GenISys

Advancing the Standard
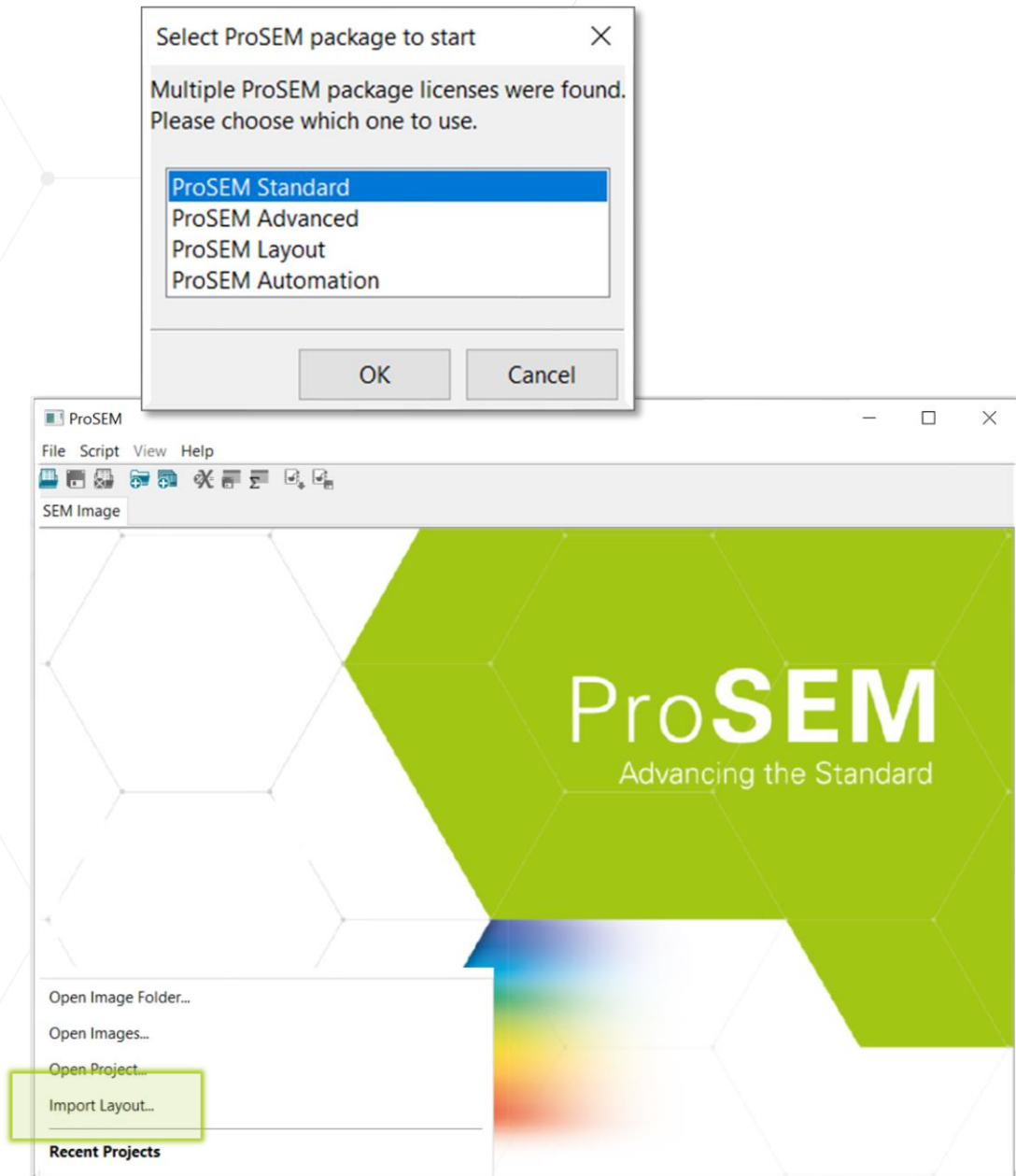
Pro**SEM**

What's New in ProSEM 3.2

ProSEM 3.2 Key News

- General
  - ProSEM Packages
  - Handling of multi-page TIFF

- Feature Detection and Export
  - 2-pass detection for fitted 2D features including cutline
  - Export (GDS, CSV) for segmented contours

- Layout Integration
  - New GUI: image/layout in parallel, metrology list
  - Extended to multiple layers and more feature types

- SEM Automation: Completely New Functionality

General

- ProSEM packages
  - New selection panel on starting ProSEM
  - Only in case different packages are available

- Opening splash screen
  - Added *Import Layout...*
  - Enables easy project start with layout file only
 - Only applies to Layout Package or higher

New ProSEM packages

- Replace the previous standard ProSEM with options

- Increasing / inclusive regarding their content

- Licensed Packages
  - Standard equivalent to ProSEM
  - Advanced will get more features
  - Layout is extended as well
  - All new is the SEM automation

| Before Packages	ProSEM (P300)	Advanced Contour Meas. (PO301)	Layout Integration (PO302)	SEM Automation *NEW*
Standard	X			
Advanced	X	X		
Layout	X	X	X	
Automation	X	X	X	X

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Advancing the Standard

- Handling of TIFF images with multiple pages implemented

  - Loading of all image pages
  - Excluding thumbnails, alpha masks etc.
  - Imported as separate images in project tree
  - In case a pixel size is included, it is applied to all images
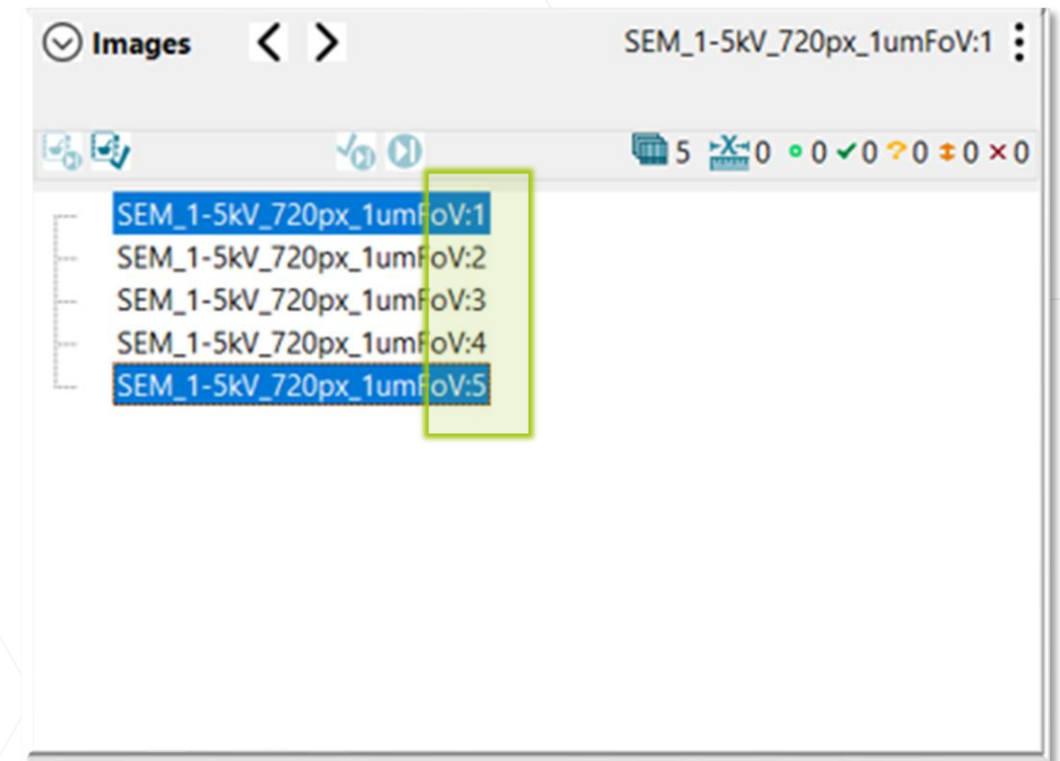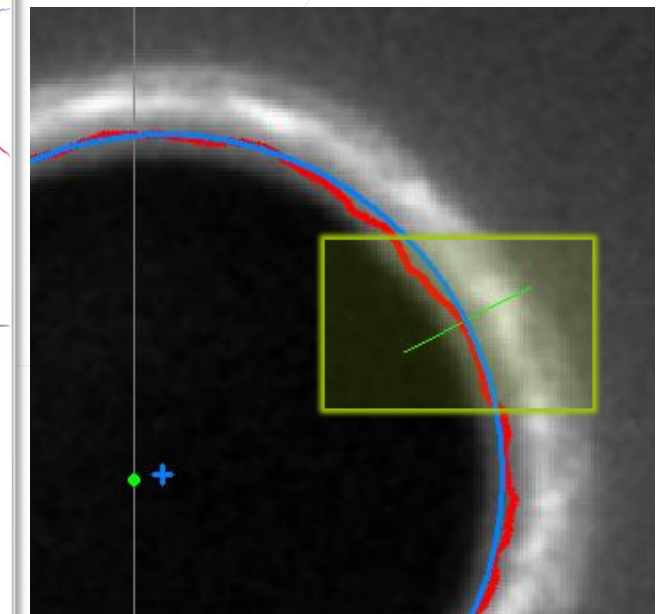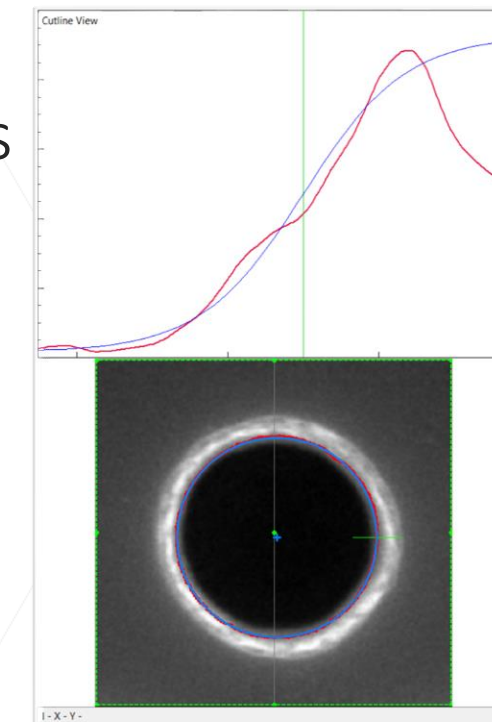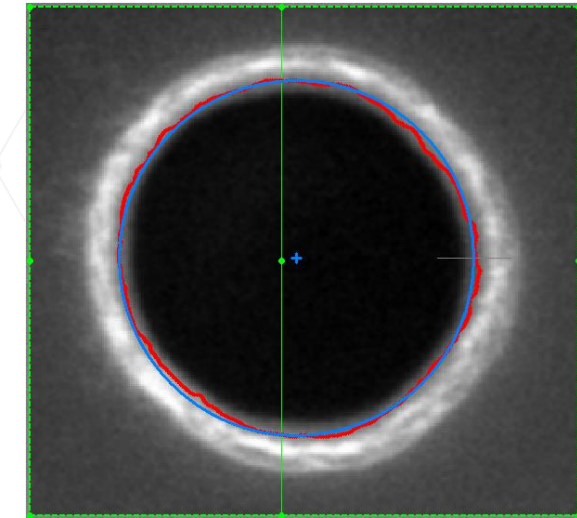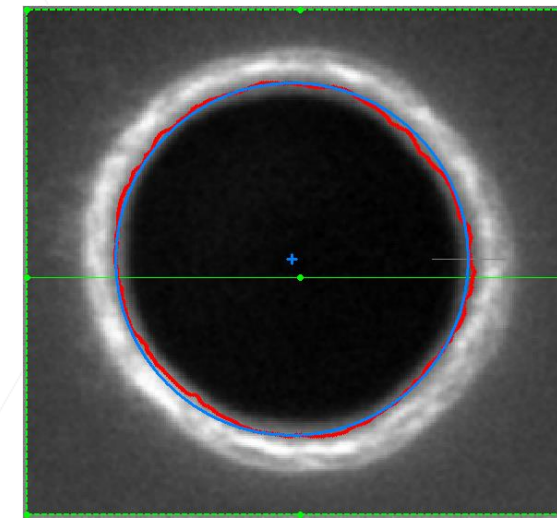
Feature Detect/ Export

- Two-pass for fitted 2D features (non L&S)
  - Implemented a 2nd pass for shape construction
  - Applies to rectangle, circle, ellipse and triangle
  - Orthogonal scanregions are used for fine detection

→ Improves the quality with 2D contours on noisy images

- Settings two-pass
  - In properties dialogue under general tab
  - Default is "on"
 - Tic box applies both to L&S and fitted 2D features
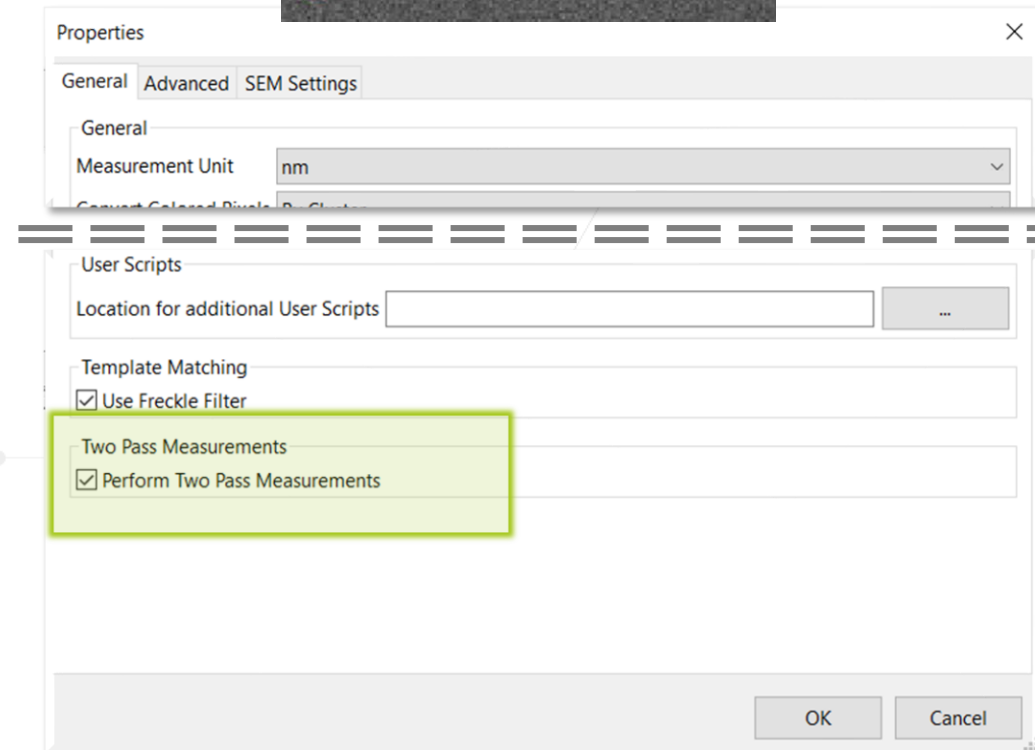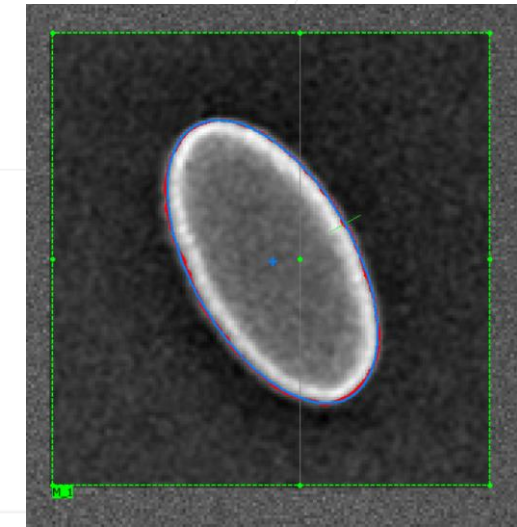
Second Cutline „non-cartesian"

- Standard cutline still available
  - In X or Y direction
  - Position can be shifted in cartesian directions

- New alternative cutline for fitted 2-pass features
  - 2nd cutline representing orthogonal scanregions
  - Can be moved along fitted shape
  - Switch between both types

- Export into GDS and CSV
  - So far, only export of closed shapes possible
  - GDS export now established for segmented contours
  - Segments are exported as single polygons
  - Edge points can also be exported as CSV
  (Available with Advanced Package or higher)

- Other line groups (L&S or multi-edge)
  - Individual lines are exported as separate polygons
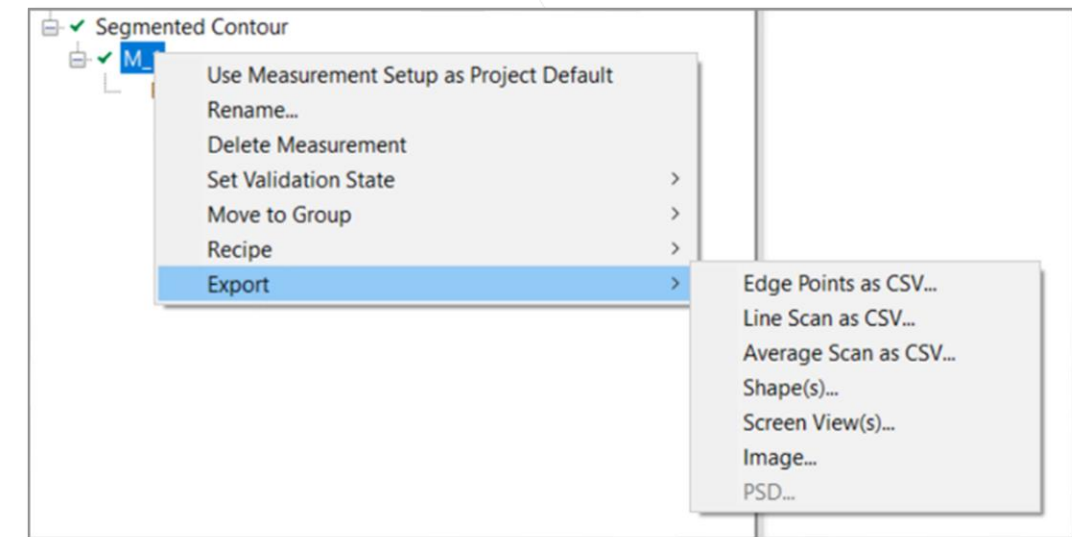
Layout Integration

Layout or Automation Package

- Handling of layouts with multiple layers
  - Loading of layers separately (no heal)
  - Switch layers in view
  - Define metrology tasks based on specific layer
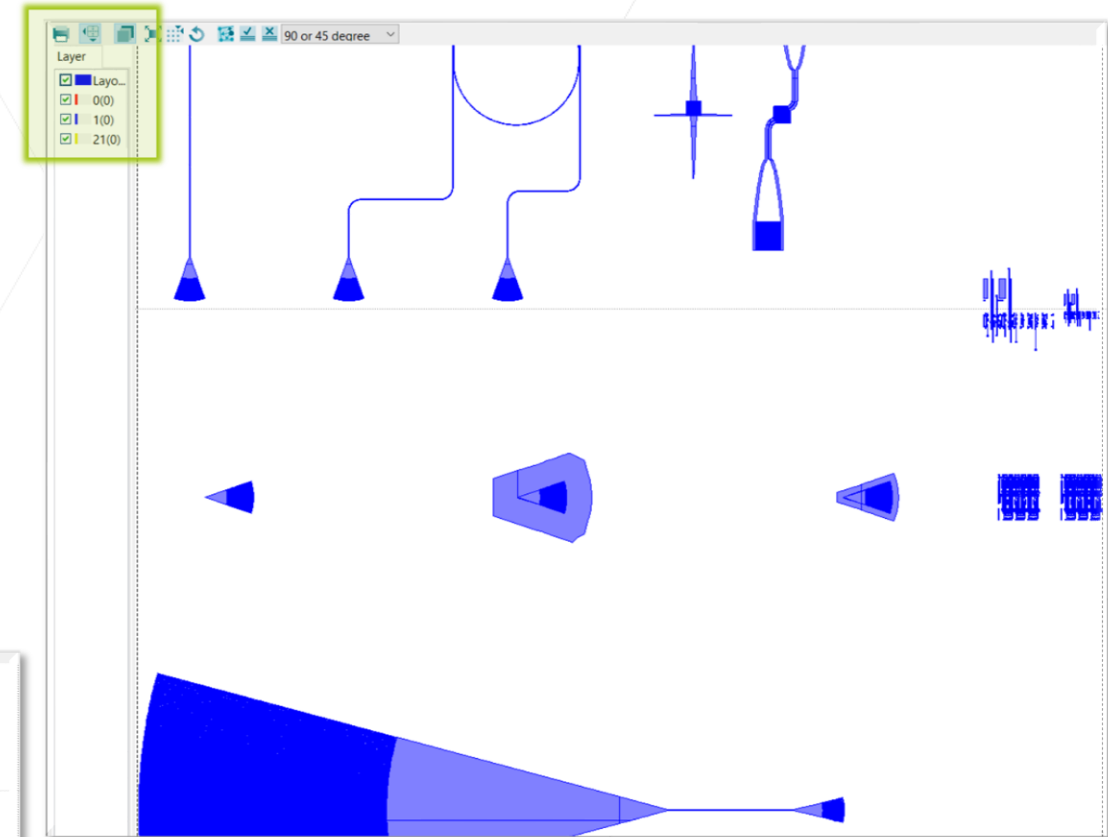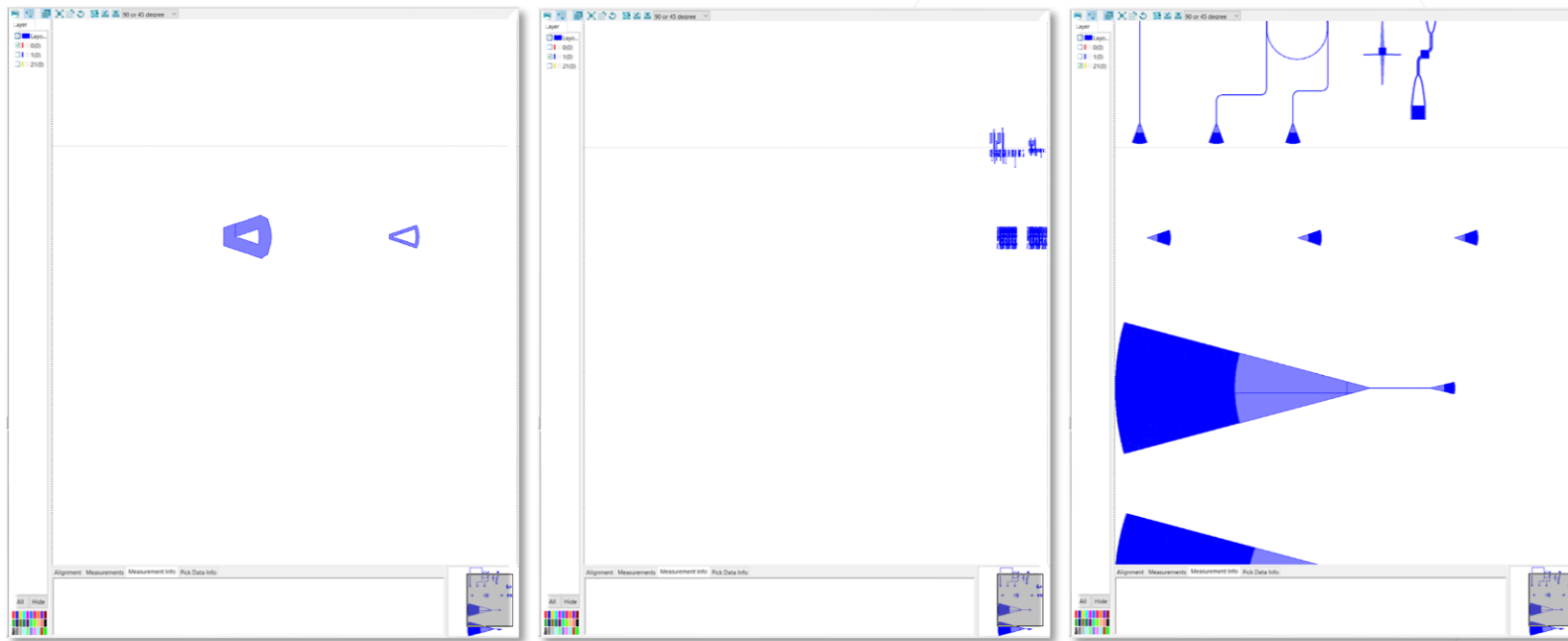
Layout Registration Improvements

- Registered coordinate system
  - Show positions in layout coordinates
  - Image info panel: image center position
  - Below image: current mouse position

  - In addition: registration quality improved
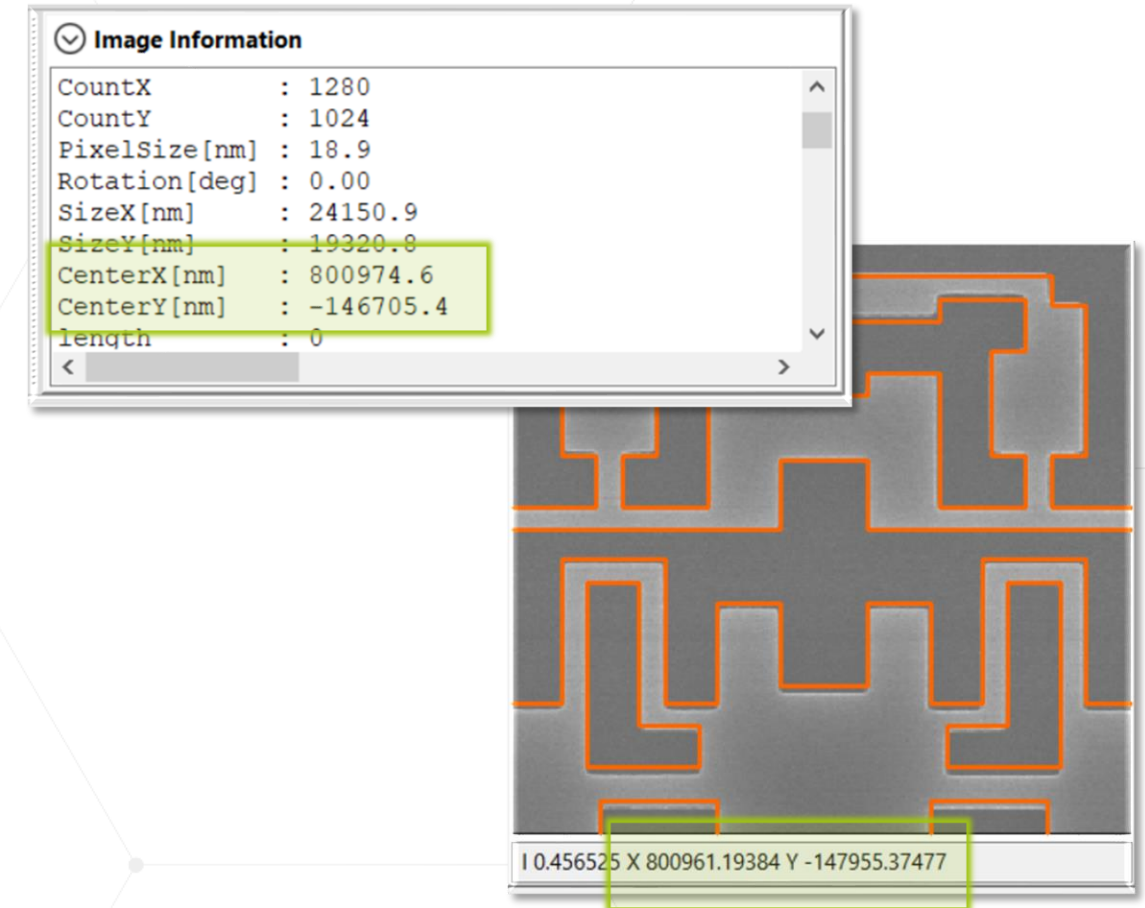
- Layout and/ or Image View

  - Image (2D/ 1D) or Viewer
  - Both in parallel

→ Convenient switching
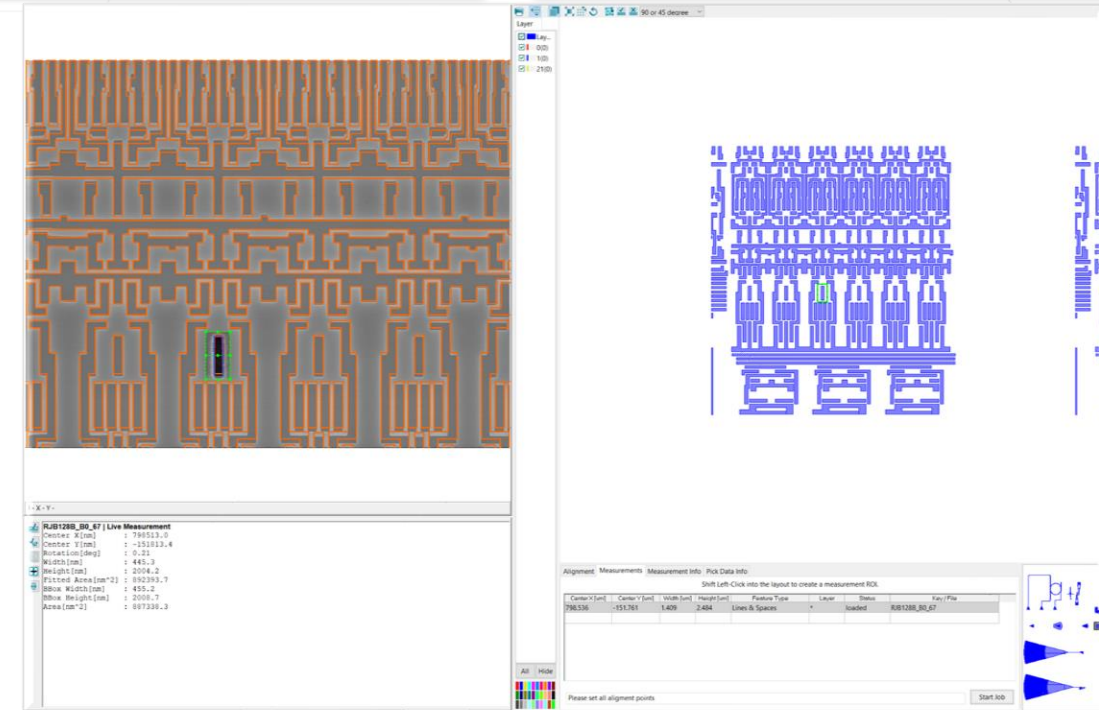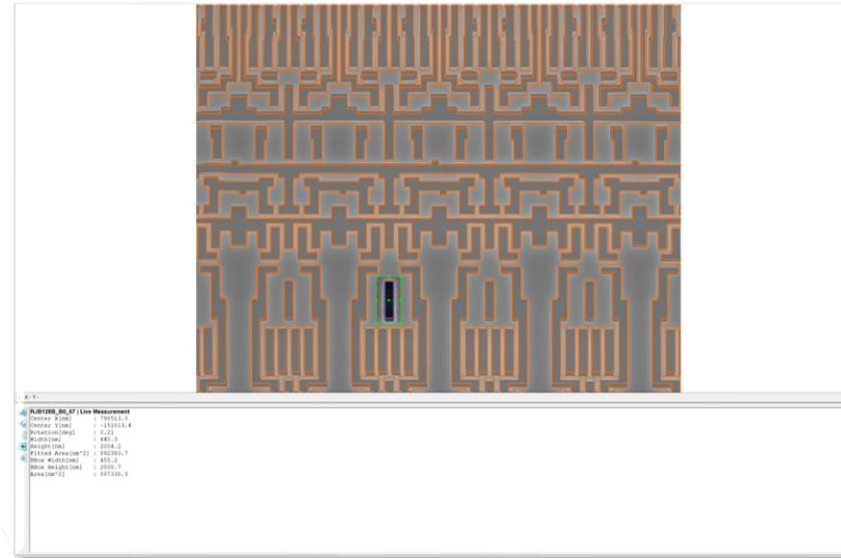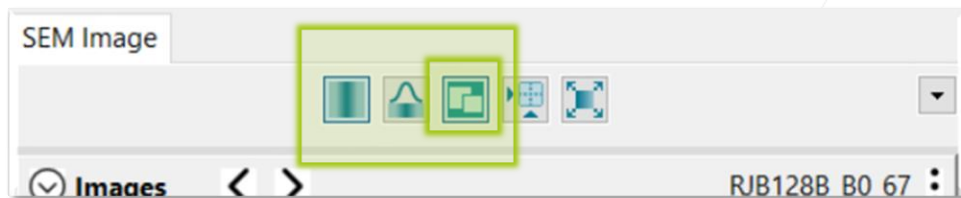
- Metrology list
  - Now integrated in Viewer tabs as "Measurements"
  - Supports existing functionality (image key/ identifier)
  - Now extended to other feature types than L&S
  - Context menu allows for direct image import/ select

SEM Automation

Automation Package

- Digital interface to SEM PC
  - Currently available for ZEISS "Remcon"
  - Next planned interfaces for FEI and JEOL

- 3-point alignment of stage & layout coordinates

- Define list of measurements based on layout

- Send SEM drive and image scan commands

- Load set of images

- Execute automated metrology measurements

→ For workflow steps see appendix

Pro **SEM**

| Registration/ alignment | ↔ | Drive to marker positions |
| | | Define image parameter |

Define list of measurements

Send coordinates → Drive XY and scan images

Load images

Automatic metrology

Control via SEM specific digital interface
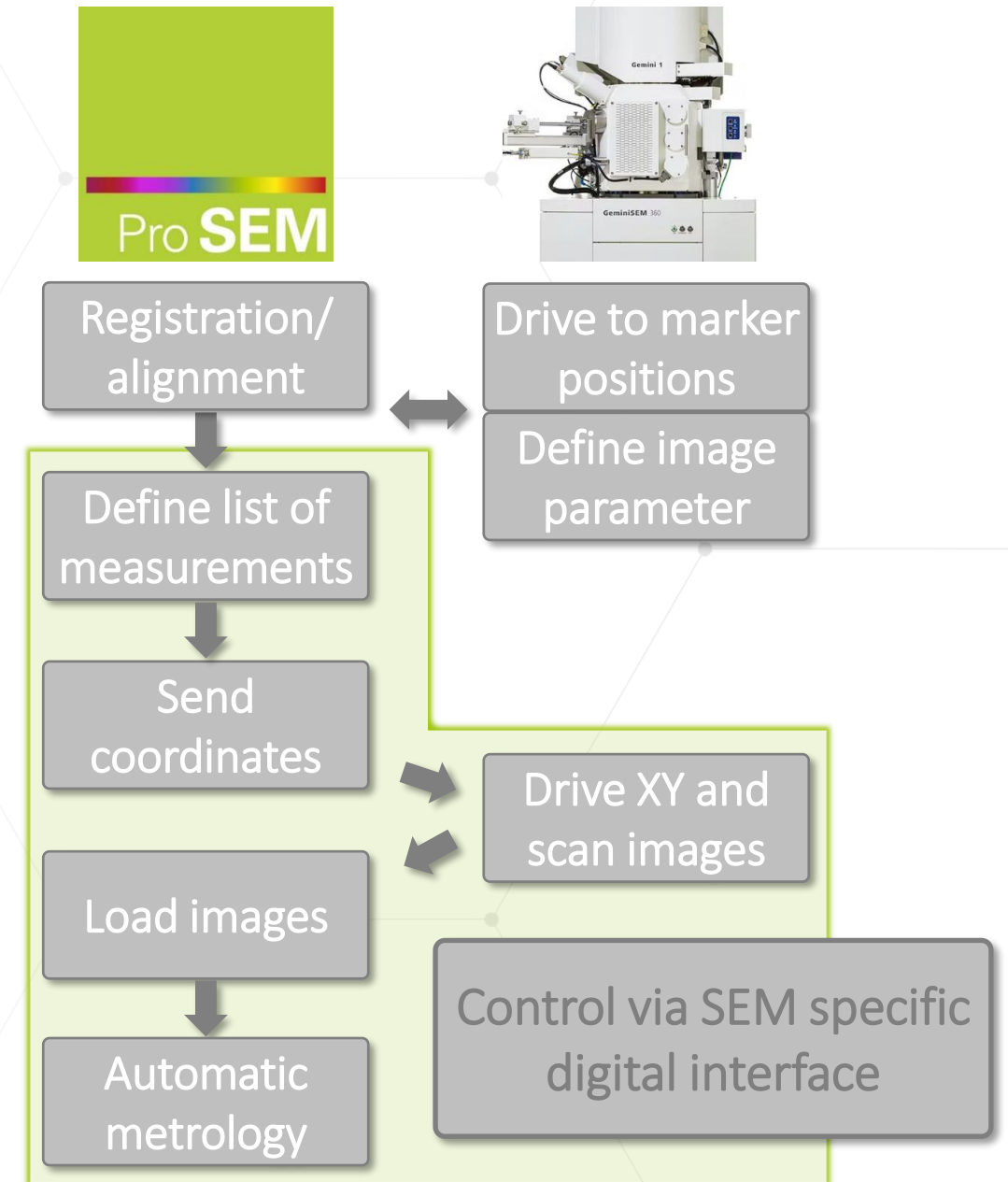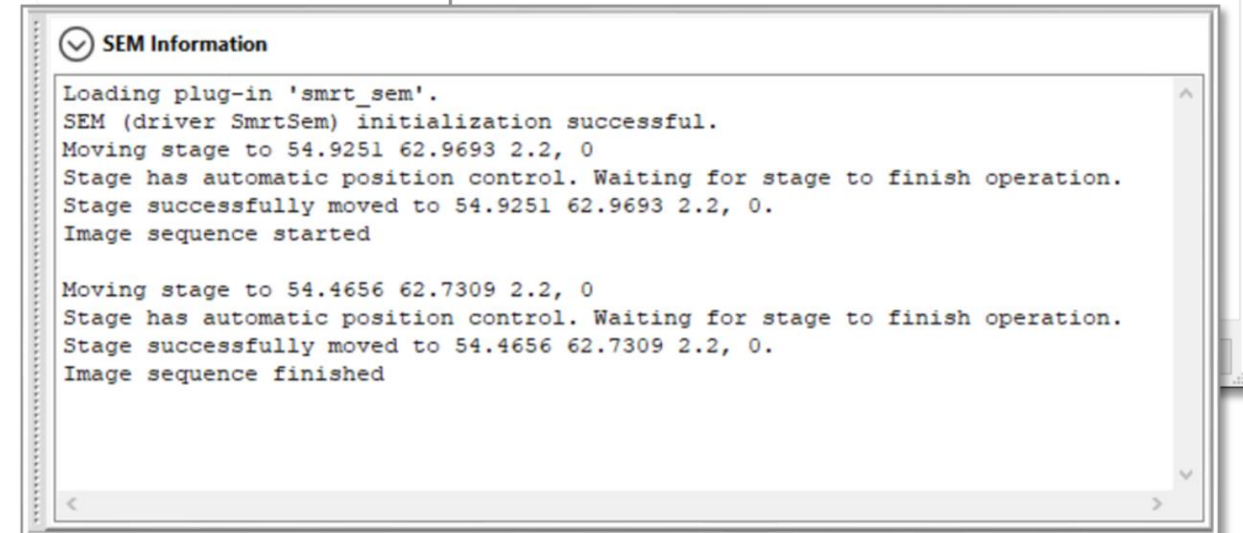
- SEM settings dialogue
  - Tab in properties menu
  - Includes settings for PC interface
  - Currently only ZEISS Remcon supported
  - Separate manual on setup of COM interface available

- SEM information panel
  - Provides logging of SEM status
  - Displays coordinates and hardware messages

Coordinates Alignment Tab

- Alignment mode
  - Integrated in Viewer tabs
  - Procedure for alignment of stage to layout coordinates
  - Apply previous alignment if available

- "Start Job" for automated SEM procedure
  - Only with valid alignment and measurements defined
  - Shows progress of automated image acquisition

- Automation list
  - Combines functionality of acquisition and metrology
  - Define ROI in layout and specify measurement
  - Positions are used for image acquisition

- "Start Job" for automated SEM procedure
  - Only with valid alignment and measurements defined
  - Shows progress of automated image acquisition

![GenISys — Advancing the Standard]

Thank You!

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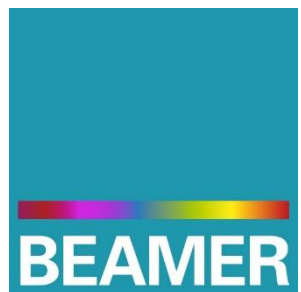
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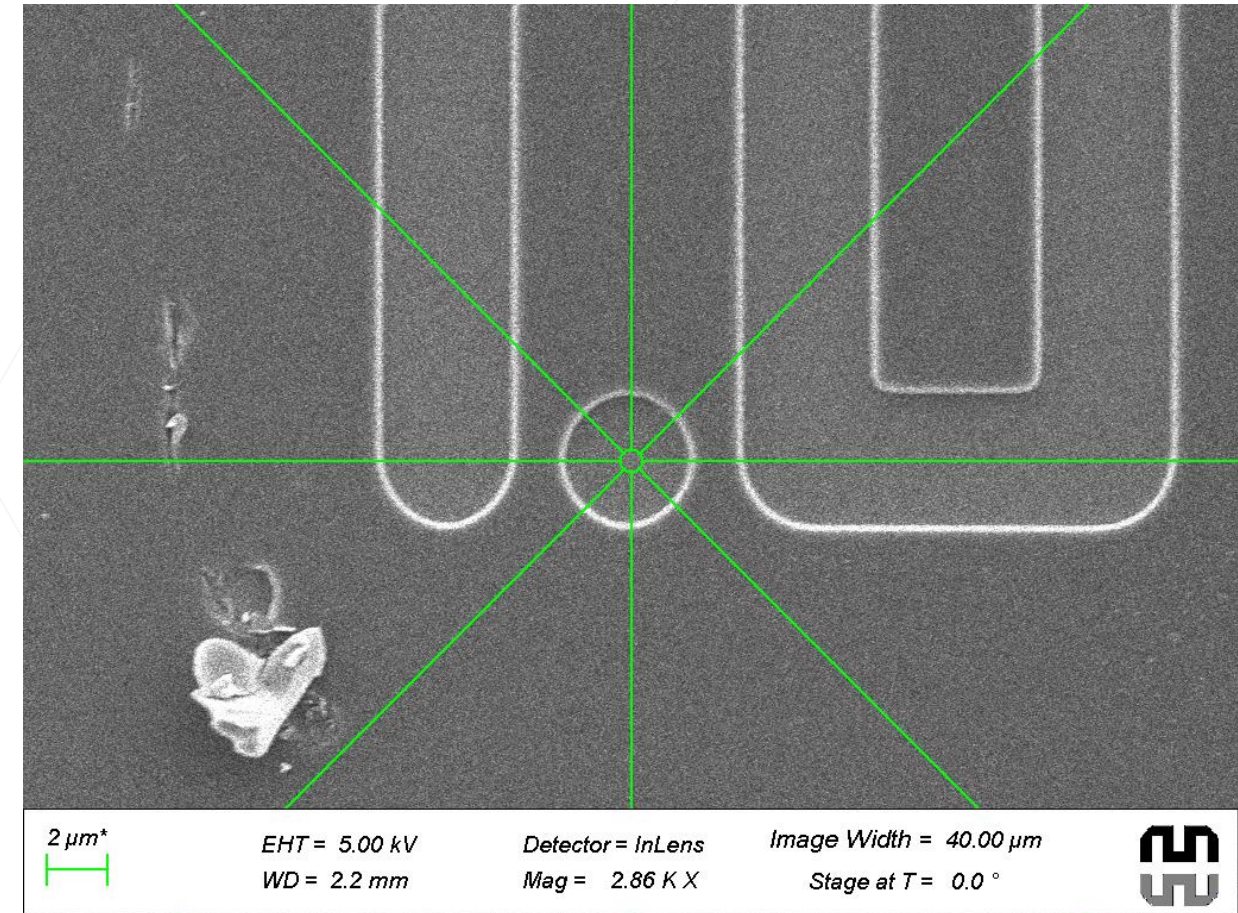
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BEAMER   **LAB**   **TRACER**   **MASKER**   **Pro SEM**   **VIEWER**

Preparation of SEM microscope

Get ready for image scan and save

- Focus, aperture align and stigmation

- Beam energy and detector

- Contrast and brightness

- Field of view

- Scan speed and averaging
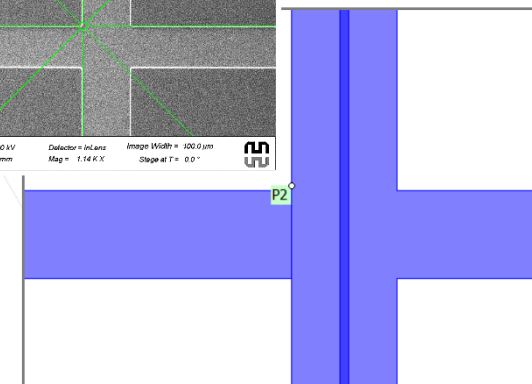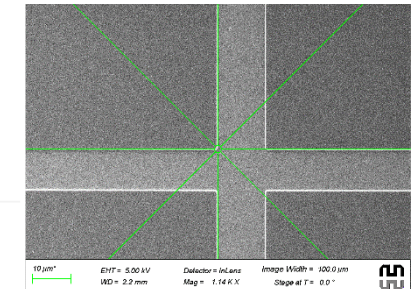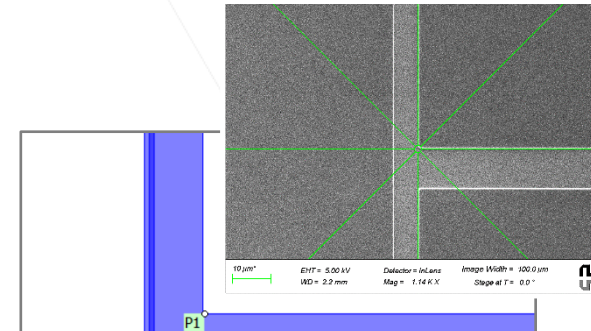
- Predefine image name/ extension and folder

| 2 μm* | EHT = 5.00 kV | Detector = InLens | Image Width = 40.00 μm |
| | WD = 2.2 mm | Mag = 2.86 K X | Stage at T = 0.0 ° |

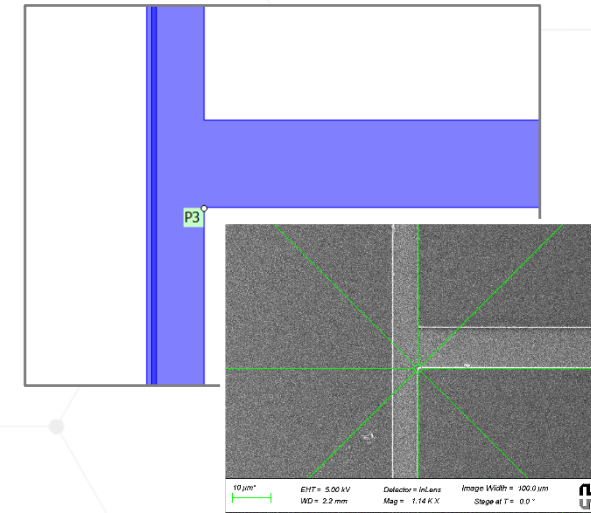## Match positions and coordinate systems

- Use 3 markers or specific locations

- Pick layout coordinates from design in ProSEM

- Drive to corresponding sample locations

- Read SEM stage coordinates in ProSEM

![GenISys - Advancing the Standard]
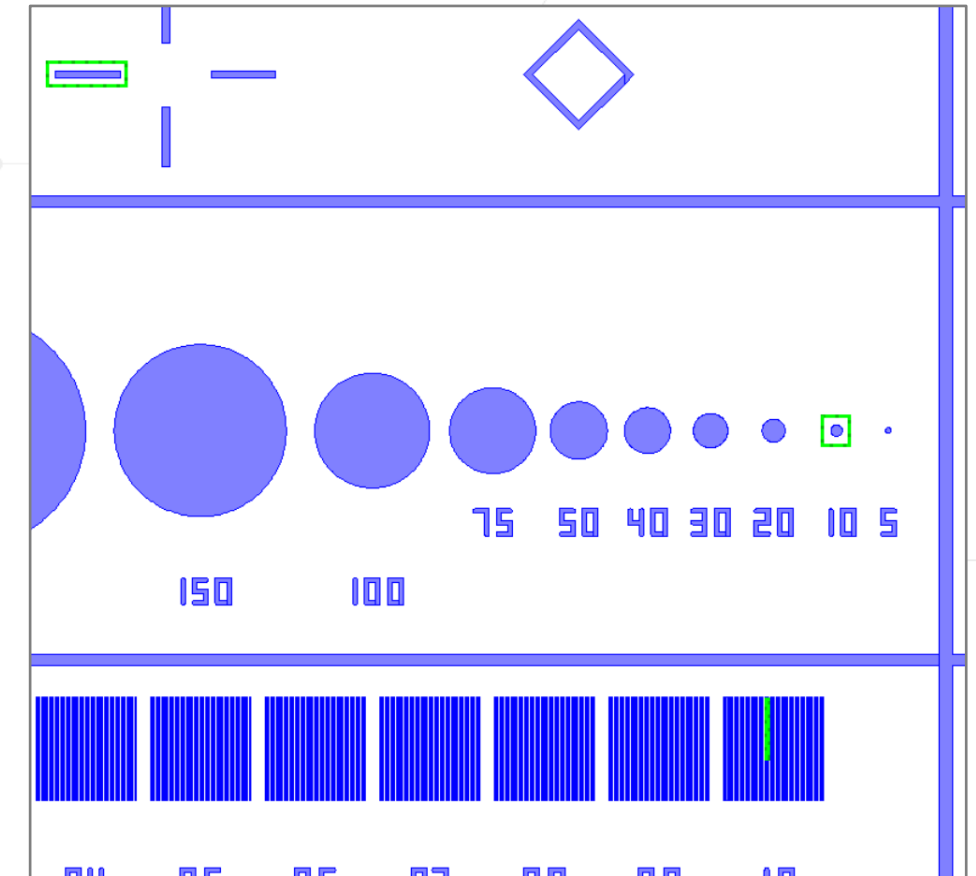
Automation and measurement list

- Define ROI's around features in layout

- Entry in table is created with position for image

- Specify feature type   (and layer optionally)

→Create full job list

→Start job

Center X [um]	Center Y [um]	Width [um]	Height [um]	Feature Type	Layer	Status	Key / File
-594.640	3287.465	23.880	20.690	Circles	CM	scan pending	<automatic>
-1247.810	3597.455	65.000	15.410	Rectangles	CM	scan pending	<automatic>
-711.585	3012.410	1.890	89.520	Lines & Spaces	CM	scan pending	<automatic>

Alignment Measurements Measurement Info Pick Data Info

Shift Left-Click into the layout to create a measurement ROI.

Stop

Acquisition & Metrology with ProSEM

Automated metrology

- Drive SEM stage and acquire image

- Load images into ProSEM

- Apply pre-defined measurement