

GenISys MIS Team November 24th 2023

ProSEM

What's New in ProSEM 3.5

What's New ProSEM 3.5



Overview

ProSEM 3.5 Key News

- General
 - Notes on OS support
 - New noise reduction filter
 - /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: *Find-Modified* for rotated and scaled features
 - Advanced Package: edge roughness for fitted 2D Shapes
- Layout Integration/ SEM Automation
 - Display and project convenience
 - Automatic image naming
 - SEM interfaces for JEOL and Hitachi



General



OS Support

Operating system supported by ProSEM

- Release 3.5 (no changes)
 - Windows 10 or 11, 64-bit
 - Redhat/Centos Linux: 7 or 8, 64-bit
 - Ubuntu Linux: 18.04 or 20.04, 64-bit
- Note on next release
 - Redhat/Centos Linux: / 7 stopped and 9 will be supported
 - Ubuntu Linux: 18 stopped and 22 will be supported



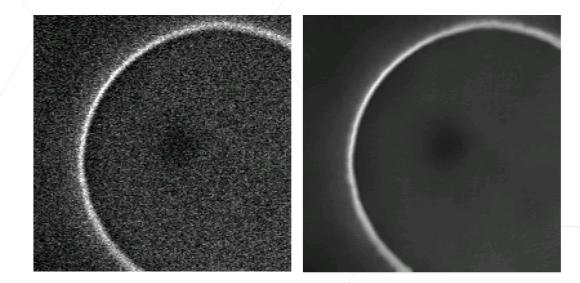
Noise Reduction Filter

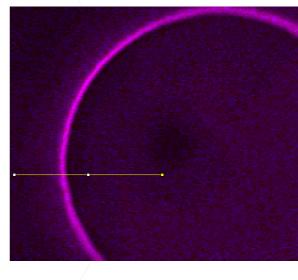
New filter for images

- Noise reduction filter "NL Means" (non-local)
- Available in image pre-processing panel
- Based on pixels with (weighted) similar gray levels
- Preserves well the edge peaks and positions
- Note: implementation not yet performance optimized

😔 Image Prep	rocessing
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-Non-local-me	ans filter settings
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Filter Size [px]	3
Filter strength	0.02
□ Line Scan Av ☑ Auto-Contra	eraging # 1 st ROI for Display

→ More robust edge detection for low SNR
→ Better comparability of CDs





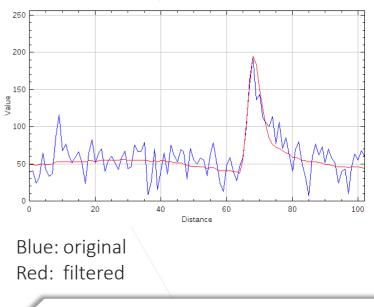




Image Meta Data Import

New and reworked SEM image meta data implemented

- JEOL image format updated
- Hitachi SEM image format extended
- Tescan image format (hdr) updated
- Hitachi CD-SEM image format added

 \rightarrow Please contact the GenISys team for additional SEM image formats!



Data Measurement Precision

Measurement unit and data precision

- Internal data precision fully available for user now
- Results down to nominally 1 pm
- Measurement unit can be selected: μm or nm
- Number of displayed digits can be set

→ Maximum theoretical precision accessible
→ Easy control of display precision

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Feature Detect & Measure



Slice Measurements

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90 Fitted

85.432

Horizontal Horizontal

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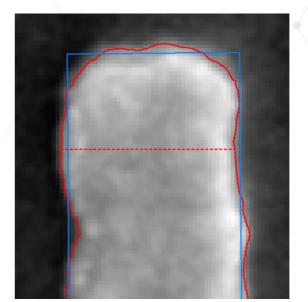
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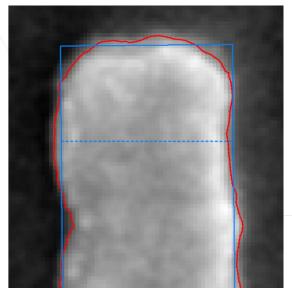
Edge

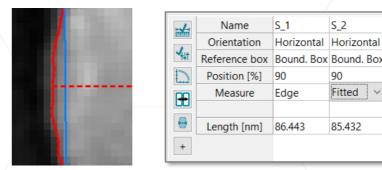
Slices for contour and feature fit

- Measurements can be on edge or fitted points
- Color code displays the selected mode
- Red: edge points/ contour is measured
- Blue: fitted feature is measured

 \rightarrow More possibilities and control of measurements \rightarrow Clear visualization







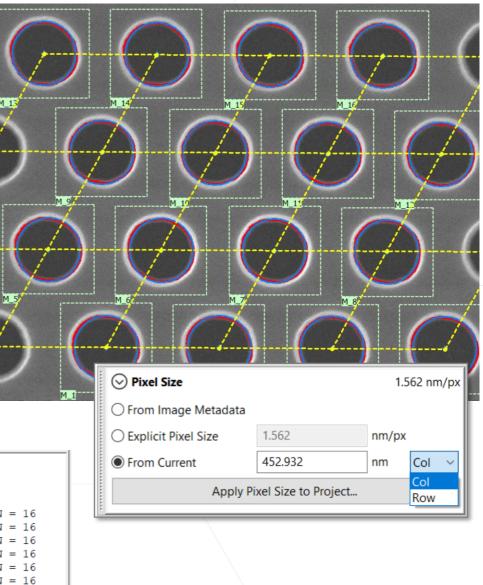


Advanced Pixel Size Calibration

Improved pixel calibration with arrays

- Pixel size calibration with gratings is extended
- Using array vectors now possible as well
- Array results reported with vector in polar coordinates
- → Improve the image calibration also by arrays
 → Use layout or device data

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Minor Diameter[nm]	: Mean	= 255.9	Min	= 254.4	Max	= 257.6	StdDev	= 0.9	
Aspect Ratio	: Mean	= 1.000	Min	= 1.000	Max	= 1.000	StdDev	= 0.000	
Fitted Area[nm^2]	: Mean	= 51418.9	Min	= 50829.7	Max	= 52118.9	StdDev	= 348.3	
BBox Width[nm]	: Mean	= 261.2	Min	= 258.7	Max	= 263.8	StdDev	= 1.5	
BBox Height[nm]	: Mean	= 251.7	Min	= 248.9	Max	= 253.4	StdDev	= 1.4	
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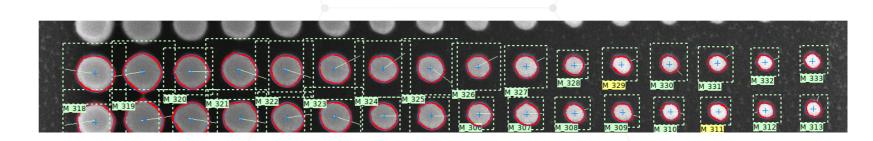


Measure Rotated or Scaled Features

Advanced algorithm for *Find-Modified*

- Measures modified shapes: with rotation and/ or scaling
- Excellent tool for meta optics, 2D/ meta materials etc.
- Automated detection and measurement of all related features
- User can define type and range of modification
- Available in separate panel (for Advanced Package and higher)
- ightarrow Advanced functionality for automatic metrology of numerous features
- \rightarrow Not yet performance optimized (e.g. large arrays)

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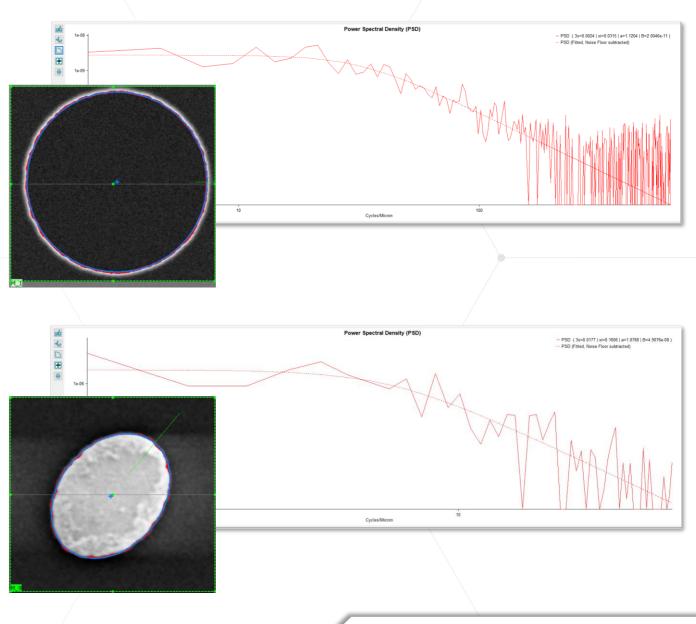




"LER" extended for 2D Shapes

Edge roughness analysis for 2D shapes

- LER extended to fitted 2D features
- Circles, ellipses, rectangle, and triangles
- Standard deviation (3- σ) relative to fitted shape
- Power Spectral Density plot (PSD) without noise floor
- Deviations at corners are excluded
- Correlation length (ξ) and roughness exponent (α)
- \rightarrow Available for <u>Advanced Package and higher</u>





Layout/ Automation



Layout/Image Display and Project

Layout/ image convenience improvements

- UI display area adapts to project content
- Layout only and layout projects automatically show corresponding display (layout only or image+layout)
- For layout projects all images can be removed now

ightarrow Better overview and convenience

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Automatic Image Naming

Various features for naming of images

- With existing name do auto fill
- For new entry and copy/ paste
- Special dialogue for auto naming
- Combination with duplicate matrix
- General: show labels in layout view

ightarrow Convenience especially for large jobs

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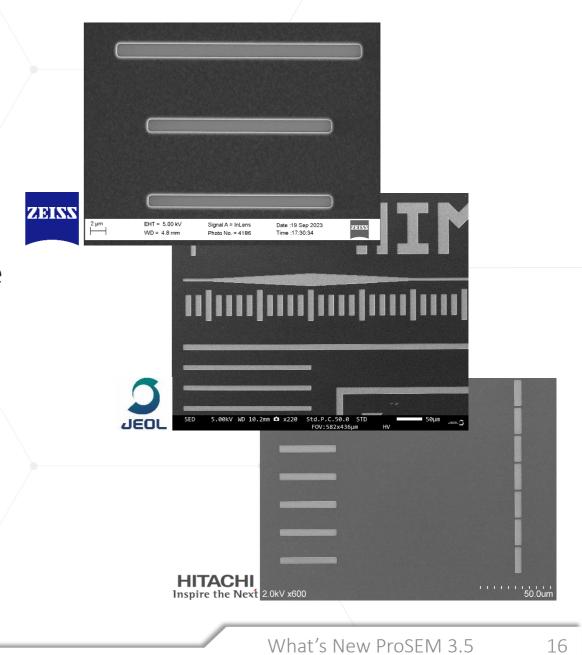


New SEM Interfaces

List of supported SEM interfaces

- ZEISS serial interface
- JEOL ethernet interfaces
- Hitachi interfaces
- Other vendors: technology available, test sites welcome

- → Continuously extending the supported interfaces
 → Installation Guide available
- → Contact the GenISys team for details





BEAMER

Thank You!

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ProSEM

VIEWER

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