

BEAMER

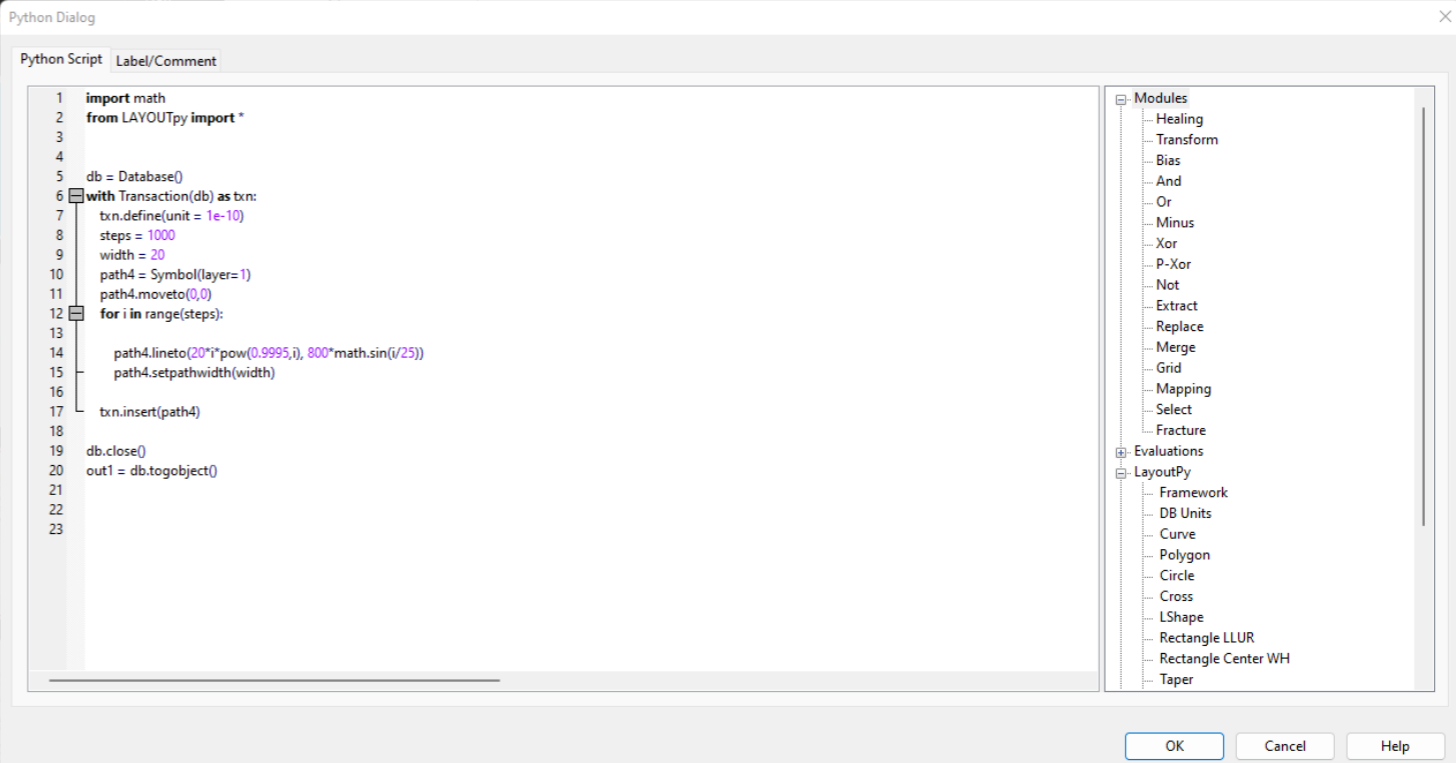
What's New v6.3

Integrated Python

Python

The new Python module allows Python scripts to run within a BEAMER flow. Scripting enables more complex computation and flow control than flows built with just discrete modules. Python modules can take multiple input layouts and produce multiple output layouts.

- Scripts can be edited directly when a Python module is opened.



The screenshot shows a 'Python Dialog' window with a text editor on the left and a 'Modules' list on the right. The text editor contains the following Python code:

```
1 import math
2 from LAYOUTpy import *
3
4
5 db = Database()
6 with Transaction(db) as txn:
7     txn.define(unit = 1e-10)
8     steps = 1000
9     width = 20
10    path4 = Symbol(layer=1)
11    path4.moveto(0,0)
12    for i in range(steps):
13
14        path4.lineto(20*i*pow(0.9995,i), 800*math.sin(i/25))
15        path4.setpathwidth(width)
16
17    txn.insert(path4)
18
19 db.close()
20 out1 = db.togobject()
21
22
23
```

The 'Modules' list on the right includes:

- Healing
- Transform
- Bias
- And
- Or
- Minus
- Xor
- P-Xor
- Not
- Extract
- Replace
- Merge
- Grid
- Mapping
- Select
- Fracture
- Evaluations
- LayoutPy
 - Framework
 - DB Units
 - Curve
 - Polygon
 - Circle
 - Cross
 - LShape
 - Rectangle LLUR
 - Rectangle Center WH
 - Taper

Not available for RedHat 6

- Script pane

Here one can program full python code using basic Python libraries and anything what can be done within Python

Supported Libraries are:

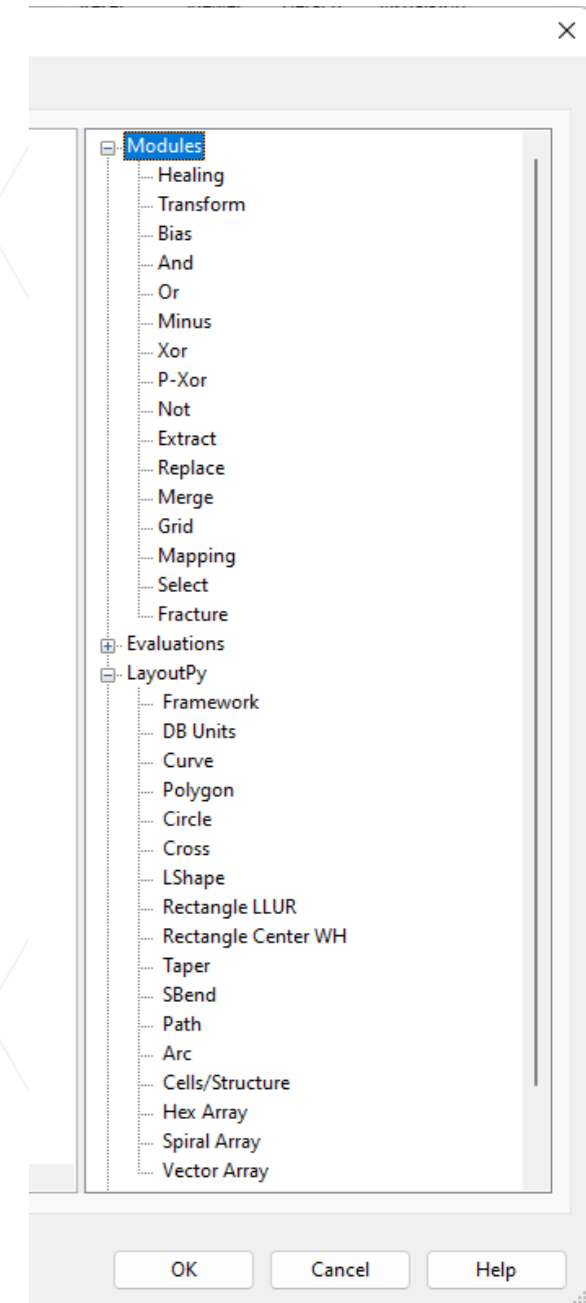
BEAMERpy, LayoutPy, numpy, math, sys, PIL, matplotlib, wx, xlsxwriter, xlwt

- Snippet pane

The snippet pane allows easy access to relevant functions.

These are arranged in a tree type layout

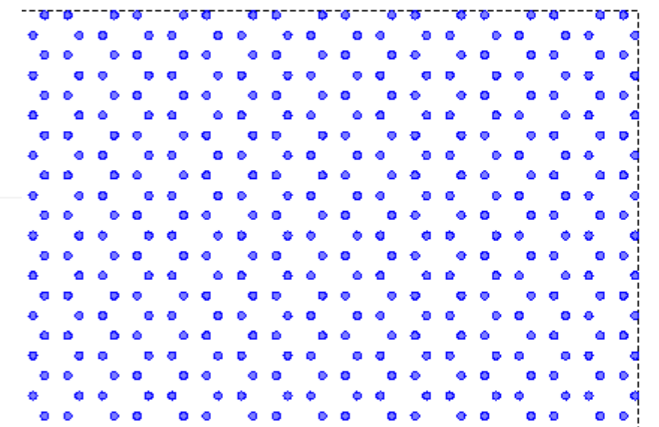
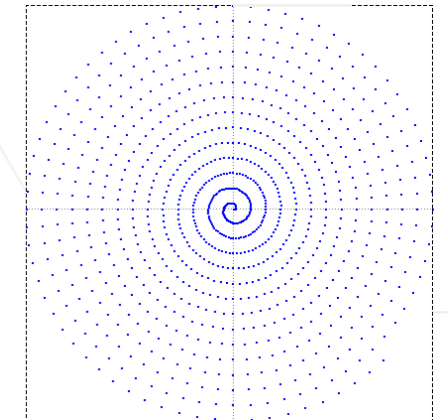
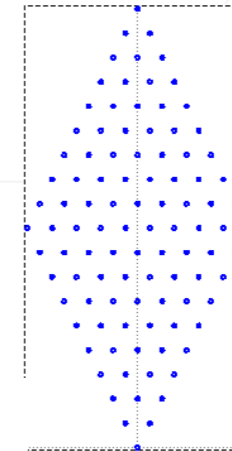
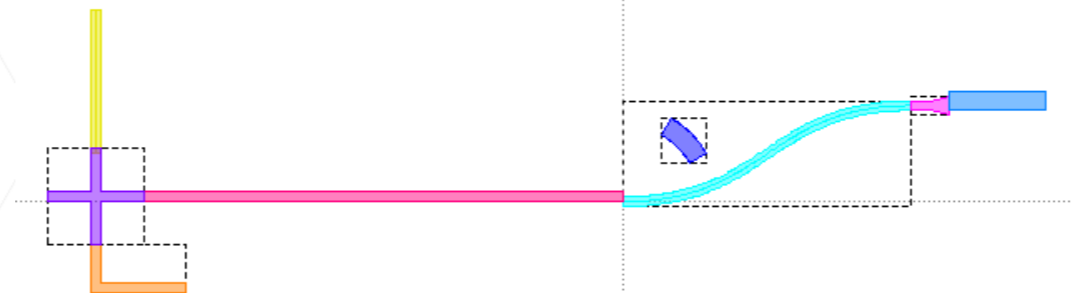
- Math
- Module – contain all layout operations of BEAMER
- Evaluations – contain the pattern analysis routines of the IF module
- LayoutPy – offers layout generation via scripting
- Examples – some pre-scripted LayoutPy and general script samples
- Snippets – a custom repository of any code snippet the user wants to store



LayoutPy

Layout creation

LayoutPy is a library included with BEAMER that can generate layouts with many common shapes using Python code

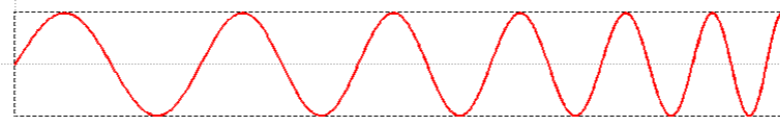


```
db1=Database()
s1=Structure(db1,b'Test1')

taper = Taper( (x, y), (length_left,width_left), (length_right,width_right), layer=10)
taper.toDatabase(s1)

cross = Cross( (x, y), (width,length), layer=10)
cross.toDatabase(s1)
```

```
for i in range(steps):
    path4.lineto(20*i*pow(0.9995,i), 800*math.sin(i/25))
    path4.setpathwidth(width)
    txn.insert(path4)
```



Flow integration due to multi port capability

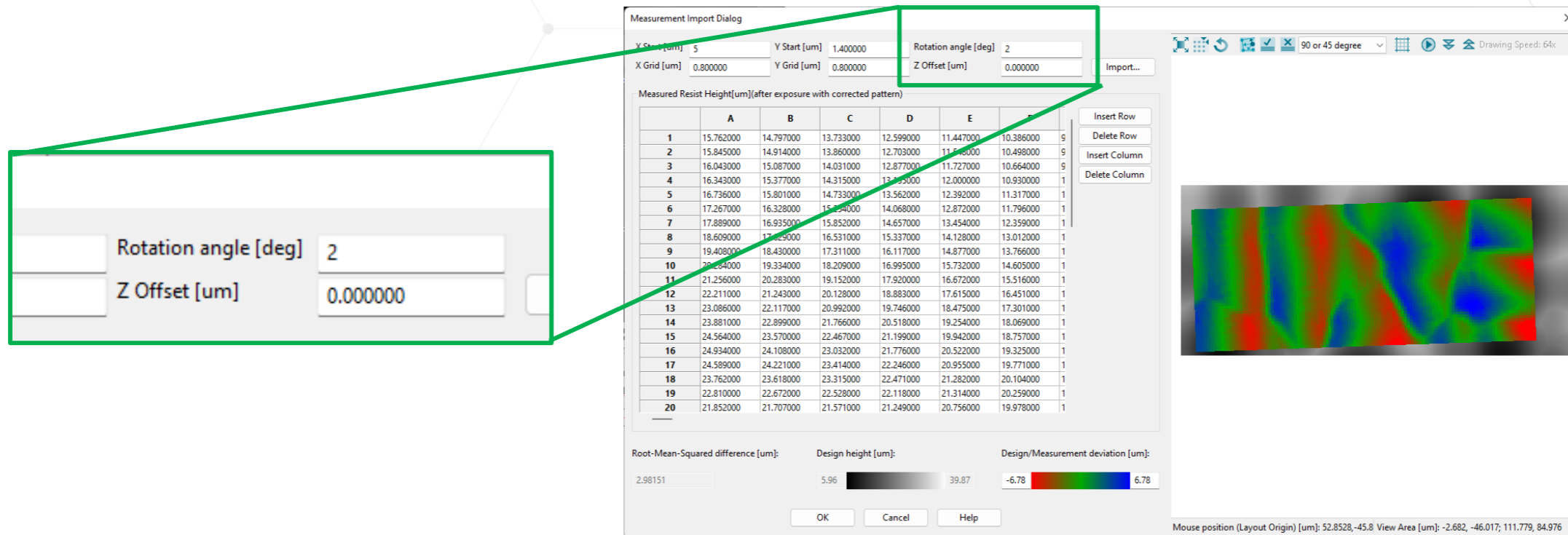
- Any number of inputs can be provided to the module
 - The layouts from the inputs are accessed from the script as in#, where # is the input port number, from left to right, for example: in1, in2, in3...
 - These are each a python layout object the module functions can operate on
- Any number of outputs can be defined
 - These are also layouts, which are named as out#, where # again counts from left to right
 - Layout out1 goes to the leftmost output port, and so on.

```
Python Dialog
Python Script Label/Comment
1 #Bulk
2 result1 = beamer.bias(in1, { 'Bias' : -0.100000 })
3 #Sleeve
4 result2 = beamer.minus(in1, result1, { 'SoftFrame' : 0.300000 })
5
6 out1 = result2
```

3D PEC & 3D Simulation

3D Feedback loop Alignment Enhancement

- The 3D Feedback loop option allows the overlay of target and measurement data to fine tune the correction.
- As alignment is key to that operation the data can now also be rotated in the alignment process. This is considered that not always the measurement data is perfectly aligned to the correction data.



Measurement Import Dialog

X Start [um] 5 Y Start [um] 1.400000 Rotation angle [deg] 2
 X Grid [um] 0.800000 Y Grid [um] 0.800000 Z Offset [um] 0.000000 Import...

Measured Resist Height[um](after exposure with corrected pattern)

	A	B	C	D	E	
1	15.762000	14.797000	13.733000	12.599000	11.447000	10.386000
2	15.845000	14.914000	13.860000	12.703000	11.580000	10.498000
3	16.043000	15.087000	14.031000	12.877000	11.727000	10.664000
4	16.343000	15.377000	14.315000	13.195000	12.000000	10.930000
5	16.736000	15.801000	14.733000	13.562000	12.392000	11.317000
6	17.267000	16.328000	15.240000	14.068000	12.872000	11.796000
7	17.889000	16.935000	15.852000	14.657000	13.454000	12.359000
8	18.609000	17.629000	16.531000	15.337000	14.128000	13.012000
9	19.408000	18.430000	17.311000	16.117000	14.877000	13.766000
10	20.284000	19.334000	18.209000	16.995000	15.732000	14.605000
11	21.256000	20.283000	19.152000	17.920000	16.672000	15.516000
12	22.211000	21.243000	20.128000	18.883000	17.615000	16.451000
13	23.086000	22.117000	20.992000	19.746000	18.475000	17.301000
14	23.881000	22.899000	21.766000	20.518000	19.254000	18.069000
15	24.564000	23.570000	22.467000	21.199000	19.942000	18.757000
16	24.934000	24.108000	23.032000	21.776000	20.522000	19.325000
17	24.589000	24.221000	23.414000	22.246000	20.955000	19.771000
18	23.762000	23.618000	23.315000	22.471000	21.282000	20.104000
19	22.810000	22.672000	22.528000	22.118000	21.314000	20.259000
20	21.852000	21.707000	21.571000	21.249000	20.756000	19.978000

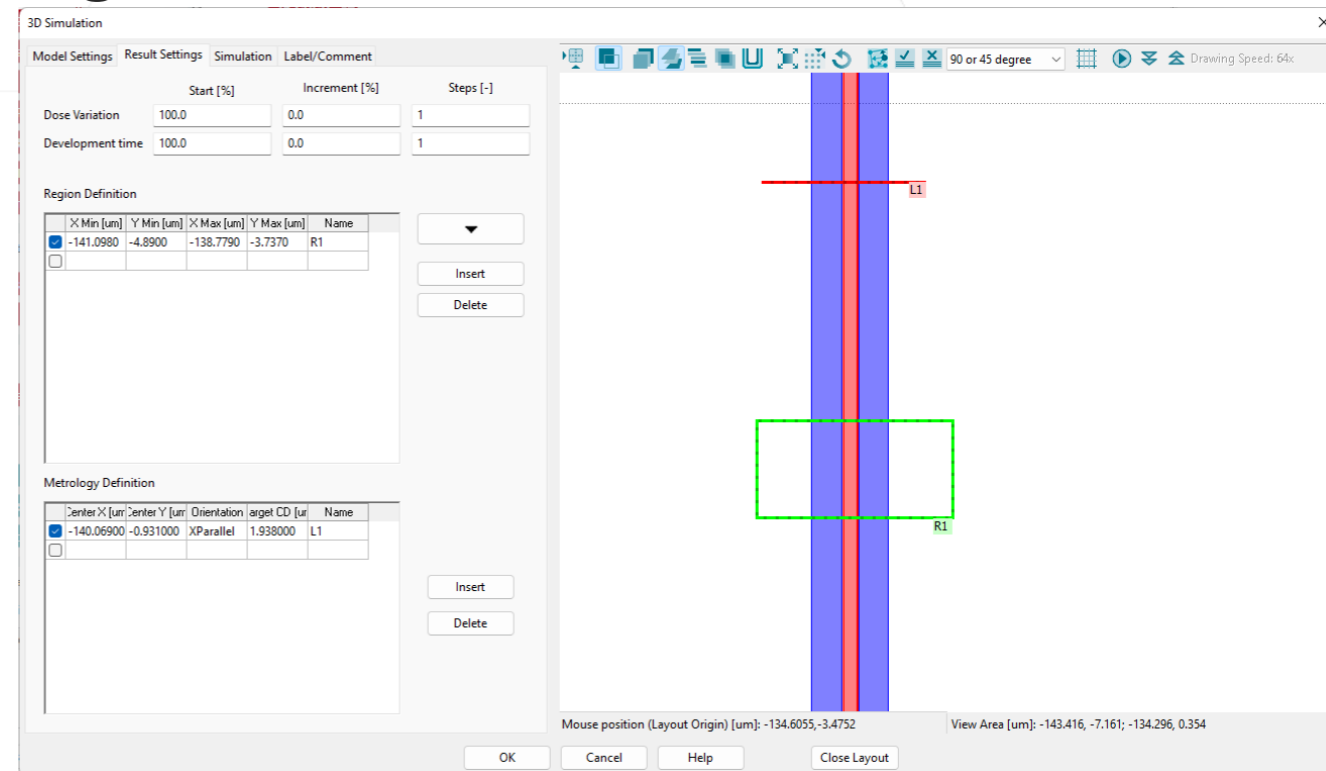
Root-Mean-Squared difference [um]: 2.98151 Design height [um]: 5.96 Design/Measurement deviation [um]: -6.78

OK Cancel Help

Mouse position (Layout Origin) [um]: 52.8528, -45.8 View Area [um]: -2.682, -46.017; 111.779, 84.976

3D Simulation definition by a line

- The 3D Simulation module can simulate larger areas as a volume
For some applications where only a cross-section is of interest, such as a t-gate, the simulation definition can be simplified by just specifying a line.
- The definition of lines is now possible to get a cross-section simulation along the line
- SHIFT + right Click to start and stop a line definition
- When inspecting a line simulation the view will open directly in a x,z view (y,z if applicable)

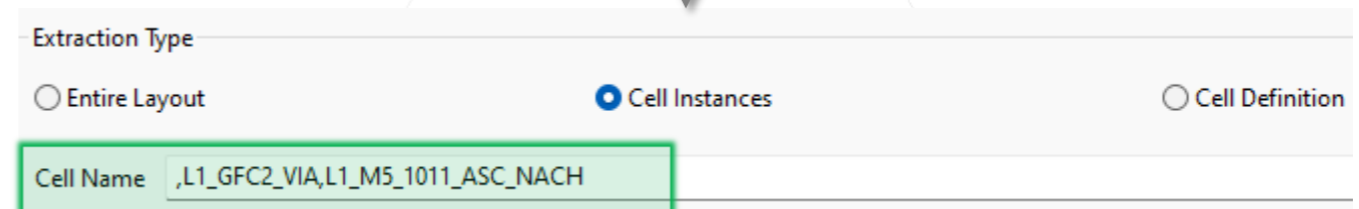
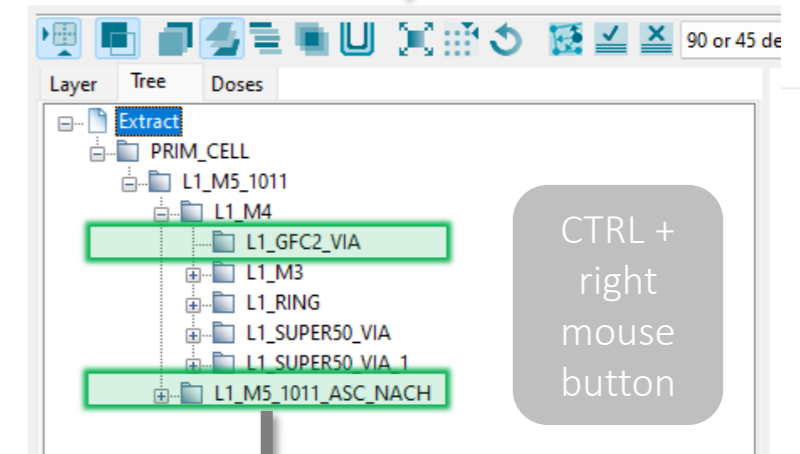
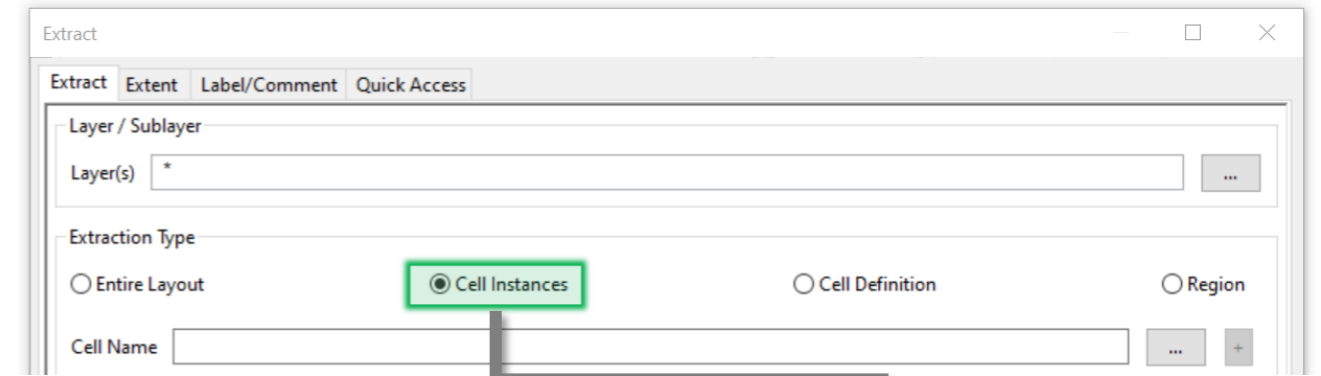
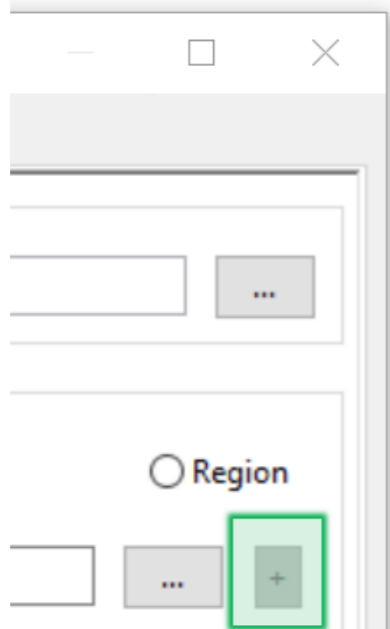


Layout Operation

Extract: Enhancement for Cell Extract

Extract cell can now be populated interactively by using the tree view in the layout preview.

- Use CTRL + right mouse button or
- Select a cell in the tree and press +



Extract: Remove Sub-cell

Extract

Extract Extent Label/Comment Quick Access

Layer / Sublayer
Layer(s) *

Extraction Type
 Entire Layout
 Cell Instances
 Cell Definition
 Region

Cell Name PRIM_CELL

Add a cell name to the above list by right click on a cell name in the layout tree or by selecting a cell in the layout tree and pressing the "+" button.

Region Box Default Mode Clip Apply to all

	X Min [um]	Y Min [um]	X Max [um]	Y Max [um]	Name	Mode
<input type="checkbox"/>						

Import... Export... Draw Region Insert Row Delete Row

Region Layer ... Clip

Keep region layer

Region(s)/Instances only
 Exclude Region(s)/Instances
 Remove Sub-Cells

- In Extract module, the cell instance extract has an additional option "Remove Sub-Cells".
- This mode extracts only the flat pattern from the chosen cell instances.

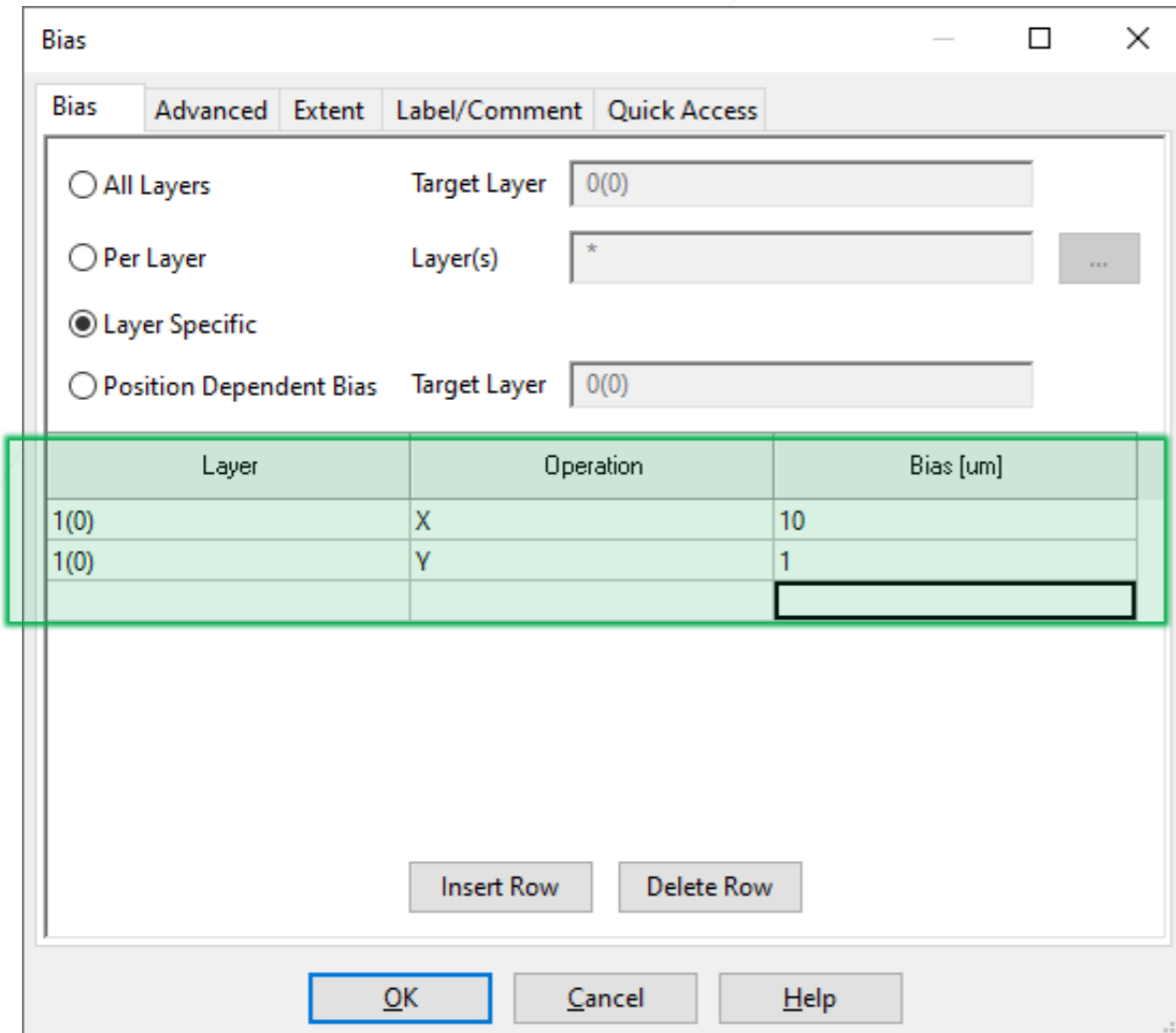
Layer Tree Doses

Extract

- TOP_CELL_BEAMER_Rev_1_1_1_
 - PRIM_CELL
 - L1_M5_1011
 - L1_M4
 - L1_M5_1011_ASC_NACH

Bias/Size: More Flexible Layer Operations

- Bias/Size module allows separate bias value on the same layer for different operations.
- The flexibility for layout modification is enhanced.
- In previous versions a layer could only occur once.



Bias

All Layers Target Layer 0(0)

Per Layer Layer(s) * ...

Layer Specific

Position Dependent Bias Target Layer 0(0)

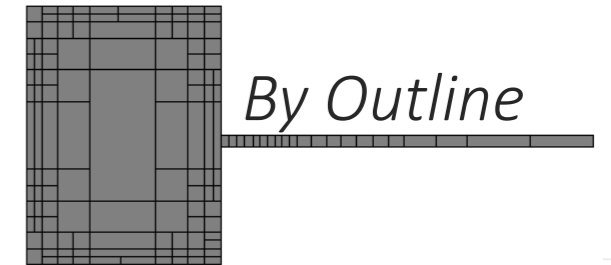
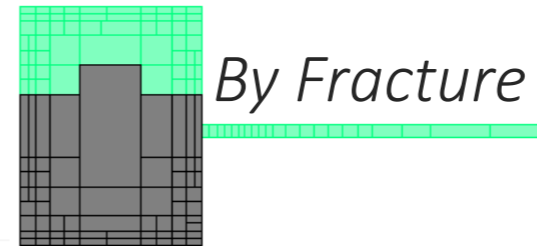
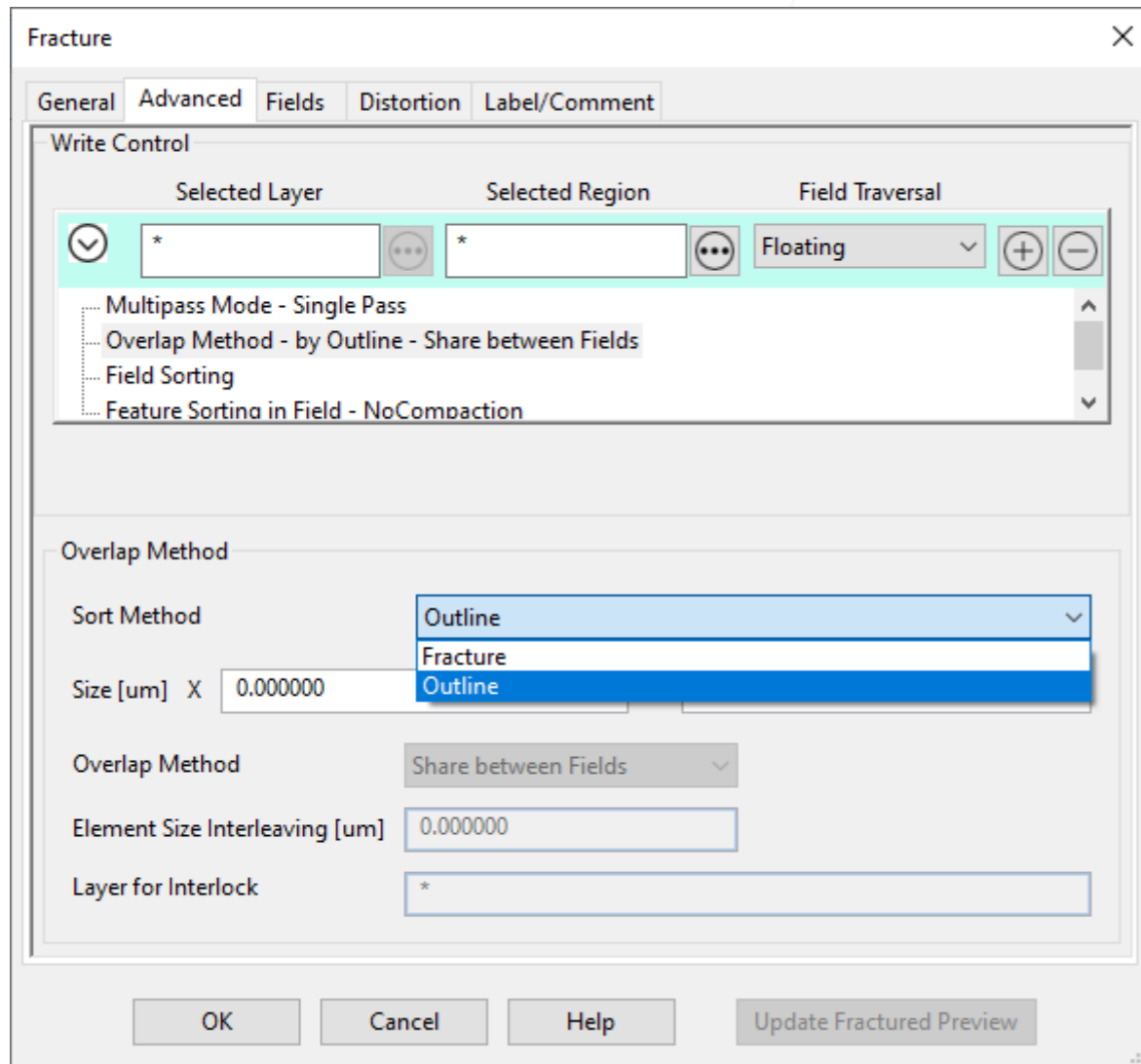
Layer	Operation	Bias [um]
1(0)	X	10
1(0)	Y	1

Insert Row Delete Row

OK Cancel Help

Fracture: Faster Floating Fields

- The processing time for Floating Field algorithm has been improved for both sort method – Fracture and Outline

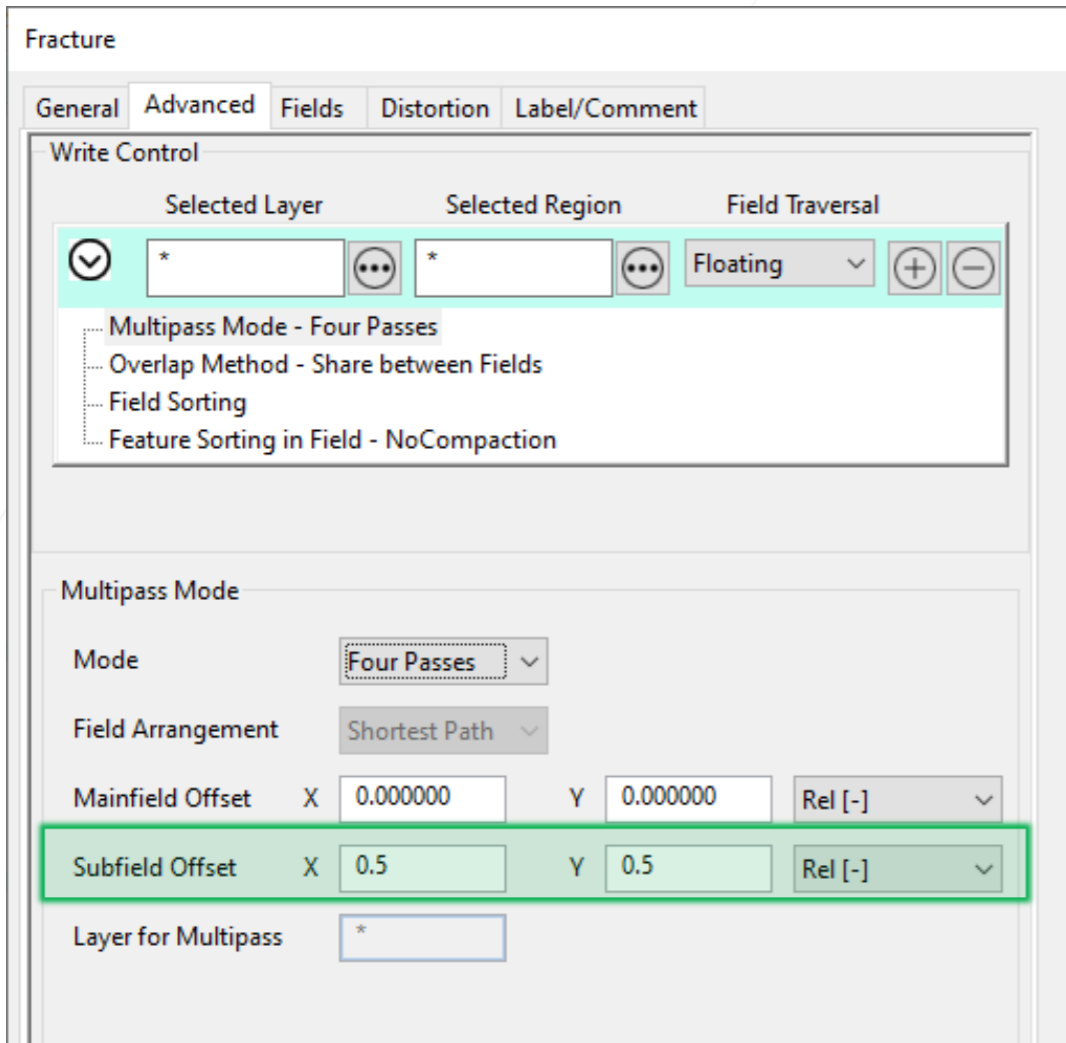


**Color by Fields*

- The improvement is most visible in case of large flat files with complex polygonal shapes
- In Export modules, the Floating Field option is also improved (based on the same code)

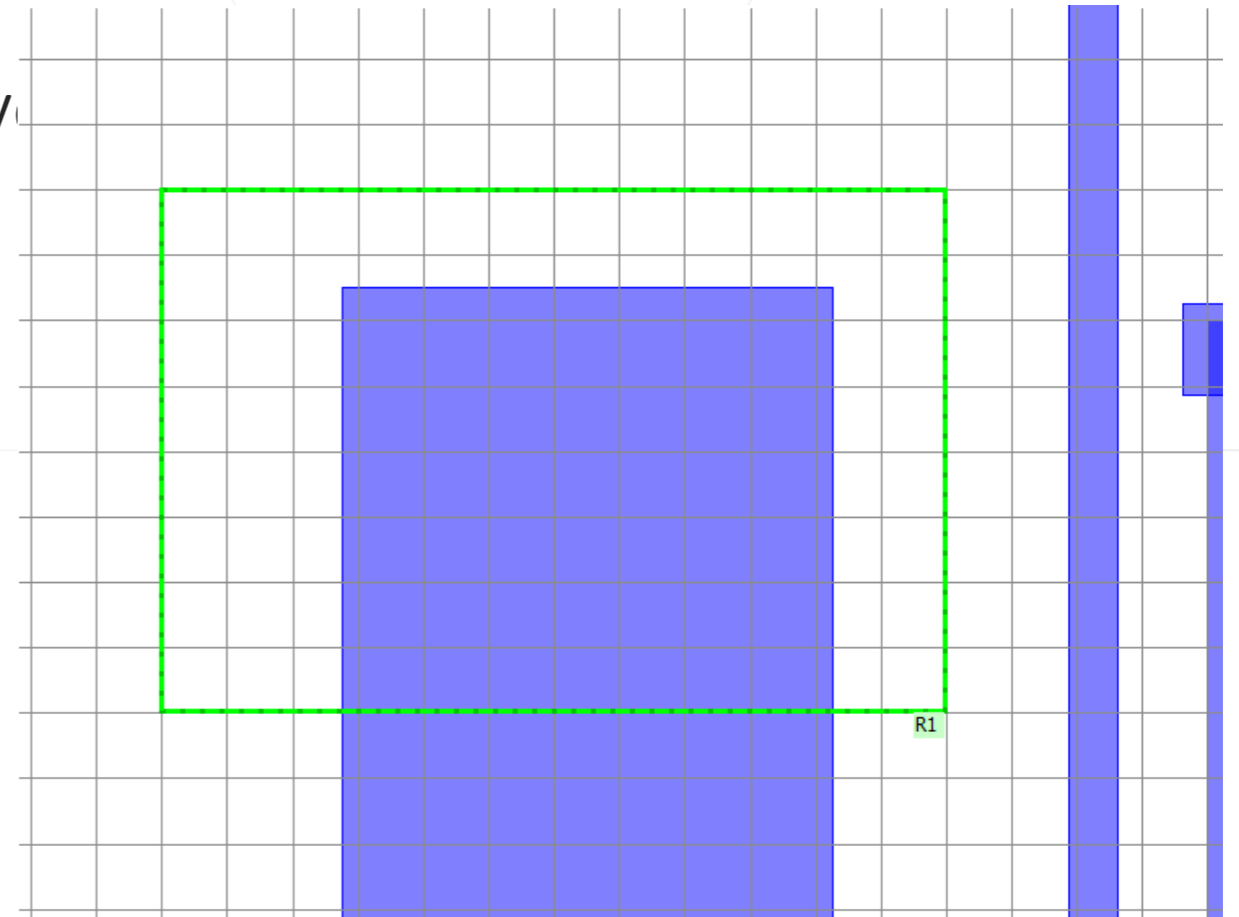
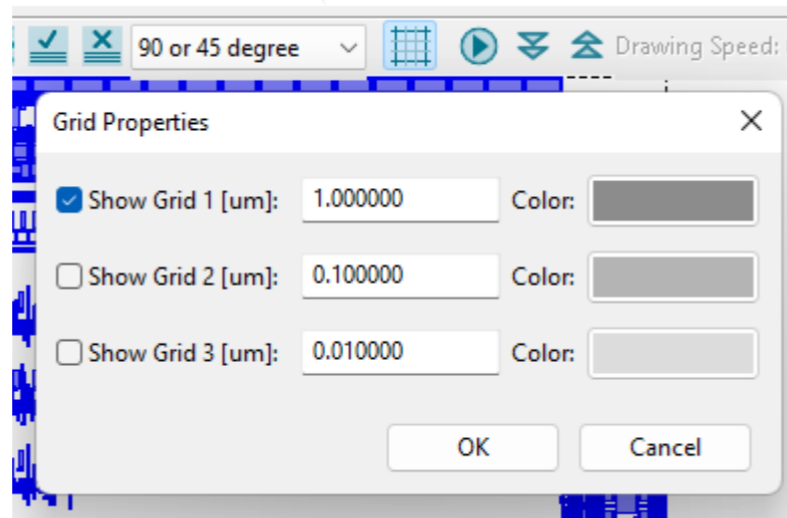
Fracture: Subfield Offset

- Subfield offset is now enabled for all fracture modes including floating and manual fracturing.
- It is disabled only when single pass is selected.



Region Definition with snapping option

- Region Definition with snapping brings with an active GRID view the option to interactively define a region and have this snap to the grid set



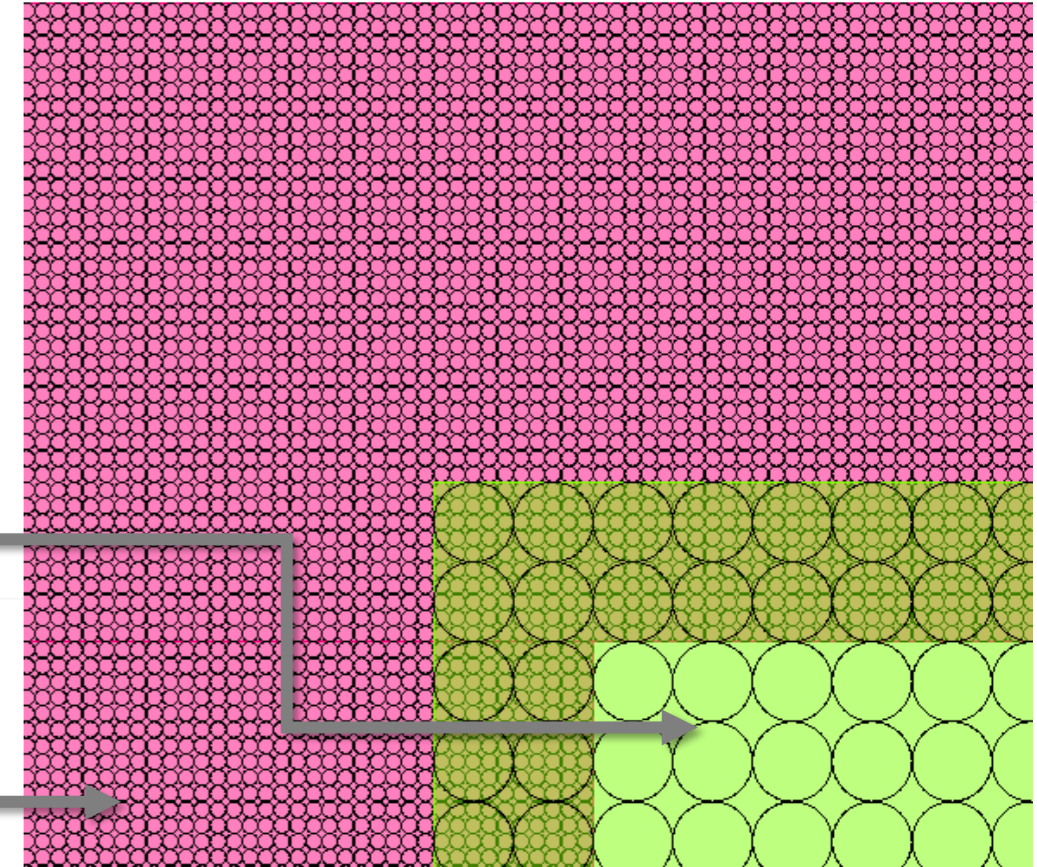
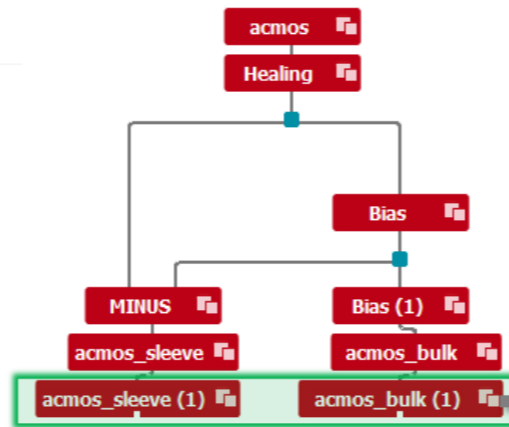
- Any numbers can be entered in the grid and the grid 3 dominates over grid 2 which overrules grid 1 when active.

VIEWER

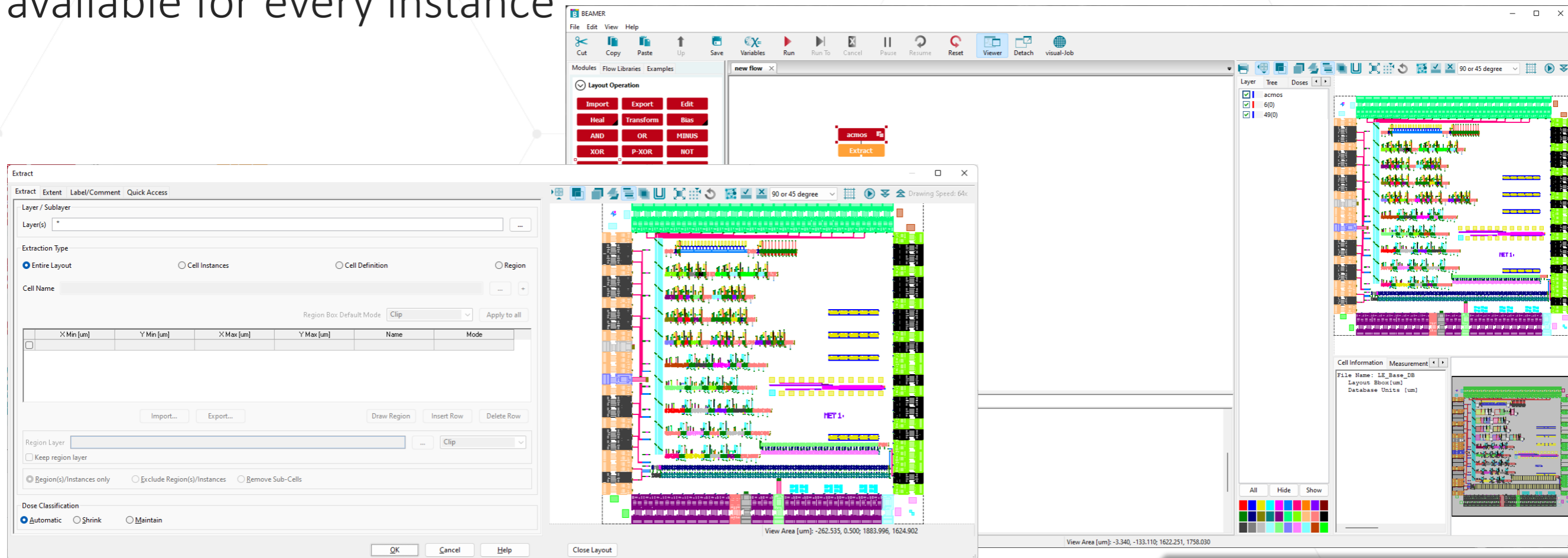
Multiview of Export with different BSS/ShotPitch

The Multiview of exported files now allows the proper representation of the shot placement.

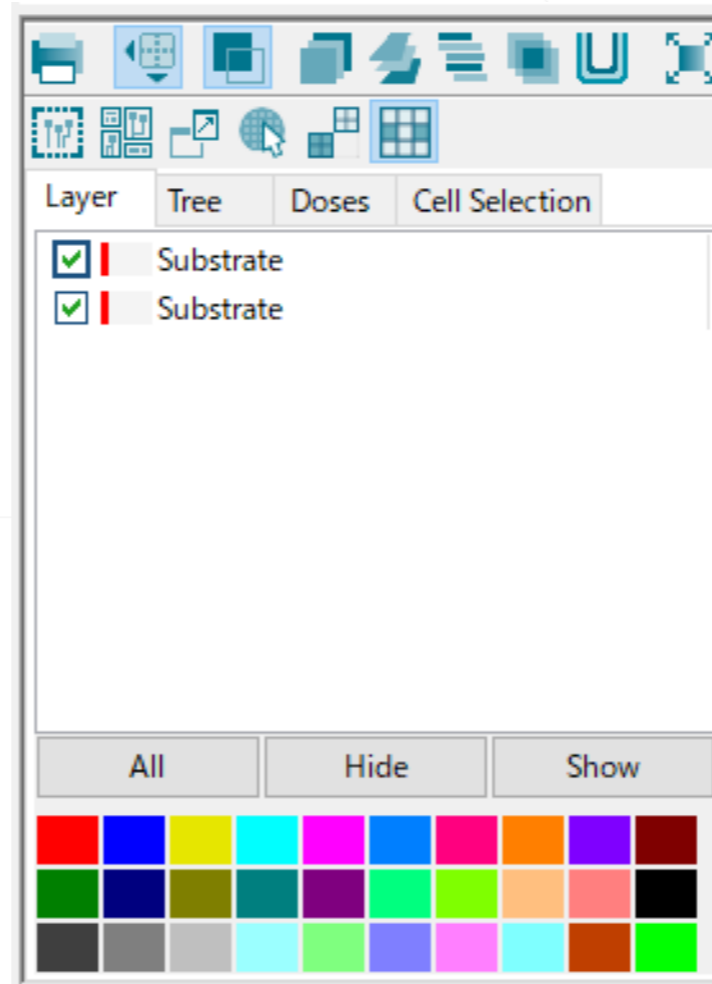
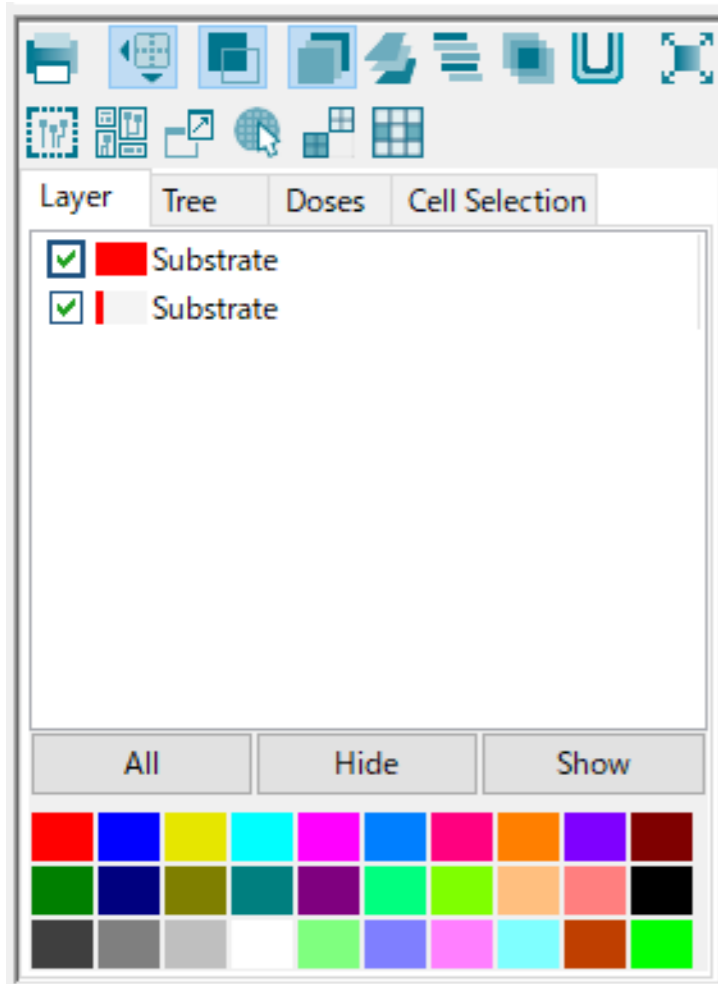
- The information is taken from the corresponding files and shown accordingly.
- No user interaction needed other than to select Multi View of the machine files of interest.



- The module integrated Viewer and the global Viewer now share the same settings.
- Via Properties / Save as Default these settings can be made available for every instance

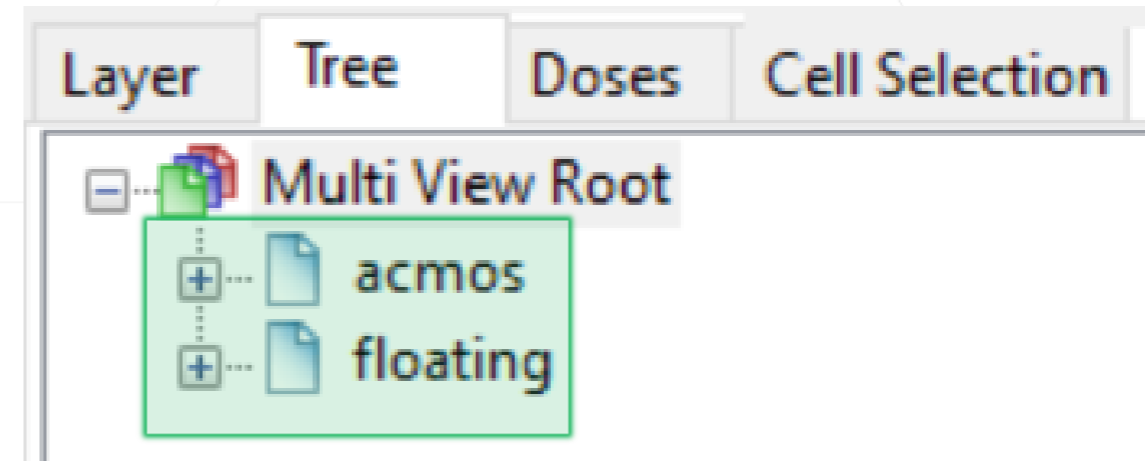
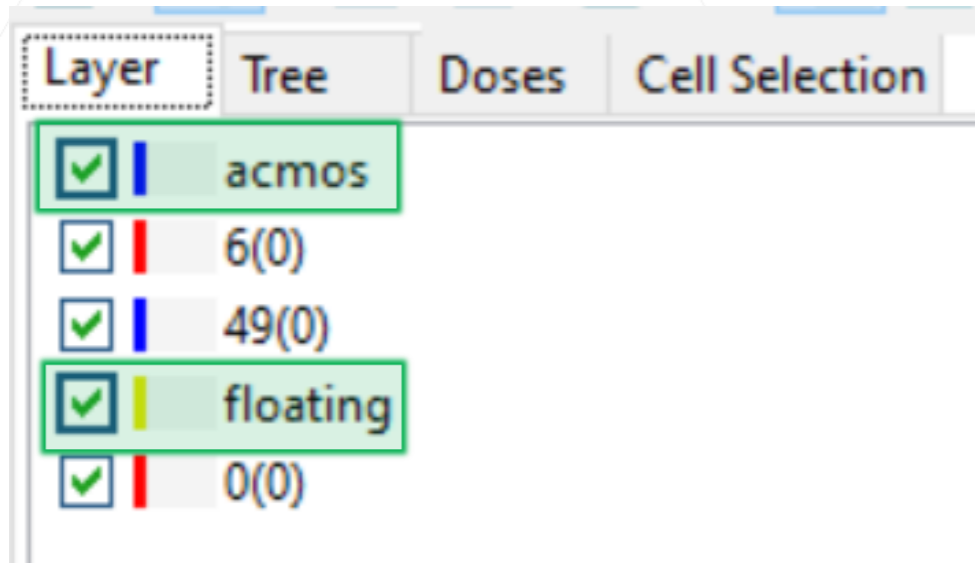


White Color is Removed in Viewer



In order to avoid looking like an empty space, “white color” has been removed from the “color by” option in global Viewer.

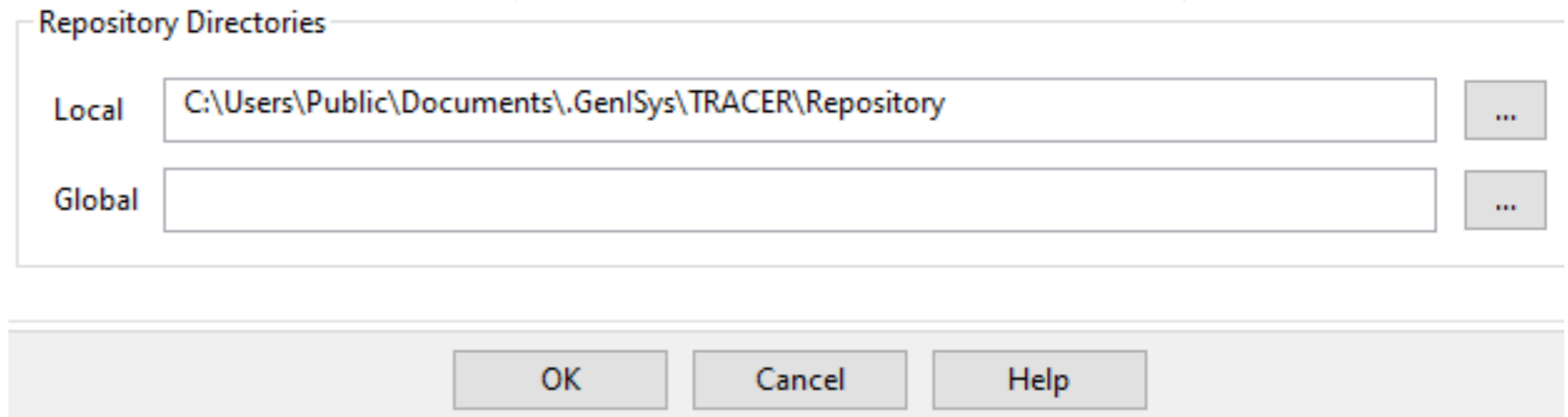
- File name is visible under tab Layer and Tree, so that multiple imported files can be intuitively differentiated.



General Enhancements

Alignment of global and local archive

- With the addition of more dedicated archives BEAMER has now undergone a redesign of the archive structure
- All archives will now be stored in a single folder that contain a fixed substructure to cover all requirements for a smooth operation.
- The new „Repository“ will store all 2D and 3D PSFs, calibrations, and cross product based also resist parameters and materials for Monte Carlo simulations. Also module configuration are stored here
- The concept is designed for local and global setups



Repository Directories

Local ...

Global ...

OK Cancel Help

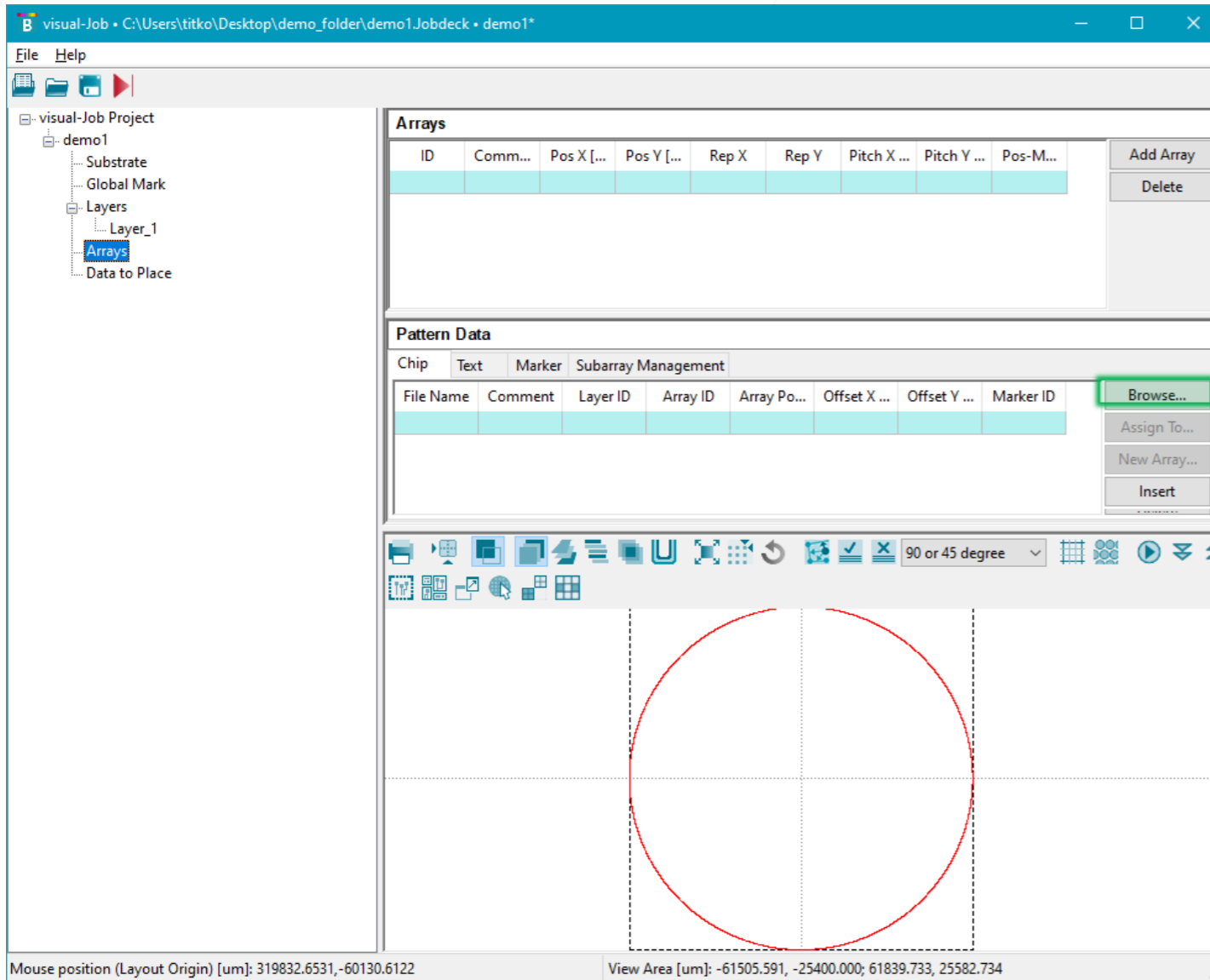
Alignment of global and local archive

At the first start of BEAMER, the existing sources will be copied (not moved) to the new folder structure.

The locations can be looked up at File / Properties / Directories and adjustments can be made from here.

ChipPlace - Text generation

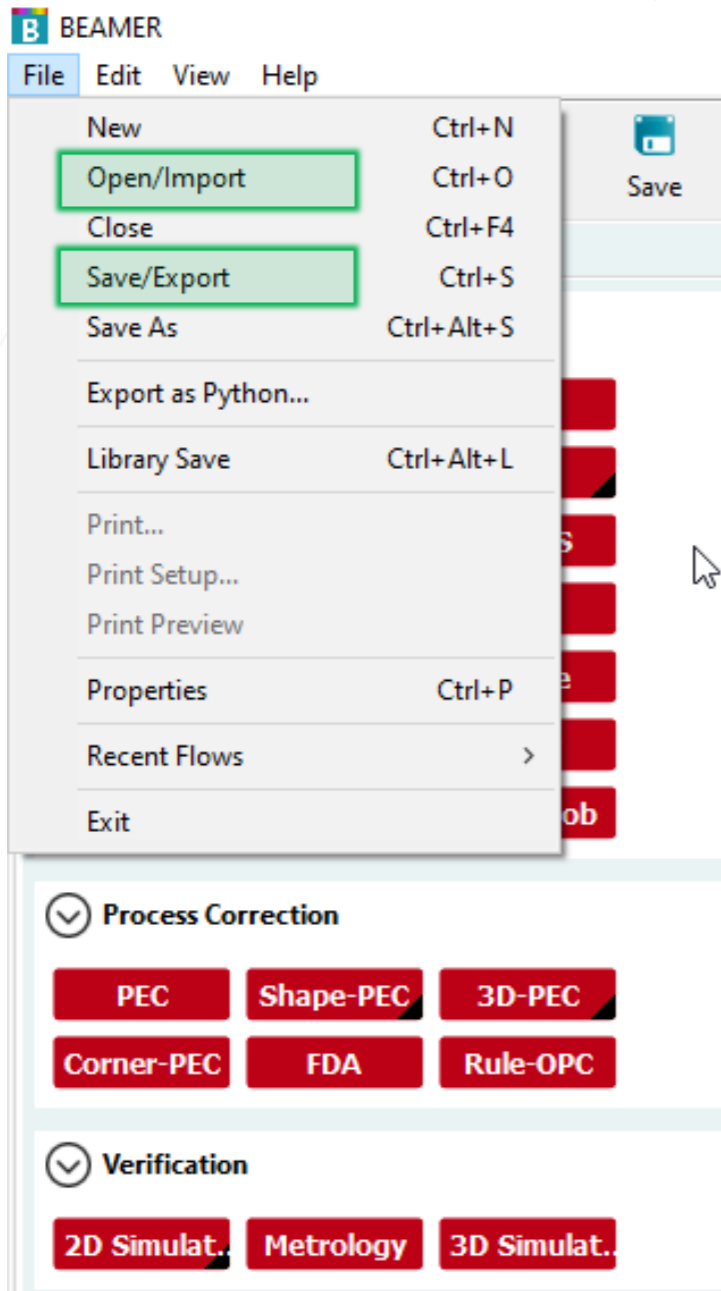
The performance for generation and illustration of text in layouts has been greatly improved



α height Δ width

This is Greek text Οἱ δὲ Φοίνικες οὗτοι οἱ
is Cyrillic text На берегу пустыни
Cyrillic text На берегу пустынных волн Стоял он дум великих полн

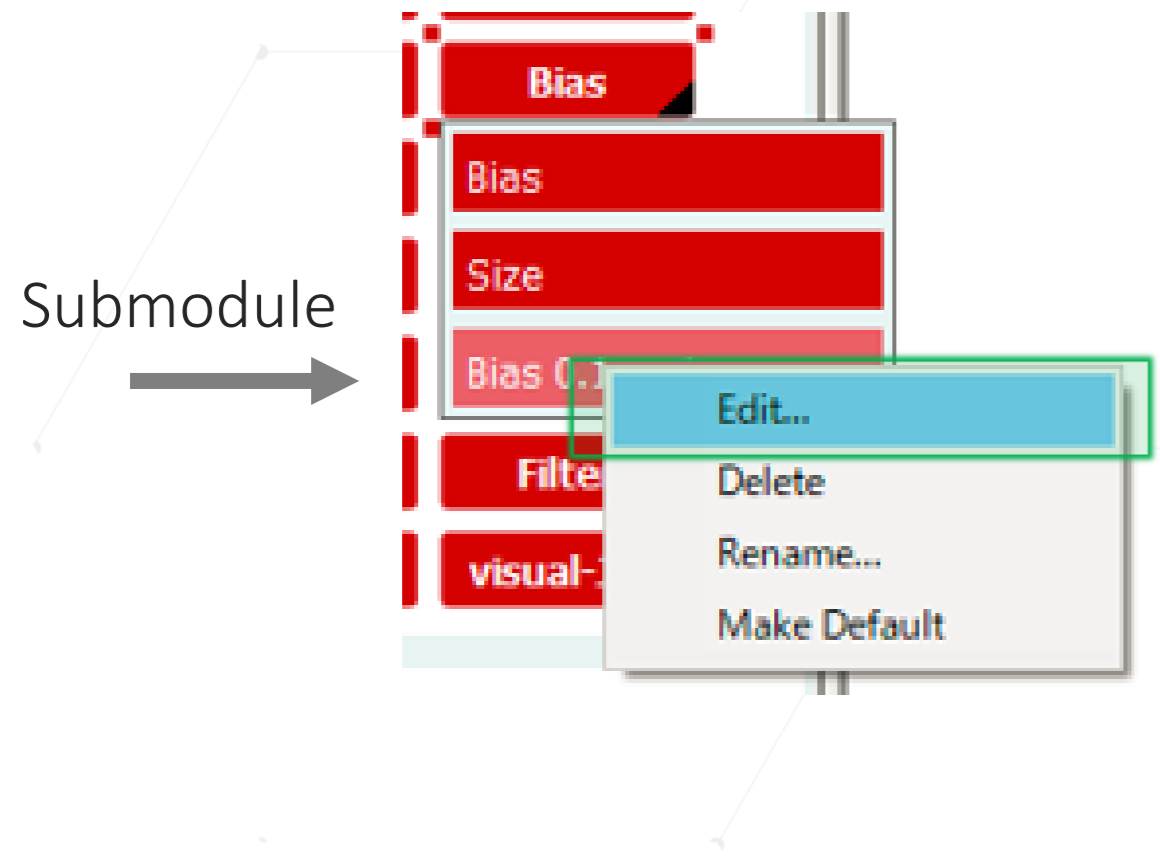
Common Open/Import and Save/Export



- In the main menu, the Open/Import and Save/Export entries have been combined.
 - User selects the file type within the dialog.
 - ftxt– Flow Text format
 - FWR – Flow with Results format

Edit capability for Submodule

The customized modules have now an additional Edit capability.



Automatic change Import/Export to file name

Optionally the automatic renaming for IMPORT and EXPORT modules can be enabled.

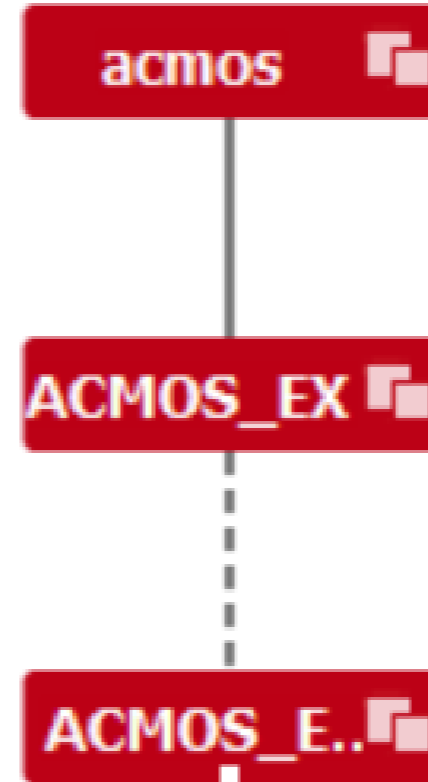
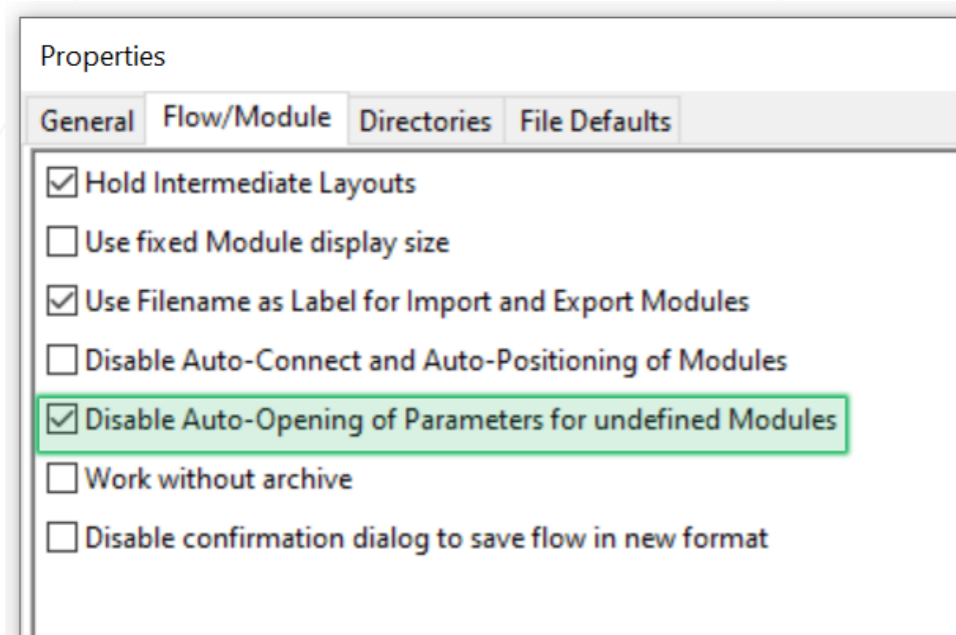
For this case the file name is placed as a label for these modules.

- Hold Intermediate Layouts
- Use fixed Module display size
- Use Filename as Label for Import and Export Modules
- Disable Auto-Connect and Auto-Positioning of Modules
- Disable Auto-Opening of Parameters for undefined Modules
- Work without archive



Modules attaching without pop-up

- Parameter dialog of attaching Import module does not pop up, when switching on Disable Auto-Opening of Parameters for undefined Modules and for single defined it is just directly attaching (IMPORT)



Parameter dialog does not open upon attaching to EXPORT

Improve usability – delete multiple rows

3D Proximity Effect Correction - 3D Laser Surface

General 3D-PEC Accuracy Advanced Label/Comment Quick Access

Mode: 3D-Surface

Surface Definition Type: RelativeThickness

Resist Contrast Parameter

Laser Contrast Curve...

Work Range Min - Max [-]: 0.000000 1.000000

In the contrast curve dialog, it is possible to delete all selected rows not only the current row

Contrast Curve

Original Thickness [um]: 2.000000

Grey Value	Resist thickness [um]
1	2
10	1.97
25	1.94
50	1.88
70	1.83
90	1.75
100	1.68
110	1.6

Import...
Export...
Insert Row
Delete Row

Thank You!

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