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Advancing the Standard

LAB

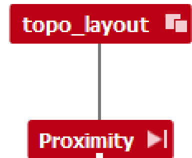
What‘s new v5.9

Topogaphy Stack View

Topography Stack View

The topography definition has been improved, to allow an easier defition of topographic stacks

- The cross view is avalaible after importing the layout.



- The user can choose between three stack types
  - Planar
  - Air stack
  - Topographic stack

Topography stack view

Stack view parameter definition

Imported layout

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Layer Type Definition

- The stack definitionallwos to choose from five surface types
  - Planar: planar surface
  - Add: underlying topographical layer
  - Add inverse: inverse topography of Add layer
  - Conformal: a layer that „conforms“ to underlying topogaphy
  - Conformal inverse: inverse of the conformal layer

Selection of surface type

Color selection

Stack Type: Topographic

Type	Material	Thickness [um]	Surface	Conformal Ratio	Layer	Angle [deg]	set color
Resist	AZ1518	0.5	Planar	--	*	90	
Layer	Si3N4	0.1	Planar	0.5	*	90	
Layer	Cu	0.15	Add	--	2	90	
Substrate	SiO2	--	Add Inverse	--	*	90	

Surface dropdown options: Planar, Add, Add Inverse, Conformal, Conformal Inv.

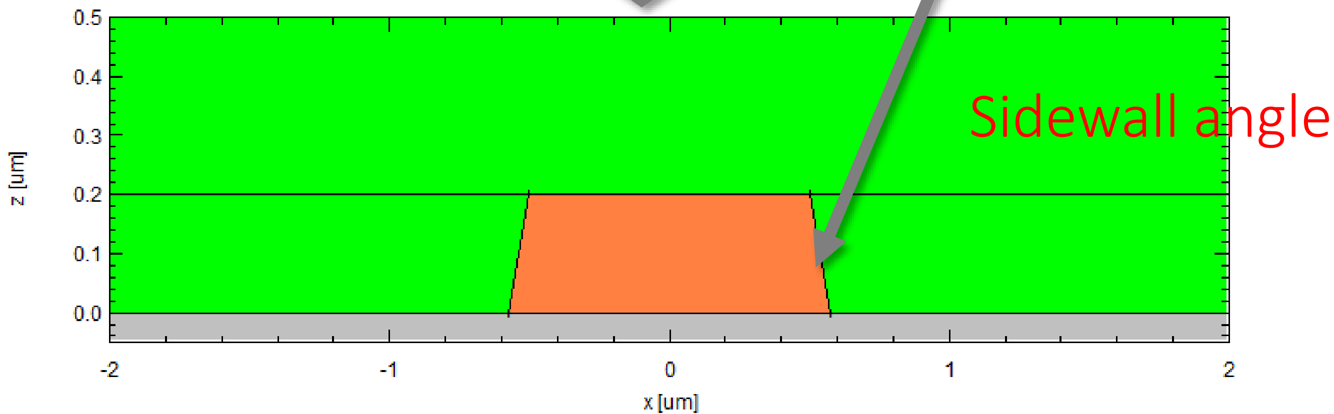
Add/Add Inverse

- The stack definitionallwos to choose from five surface types
  - Add: underlying topographical layer
  - Add inverse: inverse topography of Add layer
  - Example: layer 2(0) is defined as Add or Add inverse.

Surface type: Add

Stack Type: Topographic

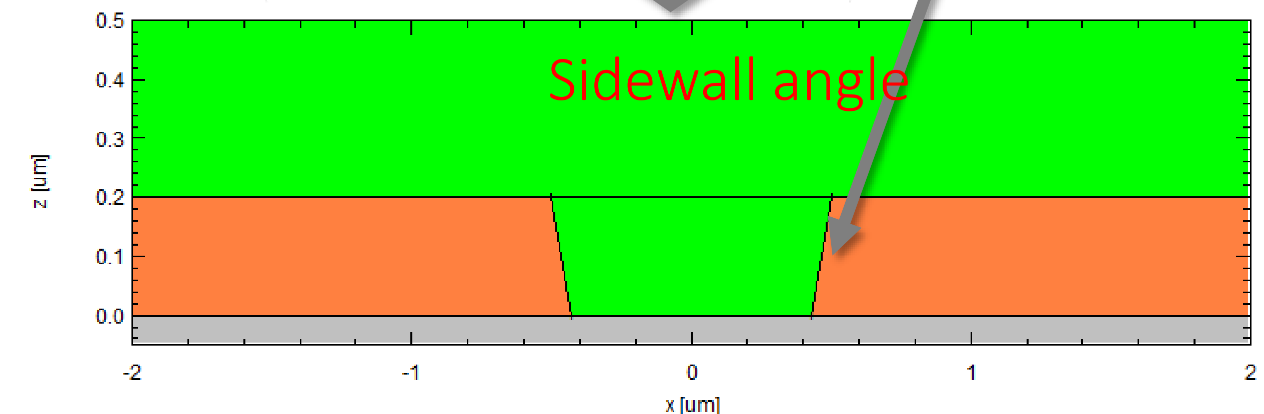
Type	Material	Thickness [um]	Surface	Layer	Angle [deg]	set color
Resist	AZ1518	0.5	Planar	*	90	
Layer	Cu	0.2	Add	2	70	
Substrate	SiO2	--	Planar	*	90	



Surface type: Add Inverse

Stack Type: Topographic

Type	Material	Thickness [um]	Surface	Layer	Angle [deg]	set color
Resist	AZ1518	0.5	Planar	*	90	
Layer	Cu	0.2	Add Inverse	2	70	
Substrate	SiO2	--	Planar	*	90	



Conformal/Conformal Inverse

- In stack definition, each material is defined with one of the five surface types
  - Example: layer 1(0) is defined as conformal or conformal inverse.

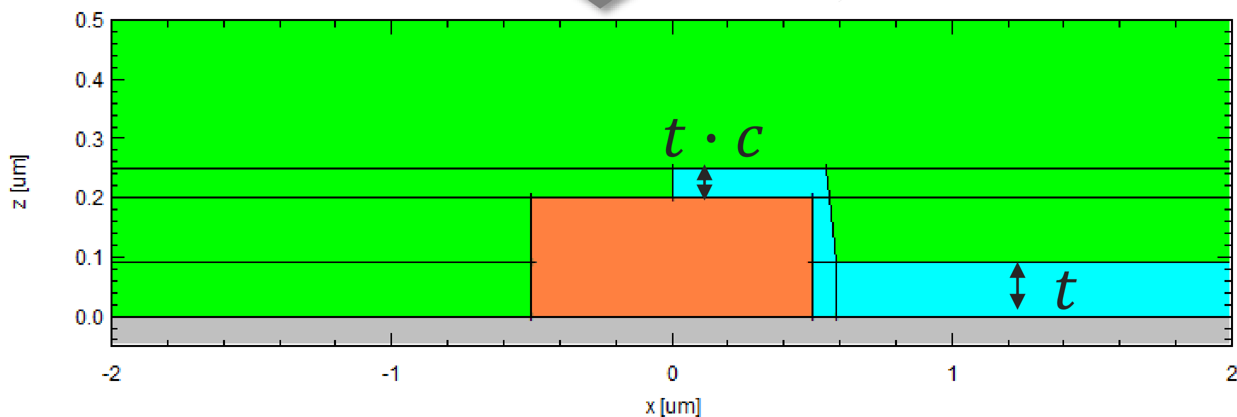
Surface type: Conformal

t: Conventional Thickness

c: Conformal Ratio

Stack Type: Topographic

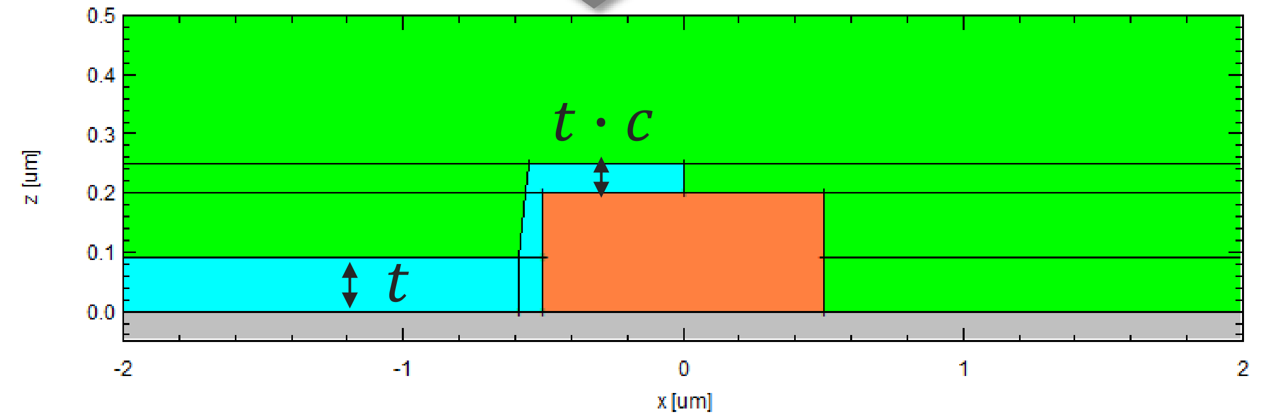
Type	Material	Thickness [um]	Surface	Conformal Ratio	Layer	Angle [deg]	set color
Resist	AZ1518	0.5	Planar	--	*	90	
Layer	Si3N4	0.1	Conformal	0.5	1	90	
Layer	Cu	0.2	Add	--	2	90	
Substrate	SiO2	--	Planar	--	*	90	



Surface type: Conformal Inverse

Stack Type: Topographic

Type	Material	Thickness [um]	Surface	Conformal Ratio	Layer	Angle [deg]	set color
Resist	AZ1518	0.5	Planar	--	*	90	
Layer	Si3N4	0.1	Conformal Inv.	0.5	1	90	
Layer	Cu	0.2	Add	--	2	90	
Substrate	SiO2	--	Planar	--	*	90	



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Topography Stack Example

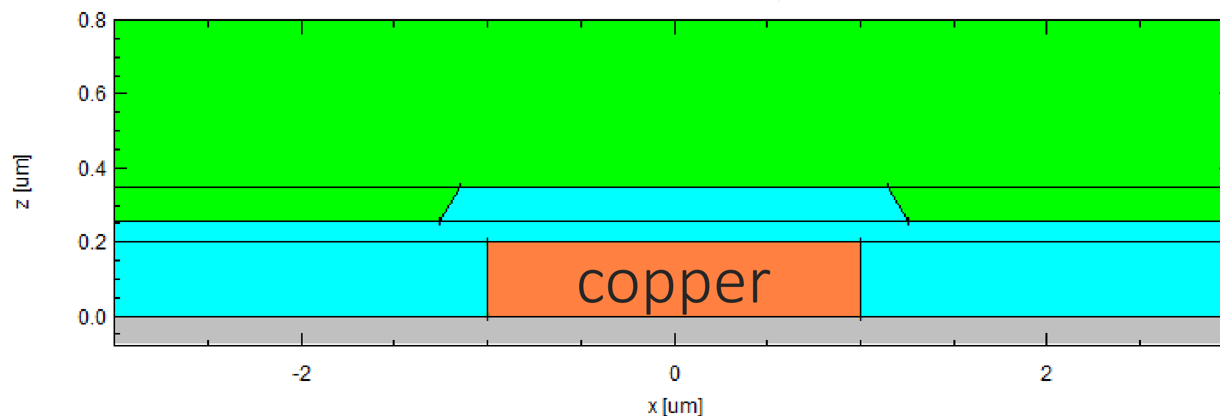
LAB models the whole stack to check the effect of non-planar substrate.

- The example below shows the effect of copper layer in modification of light intensity along the resist depth: shift of standing wave and hot spot at corners.

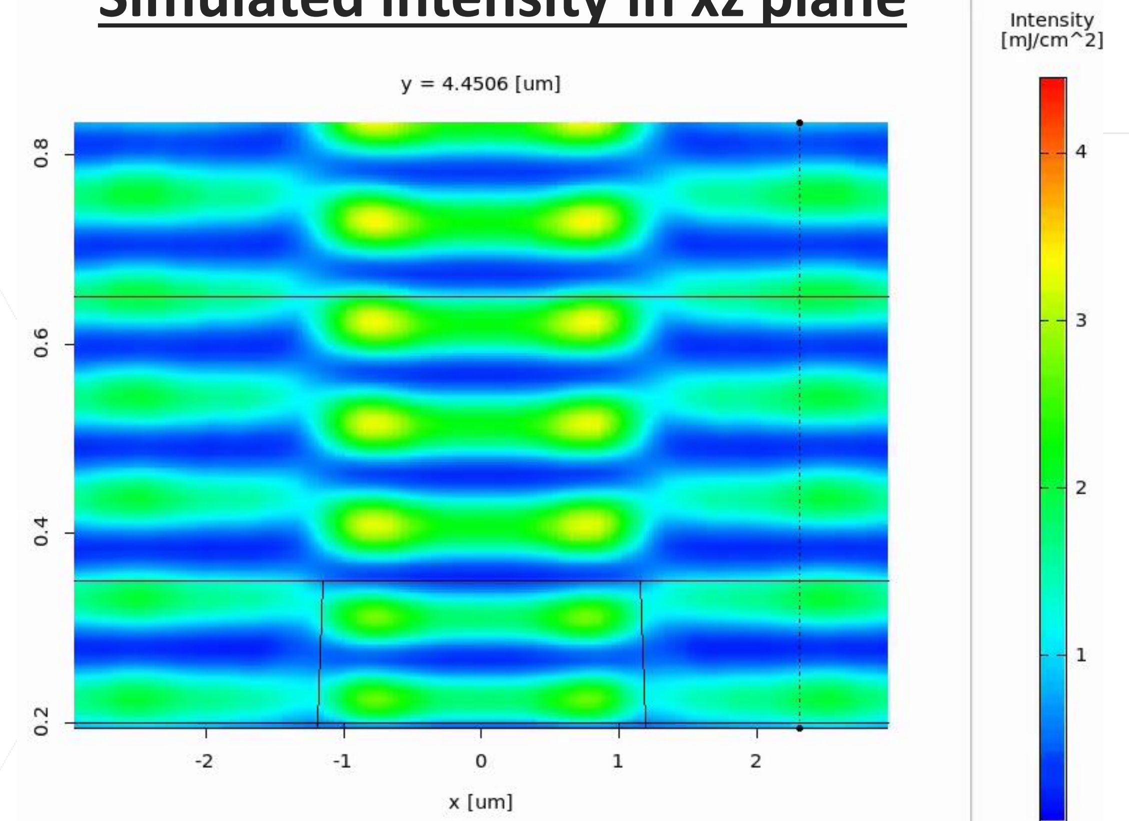
Stack definition

Type	Material	Thickness [um]	Surface	Conformal Ratio	Layer	Angle [deg]	set color
Resist	AZ1518	0.65	Planar	--	*	90	
Layer	Si3N4	0.3	Conformal	0.5	*	90	
Layer	Cu	0.2	Add	--	2	90	
Substrate	Si-crystalline	--	Planar	--	*	90	

Cross sectional view



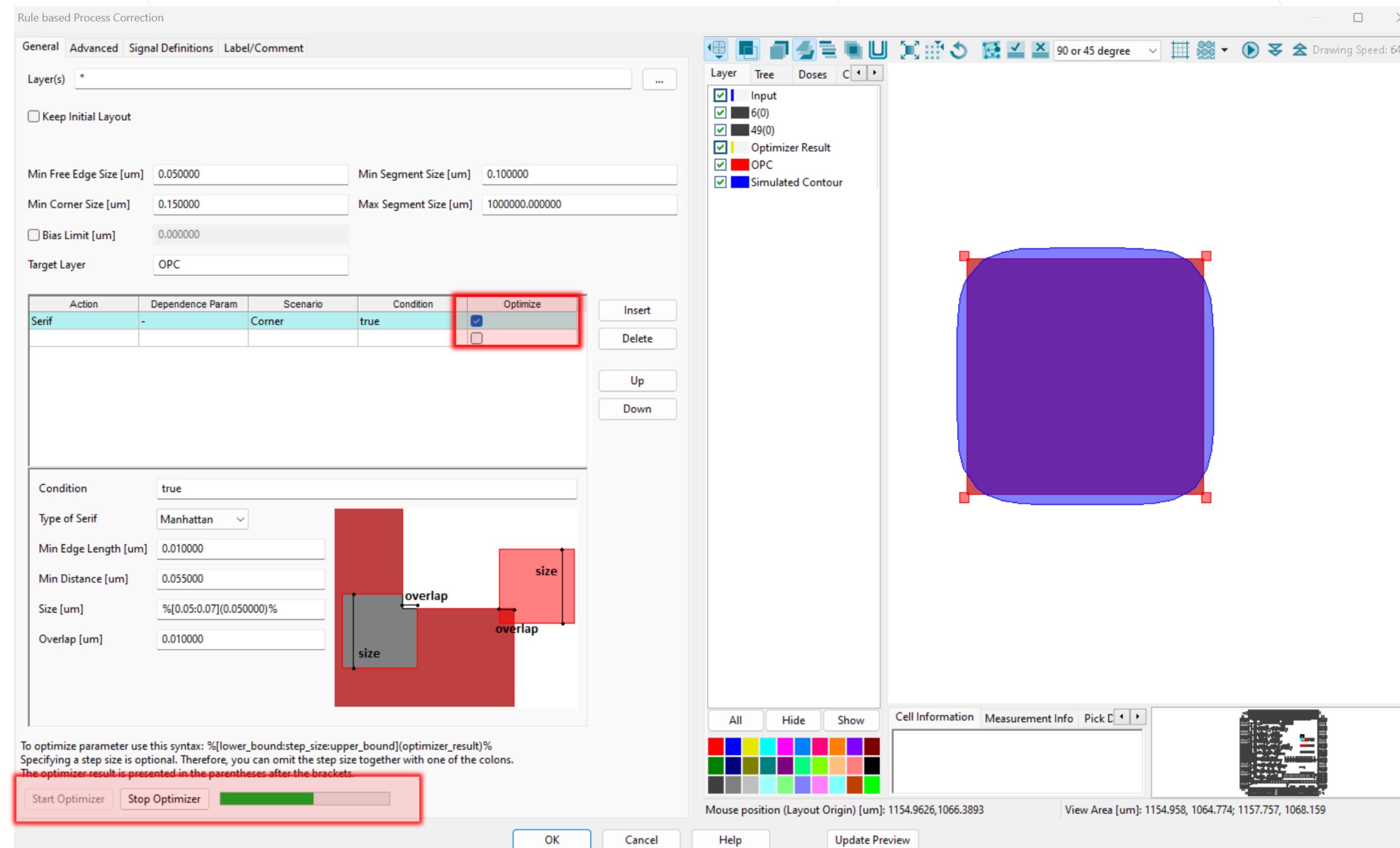
Simulated intensity in xz plane



Rule OPC

OPC Rule Optimization

Rules in the RuleOPC can be optimized based on the exposure simulation settings, to allow an easier definition of rule parameters..

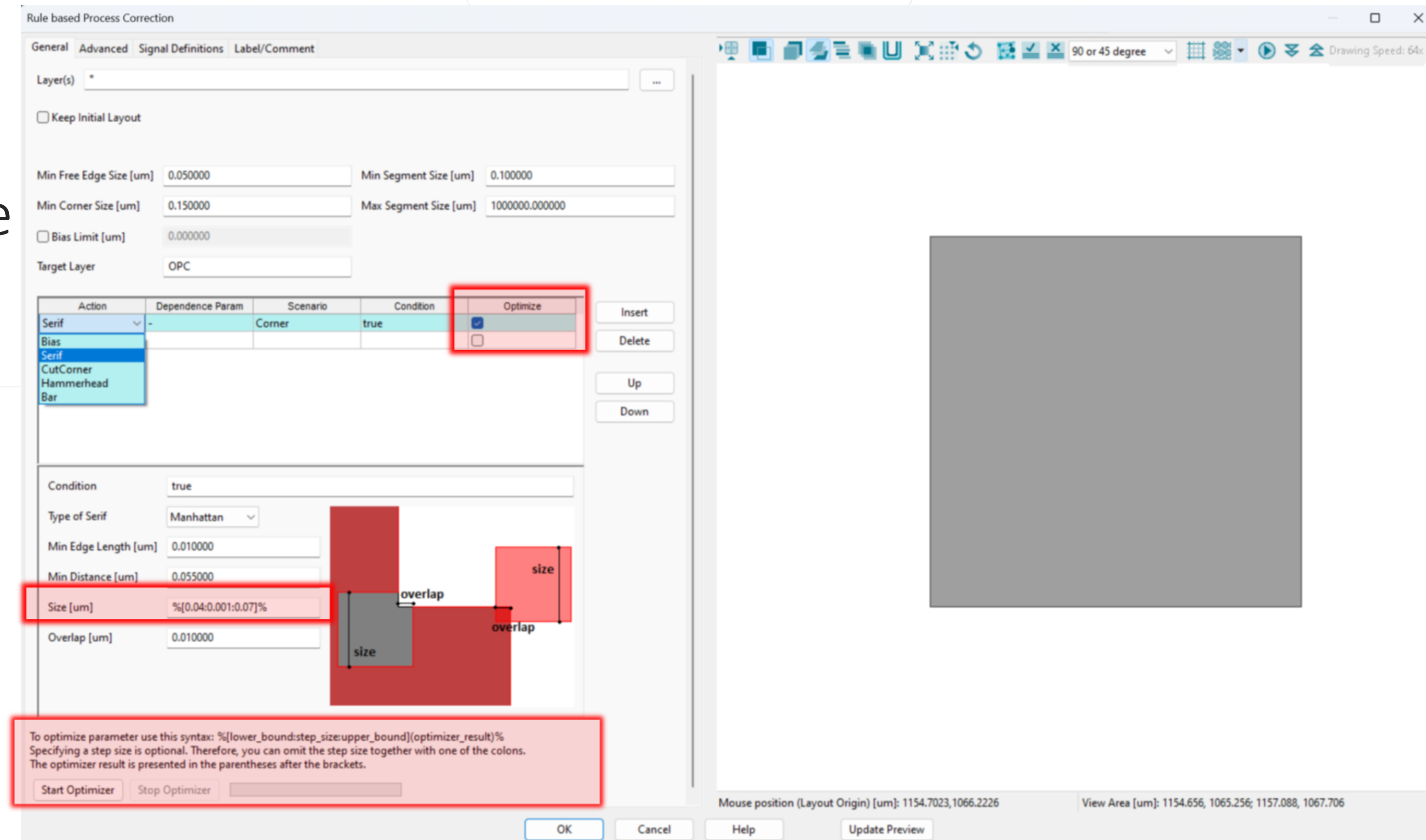


How to Optimize?

- Enable the „Optimize“ check-box enables the Rule Optimizer
  - Select the rule for optimization
  - Then define the variables of the rule to be optimized. The format is

  %[min value:step:max value]%

  - Finally, press „Start Optimizer“



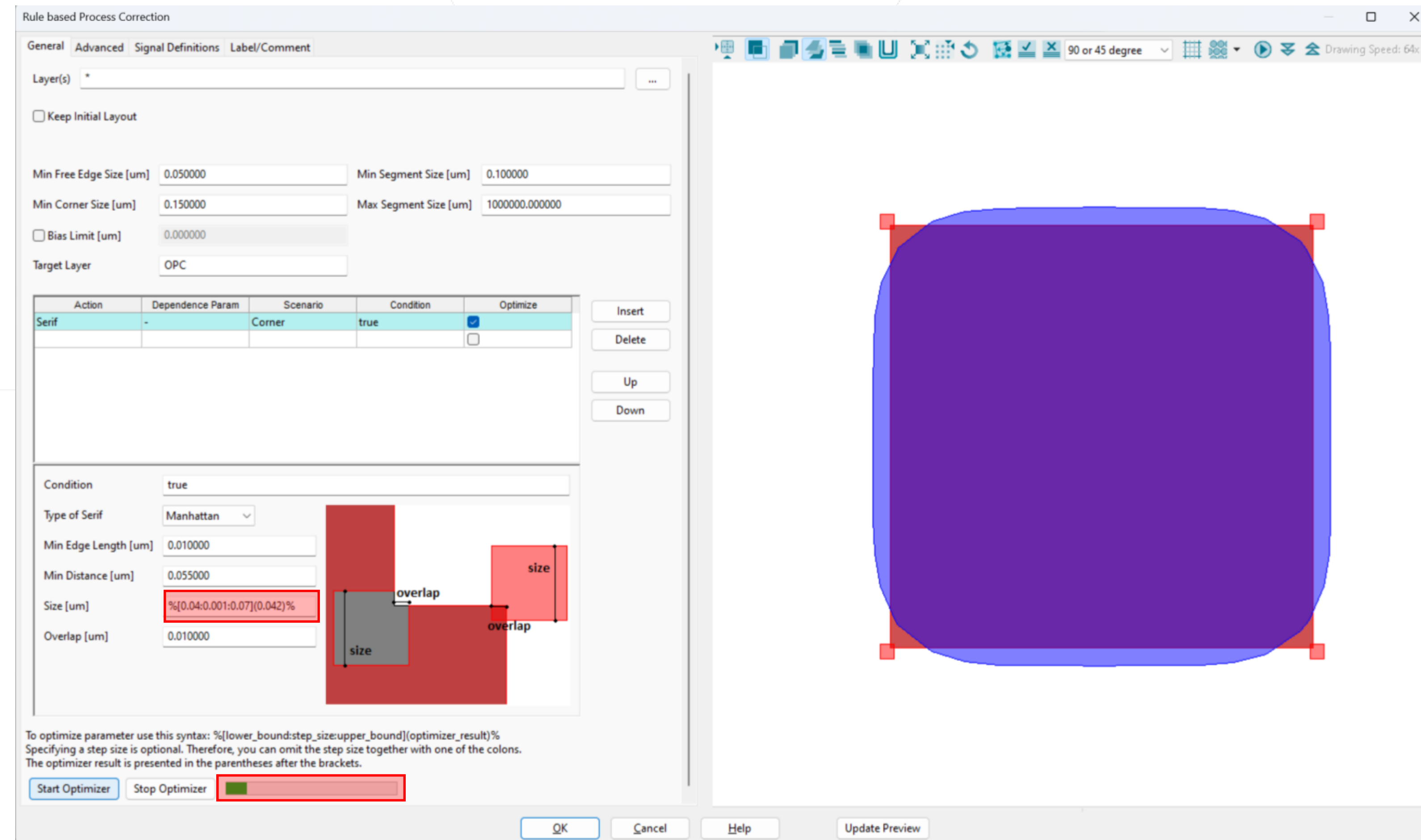
NOTE: „step“ is not a mandatory parameter, it defines the step width used during the optimization.

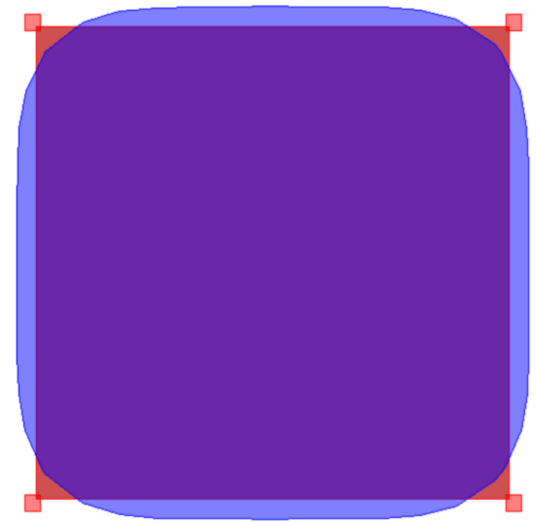
Immediate Contour Update

- The green bar shows the progress of optimization
  - Optimized value appears next to the variable-range definition

%[min val:step:max val](optimization)%

  - The resulting contour is diaplyed on the right side
  - The optimization can be stopped at any time, the last value of the optimizer will be used for the variable.

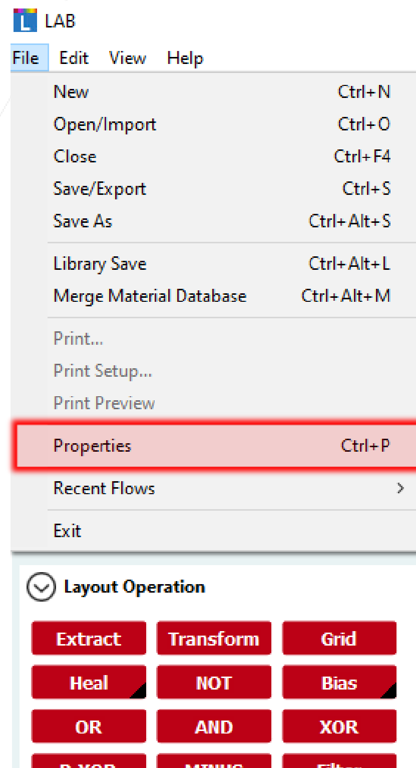


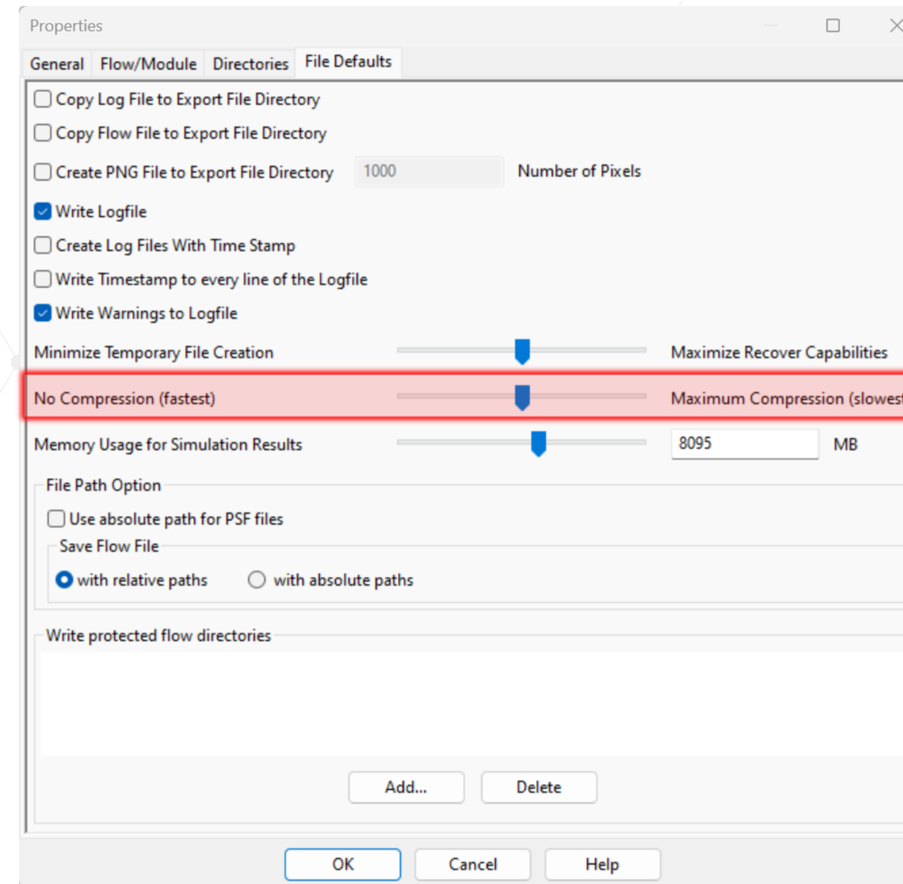


Usability

Temporary Files Compression

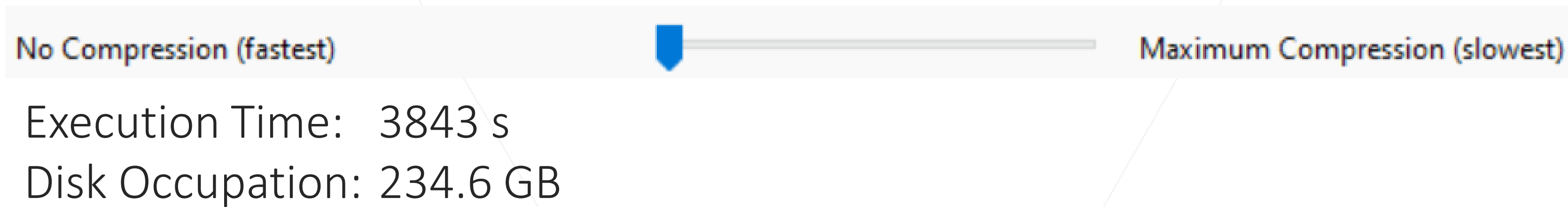
- The properties setting controls the compression of temporary files, to reduce the occupied memory



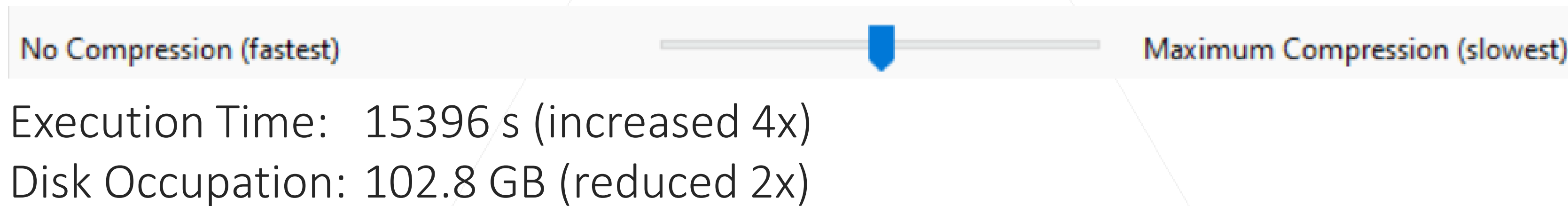


Temporary Files Compression

- Compromise between processing time and file size
  - For an example simulation with a large burden,



Execution Time: 3843 s
Disk Occupation: 234.6 GB



Execution Time: 15396 s (increased 4x)
Disk Occupation: 102.8 GB (reduced 2x)

Laser Exposure Dose

- The base dose for DWL tools is now calculated on maschine parameters.

Laser Exposure

Region | Stack | Tool | Simulation | Analysis | Label/Comment

Machine Type	DWL 66+
DWL Head	2mm
Wavelength [nm]	375
Pixel Size [nm]	100
Number of Gray-Tone Levels	0
NA	0.9
Focus Offset [um]	0.000000
Flare Background	0.000000

○ Wafer Parameter

Beam Size FWHM [nm]	555.555393

● Tool parameter

Gaussian Beam Radius [mm]	1.160740
Focal Length [mm]	2

Exposure Dose

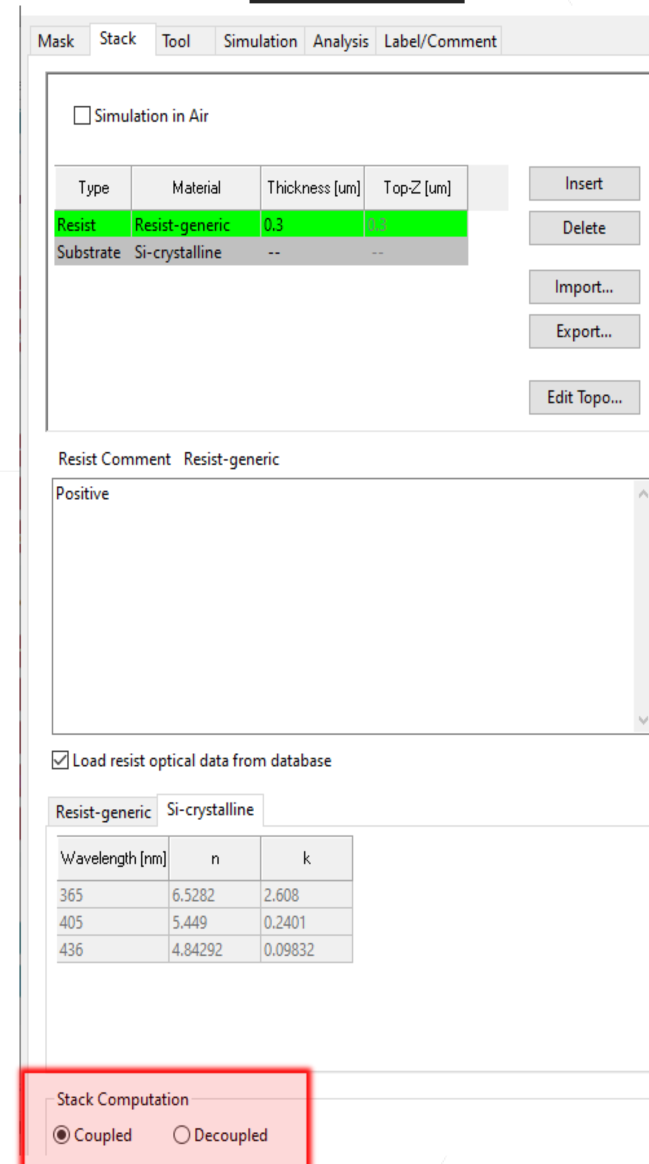
○ Direct Input
Exposure Dose [mJ/cm^2] 14905.5

● Machine Parameters
Power [W] 0.3
Transmission Filter [%] 100
Optical Efficiency [%] 100

Stack computation

- The decision for the stack computation method is based on the following criteria
  - **Proximity**: *Coupled* for topography in non-periodic direction, else decoupled
  - **Projection**: *Decoupled* for bleaching stack and NA ≤ 0.5, else coupled
  - **Laser**: *Decoupled*

LAB 5.8



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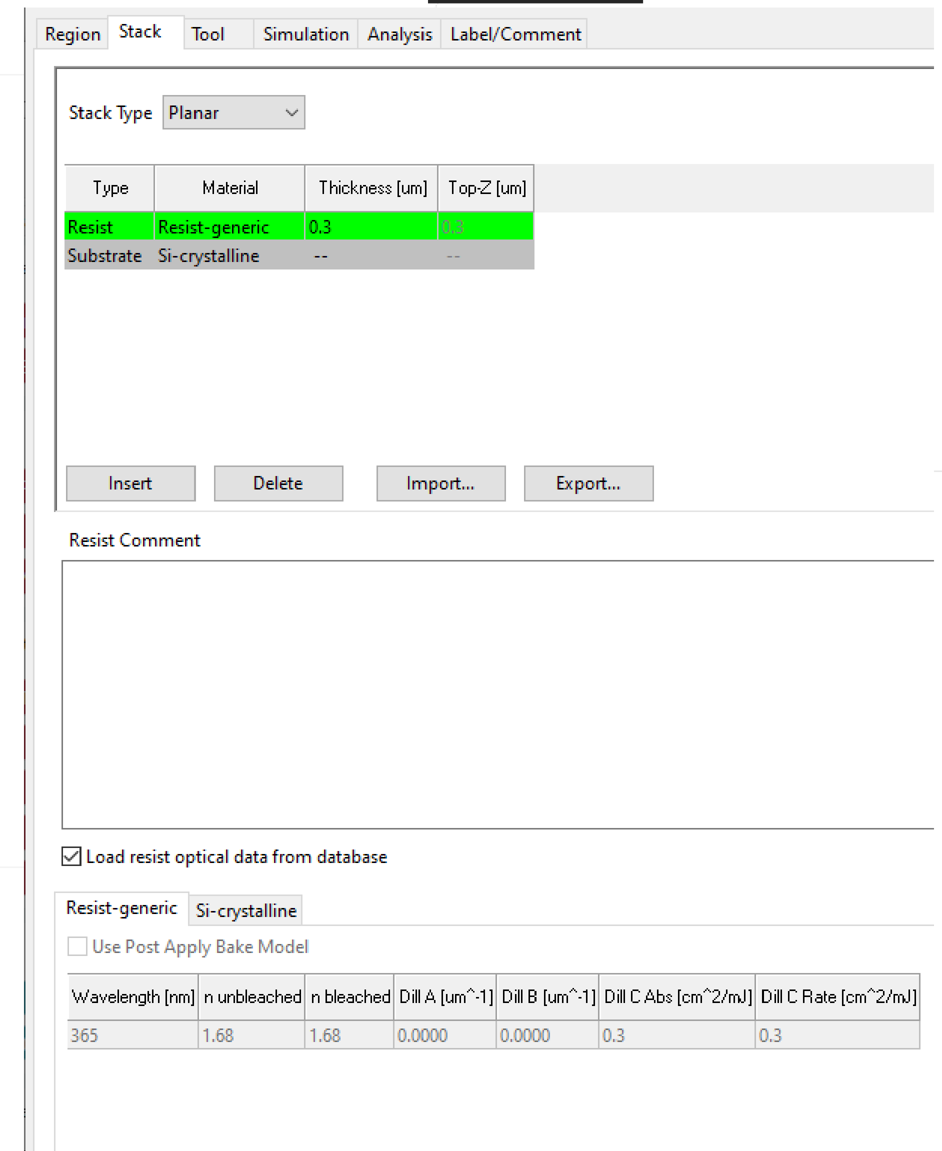

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Thank You!

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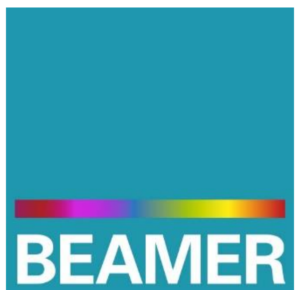

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