

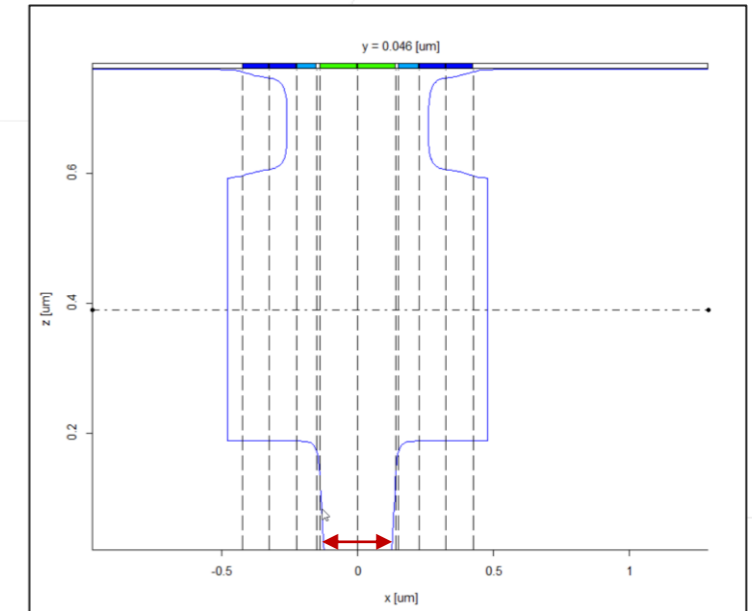
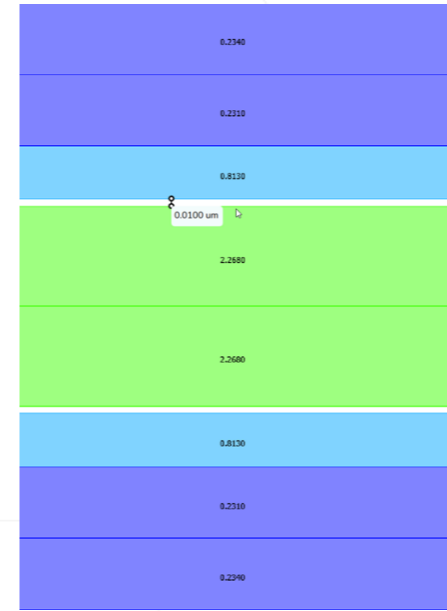
# BEAMER

Update – What's new / What's coming up

# PEC

The correction criteria has been adjusted to the bottom CD of the Tgate foot to ensure clearing of the resist (10% above the substrate interface).

**This will change the correction results in BEAMER 7.2.**



**info**

3D Settings:

3D Assignments:

Idx	Layer	Assignment	rel. Dose
0	1(0)	-----	0.4657
1	2(0)	-----	0.1306
2	0(0)	-----	1.0969
3	3(0)	-----	2.1938

Resist Process Time Factor (relative to contrast curve process of critical layer) = 1.0000

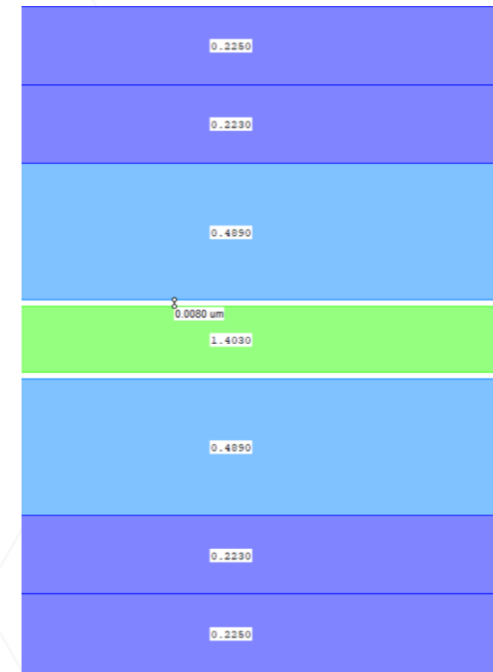
Equivalent Alpha[um]: 0.057, Equivalent Beta[um]: 2.512, Equivalent Eta : 1.145

Min. layout independent LR dose factor = 0.652

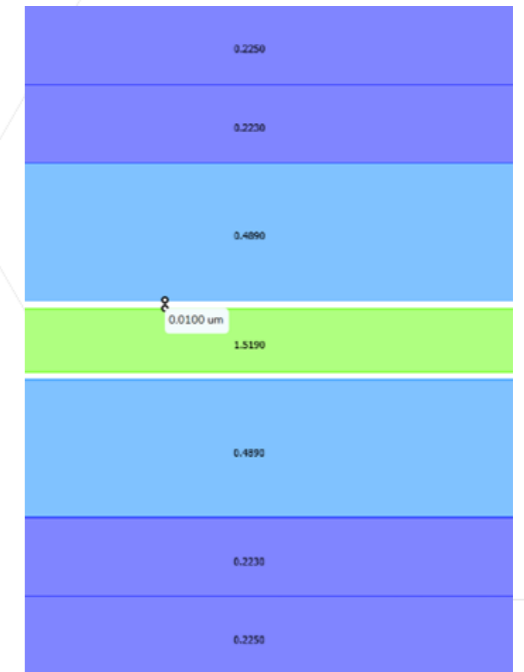
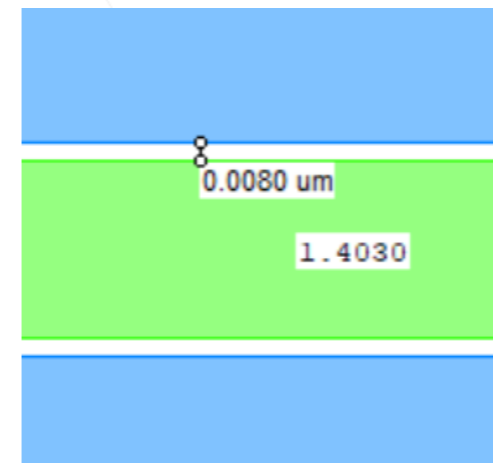
Number Doseclasses: 255

# 3D T-gate PEC: Contrast Curve data processing

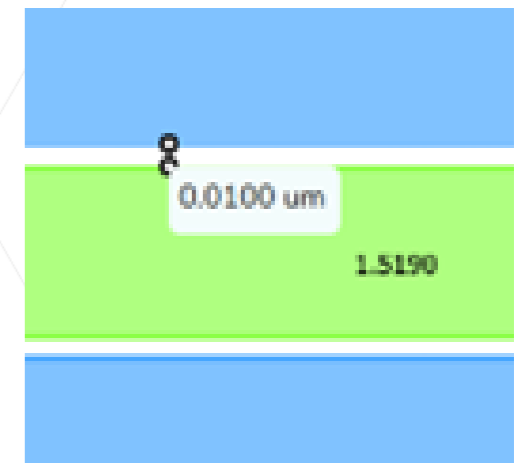
- In the previous version, the default gate-PEC dose was equal to the dose to clear of the foot Contrast Curve, so the development time had to be slightly increased.
- It is now assumed that the CC and the T-gate PEC are performed with the same process, including time. This increases the default gate-PEC dose since we need a dose that fully develops through all layers within the same process time.
- In summary, the foot layer receives a higher dose making it consistent with the simulation.



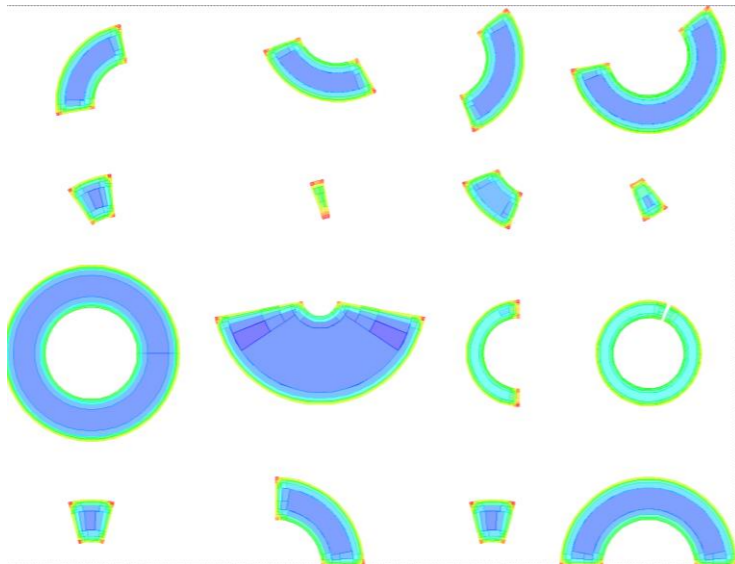
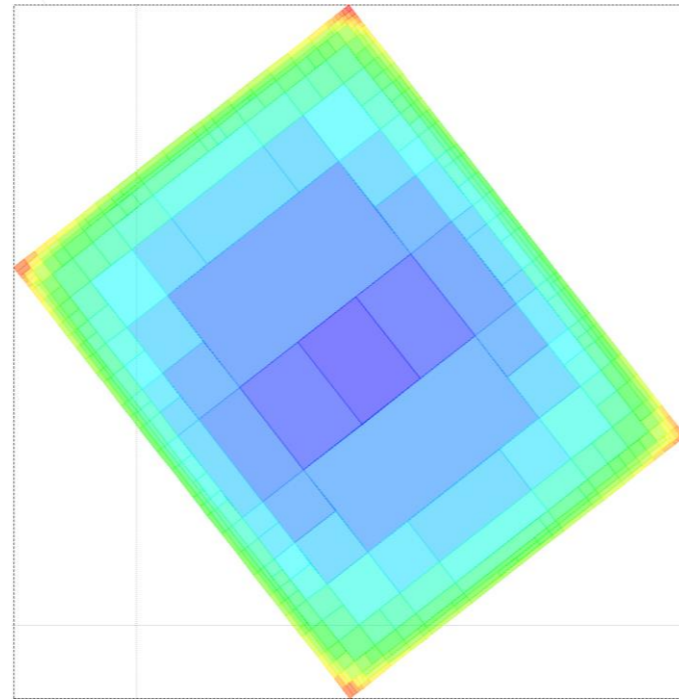
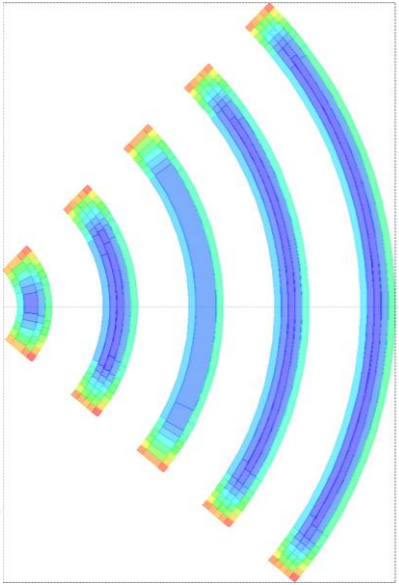
*BEAMER 7.1.0*



*BEAMER 7.2.0*



# Improved PEC fracturing

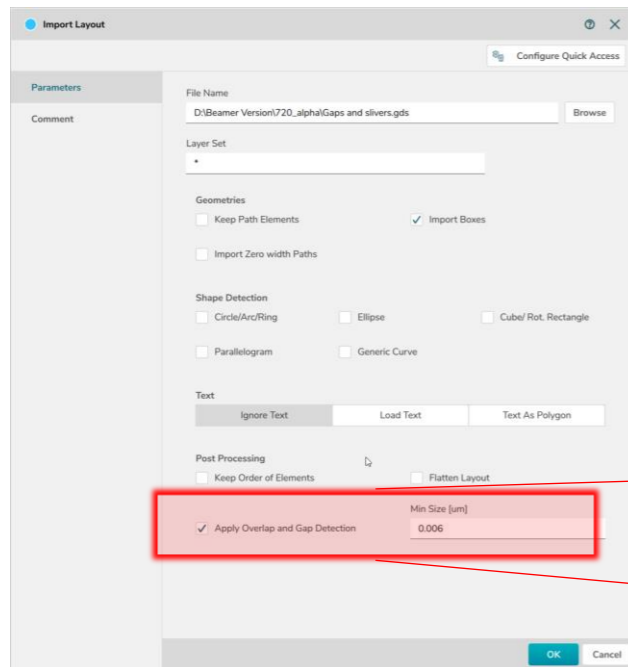
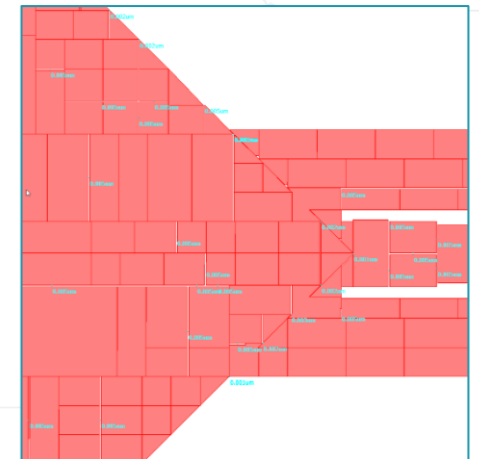
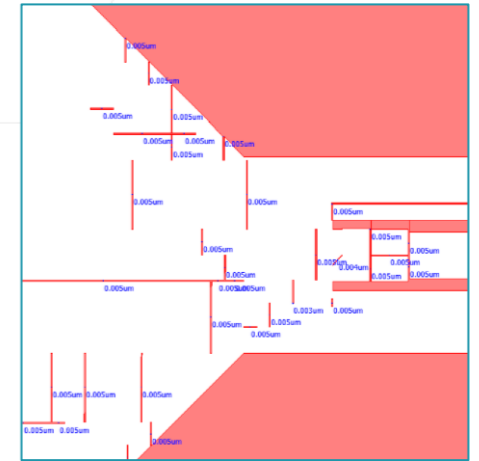


Generic element types like Circles / Arcs / Rotated Rectangles are maintained during fracturing. Dose fracturing of PEC will fracture e.g. ARC elements only into smaller ARC elements to improve the fracture quality.

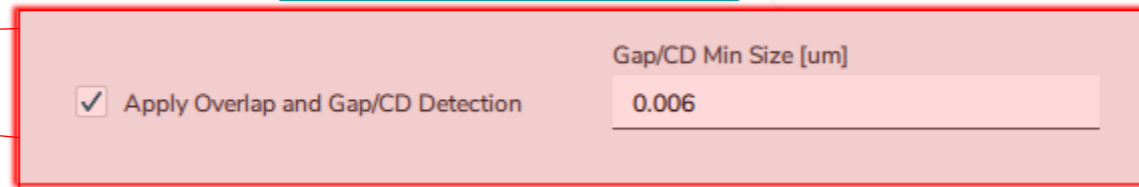
# Pattern validation

# Add functionality (view mode) to show gaps and slivers

*GDS and DXF Import new feature:  
Small elements with unintended design  
issues (gaps and slivers) can be detected  
and highlighted in viewing mode.*



Additional *Layers* are created

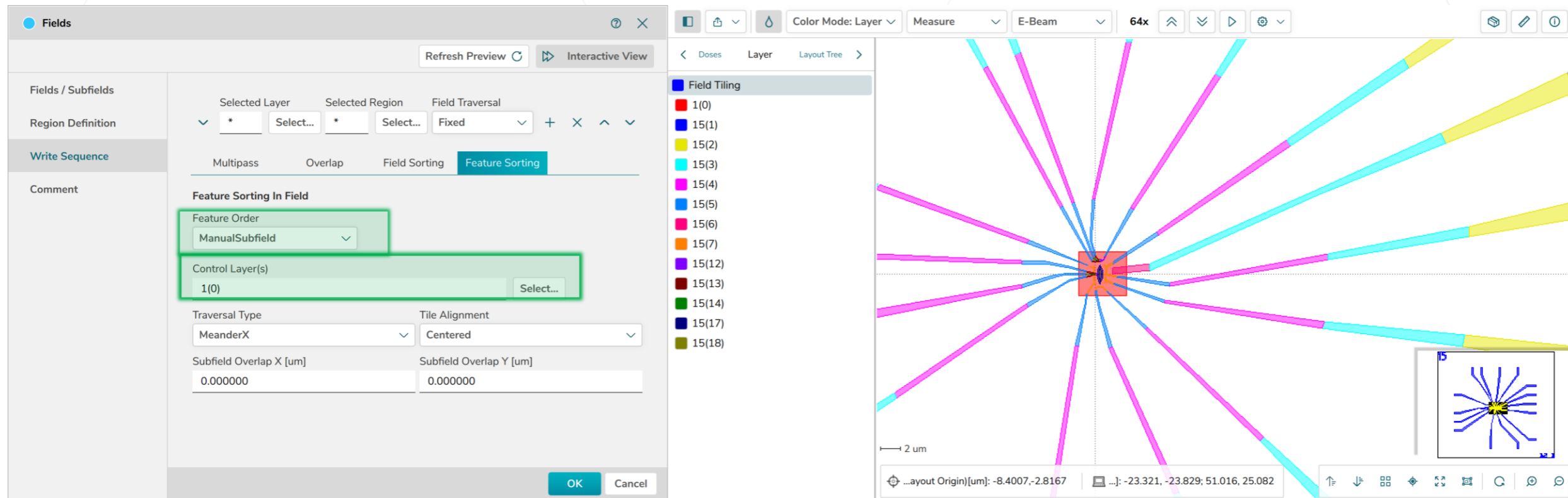


# Field control



# Fields module – ManualSubfield mode

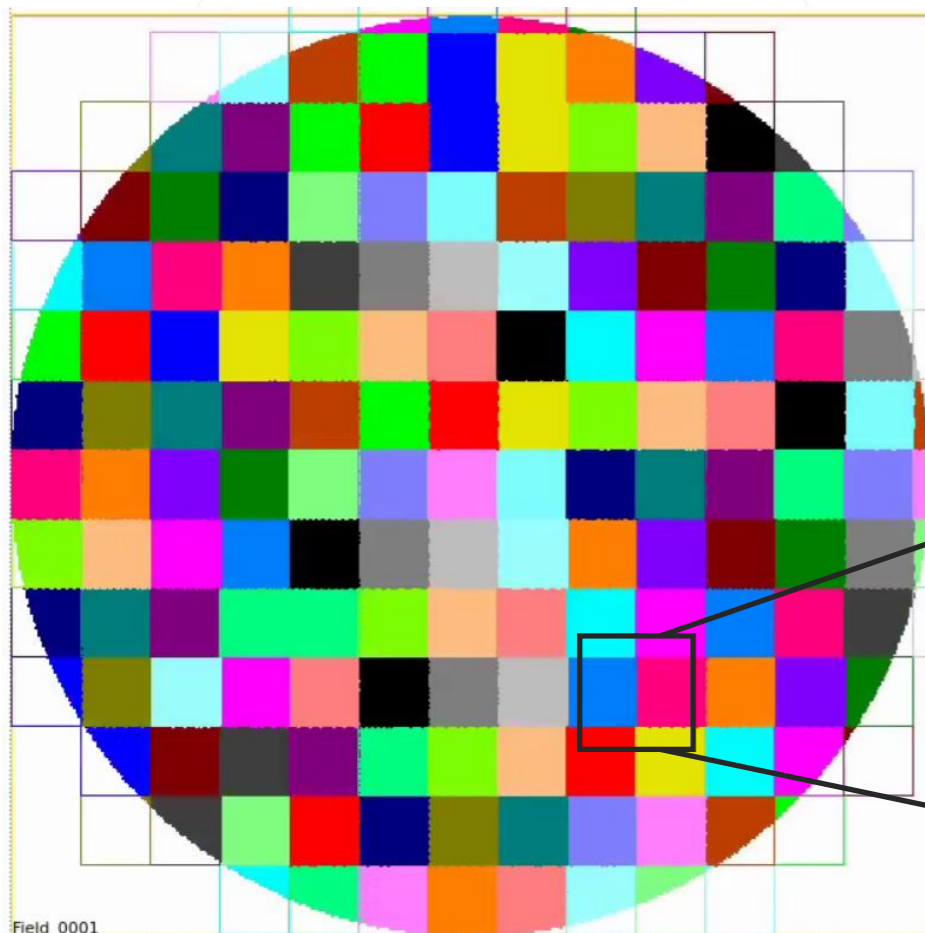
- The exposure order of critical regions within a Field are optimized using ManualSubfield
- The Control layer can be used to identify critical layout parts



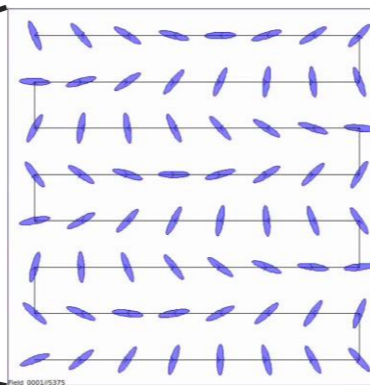
The screenshot displays the GenISys Fields module interface. On the left, the 'Fields' panel is open, showing the 'Feature Sorting' tab. The 'Feature Order' is set to 'ManualSubfield', and the 'Control Layer(s)' is set to '1(0)'. The 'Traversal Type' is 'MeanderX' and the 'Tile Alignment' is 'Centered'. The 'Subfield Overlap X [um]' and 'Subfield Overlap Y [um]' are both set to '0.000000'. The 'Interactive View' is active, showing a field layout visualization on the right. The visualization shows a central red square with multiple colored lines radiating outwards, representing different subfields. A '2 um' scale bar is visible. The 'Color Mode' is set to 'Layer', and the 'E-Beam' is set to '64x'. The 'Layout Tree' on the left shows a list of subfields: 1(0), 15(1), 15(2), 15(3), 15(4), 15(5), 15(6), 15(7), 15(12), 15(13), 15(14), 15(17), and 15(18).

# Manual Subfield ordering

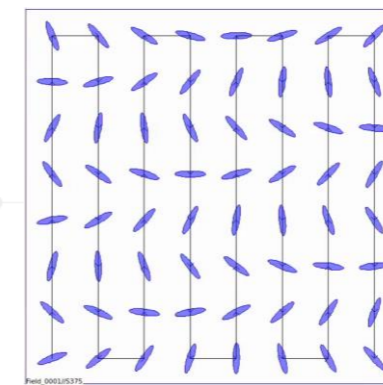
- BEAMER extends the writing field control down to the Subfield level using the Manual Subfield feature sorting, by applying a write sequence to the shapes within a subfield.



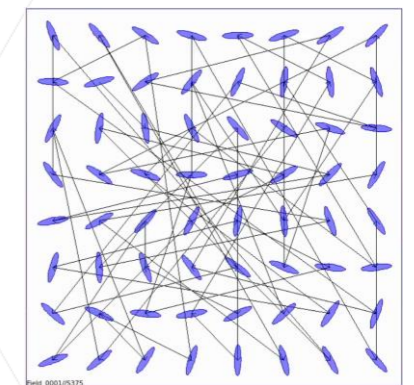
Field\_0001



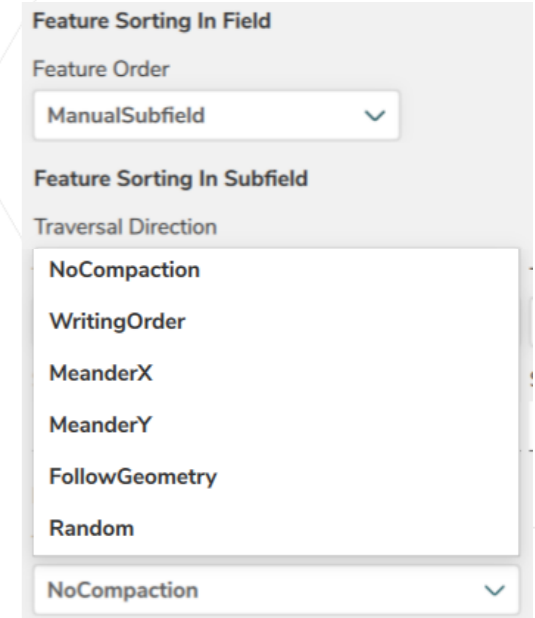
Meander X



Meander Y

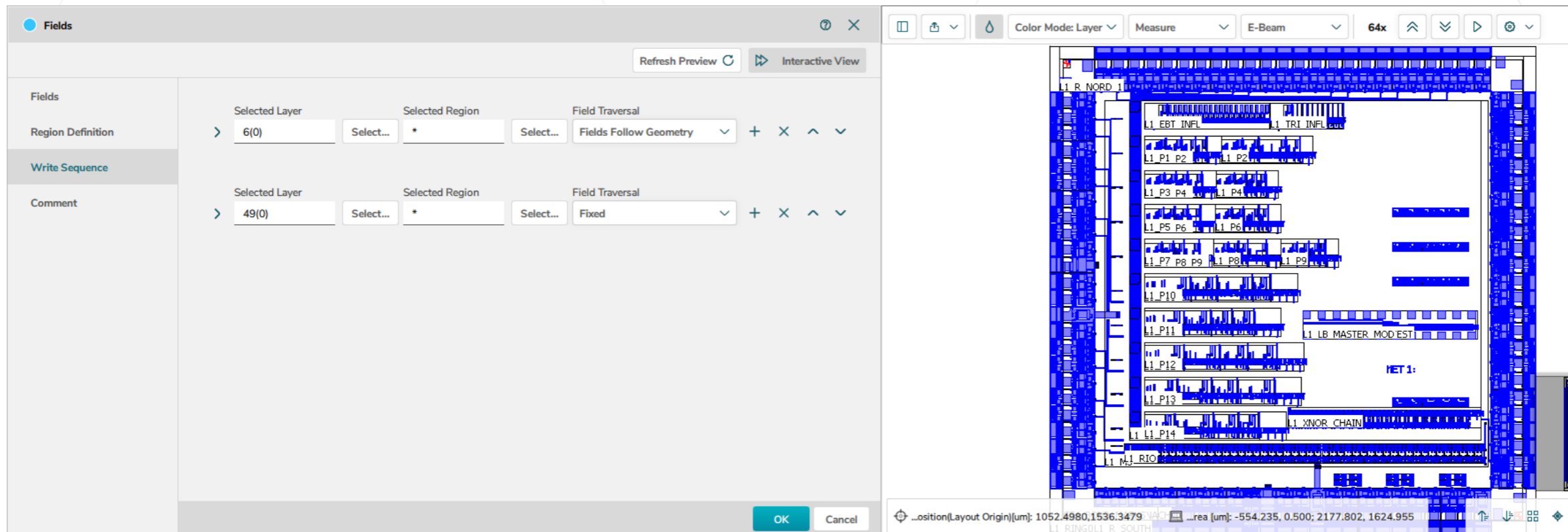


Random



New field sorting module – for advanced Region and field sorting applications

- The fields module can create field and region/ sub fields within a layout
- During the system specific export, the user makes use of this structure via cell to field / cell to SF



The screenshot displays the 'Fields' module interface. On the left, there are two sections for configuration:

- Region Definition:**
  - Selected Layer: 6(0)
  - Selected Region: \*
  - Field Traversal: Fields Follow Geometry
- Write Sequence:**
  - Selected Layer: 49(0)
  - Selected Region: \*
  - Field Traversal: Fixed

The right panel shows a preview of a layout with various field and region labels, including:

- L1 R\_NORD 1
- L1 EBT INFL
- L1 TRI INFL
- L1 P1 P2
- L1 P3 P4
- L1 P5 P6
- L1 P7 P8 P9
- L1 P10
- L1 P11
- L1 P12
- L1 P13
- L1 P14
- L1 LB\_MASTER\_MOD\_EST
- NET 1:
- L1\_XNOR\_CHAIN
- L1 M2\_RIO

The interface includes a 'Refresh Preview' button and an 'Interactive View' toggle. The bottom status bar shows coordinates: ...osition(Layout Origin)[um]: 1052.4980,1536.3479 and ...rea [um]: -554.235, 0.500; 2177.802, 1624.955.

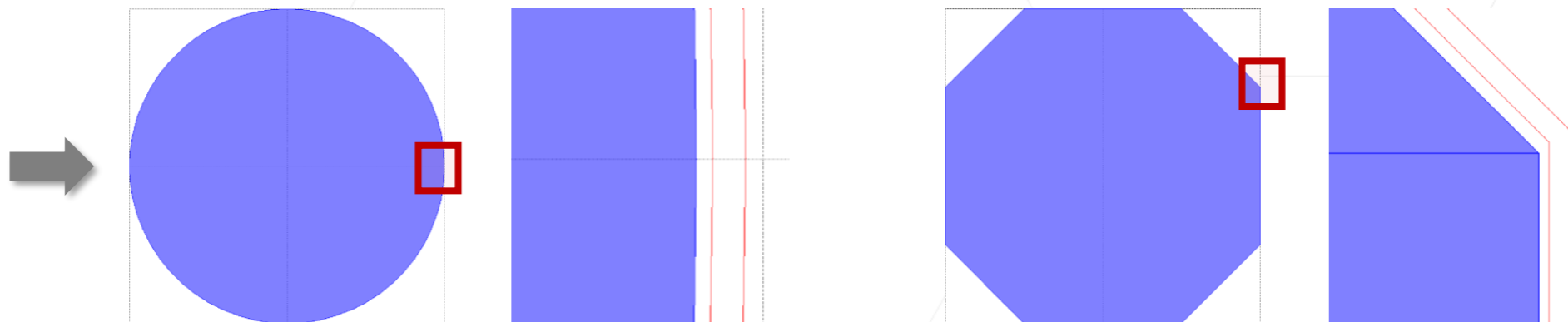
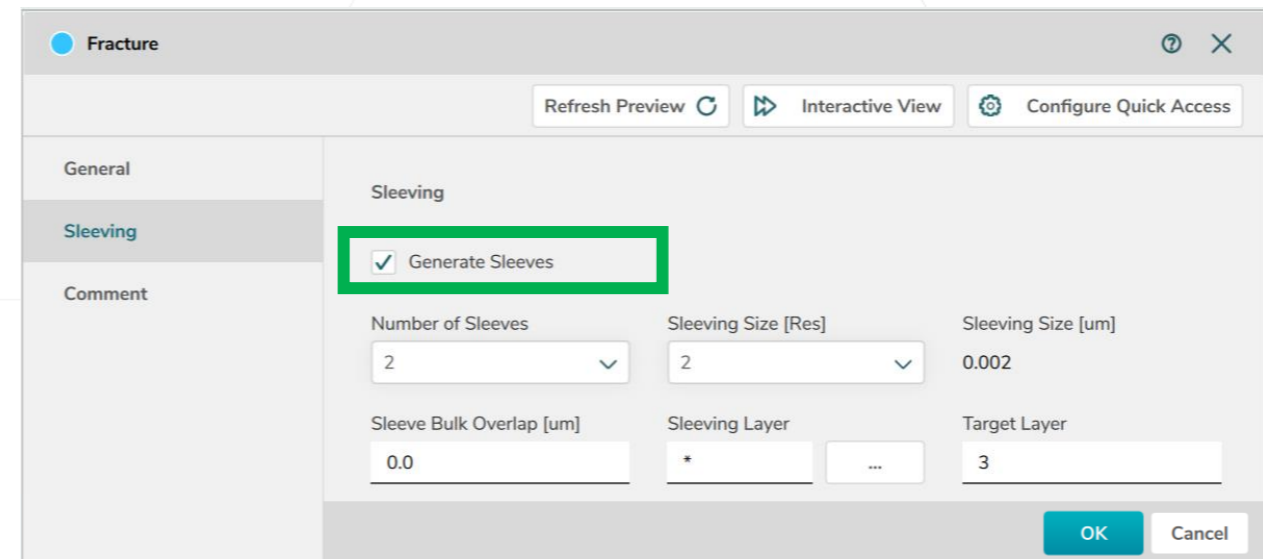
# Shape Sleeving

New Fracture Feature

The *Fracture* module includes a fast and easy way to *Generate Sleeves* on target layers using zero width path exposure characteristics increasing pattern quality without affecting throughput.

Parameters to control:

- Number of Sleeves
- Sleeving Size
- Overlap between Sleeve and Bulk
- Sleeving Layer



Sleeves generated by this method can find use in the capability of several tool exports:

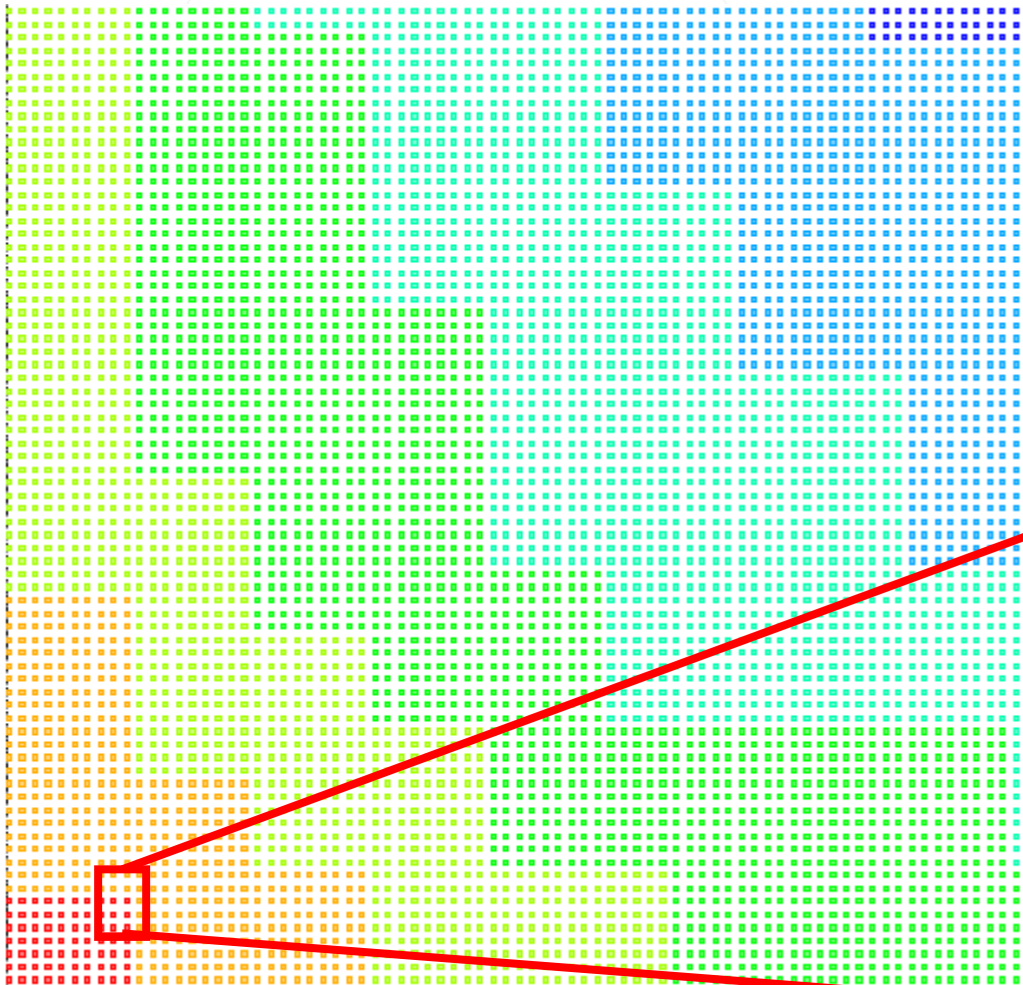
- taking benefit of the unique treatment during the exposure
- utilizing FDA to assign a compensational dose factor for example to benefit from a improved contrast at the edge of the shape
- utilizing Extract & Transform to duplicate the sleeves and create an intentional pattern smoothing (shift by half a beam step size and halving the dose)

# Layout operation



# REPLACE inherits dose from placeholder

REPLACE can now inherit the dose information of the element it is replacing and apply it to the input pattern.



Replacement Type  
Geometry Of Layers Replaced By Layout

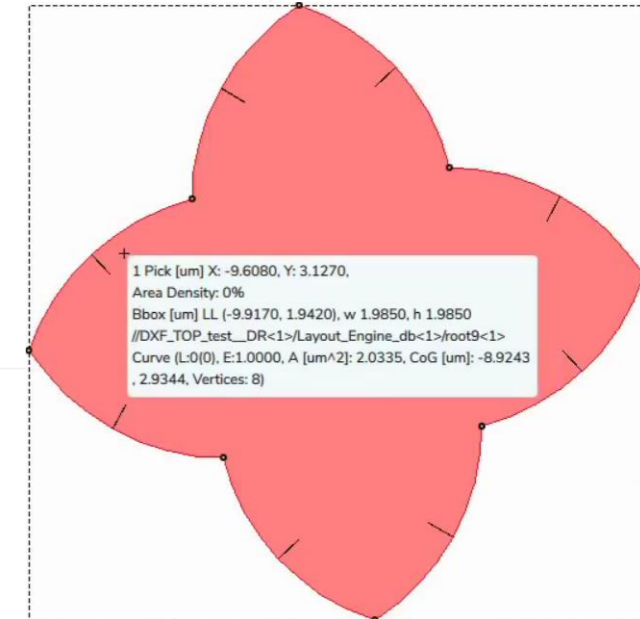
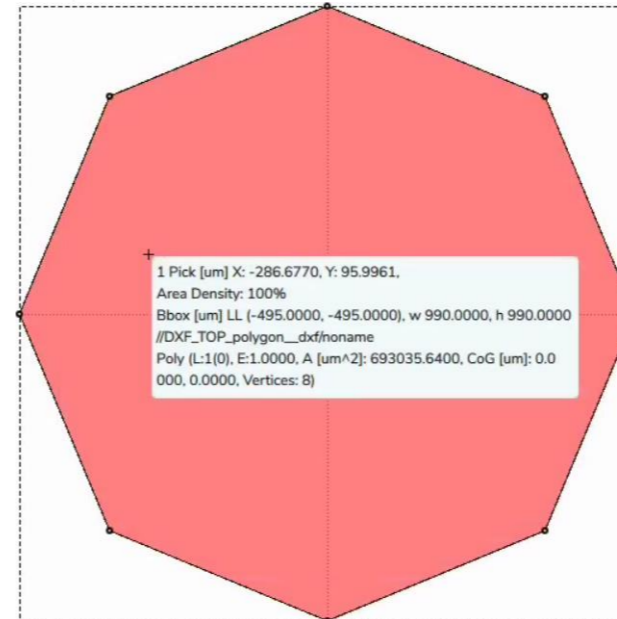
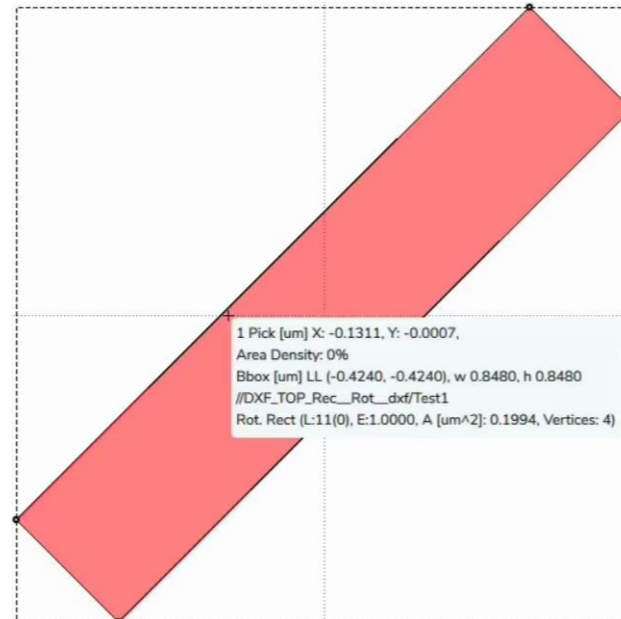
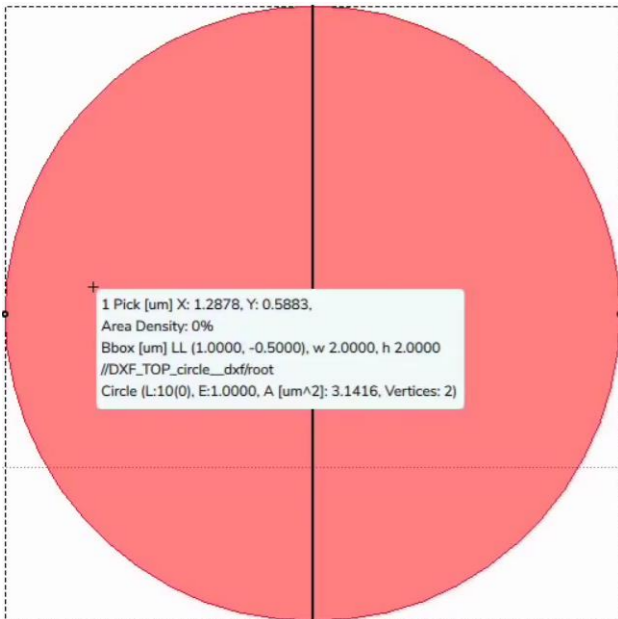
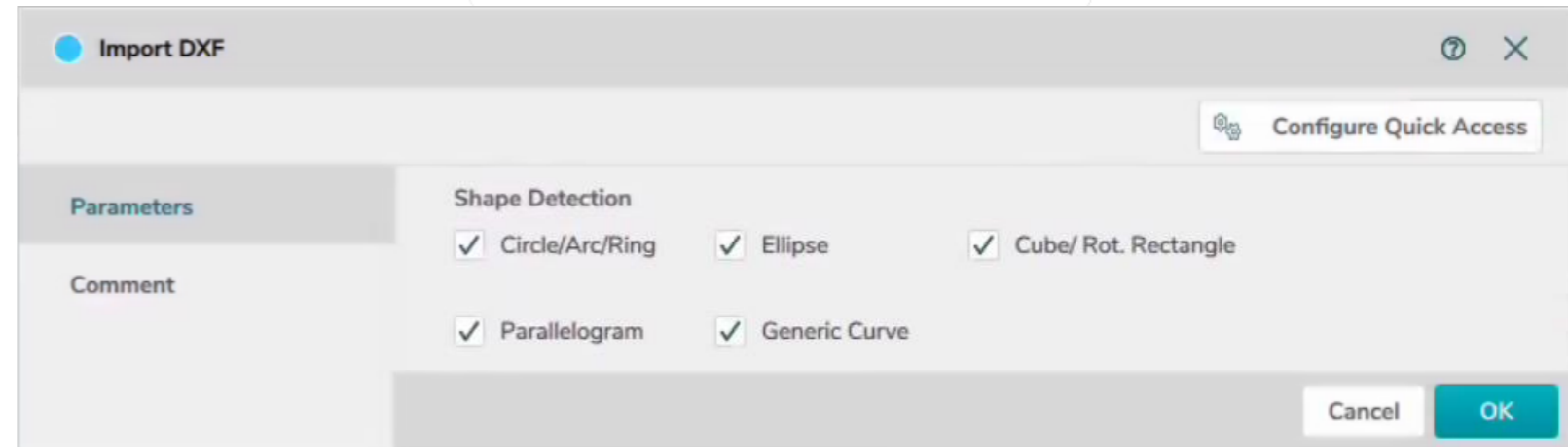
Replace Settings  
Layer(s)  
1(0) Select...

Apply Dose to Replaced Geometries



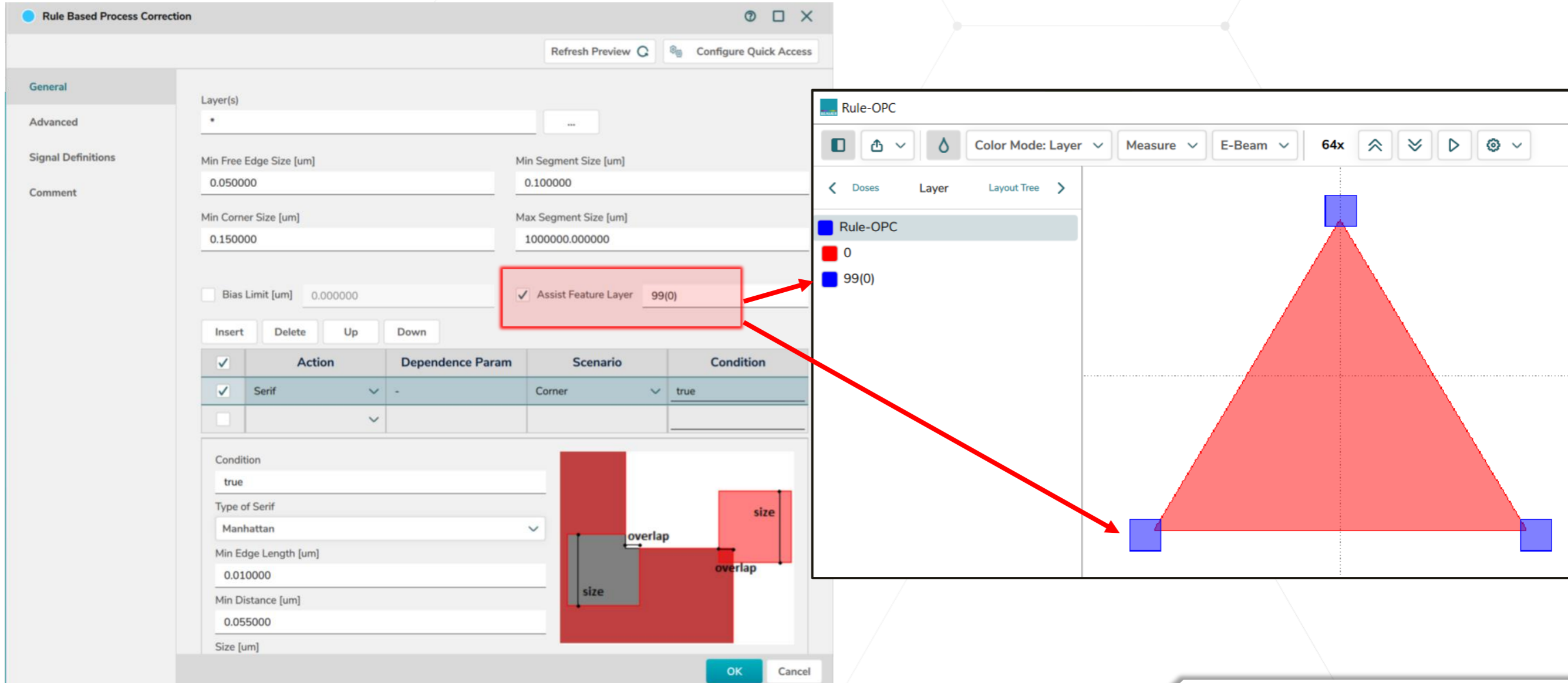
# Shape detection DXF

DXF format increases its import settings to detect special shapes:  
*Circles, Rings, Arcs, Ellipses, Rotated Rectangles, Parallelograms and Generic Curves*



# Rule-OPC

- Rule-OPC can outputs the Assist Features (serifs,...) onto a separate layer



The screenshot displays the 'Rule Based Process Correction' software interface. The 'General' tab is active, showing various configuration parameters for the 'Rule-OPC' rule. A red box highlights the 'Assist Feature Layer' setting, which is set to '99(0)'. This setting is linked to the 'Layer' panel in the 'Rule-OPC' preview window, where '99(0)' is selected as the output layer for the assist features. The preview window shows a red triangle with blue squares at its vertices, representing the assist features. A red arrow points from the 'Assist Feature Layer' setting to the '99(0)' layer in the preview window. Another red arrow points from the 'Assist Feature Layer' setting to the 'Rule-OPC' layer in the preview window.

**Rule Based Process Correction Configuration:**

- Layer(s): \*
- 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
- Assist Feature Layer:  99(0)

Action	Dependence Param	Scenario	Condition
<input checked="" type="checkbox"/> Serif	-	Corner	true

**Rule-OPC Preview:**

- Color Mode: Layer
- Measure
- E-Beam
- 64x
- Layer: Rule-OPC, 0, 99(0)

# RuleOPC – Import/Export

Rule Based Process Correction

Configure Quick Access

**General**

Layer(s): \*

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

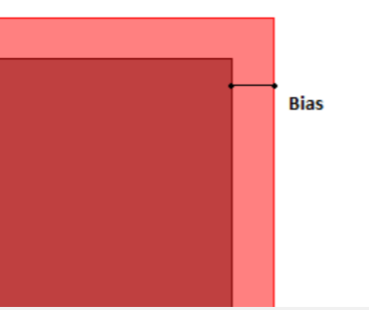
Insert Delete Up Down

<input checked="" type="checkbox"/>	Action	Dependence Param	Scenario	Condition
<input checked="" type="checkbox"/>	Bias	CD	AnySegment	true
<input checked="" type="checkbox"/>		-	-	

Condition

CD [um]	Bias [um]
0.000000	0.000000

Import Export Insert Delete



Segment Assignment Preview OK Cancel

For easier rule setup an import/export option has been added for the CD dependend bias correction

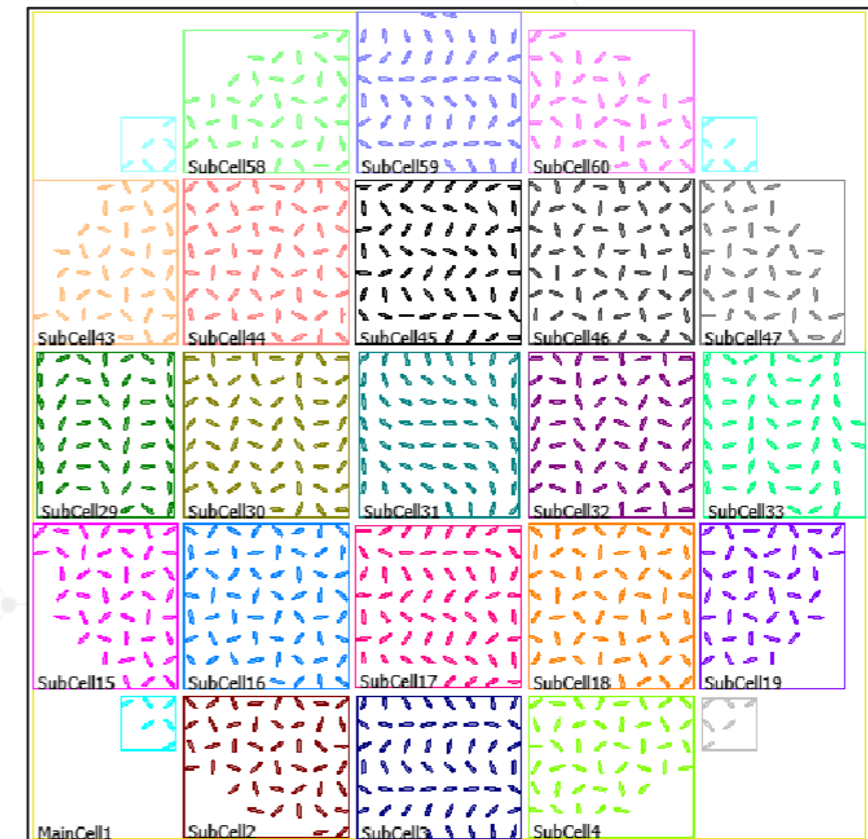
# LayoutPy examples

- LayoutPy includes a simple example to create Metalenses for a desired wavelength and focal length and with optimised Field and Subfield ordering

```

Python Dialog
Python Script
1  ##Equation and lens design from: Science 352,1190-1194(2016). DOI:10.1126/science.aaf6644
2
3  from LAYOUTpy import *
4  import numpy as np
5
6  # Units in [nm]
7  #---- Lens parameters ----
8  radius      = 120000
9  wavelength  = 660
10 focus      = 90000
11
12 #---- Element parameters ----
13 size_x = 205 #radius in x
14 size_y = 42.5 #radius in y
15
16 #---- Tool parameters ----
17 subfieldSize = 4525 #Set to 0 if a default of 2 shapes in X and Y is desired
18 Mainfield    = 60000 #60[um]
19
20
Comment
Preview Interactive View
LayoutPy
Math
Examples
External Libraries
Execute files
Y Splitter
A hex array
Spiral Array
Vector Array
Circle
Cross
LShape
Rectangle LLUR
Rectangle Center WH
Linear Taper
SBend
Path
EllipticArc
Generate Metalens
Runtime Error
Snippets
History
OK Cancel

```



# Usability



# **BEAMER 7.3**

- Protected flow – read only
- Extend field placement options in fields module
- Extend python module with UI
- Extend QA options

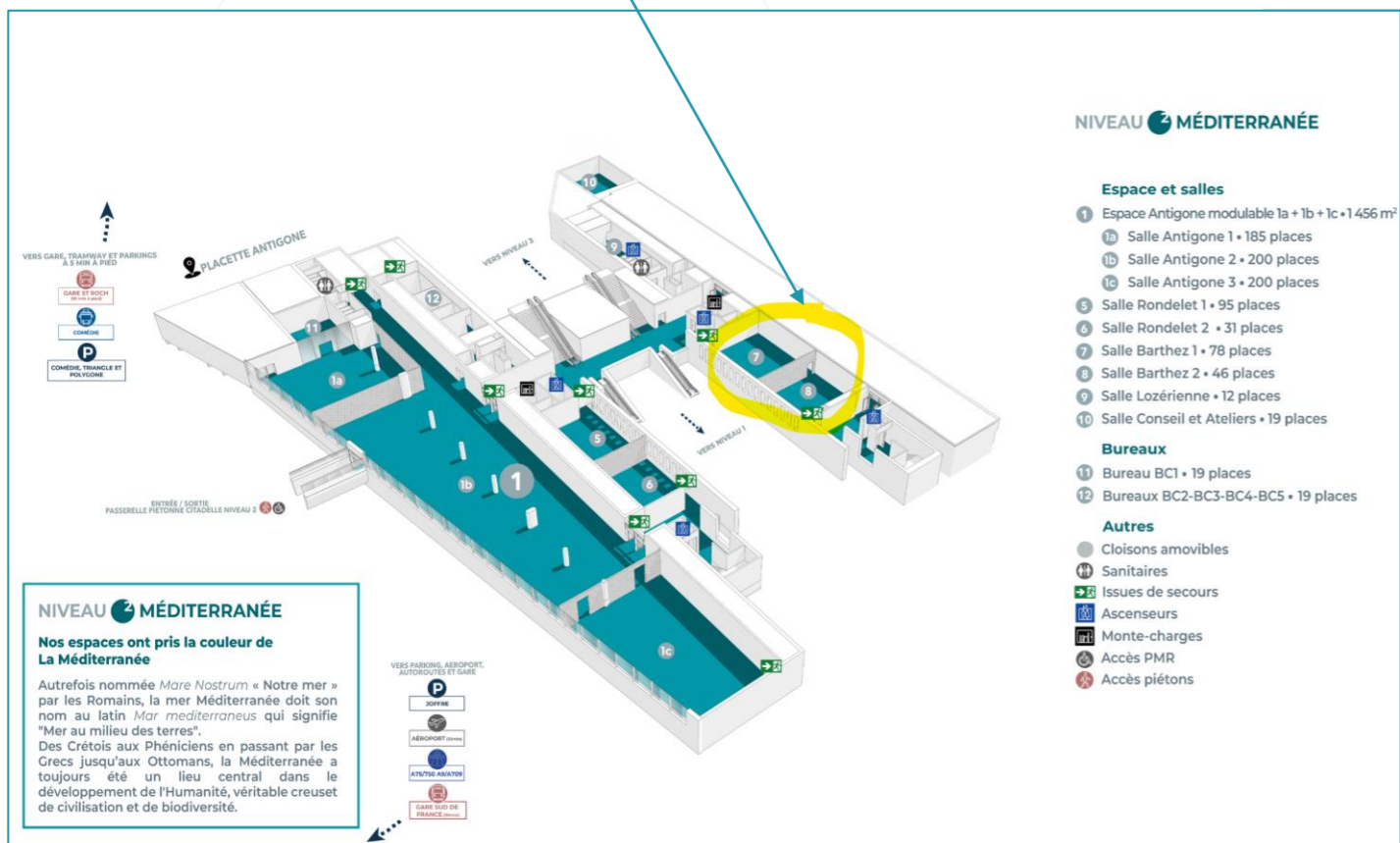


BEAMER 7.3 release Jan 2025

The image shows two overlapping screenshots of the GenISys website. The background screenshot displays the 'Applications' page, which features a grid of application categories such as 'Advanced exposure technique', 'Fracture Optimization', 'Flexibility', and 'SIUSS-MicroOptics Source Mask Optimisation'. The foreground screenshot shows a 'Webinar Series: Proximity Effect in E-Beam Lithography' page. This page includes a 'Webinar Series Summary' section with a list of seven parts: Part 1 – Electron Scattering and Proximity Effect, Part 2 – Dose PEC Algorithm and Parameter, Part 3 – Optimization of Dose PEC Parameter, Part 4 – Process Effect, Calibration and Correction, Part 5 – Shape PEC – “ODUS” Contrast Enhancement, Part 6 – 3D Surface PEC for grayscale lithography, and Part 7 – 3D T-Gate and Edge PEC for multilayer resist.

## BARTHEZ 2

## BAR A TARTINES 1



**NIVEAU MÉDITERRANÉE**

**Espace et salles**

- 1 Espace Antigone modulable 1a + 1b + 1c • 1 456 m<sup>2</sup>
- 1a Salle Antigone 1 • 185 places
- 1b Salle Antigone 2 • 200 places
- 1c Salle Antigone 3 • 200 places
- 5 Salle Rondelet 1 • 95 places
- 6 Salle Rondelet 2 • 31 places
- 7 Salle Barthez 1 • 78 places
- 8 Salle Barthez 2 • 46 places
- 9 Salle Lozérienne • 12 places
- 10 Salle Conseil et Ateliers • 19 places

**Bureaux**

- 11 Bureau BC1 • 19 places
- 12 Bureaux BC2-BC3-BC4-BC5 • 19 places

**Autres**

- Cloisons amovibles
- 🚻 Sanitaires
- ➡ Issues de secours
- 🚗 Ascenseurs
- 📦 Monte-charges
- ♿ Accès PMR
- 🚶 Accès piétons

**NIVEAU MÉDITERRANÉE**

Nos espaces ont pris la couleur de La Méditerranée

Autrefois nommée *Mare Nostrum* « Notre mer » par les Romains, la mer Méditerranée doit son nom au latin *Mar mediterraneus* qui signifie "Mer au milieu des terres".

Des Crétois aux Phéniciens en passant par les Grecs jusqu'aux Ottomans, la Méditerranée a toujours été un lieu central dans le développement de l'Humanité, véritable creuset de civilisation et de biodiversité.

VERS GARE, TRAMWAY ET PARKINGS À 5 MIN À PIED

PLACETTE ANTI-GONE

VERS NIVEAU 3

VERS NIVEAU 1

ENTRÉE / SORTIE PASSERELLE PIÉTONNE CITADELLE NIVEAU 1

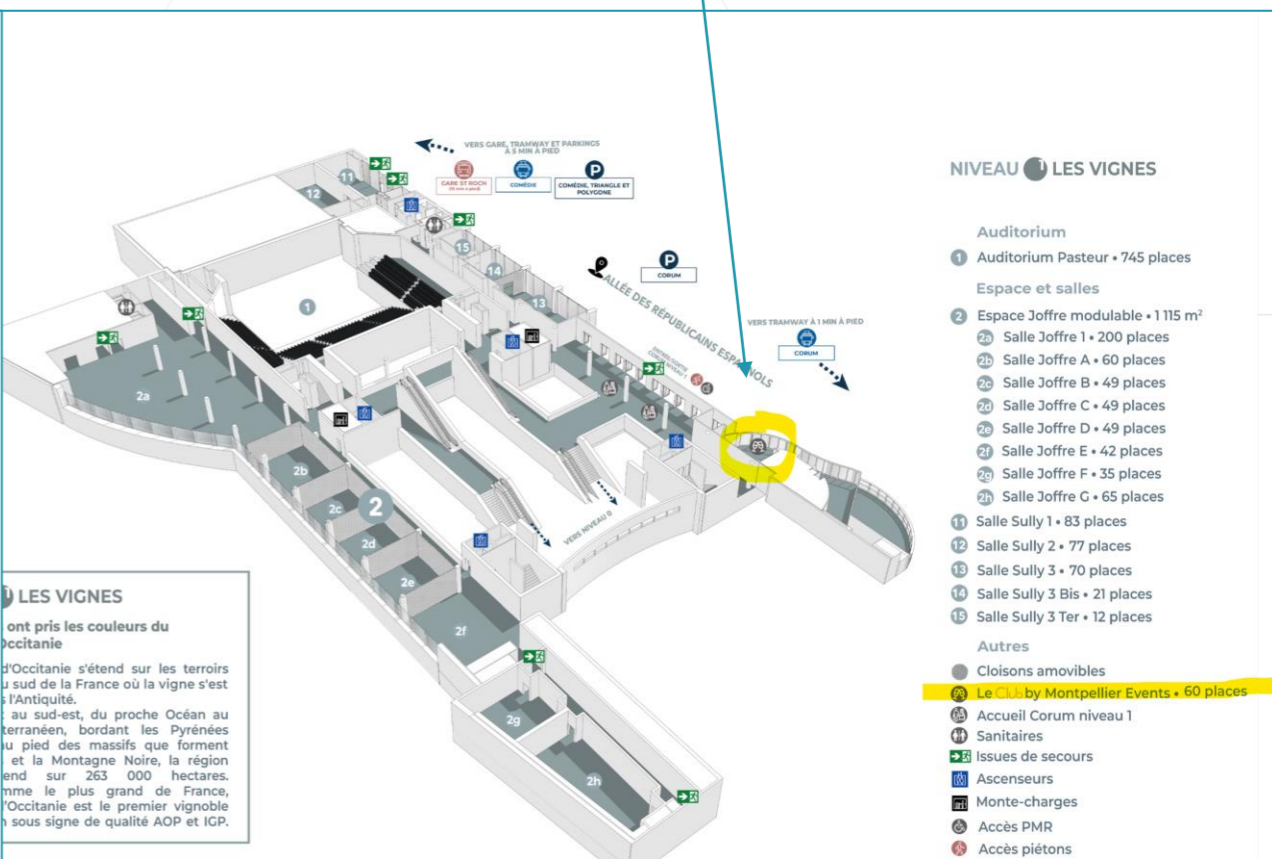
VERS PARKING, AÉROPORT, AUTOROUTES ET GARE

JOFFRE

AÉROPORT

ANT/TRA/ASBATON

GARE SUD DE FRANÇAIS



**NIVEAU LES VIGNES**

**Auditorium**

- 1 Auditorium Pasteur • 745 places

**Espace et salles**

- 2 Espace Joffre modulable • 1 115 m<sup>2</sup>
- 2a Salle Joffre 1 • 200 places
- 2b Salle Joffre A • 60 places
- 2c Salle Joffre B • 49 places
- 2d Salle Joffre C • 49 places
- 2e Salle Joffre D • 49 places
- 2f Salle Joffre E • 42 places
- 2g Salle Joffre F • 35 places
- 2h Salle Joffre G • 65 places
- 13 Salle Sully 1 • 83 places
- 12 Salle Sully 2 • 77 places
- 13 Salle Sully 3 • 70 places
- 14 Salle Sully 3 Bis • 21 places
- 15 Salle Sully 3 Ter • 12 places

**Autres**

- Cloisons amovibles
- 🚻 Accueil Corum niveau 1
- 🚻 Sanitaires
- ➡ Issues de secours
- 🚗 Ascenseurs
- 📦 Monte-charges
- ♿ Accès PMR
- 🚶 Accès piétons

**Le Club by Montpellier Events • 60 places**

**LES VIGNES**

ont pris les couleurs du Occitanie

D'Occitanie s'étend sur les terroirs du sud de la France où la vigne s'est développée dès l'Antiquité.

Au sud-est, du proche Océan au Massif Central, bordant les Pyrénées au pied des massifs que forment le Mont Ventoux et la Montagne Noire, la région occitane s'étend sur 263 000 hectares, soit le plus grand de France.

Occitanie est le premier vignoble de France sous signe de qualité AOP et IGP.

VERS GARE, TRAMWAY ET PARKINGS À 5 MIN À PIED

GARE DE POUY

COMÈDE

COMÈDE TRIANGLE ET POLY-GONE

VERS NIVEAU 1

VERS NIVEAU 2

VERS NIVEAU 3

VERS TRAMWAY À 1 MIN À PIED

ALLEE DES RÉPUBLICAINS ESPAGNOLS

VERS GARE, TRAMWAY ET PARKINGS À 5 MIN À PIED

COMÈDE TRIANGLE ET POLY-GONE

COMÈDE

VERS NIVEAU 1

VERS NIVEAU 2

VERS NIVEAU 3

# Thank You!

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