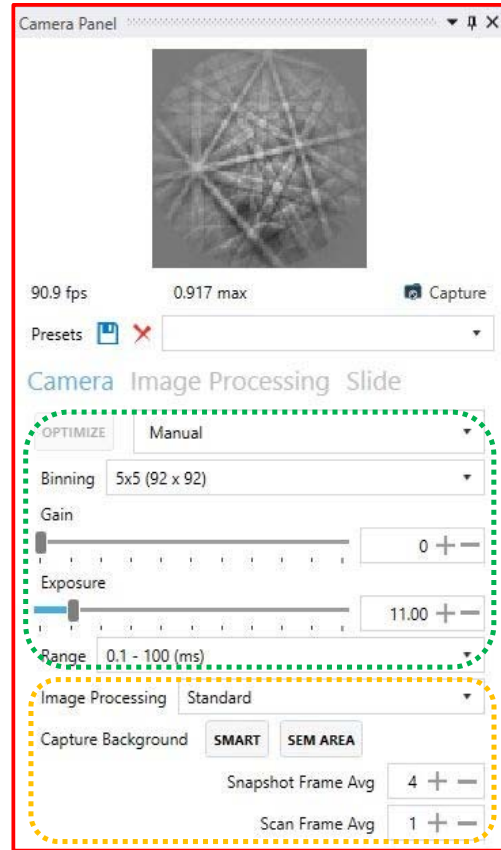
Image Processing

Select Standard or other Image Processing mode to improve the images and speed the analysis.

Camera Positioning

The EBSD detector is inserted and retracted inside the microscope chamber via the [cameraslide toolbar](#).

The camera position and status is indicated in the field to the right of the control buttons. Using this toolbar the camera can be fully inserted, fully retracted, incrementally stepped at predefined intervals, or sent to a predetermined position. To adjust the step interval refer to the Camera menu from the main menu in the application.



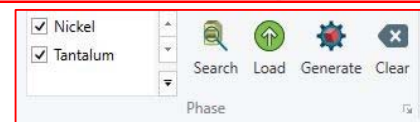
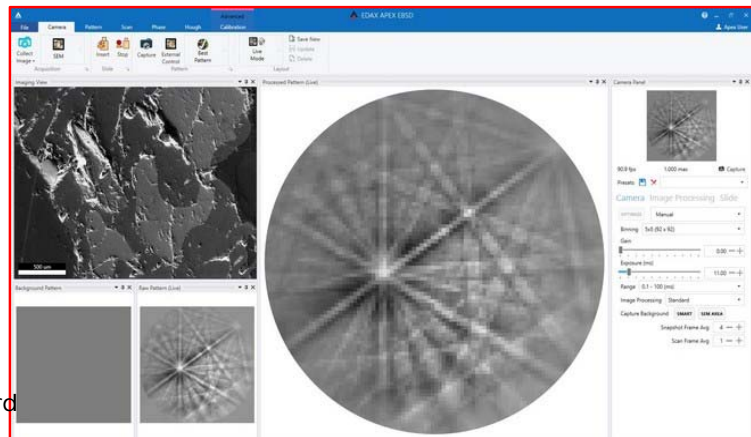
Camera Page

Checking the EBSD Pattern

Left click around the SEM image, and notice how the EBSD pattern changes in the adjacent view windows.

Pattern Page (Optional)

Use the buttons on the Pattern toolbar to index EBSD Patterns, tune patterns for calibration, record patterns, and more.



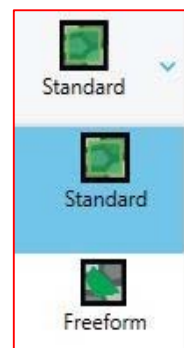
Phase Page

Use the icons on the Phase toolbar to search, load, generate, or clear phases.

Scan Page

Setting up a Scan

1. Capture the SEM image. Click the **Collect Image** button to collect the secondary electron image of the sample.
2. Define the area to be scanned. Use the drop down menu in the scan section of the toolbar to select which type of scan you'd like to perform. The user can

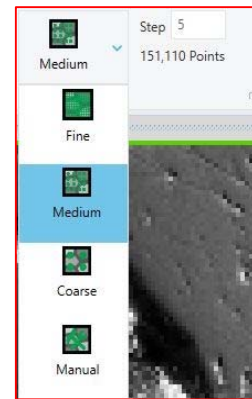


choose between a few options, which are pictured below.

3. Select the desired scan resolution from the drop down menu. Each resolution has a pre-set step size. To use a custom step size, select the manual resolution option.

Scan Resolution

The user can select coarse, medium, manual, and fine. The step size will be adjusted accordingly to match the number of points for the resolution setting as configured in the preferences dialog. However, it will try to match the number while maintaining a sensible step size by keeping the number for digits for step size to a minimum. If the user enters a value for the step size and then changes the resolution, the step size will be replaced by the calculated value.



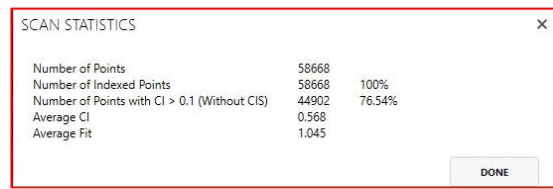
4. After defining the scan area, a dialog box will be displayed prompting the user for more detailed information about the scan. Once the dialog box has been dismissed the scan will be recorded in the batch list (Active Scan list box). The properties associated with the scan are shown in the scan information window.

5. If desired, return to step 1 and repeat. Up to 20 scans can be defined in the same manner.

6. Press the Start button to initiate scanning.

Scan Statistics Box

Once a scan has been completed, a pop-up box appears, showing different statistics from the scan. These stats include number of points, number of points indexed, average CI, number of points with a CI > .01, and the average Fit.




Analysis and Reporting

Once a scan has been completed, OIM Analysis is launched, showing each of the templates that have been predefined. This allows the user to analyze the data and maps that have been created from the scan. Microsoft Word is also launched, which generates a report based on the predefined specifications. Reports are a great way to view and interpret data. The Map data also appears in the project tree upon scan completion.

OIM Analysis of EBSD maps (post data processing can be done on the Workstation with OIM installed)

Quick-Gen Toolbar




 **Quick New** - Pops up the Quick New menu (shown below). Use this to create a new Document based on the active Partition or Dataset. This is a simpler alternative to using the Project Tree to create a new Document.




Active Partition - This drop down list allows the user to select the active Partition and Dataset for use in the other Quick-Gen options.














 **IPF Quick Map** - Generate an 001 [inverse Pole Figure Map](#) for the active Partition.

 **IQ Quick Map** - Generate an [Image Quality Map](#) for the active Partition.

 **Unique Grain Color Quick Map** - Generate a [Unique Grain Color Map](#) for the active Partition.










 **Grain Boundary Quick Map** - For the active Partition, generate an Image Quality Map with Rotation Angle Boundaries as follows: 1-5 degrees in red, 5-10 degrees in green, 10-180 degrees in black.

 **Phase Map** - Generate a [phase map](#) for the active Partition.

-  **EDS Quick Maps** - Generates [EDS maps](#) for the active Partition an EDS map using a different color is generated for each element for which counts were selected during the OIM scan.
-  **User Defined Quick Maps** - Generates a map based on a user-assigned [template](#) selected in the preferences dialog. The template assigned to this button will be displayed when the mouse is hovered over the button.
-  **Quick Pole Figure** - Generate a [Discrete 001 Pole Figure](#) for the active Partition.
-  **Quick Inverse Pole Figure** - Generate a [Discrete 001 Inverse Pole Figure](#) for the active Partition.
-  **User Defined Quick Plots** - Generates a discrete plot based on a user-assigned [template](#) selected in the preferences dialog. The template assigned to this button will be displayed when the mouse is hovered over the button.
-  **Grain Size Quick Chart** - Generate a [Grain Size Chart](#) for the active Partition.
-  **Misorientation Angle Quick Chart** - Generate a [Misorientation Angle Chart](#) for the active Partition.
-  **User Defined Quick Charts** - Generates a chart based on a user-assigned [template](#) selected in the preferences dialog. The template assigned to this button will be displayed when the mouse is hovered over the button.
-  **Auto Partition** - A partition is created containing all of the datapoints with CI values greater than 0.1. The IQ, Unique Grain Color, Grain Boundary and IPF Quick Maps are all created automatically along with the Misorientation Angle Quick Chart.
-  **User Defined Quick Partition** - Generates a partition based on a user-assigned [template](#) selected in the [QuickGen Preferences Dialog](#). Partition templates not only contain the partition definition but may also contain maps, plots, charts and textures. The template assigned to this button will be displayed when the mouse is hovered over the button.
-  **Auto CI Standardization** - Performs an automatic [Confidence Index Standardization](#) on the dataset. A grain tolerance of 5 degrees is used with a minimum grain size of three datapoints, but the three datapoints must extend over multiple rows.
-  **User Defined Data set** - Generates all the partitions, maps, charts... assigned to a [dataset template](#) on the current dataset. The template assigned to this button will be displayed when the mouse is hovered over the button.
-  **Template Selector** - The user can select any template or cleanup recipe saved in the templates folder. The templates folder is the folder containing the last template selected by the user. Cleanup recipe's can be created using the [Batch Processor](#).


Highlighting Toolbar



-  **Record** - Toggles the interactive data record mode on/off. If toggled on, interactive data is collected with each mouse click in a Map document and displayed in the Interactive List.
-  **Undo** - Remove the last highlighting operation from all Documents.
-  **Redo** - Resend the last highlighting operation to all Documents.
-  **Clear** - Remove all highlighting from all Documents.
-  **Tolerance Angle** - Allows the user to change the tolerance angle used for Tolerance Mode highlighting.
-  **Vector profile width** - By increasing the width beyond 1 the values in the measurement points perpendicular to the profile vector are averaged together in the resulting profile chart.
-  **Plane Trace HKL** - Set the indices for the plane of interest when highlighting plane traces.
-  **Use Average Grain Orientations** - For the Boundary and Triple Junction Modes, instead of calculating misorientations based on the actual orientation associated with each point in the pair, calculate the misorientation based on the average orientation of the grain to which each point belongs.
-  **Overlay Size** - Change the size of the [crystal lattice wireframe](#) and the [plane trace](#) overlays as well as the thickness of any boundaries drawn because of highlighting (i.e.

- like on a misorientation angle chart).
- **Point Mode** - Highlight an individual point when clicking in a Map, and record the orientation data for that point in the Interactive List.
 - **Tolerance Mode** - Highlight all points within a certain tolerance of the point clicked on in a Map, and record the orientation data for each point in the Interactive List.
 - **Grain Mode** - Highlight all points of the grain clicked on in a Map, and record the orientation data for the grain in the Interactive List.
 - **Boundary Mode** - Highlight the two points clicked on in a Map, and record the misorientation data in the Interactive List.
 - **Triple Junction Mode** - Highlight the three points clicked on in a Map, and record the misorientation data in the Interactive List.
 - **Vector Profile Mode** - Highlight all points along the line segments drawn on a Map, and record the orientation and misorientation data in the Interactive List
 - **Crystal Direction Mode** - display the crystal direction parallel to the vector draw on a Map.
 - **Plane Traces** - Draw the traces of the specified plane for the datapoint selected on a Map. The length of the traces drawn is proportional to the inclination of the plane relative to the sample surface. The more inclined the plane the longer the trace.
 - **Crystal Lattice** - Draw a crystal lattice in the orientation of the data point selected on a map.
 - **Ruler** - Measure the distance between two points on a map (x, y and overall distance).
 - **Tolerance** - Show the points within the specified angular tolerance relative to the point clicked in a Plot.
 - **Misorientation** - Show the misorientation between two points clicked in a Plot. For pole figures the angular distance between the two sample directions, for inverse pole figures the angular distance between the two crystal directions, in ODFs the angular distance between two orientations (the minimum misorientation based on the crystal symmetry). Not implemented for misorientation plots.
 - **Color** - Select the current highlighting color, which is used for the Point, Boundary, and Triple Junction Modes.
 - **Color Gradient** - Select the current highlighting gradient, which is used for the Tolerance, Grain, and Vector Modes.

After Data Collection

- 1) Retract the EBSD camera by clicking Retract button,  Retract, from the toolbar in the Camera Page.
- 2) Return stage tilt to 0°.
- 3) Vent SEM chamber and remove sample.
- 4) Pump the SEM chamber to high vacuum.
- 5) Log off your SEM session.