

LAB

What's new v5.7

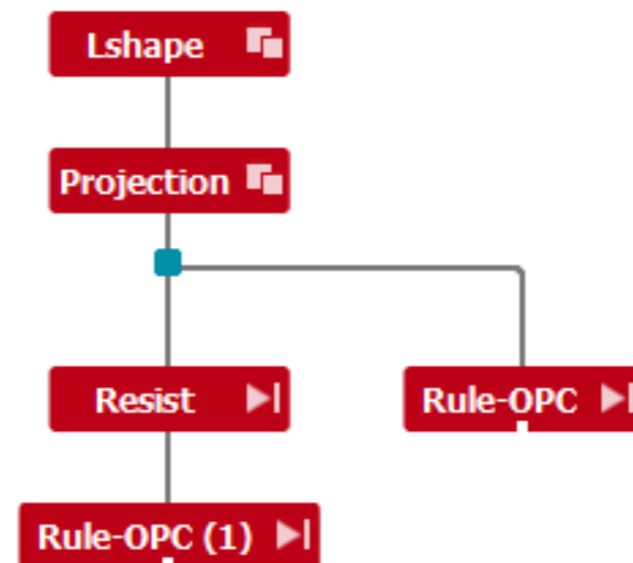
Rule OPC

New features and enhancements

OPC Rule Definition Enhancement

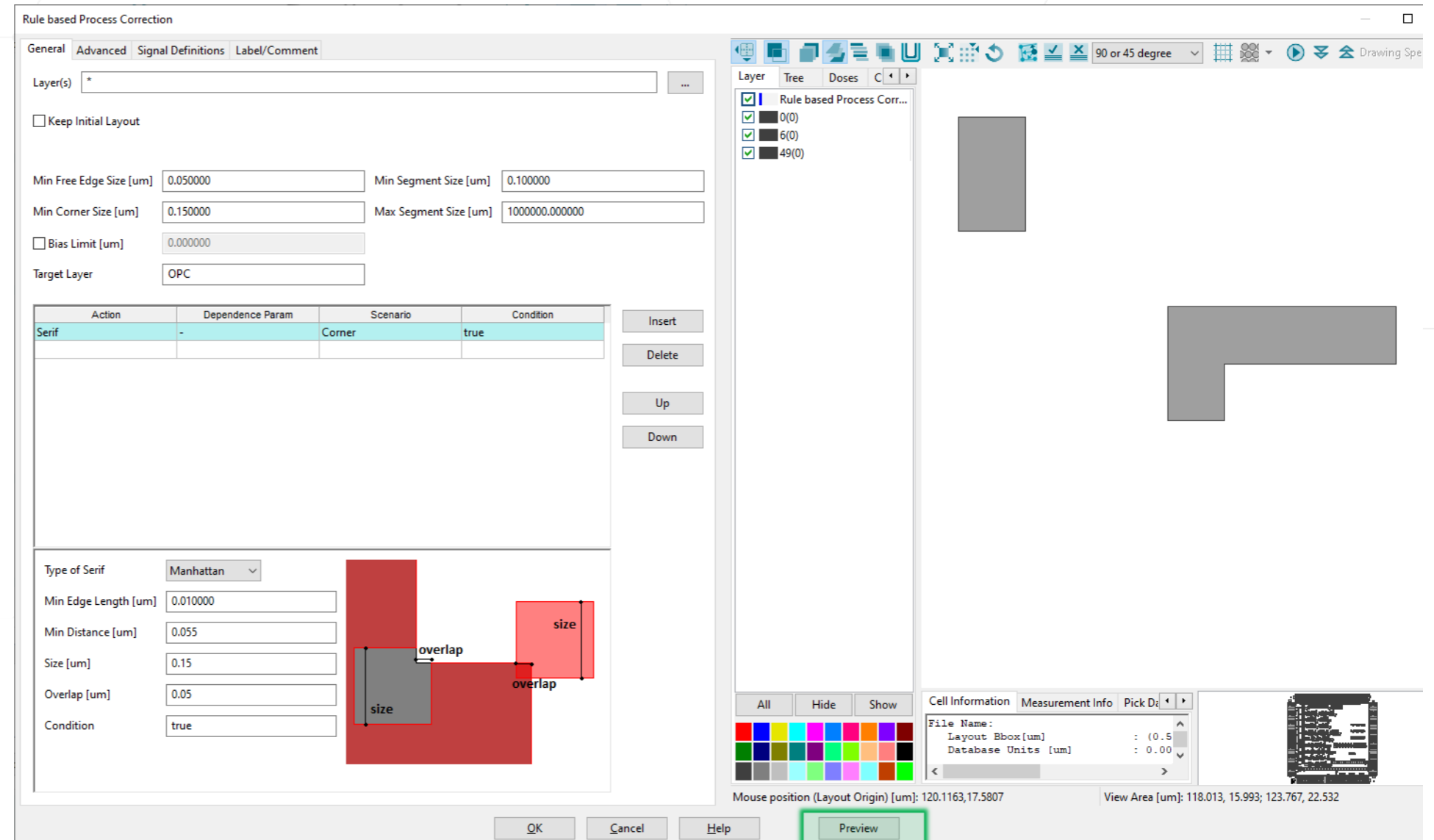
In LAB5.7, OPC rules can be previewed and analyzed in the Rule-OPC panel.

- Rule-OPC module is connected to an exposure module or resist module
- The connection is to extract the exposure information for defined rule preview.
- This feature enhances user convenience to set up OPC rules.



After execution of the connected exposure/resist module, rule definition preview is available.

- With the defined rule, click on the preview button to analyze the results on the visible region.
- The „preview“ is active when the visible region requires a reasonable calculation time.



Rule based Process Correction

General | Advanced | Signal Definitions | Label/Comment

Layer(s) *

Keep Initial Layout

Min Free Edge Size [um] 0.050000 Min Segment Size [um] 0.100000

Min Corner Size [um] 0.150000 Max Segment Size [um] 1000000.000000

Bias Limit [um] 0.000000

Target Layer OPC

Action	Dependence Param	Scenario	Condition
Serif	-	Corner	true

Insert
Delete
Up
Down

Type of Serif Manhattan

Min Edge Length [um] 0.010000

Min Distance [um] 0.055

Size [um] 0.15

Overlap [um] 0.05

Condition true

size overlap

size overlap

Layer Tree Doses C

- Rule based Process Corr...
- 0(0)
- 6(0)
- 49(0)

All Hide Show

Cell Information Measurement Info Pick Di

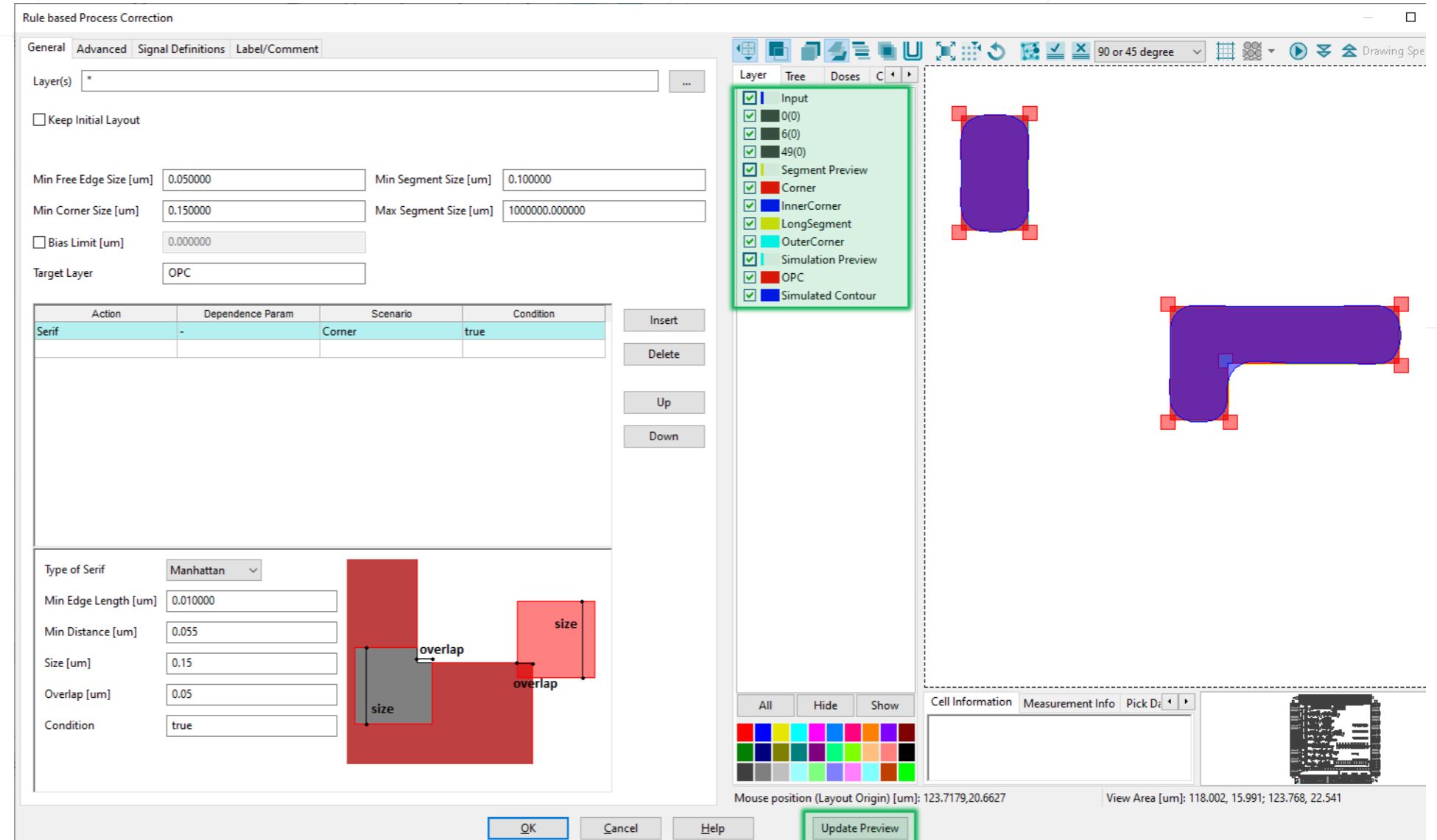
File Name:
Layout Bbox[um] : (0.5
Database Units [um] : 0.00

Mouse position (Layout Origin) [um]: 120.1163,17.5807 View Area [um]: 118.013, 15.993; 123.767, 22.532

OK Cancel Help **Preview**

After execution of the connected exposure/resist module, rule definition preview is available.

- Input layout, Segment preview and Result preview are assigned on different layers.
- User can „Update Preview“ when rules or visible region are changed.



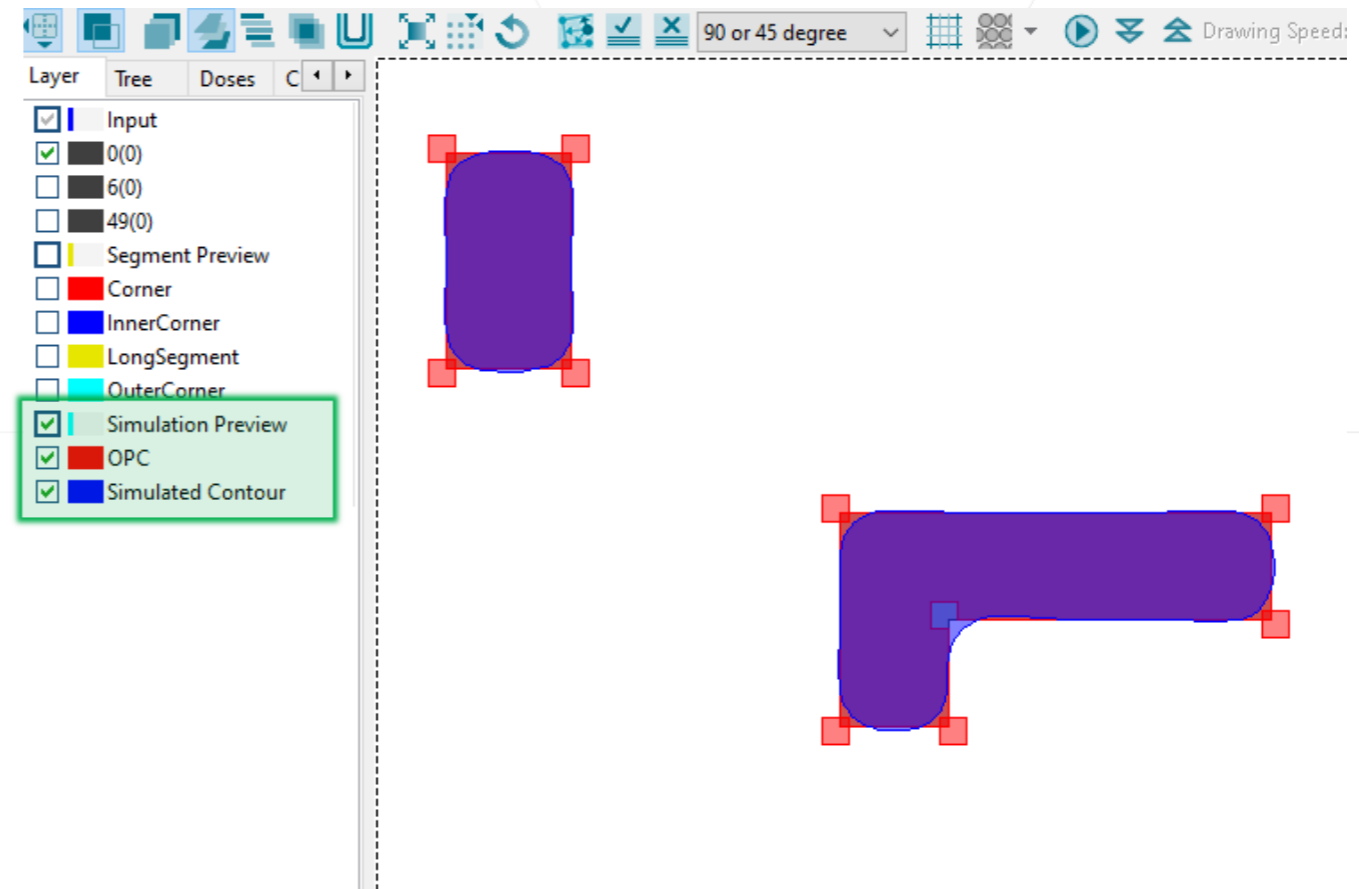
The screenshot displays the 'Rule based Process Correction' dialog box with the following settings:

- General Tab:**
 - Layer(s): *
 - Keep Initial Layout
 - Min Free Edge Size [um]: 0.050000
 - Min Segment Size [um]: 0.100000
 - Min Corner Size [um]: 0.150000
 - Max Segment Size [um]: 1000000.000000
 - Bias Limit [um]: 0.000000
 - Target Layer: OPC
- Table:**

Action	Dependence Param	Scenario	Condition
Serif	-	Corner	true
- Advanced Tab:**
 - Type of Serif: Manhattan
 - Min Edge Length [um]: 0.010000
 - Min Distance [um]: 0.055
 - Size [um]: 0.15
 - Overlap [um]: 0.05
 - Condition: true
- Preview:** Shows a diagram of a corner with 'size' and 'overlap' labels, and a 3D-like view of a purple corner with red bounding boxes.
- Layer Tree:**
 - Input
 - 0(0)
 - 6(0)
 - 49(0)
 - Segment Preview
 - Corner
 - InnerCorner
 - LongSegment
 - OuterCorner
 - Simulation Preview
 - OPC
 - Simulated Contour
- Buttons:** OK, Cancel, Help, Update Preview (highlighted in green).

After execution of the connected exposure/resist module, rule definition preview is available.

- The preview simulates regions shown in the viewer.
- The „OPC“ layer is the layout correction with rules applied.
- The „Simulated Contour“ layer shows the simulated contour of the OPC layout.



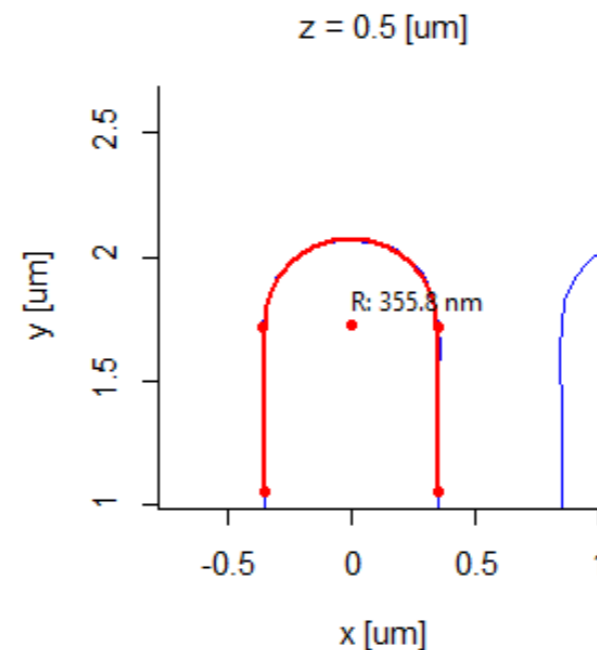
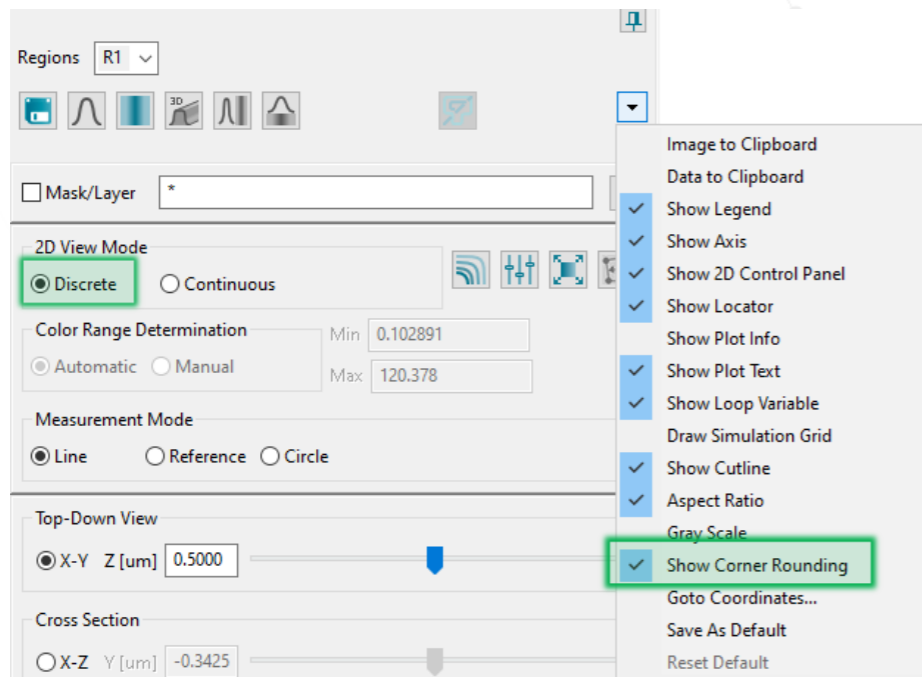
Corner Rounding

New features and enhancements

Corner Rounding Measurement

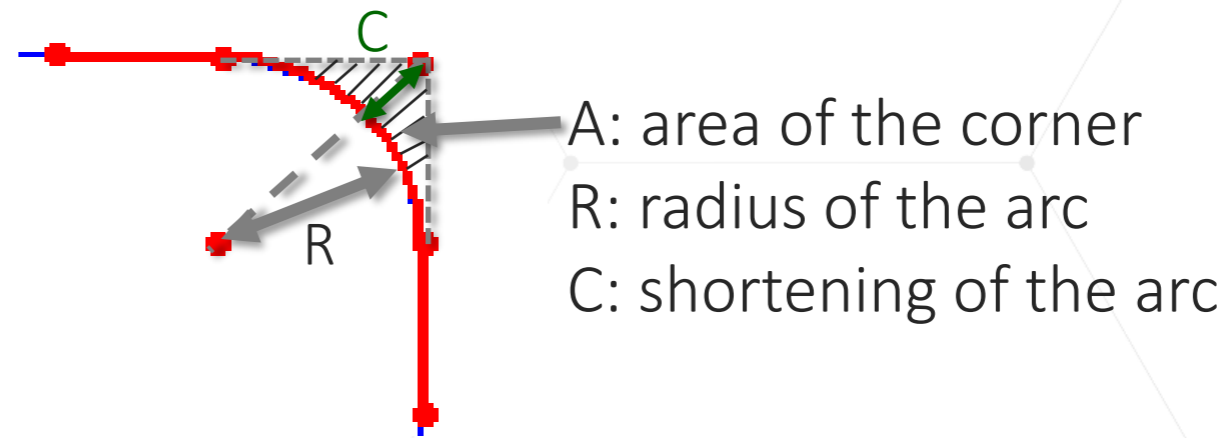
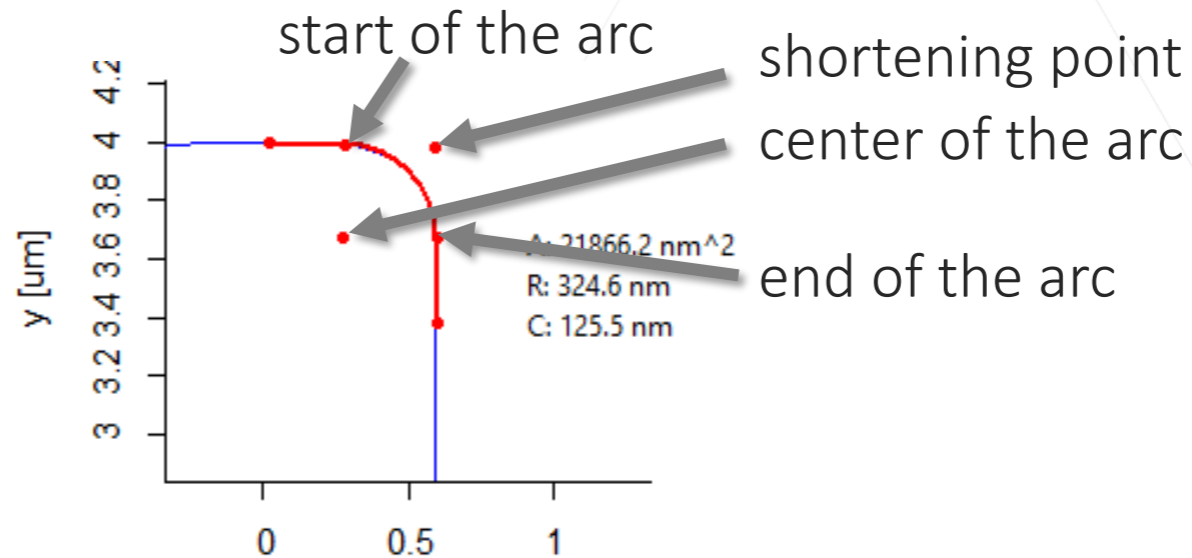
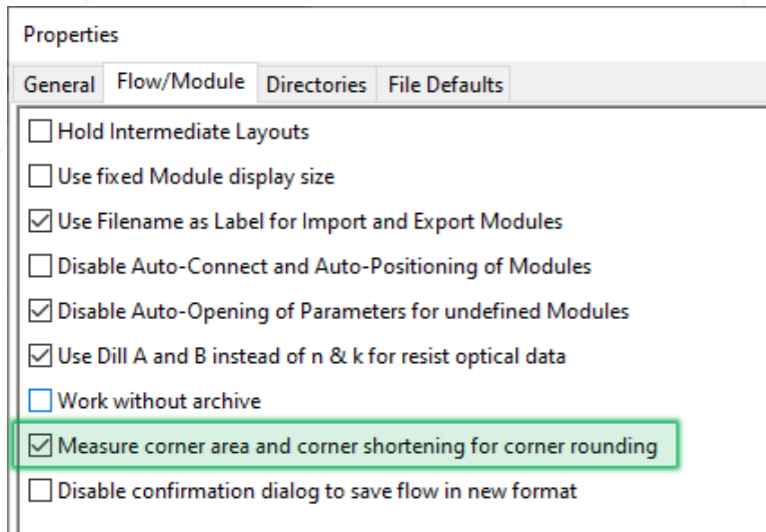
In intensity/resist profile image, the measurement of corner rounding is activated by clicking on the „Show Corner Rounding“ button.

- In intensity image, the measured corner radius is activated for 2D discrete mode with only one intensity contour.
- In resist profile and intensity view, the corner rounding measurement is visible when enlarged to the expected region.



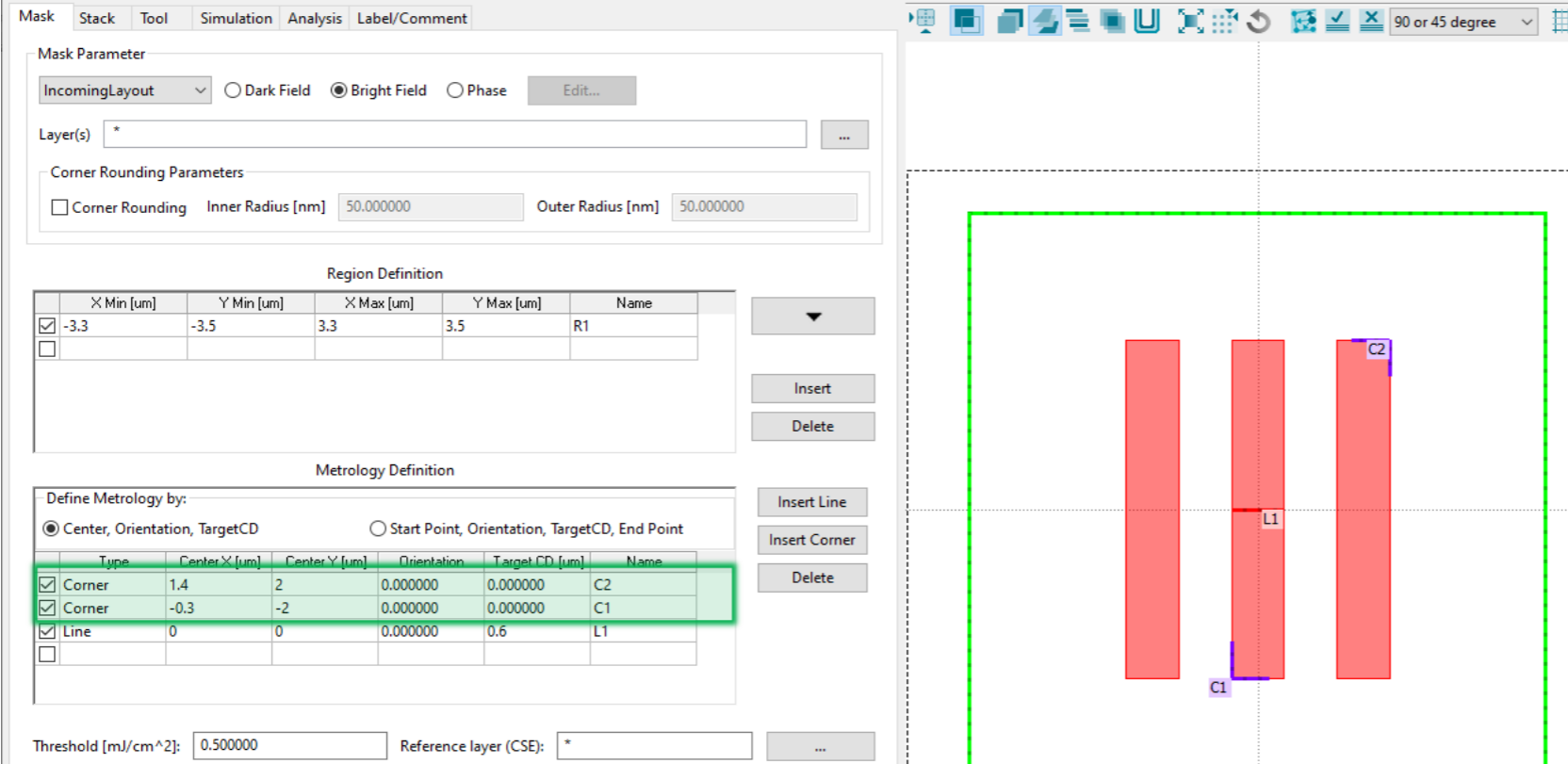
Corner Rounding Measurement

As well as corner radius, corner area and corner shortening are also available when activated in the File/Properties tab.



User can analyze the corner radius in bulk image and resist profile.

- The corner for analysis is first defined in an exposure module.
- The definition is accessible in metrology definition via Alt+right click or „Insert Corner“+left click.
- Note: corner analysis requires a region definition covering the defined corner.



The screenshot displays the software's Metrology Definition panel on the left and a 3D visualization of a resist profile on the right. The panel includes sections for Mask Parameter, Region Definition, and Metrology Definition. The Metrology Definition table is highlighted with a green border.

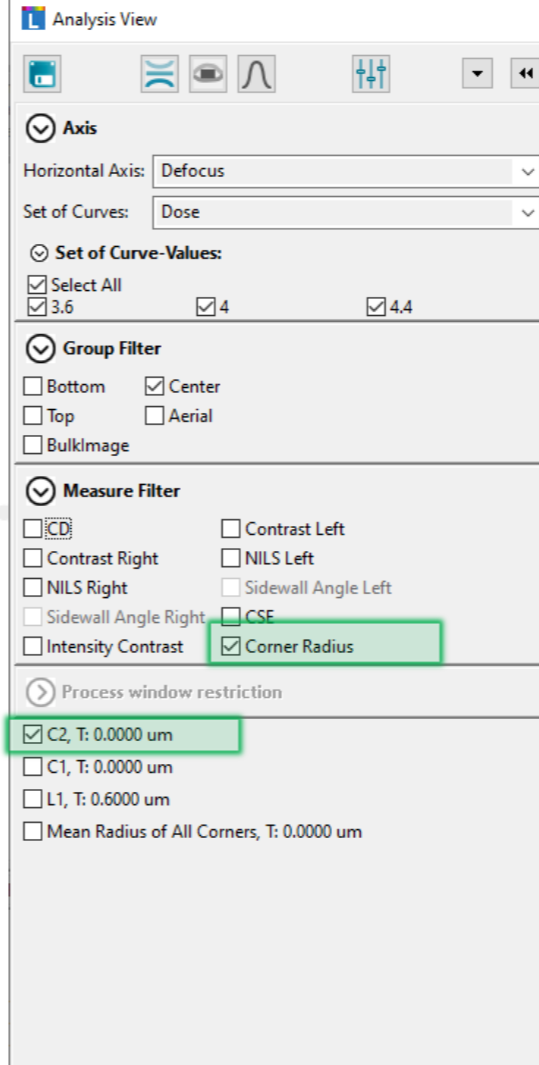
Type	Center X [um]	Center Y [um]	Orientation	Target CD [um]	Name
<input checked="" type="checkbox"/> Corner	1.4	2	0.000000	0.000000	C2
<input checked="" type="checkbox"/> Corner	-0.3	-2	0.000000	0.000000	C1
<input checked="" type="checkbox"/> Line	0	0	0.000000	0.6	L1
<input type="checkbox"/>					

Additional parameters shown in the interface include: Threshold [mJ/cm²]: 0.500000, Reference layer (CSE): *

The 3D visualization shows three red vertical bars representing resist profiles. A green rectangular region is defined around them. Purple labels C1 and C2 indicate the defined corners, and a red label L1 indicates a defined line. A toolbar at the top right of the visualization area includes a dropdown menu set to "90 or 45 degree".

After corner definition, the measured corner radius is available in both the analysis view and log file.

- The „Corner Radius“ analysis is shown when it is selected under Measure Filter.
- All the defined corners can be shown as well as the mean radius.



Analysis View

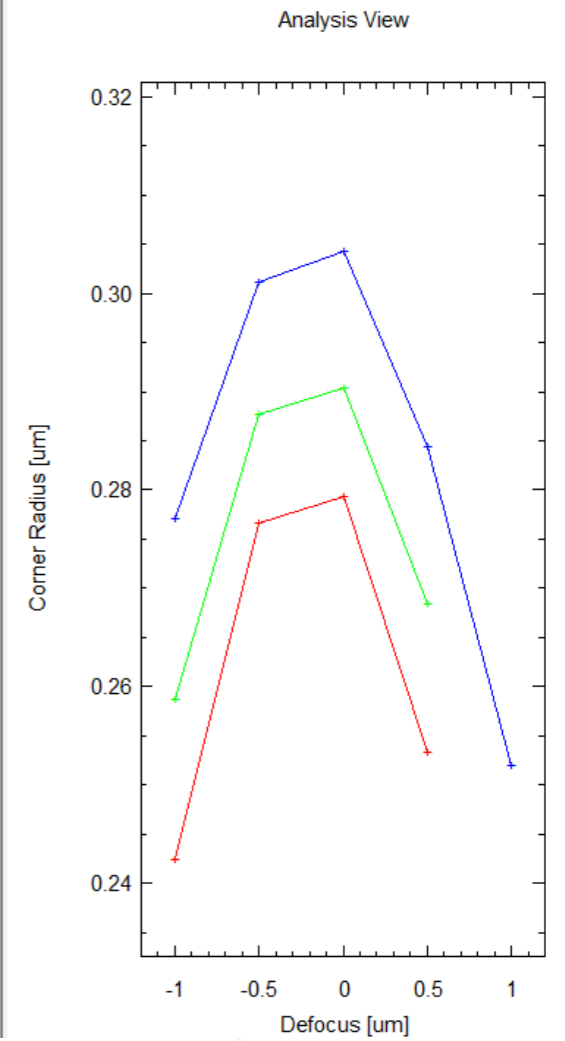
Axis
Horizontal Axis: Defocus
Set of Curves: Dose

Set of Curve-Values:
 Select All
 3.6 4 4.4

Group Filter
 Bottom Center
 Top Aerial
 BulkImage

Measure Filter
 Contrast Right Contrast Left
 NILS Right NILS Left
 Sidewall Angle Right Sidewall Angle Left
 Intensity Contrast CSE
 Corner Radius

Process window restriction
 C2, T: 0.0000 um
 C1, T: 0.0000 um
 L1, T: 0.6000 um
 Mean Radius of All Corners, T: 0.0000 um



```
In region: R1 LL(-3.3,-3.5), UR(3.3, 3.5)
region measure: threshold [mJ/cm^2]: 0.5
*** Bot - 10% resist(0.1), MEASURE CSE: 71.8532 [nm] ***
*** Cen - 50% resist(0.5), MEASURE CSE: 14.8972 [nm] ***
*** Top - 90% resist(0.9), MEASURE CSE: 30.6688 [nm] ***
*** Aer - MEASURE CSE: 59.0071 [nm] ***

metrology corner:   measure center: (1.4,2, comment: C2, threshold [mJ/cm^2]: 0.5
*** Bot - 10% resist(0.1), MEASURE corner radius: 0.224999 [nm] ***
*** Cen - 50% resist(0.5), MEASURE corner radius: 0.290323 [nm] ***
*** Top - 90% resist(0.9), MEASURE corner radius: 0.278082 [nm] ***
*** Aer - MEASURE corner radius: 0.247236 [nm] ***

metrology corner:   measure center: (-0.3,-2, comment: C1, threshold [mJ/cm^2]: 0.5
*** Bot - 10% resist(0.1), MEASURE corner radius: 0.223039 [nm] ***
*** Cen - 50% resist(0.5), MEASURE corner radius: 0.287838 [nm] ***
*** Top - 90% resist(0.9), MEASURE corner radius: 0.276001 [nm] ***
*** Aer - MEASURE corner radius: 0.246195 [nm] ***
```

The metrology definition for the predefined layout has been updated with slanted lines and corners.

Proximity Exposure

Mask Stack Tool Simulation Analysis Label/Comment

Mask Parameter

2DArray Dark Field Bright Field Phase Edit...

CD x [um] 0.600000 CD y [um] 0.600000 Pitch x [um] 1.200000 Pitch y [um] 1.200000

Corner Rounding Parameters

Corner Rounding Inner Radius [nm] 50.000000 Outer Radius [nm] 50.000000

Region Definition

	X Min [um]	Y Min [um]	X Max [um]	Y Max [um]	Name
<input checked="" type="checkbox"/>	-1.2	-1.2	1.2	1.2	R1
<input type="checkbox"/>					

Metrology Definition

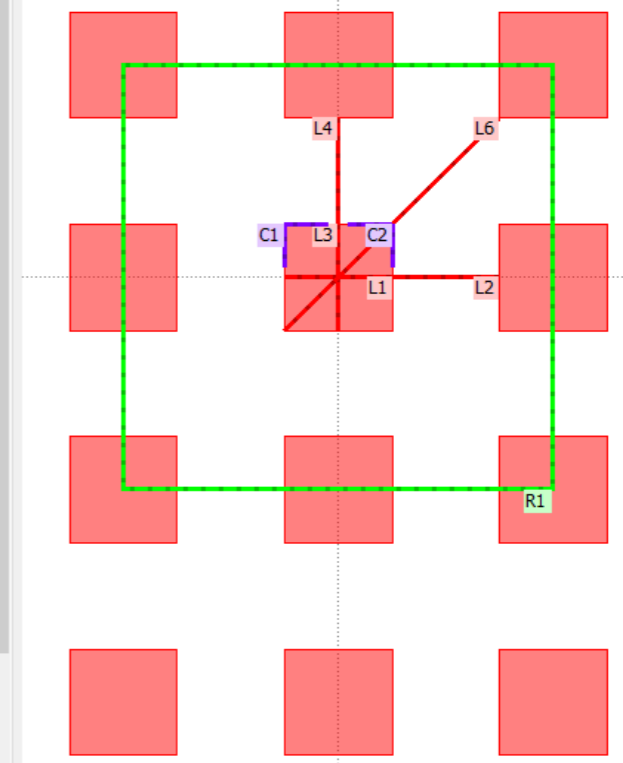
Define Metrology by:

Center, Orientation, TargetCD Start Point, Orientation, TargetCD, End Point

	Type	Center X [um]	Center Y [um]	Orientation	Target CD [um]	Name
<input checked="" type="checkbox"/>	Line	0.0	0.0	0.000000	0.600000	L1
<input checked="" type="checkbox"/>	Line	0.6	0.0	0.000000	0.6	L2
<input checked="" type="checkbox"/>	Line	0.0	0.0	90.000000	0.600000	L3
<input checked="" type="checkbox"/>	Line	0.0	0.6	90.000000	0.6	L4
<input checked="" type="checkbox"/>	Line	0.000000	0.000000	45.000000	0.848528	L5
<input checked="" type="checkbox"/>	Line	0.600000	0.600000	45.000000	0.848528	L6

Threshold [mJ/cm²]: 0.500000 Reference layer (CSE): *

OK Cancel Help



Mouse position (Layout Origin) [um]: -1 View Area [um]: -1.761, -2.970; 1.764, 1.764

Thank You!

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