# Imaging and Small Area Spectroscopy Procedure for XPS1

## Imaging

The imaging mode allows you to pick specific peak energies and make a spatial map of their locations on your sample.  You will typically follow these steps to perform imaging:

1. Pick one element or chemical state energy peak value of interest (e.g., from your survey scan)
2. Optimize the sample height to bring the image map of this energy value into best resolution
3. Set up an image mapping flowchart in the manager to collect image maps of all energy peak values of interest

### *Optimizing Sample Height*

1. **Follow the Z-height optimization procedure to manually adjust the Z-height for maximizing the number of counts for the element of interest**.
2. **Set up the parameters for general alignment imaging (see Acquisition Conditions Reference Sheet):**
   a. **Analyzer Section**
      i. **Analyzer mode:** Imaging
      ii. **Lens Mode:** FOV1
      iii. **Resolution:** 160
      iv. **Aperture:** Imaging Low Res
   b. **Parallel XPS Imaging Section**
      i. **Choose Single Integration**
      ii. **Integration time: 60 seconds**
      iii. **Refresh time: 1 second**
      iv. **Enter energy value based on element or chemical state energy peak value of interest**
      v. **Select B.E. (Binding Energy)**
      vi. **Choose Ref Al(mono)**
3. **Turn Parallel XPS Imaging on**
4. **Look in real time display window to view results**
   a. Adjust Z height manually to optimize focus of image
   b. Move X,Y stage manually to view different regions
5. **If you would like to save the collected image:**
   a. In the Parallel XPS imaging section, enter a name for the image
   b. Click "Grab Image"
   c. Go the manager zone and look for the data object with the name you entered

## *Setting up an image mapping flowchart*

1. **Click on the "Manager" zone in the top task bar to open the Vision Instrument Manager work area**
2. **Choose the "Dataset" button**
3. **Enter a filename for storing your data in the filename field**
4. **Click on the middle mouse button to paste the "Dataset" sequence in the flow chart**
5. **Choose the "Acquisition" button and enter a name for this flow chart item in the name field (e.g., Map)**
6. **Set up the parameters for elemental or chemical state imaging (see Acquisition Conditions Reference Sheet):**
   a. **Analyzer**
      i. **Analyzer mode:** Imaging
      ii. **Lens Mode:** Choose FOV1, FOV2, or FOV3 based on desired area and magnification:
      iii. FOV1: 900μm x 900μm
      iv. FOV2: 400μm x 400μm
      v. FOV3: 250μm x 250μm
      vi. **Resolution:** 160 for elemental imaging, 40 or 80 for chemical state imaging
      vii. **Aperture:**
      viii. FOV2: Medium Res or High Res
      ix. FOV3: High Res
   b. **Scan Control**
      i. **Choose Map**
      ii. **Enter region names or energy values based on element or chemical state energy peak values of interest** (Multiple energy values can be entered on separate rows to map multiple elements or chemical states)
      iii. **Dwell:** 20 (or even much longer for a low intensity signal or at lower pass energy)
      iv. **# Sweeps:** 1 (or more if desired)
7. **Click on the middle mouse button to paste the "Map" sequence in the flow chart**
8. **Click on "Submit" to start the flowchart job.** An image map will be taken and a file created for each energy value that was entered.
9. **If desired, choose "Acquiring" in the view window to see the image data being collected in the Real Time Window**
10. **When run is completed, highlight the files in the viewing window and paste into the Real Time Display window to view all maps.** (You may also use the functions in the Process zone to view all maps simultaneously or overlap maps, etc.)

**<u>Small Area and Multipoint Spectroscopy</u> (Kratos Manual Section 6.3.5)**
After an image map is taken, it is often desired to collect spectroscopic scans in smaller areas of interest on the sample. This procedure explains how to take spectroscopic scans in small regions that have been identified from an image map.

*<u>Multipoint Small Area Scans</u>*

1. **Click on the "Manager" zone in the top task bar to open the Vision Instrument Manager work area**
2. **Choose the "Dataset" button**
   a. **Enter a filename for storing your data in the filename field**
3. **Click on the middle mouse button to paste the "Dataset" sequence in the flow chart**
4. **Choose the "Acquisition" button and enter a name for this flow chart item in the name field (e.g., Small Spot)**
5. **Set up the parameters for a small area scan.**
   a. **See the Acquisition Conditions Reference Sheet to set values for desired spot size.** *Note that FOV2 is the only field of view that is referenced to the various apertures to give the spot size shown in the Acquisition Conditions Reference Sheet.*
   b. **Analyzer mode should be "Spectrum"**
   c. **Enter Scan Control parameters for desired energy and spectra settings.**
      *Typical parameters are:*
         o *Energy width of 15eV around the energy value of interest*
         o *Step size of 0.1*
         o *Dwell time of 200*
         o *# Sweeps = 1*
6. **Bring up the image map and point the mouse to the area where you want the scan to be performed, and then left click on the mouse button.**
7. **In the Analysis Position section of the Manager window, click on "Import Position".** The x,y position of the point identified in the image map will be input.
8. **Click on the middle mouse button to paste the "Small Spot" sequence in the flow chart**
9. **To perform small area spectroscopy on multiple points in an image map:**
   a. **Copy and paste the "Small Spot" sequence in the flow chart. Paste as many copies as desired points**
   b. **Go into each small spot sequence, choose the position on the image map and import the position (as in Steps 6 and 7).**
10. **Click on "Submit" to start the flowchart job**
11. **If desired, choose "Acquiring" in the view window to see the scan data being collected in the Real Time Window**
12. **When completed, the scan may be viewed in the Real Time Window** (You may also use the functions in the Process zone to view all scans simultaneously, etc.)

## *Line Scans*

1. **Set up a filename and flowchart in the Manager Window** (See steps 1-3 in the Multipoint Small Scans Procedure)
2. **Choose the "Acquisition" button and enter a name for this flow chart item in the name field (e.g., Line Scan)**
3. **Set up the parameters for a small area scan.**
   a. **See the Acquisition Conditions Reference Sheet to set values for desired spot size.**
   b. **Analyzer mode should be "Spectrum"**
   c. **Enter "Line Scan" in the Scan Control Sections**
   d. **Enter other Scan Control parameters for desired energy and spectra settings.** (as in Step 5 of Multipoint Small Scans Procedure)
4. **Bring up the image map and click and drag the mouse to form a rectangle in the area where you want the scan to be performed. The line scan will proceed from the upper left corner of the rectangle to the lower right corner.**
5. **In the Analysis Position section of the Manager window, click on "Import Position".** The coordinates of the line identified in the image map will be input.
6. **Click on the middle mouse button to paste the "Line Scan" sequence in the flow chart**
7. **Click on "Submit" to start the flowchart job**
8. **If desired, choose "Acquiring" in the view window to see the scan data being collected in the Real Time Window**
9. **When completed, the scan may be viewed in the Real Time Window** (You may also use the functions in the Process zone to view all scans simultaneously, etc.)