

# The „best“ SEM Metrology Solution

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## *ProSEM vs. InSPEC*



# Metrology Products



*SEM Image Analysis &  
Metrology Software*

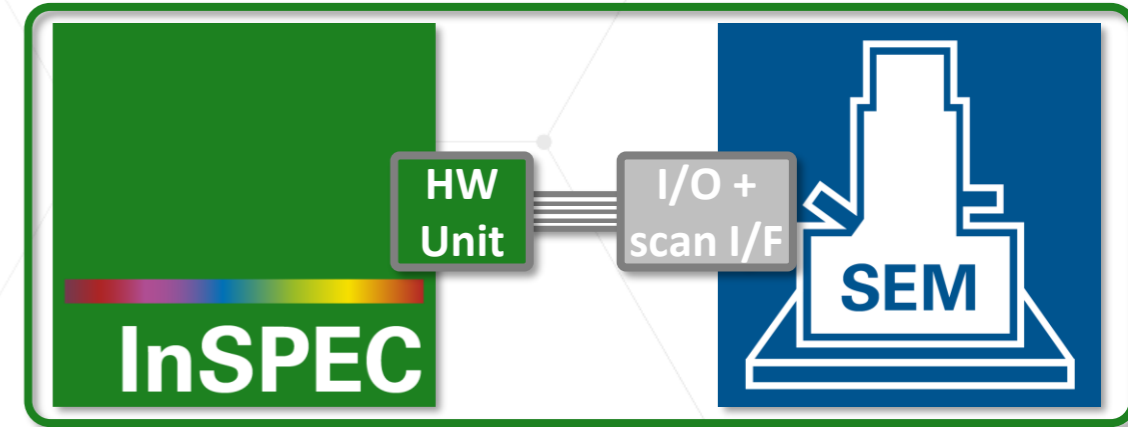
- Easy-to-use with existing tools
- Mainly offline or with SEM remote
- SEM auto: small area single field



*Integrated SEM Metrology &  
Inspection Upgrade Kit*

- Sophisticated and comprehensive
- Integrated solution for experts
- Advanced multi-chip metrology jobs

# ProSEM vs. InSPEC



SW for SEM Image Analysis & Metrology

Easy-to-use Offline Software Package

Optional Automation via digital PC interface

Operation in conjunction with SEM SW

Upgrade Kit for a Metrology SEM

Direct SEM control with hardware integration

Comprehensive full layout-based workflow

Integrated scanning, automation & metrology

Multi-Chip jobs with hierarchical structure

Expert metrology & data processing with "FLOW"



ProSEM

File Script View Help

SEM Image

→ *Get more results from SEM images with minimum effort*

**ProSEM**  
Advancing the Standard

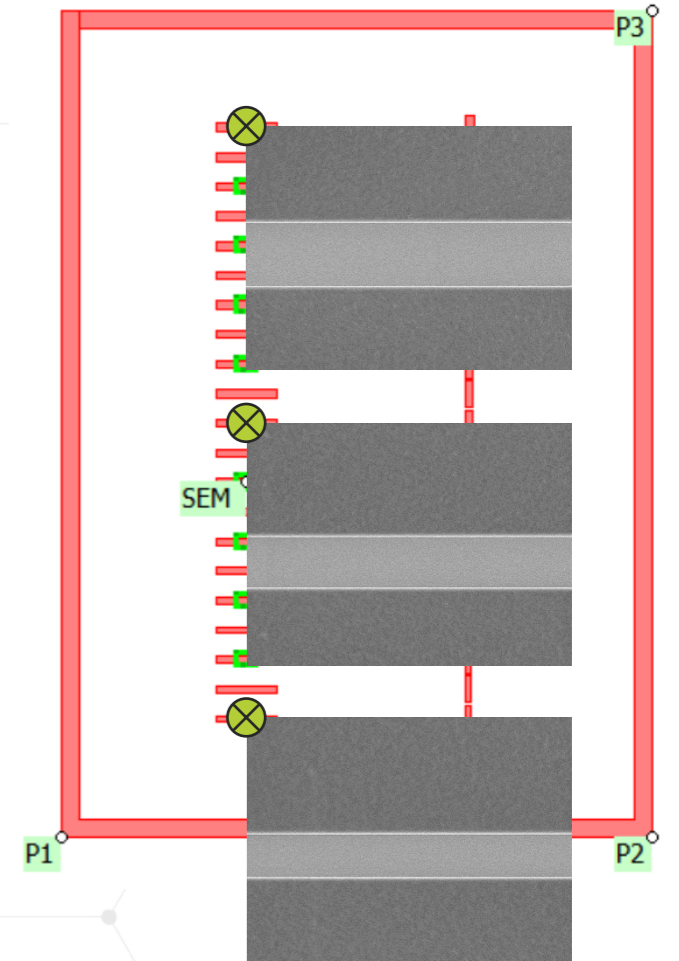
Open Image Folder...  
Open Images...  
Open Project...  
Import Layout...

Group\_1

# Step 1: Image Acquisition

## Automated metrology

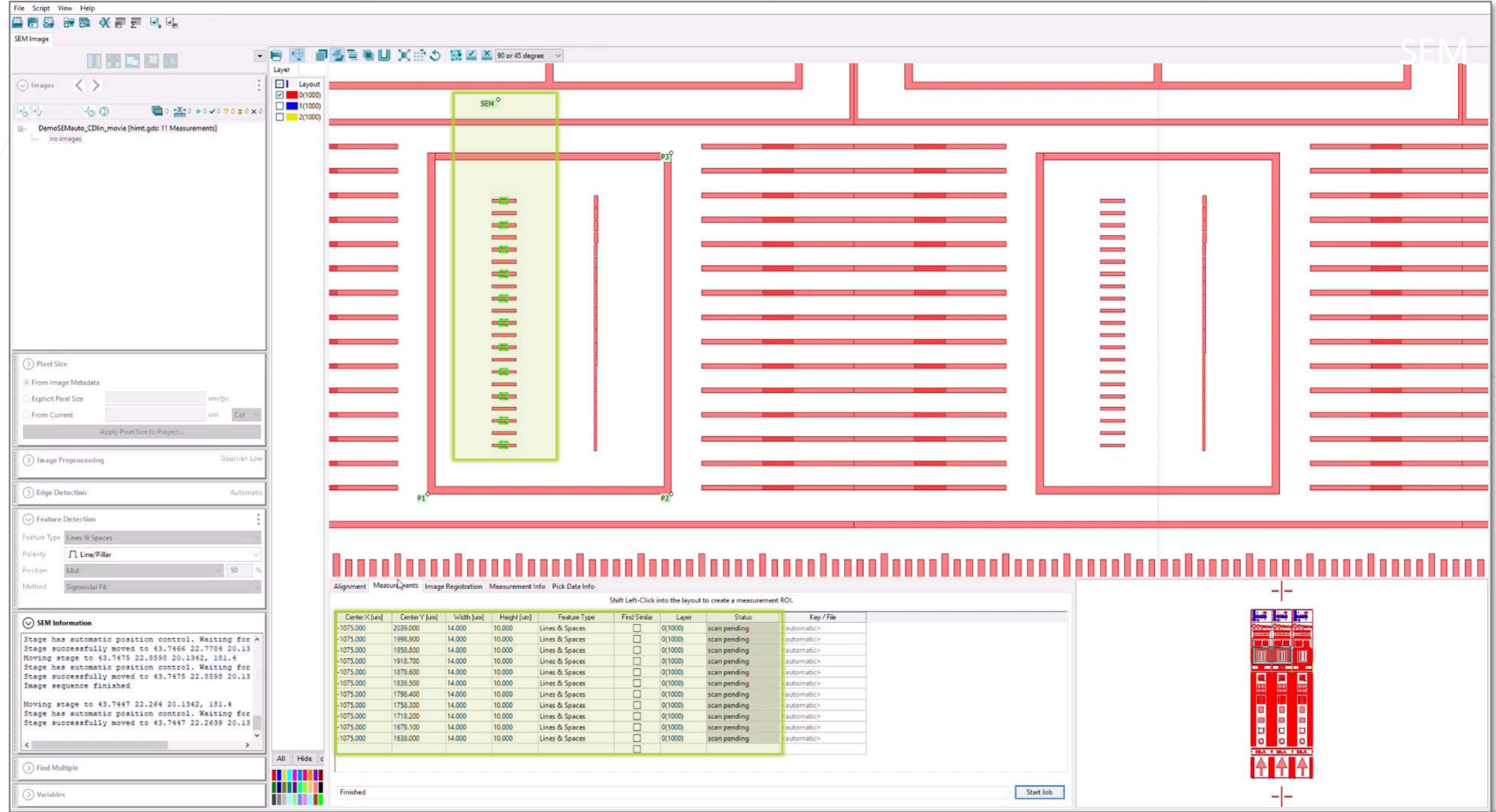
- Drive SEM stage and acquire set of images



Center X [um]	Center Y [um]	Width [um]	Height [um]	Feature Type	Find Similar	Layer	Status	Key / File
-1075.000	2039.000	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan finished	<automatic>
-1075.000	1998.900	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan finished	<automatic>
-1075.000	1958.800	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan finished	<automatic>
-1075.000	1918.700	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan finished	<automatic>
-1075.000	1878.600	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scanning	<automatic>
-1075.000	1838.500	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>
-1075.000	1798.400	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>
-1075.000	1758.300	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>
-1075.000	1718.200	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>
-1075.000	1678.100	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>
-1075.000	1638.000	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	<automatic>

Stop

# Step 1: Image Acquisition



SEM Image

File Script View Help

SEM

90 or 45 degree

Layer

- Layout
- 0(1000)
- 1(1000)
- 2(1000)

Images < >

DemoSEMAuto\_CDlin\_movie [hmt.gds: 11 Measurements]

no images

Pixel Size

- From Image Metadata
- Explicit Pixel Size  um/px
- From Current  um

Apply Pixel Size to Project...

Image Preprocessing Gaussian Low

Edge Detection Automatic

Feature Detection

Feature Type Lines & Spaces

Polarity  Line/Pillar

Position Mid 50 %

Method Sigmoidal Fit

SEM Information

Stage has automatic position control. Waiting for Stage successfully moved to 43.7466 22.7784 20.13  
 Moving stage to 43.7475 22.8598 20.1342, 181.4  
 Stage has automatic position control. Waiting for Stage successfully moved to 43.7475 22.8598 20.13  
 Image sequence finished

Moving stage to 43.7447 22.264 20.1342, 181.4  
 Stage has automatic position control. Waiting for Stage successfully moved to 43.7447 22.2639 20.13

Find Multiple

Variables

Alignment Measurements Image Registration Measurement Info Pick Data Info

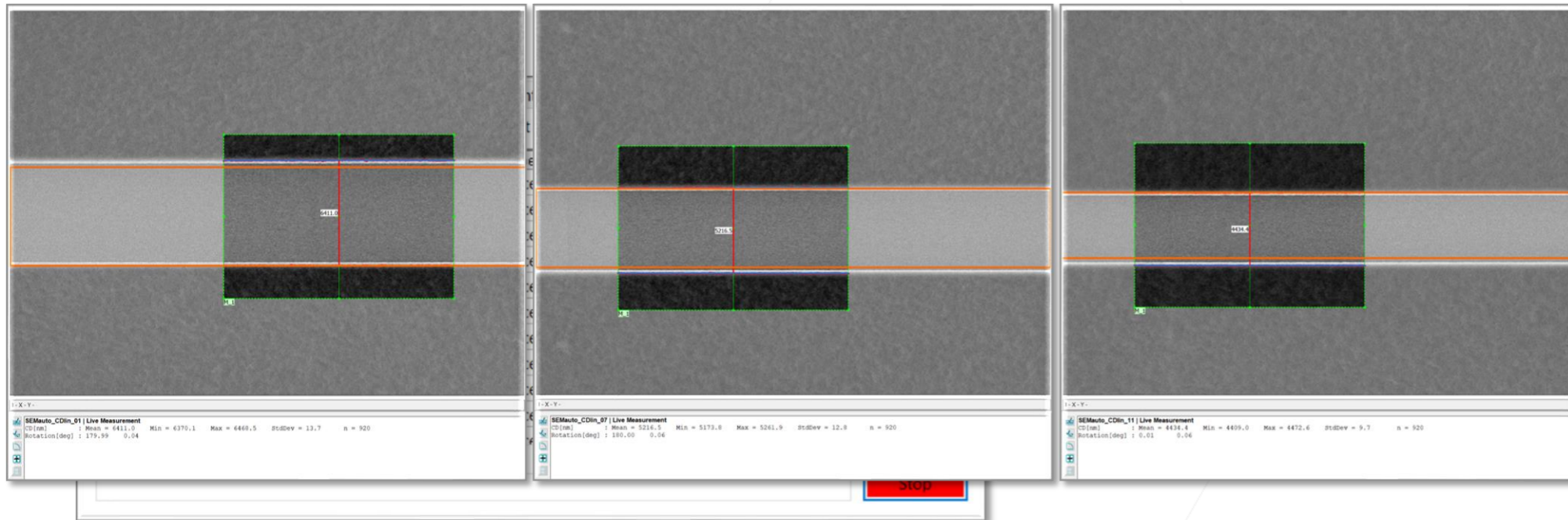
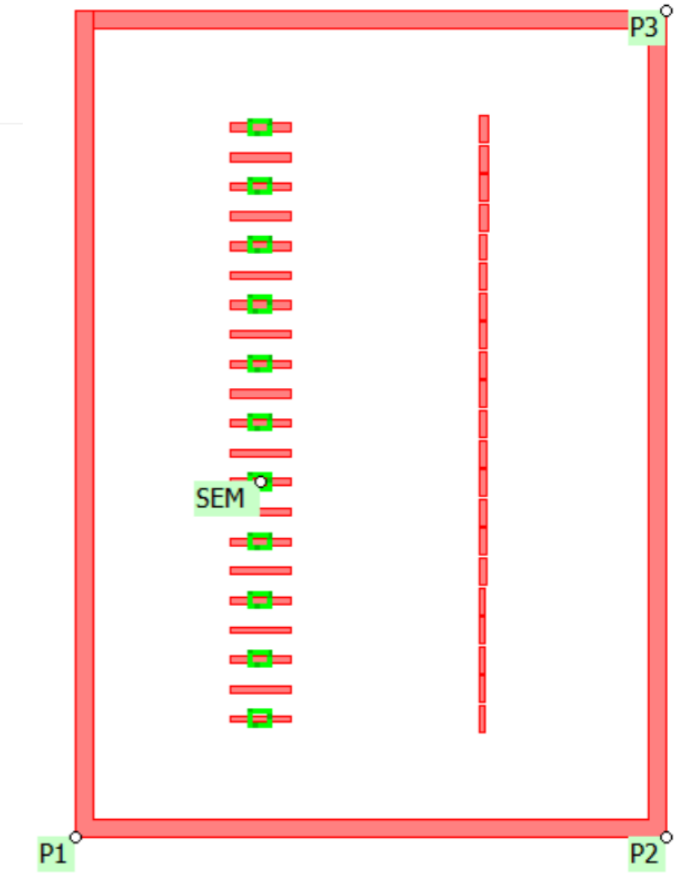
Shift Left-Click into the layout to create a measurement ROI.

Center X [um]	Center Y [um]	Width [um]	Height [um]	Feature Type	Find Similar	Layer	Status	Key / File
-1075.000	2039.000	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	automatic>
-1075.000	1998.900	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	automatic>
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-1075.000	1718.200	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	automatic>
-1075.000	1678.100	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	automatic>
-1075.000	1638.000	14.000	10.000	Lines & Spaces	<input type="checkbox"/>	0(1000)	scan pending	automatic>

Finished

## Automated metrology

- Drive SEM stage and acquire set of images
- Load images with (local) alignment
- Apply pre-defined measurements automatically
- Save results to data table



# Integrated Workflow along 5 Main Modes

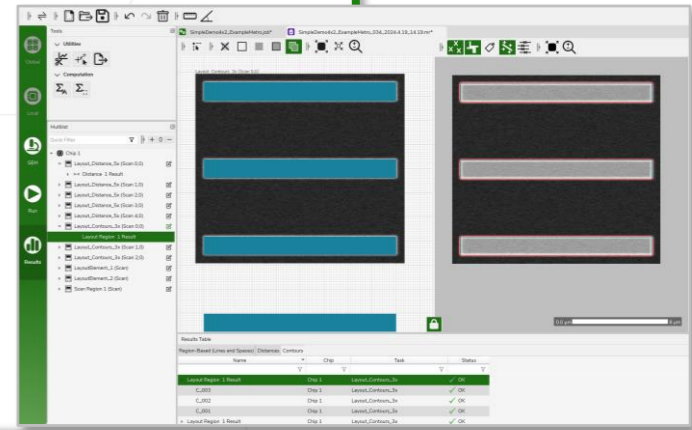
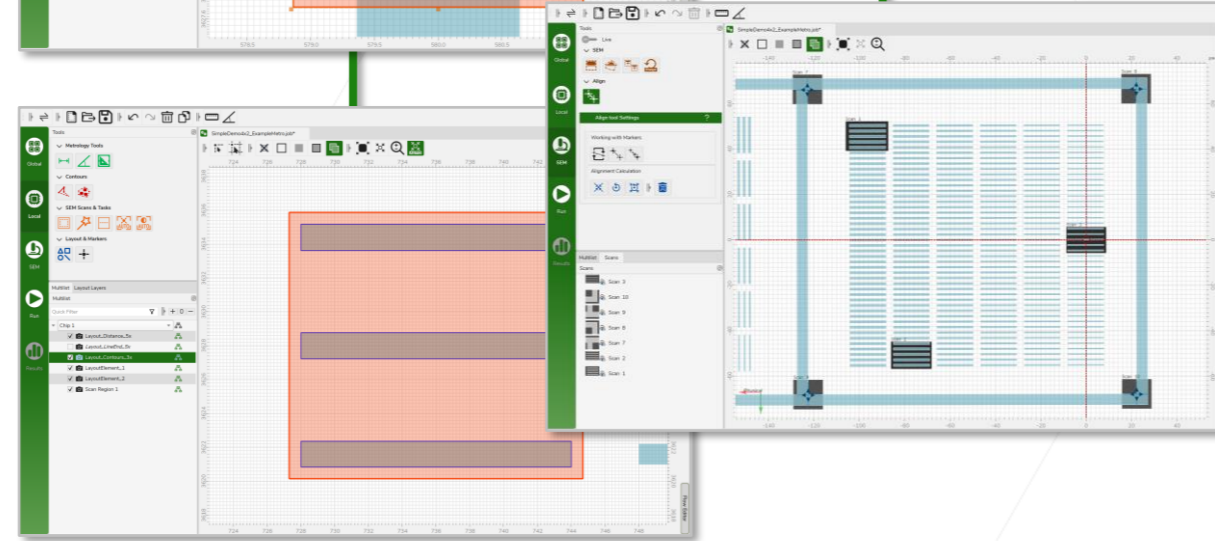
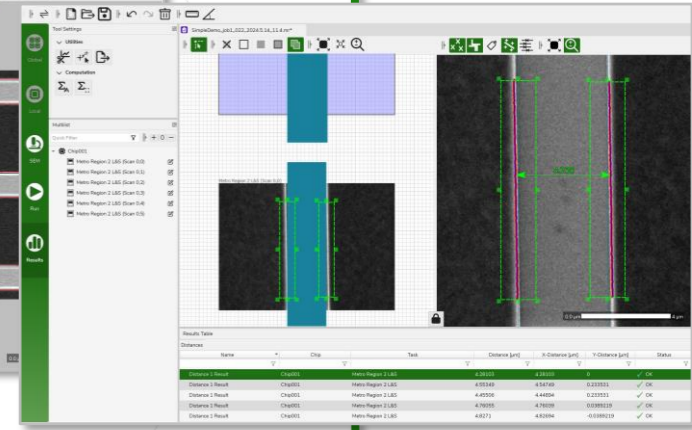
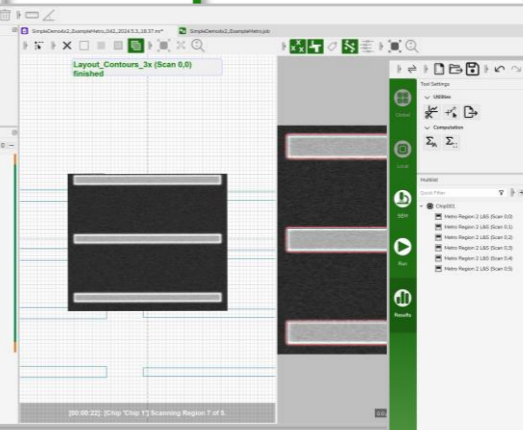
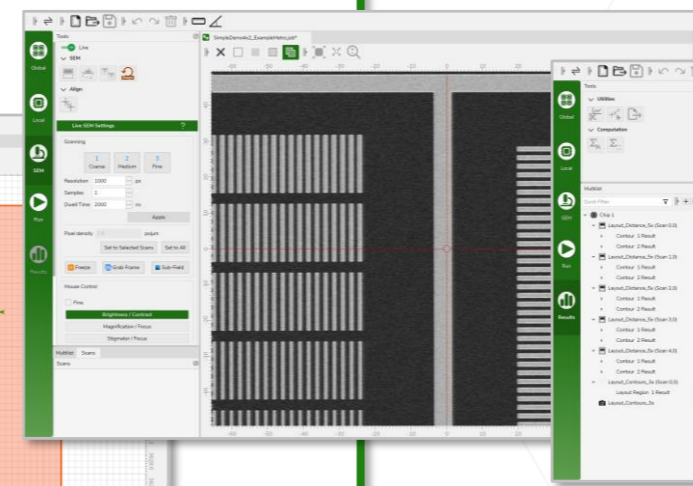
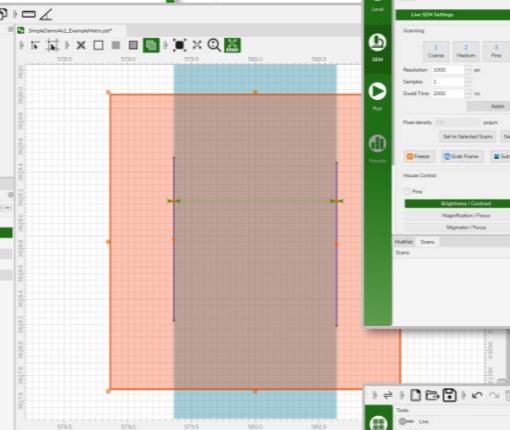
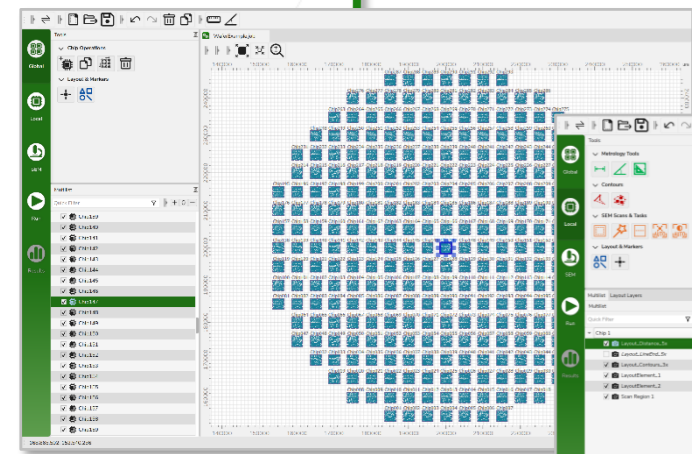
 **Global**

 **Local**

 **SEM**

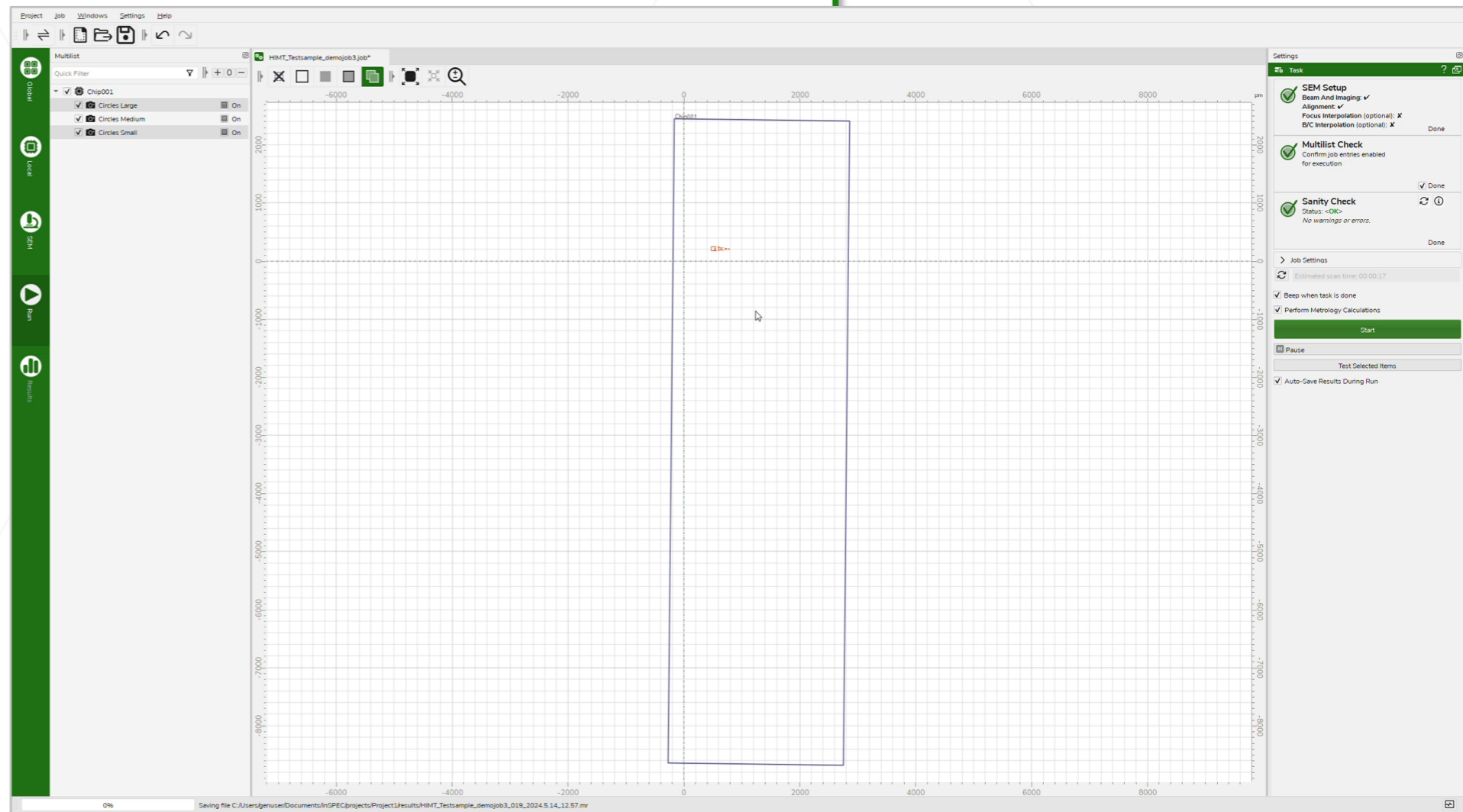
 **Run**

 **Results**





# Run the Metrology Job

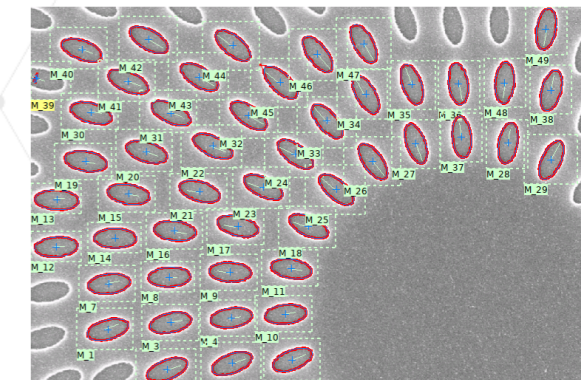
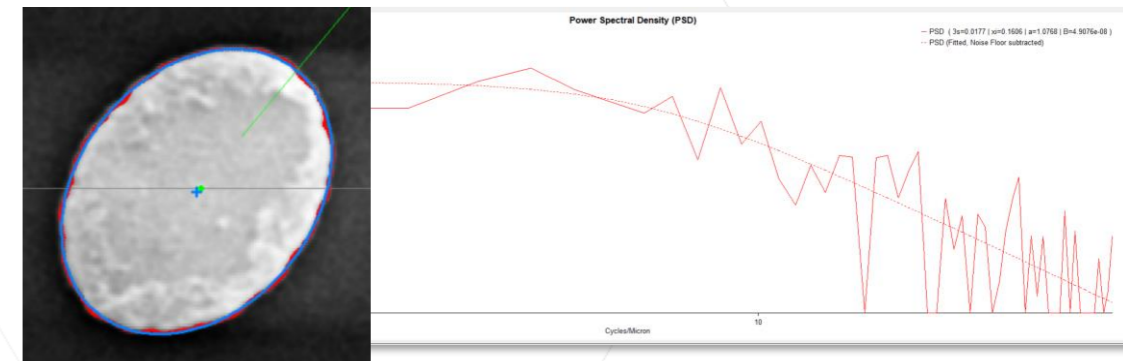
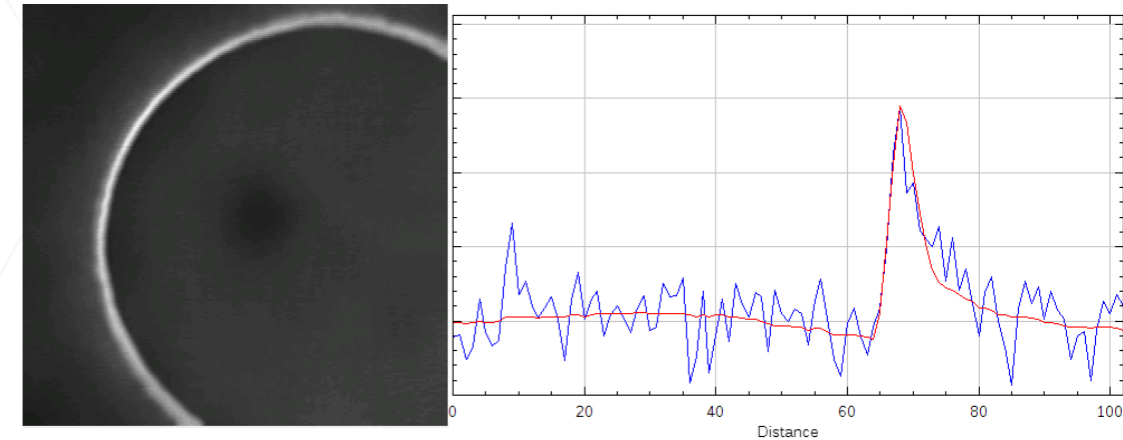


- Job execution

- Job start and pause/ stop
- Progress of job sequence
- Live scans on layout
- Parallel activities
  - Scanning
  - Corrections
  - Contour detection
  - Metrology
  - Data processing
- Creates result file

## ProSEM 3.5 Key News

- General
  - New noise reduction filter “NL Means”
  - Image meta data for various SEM formats
  - Measurement data accuracy settings
- Feature Detection and Measurements
  - Slice measurement for edge and fit
  - Pixel calibration based on array vectors
  - Advanced Package: edge roughness for fitted 2D Shapes
  - Advanced Package: *Find-Modified* for rotated and scaled features
- Layout Integration/ SEM Automation
  - Display and project convenience
  - Automatic image naming
  - SEM interfaces for JEOL and Hitachi (more to come)



- ProSEM 3.6 (for end of 2024)
  - User control for find-similar matching
  - Shape fitting with rounded corners
  - Additional SEM interfaces
- ProSEM new GUI (qt based)
  - Concept work started (“improved evolution”)
  - Timing of release 4.0 linked to backend topics
- InSPEC
  - Current pilot release 1.1/ 1.2/ 1.3 with many new features
  - Release 2.0 as stabilization planned for July
  - Open for application specific cooperations
  - Next topics
    - Line scanning (advanced strategies)
    - Integration with TRACER
    - Layout comparison/ more evaluation modules
    - Improved contour detection



# Thank You!

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