

#### **Flexible Region Configuration**

#### Abstract



In optical modeling, a finite region is often used as the area for further operation. VirtualLab Fusion supports the region concept, e.g. for optimization region, evaluation region, grating region which perform different functionalities. VirtualLab Fusion supports to generate regions in different manners with great ease. The generated regions can be imported in specific applications with great ease. Different types of regions are available, e.g. analytic or sampled regions.

#### Task

 how to generate regions in different manners, and how to use them as signal regions in specific applications.

Create New 2	D Region			×	ľ
Region Typ	e Simple Polygon	Region ~	Spectral Domain	Region Name Polygon Region	Γ
Polygon Va A B C D	x-Coordinate -2.5 mm 2.5 mm 1.5 mm -1.5 mm	y-Coordinate -1.4434 mm -1.4434 mm 2.8868 mm 3.5 mm	E Append New	OK Cancel Help	



## **Region Generation**



- In the *Functions* ribbon, we click on the *Region* icon.
- In what follows, we take 2D regions as examples.

Create New 2D	Region			
Region Type	Rectangular Region	~	Spectral Domain	Region Name Rec
Definition of Center X Width	Unrotated Rectangle 0 m 10 mm Kee Rotation Angle	Center Y [ Height [ p Aspect Ration 0	0 m 5 mm Validity: •	[mm] Å
				ОК Саг

## **Region Generation**



# **Types of Regions**

- Rectangular
- Elliptic
- Simple Polygon "Simple" means that they consist of straight, non-interssecting lines.
- Sampled

This option allows the usage of any picture as reference. The resolution is detemined by that.

Composed

Any number of regions can be compiled via the mathematical operators "Intersection (AND)", "Union (OR)", "Antivalence (XOR)" and "Difference". This option also allows to use nested regions.

# **Example: Rectangular**

- Rectangular region
  - Define center position, width and height, and rotation angle.

Create New 2D Region Region Name Ro Spectral Domain Region Type Rectangular Region  $\sim$ Definition of Unrotated Rectangle Center X 0 m Center Y 0 m 10 mm 5 mm Width Height 2 ۲ [mm] Keep Aspect Ratio 0 Validity: 🕑 30° Rotation Angle 1: 2D Region 'Rot. Rect. Region' 2D Region 4 CV. E -2 0 2 4 X [mm]

Rectangular region is defined analytically by its parameters, and thus can be zoomed arbitrarily.

# **Example: Simple Polygonal**

- Polygon region
  - Type in positions of polygon vertices in successive sequence.

Create New 2D Region X				
Region Type Simple Polygon Region V		Spectral Domain	Region Name Polygon Region	
Polygor Name A B C D	Vertices x-Coordinate -2.5 mm 2.5 mm 1.5 mm -1.5 mm	y-Coordinate -1.4434 mm -1.4434 mm 2.8868 mm 3.5 mm	E Append New	m - D C m - C - A B -2 0 2 X [mm]
				OK Cancel Help



Polygon region is also defined analytically by its parameters.

# **Example: Elliptical**

- Elliptic region
  - Define center position, half axes, and rotation angle.



Elliptic region is defined analytically by its parameters.

# **Example: Sampled**

- Sampled region
  - It is defined by sampled data, which can be loaded from existing file, imported from text or bitmap, or selected from active Numerical DataArray in VirtualLab window.
  - We load the attached Numerical DataArray.

Pixelated effect from discrete sampling points is obvious.



# **Example: Composed**

- Composed region
  - Create two subregions, both in circular shape.
  - One with smaller radius and the other larger.
  - Choose XOR under Composition Mode.
  - A ring shape is then obtianed.



# **Example: Composed – Differently Linked**

The different mathematical linkages are demonstrated using a sampled region (LightTrans logo) and an elliptic region:



### **Used as Optimization Region**

Iterative Fourier transform algorithm (IFTA) optimization



One can select any active region documents as *Optimization Region* for the design.



### **Used as Evaluation Region**

#### • Diffractive optics merit functions detector

	Detector Window and Resolution Detector Function				
	Vectorial Component Ex Component				
Geometry / Channels	Selected Merit Functions				
Position / Orientation	<ul> <li>Window Efficiency</li> <li>Conversion Efficiency</li> <li>Signal-to-Noise Ratio</li> <li>Uniformity Error</li> <li>Relative Zeroth Order Intensity</li> <li>Zeroth Order Efficiency</li> <li>Maximum Relative Intensity of Stray Light</li> <li>Optimal Scale Factor</li> </ul>				
Parameters	Outout Field Requirements				
	Desired Output Field Set				
	Evaluation Region Mode Arbitrary Evaluation Region				
	Evaluation Region Set				
	Allow Scale Freedom				
	Signal Type Select from Documents				
	Efficiency Related to Incident Field of Optical System				
	Assume Geometric Field Zone for Detector Evaluation				

One can select any active region documents as *Evaluation Region* for the detector.



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## **Used as Grating Region**

Grating region configuration in waveguide toolbox

Edit Grating Region	×	
Shape Region Channels Grating		
<ul> <li>Spectral Domain</li> <li>Load</li> <li>Select from Documents</li> </ul>	Region Name Square Region Region Type Rectangular Region	
Center X 0 m Center Y 0 m Width 1 mm Height 1 mm Keep Aspect Ratio Validity: Rotation Angle 0°	K [mm]	One can select any active region documents as <i>Evaluation Region</i> for the region shape definition. Select a 2D Region Shape definition.
Validity: 🕑	OK Cancel Help	

Ok

Cancel

#### **Document Information**

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