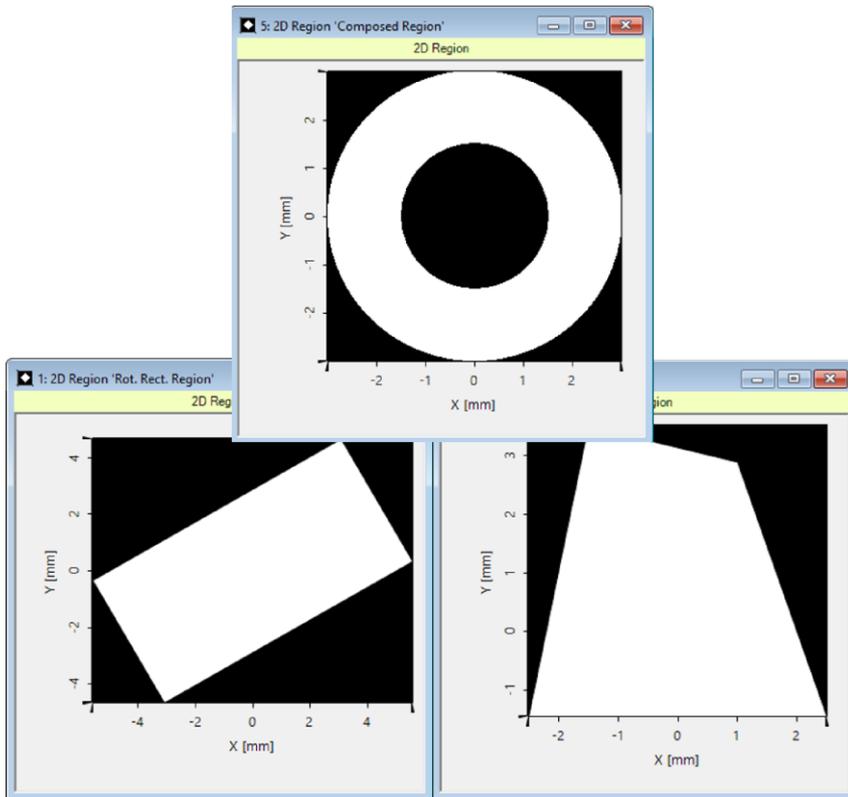# Flexible Region Configuration

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.
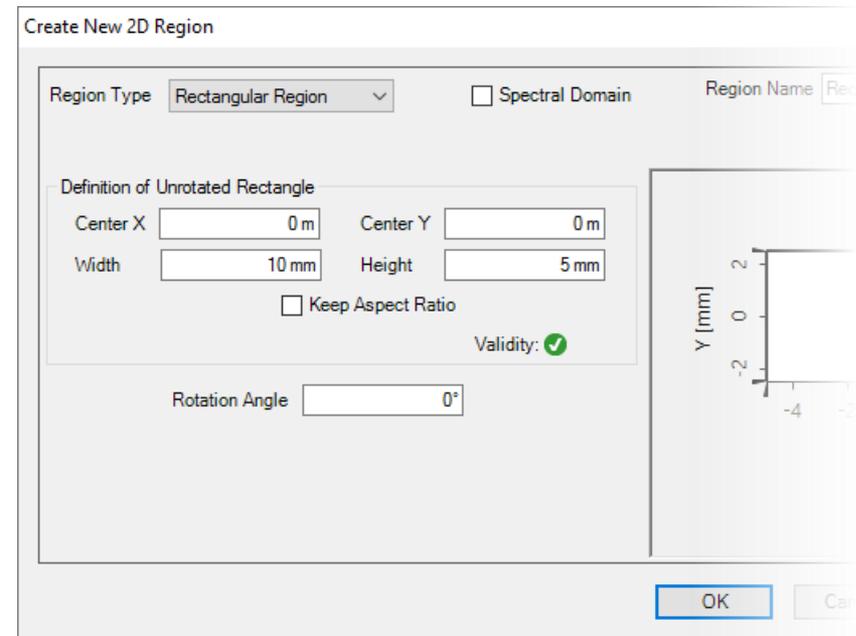
Task

- how to generate regions in different manners, and how to use them as signal regions in specific applications.
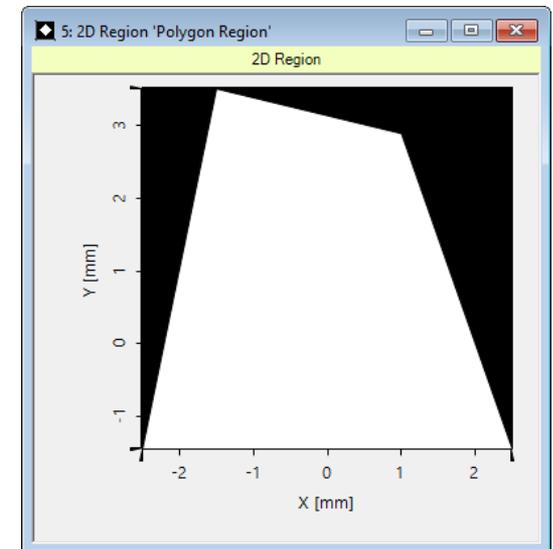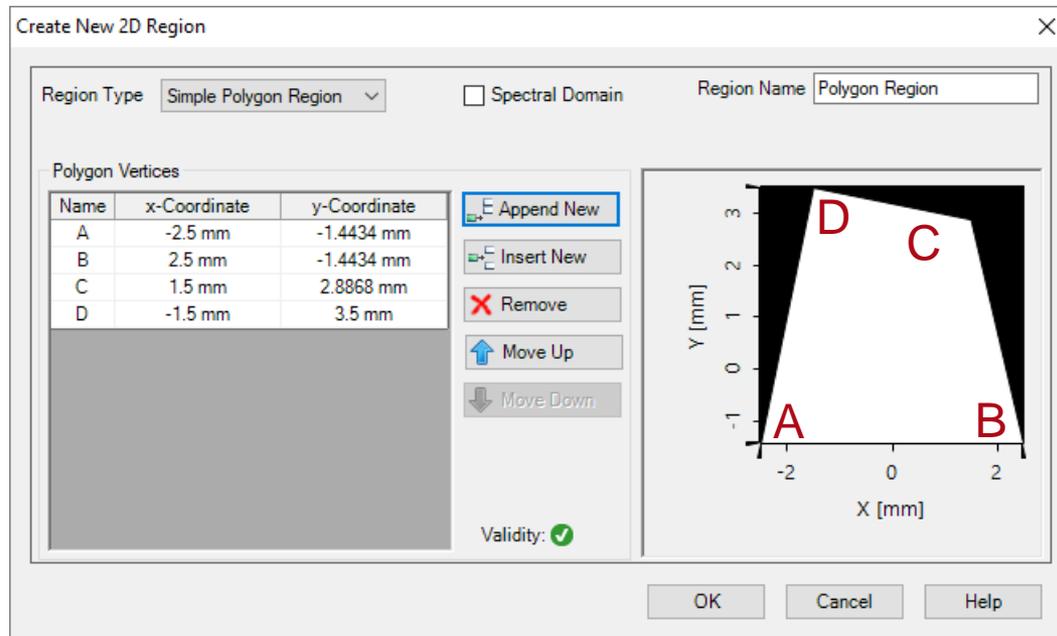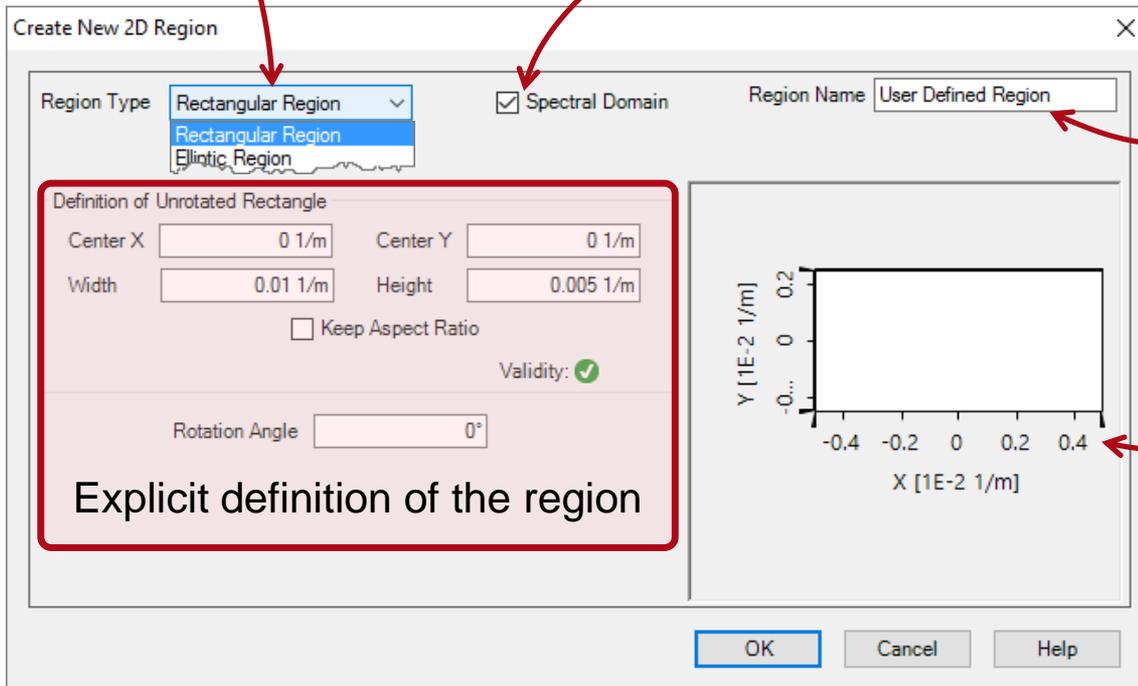
Region Generation
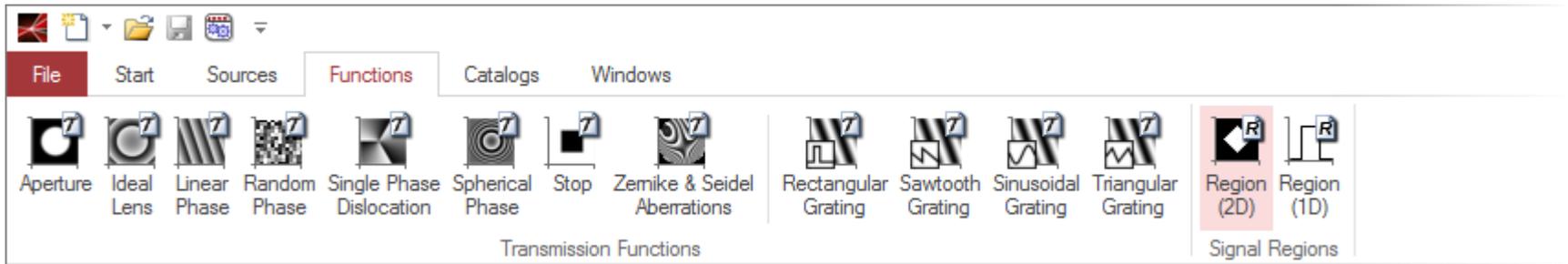
- In the *Functions* ribbon, we click on the *Region* icon.

- In what follows, we take 2D regions as examples.

Region Generation

Select region type

Specify definition domain of region: check (angular) Spectral Domain when used as optimization region for the diffractive optics element define with Angular Spectrum setup

Name of the region

Preview of the region

Create New 2D Region   ✕

| Region Type | Rectangular Region ▾ | | ☑ Spectral Domain | Region Name | User Defined Region |

Rectangular Region
Elliptic Region

Definition of Unrotated Rectangle

| Center X | 0 1/m | Center Y | 0 1/m |
| Width | 0.01 1/m | Height | 0.005 1/m |

☐ Keep Aspect Ratio

Validity: ✔

Rotation Angle 0°

Explicit definition of the region

Y [1E-2 1/m]

X [1E-2 1/m]
-0.4 -0.2 0 0.2 0.4

OK   Cancel   Help

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.
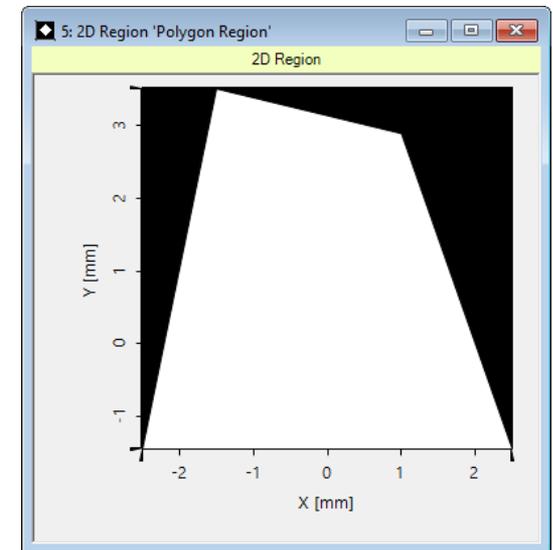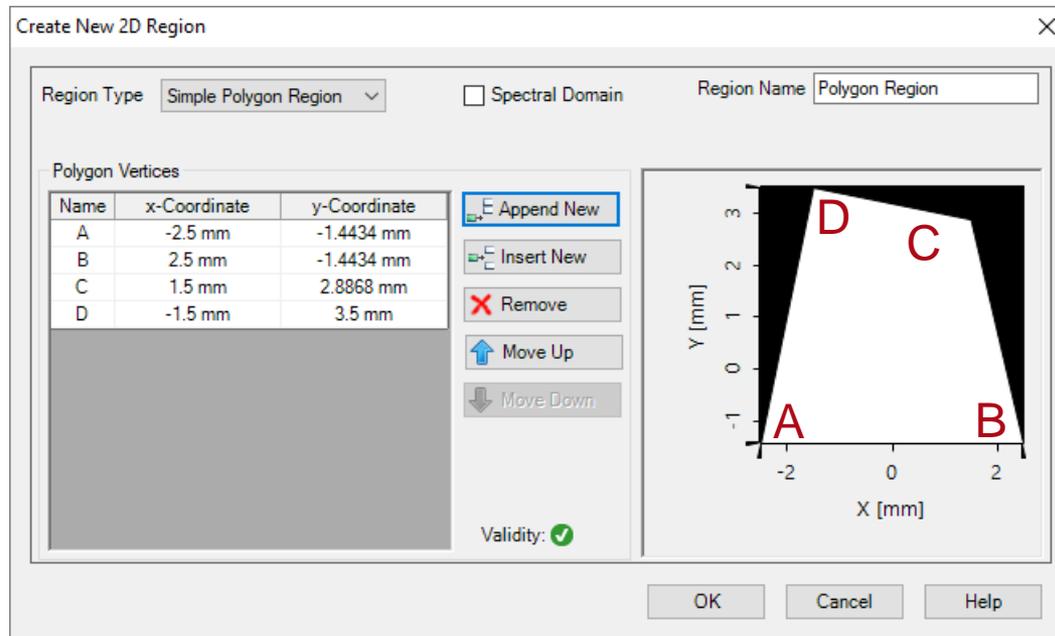
Example: Rectangular

- Rectangular region
  - Define center position, width and height, and rotation angle.
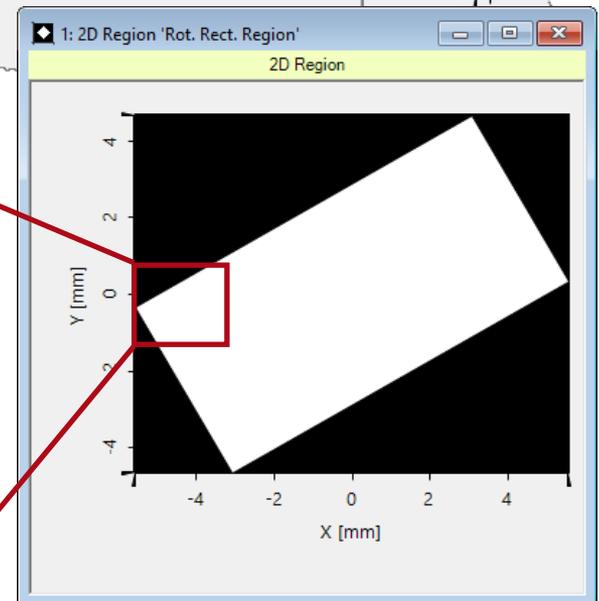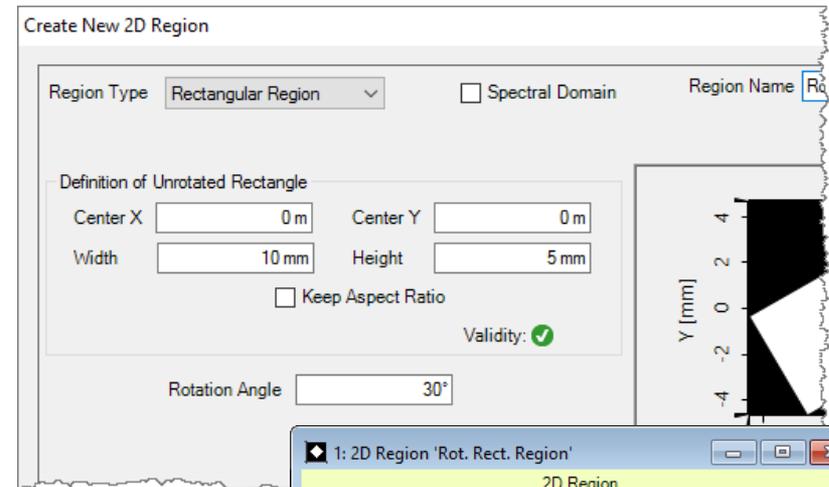
Rectangular region is defined analytically by its parameters, and thus can be zoomed arbitrarily.
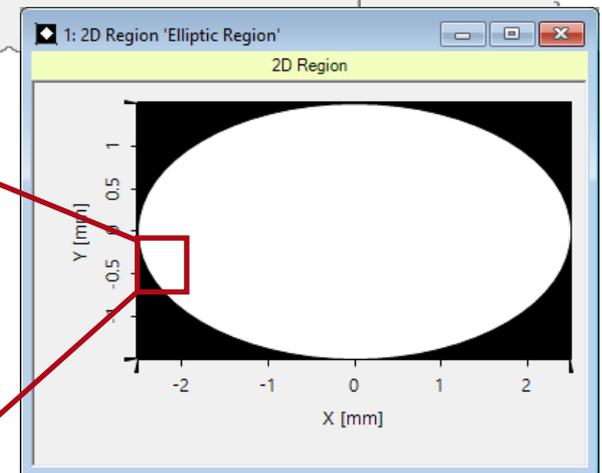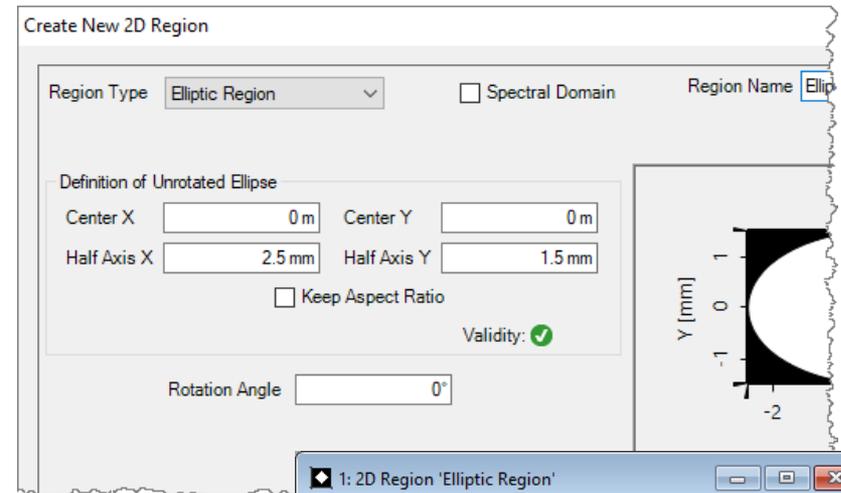
Example: Simple Polygonal

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

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.
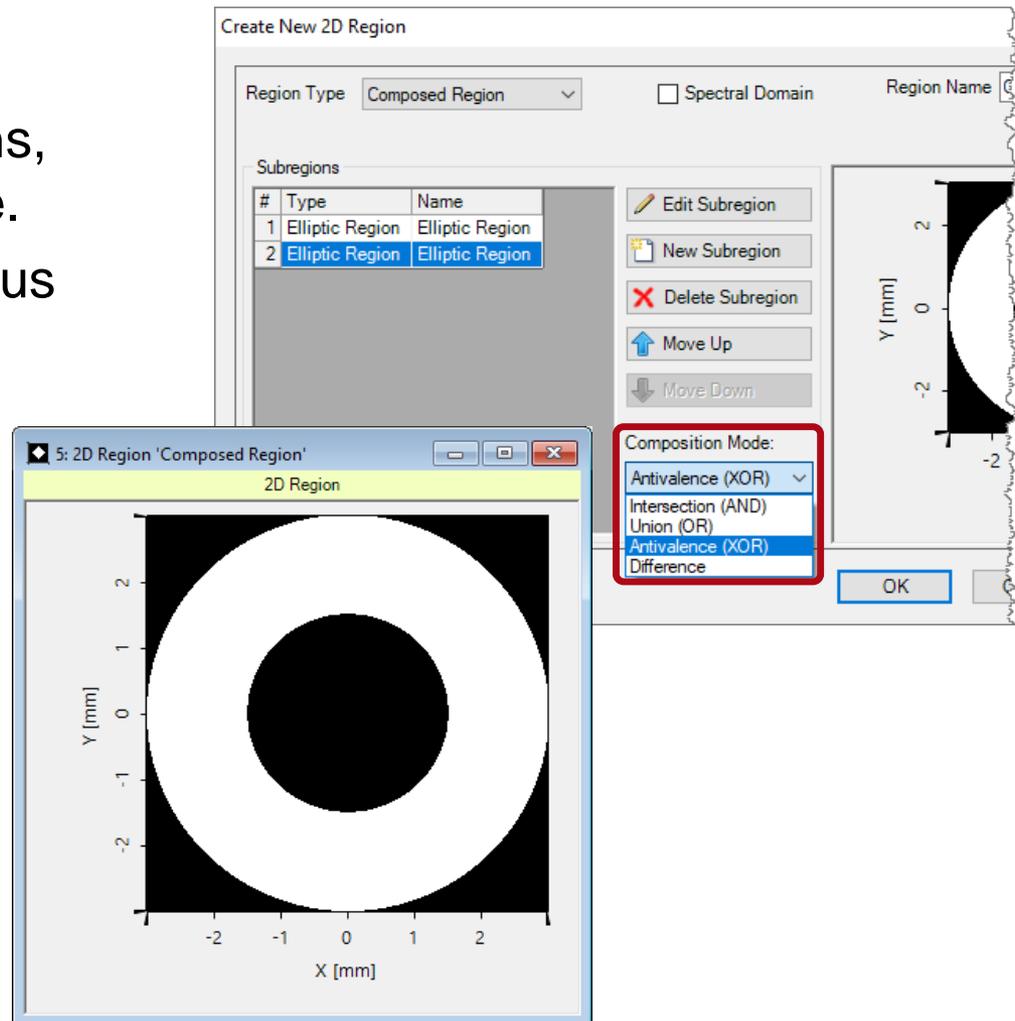
Example: Sampled

- 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.
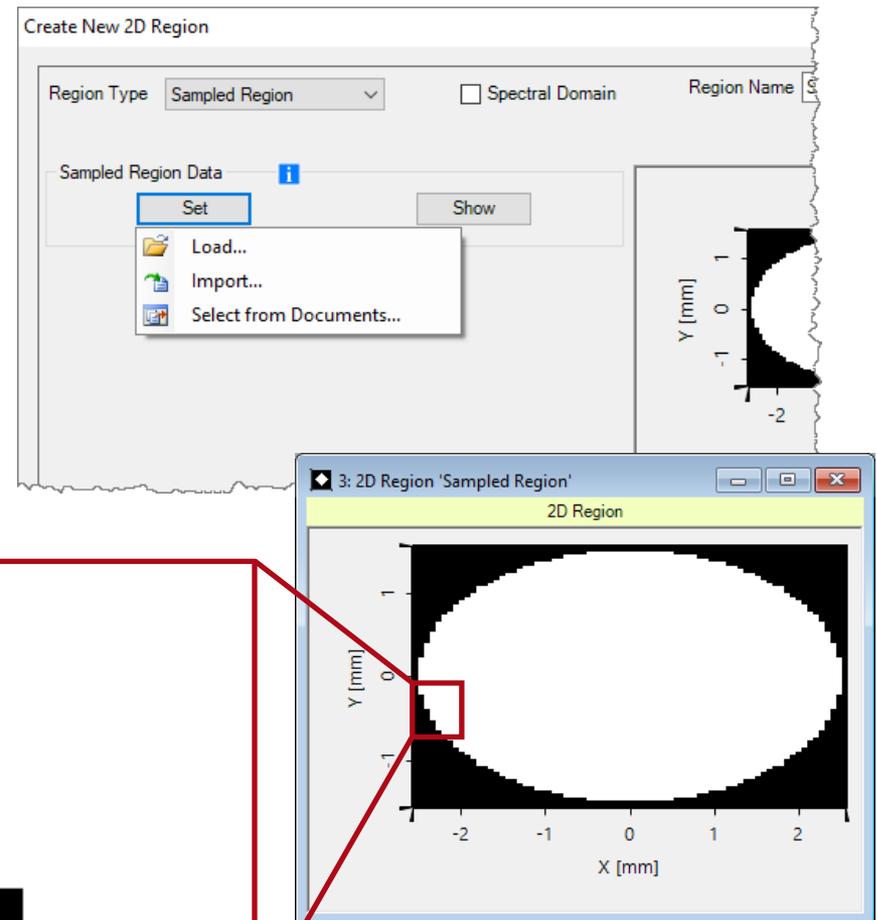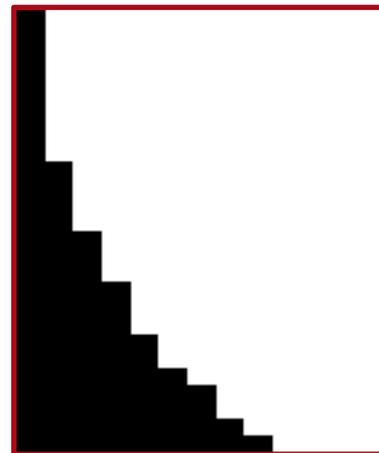
Example: Composed

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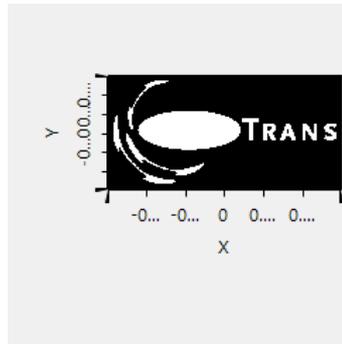 - A ring shape is then obtianed.

Example: Composed – Differently Linked

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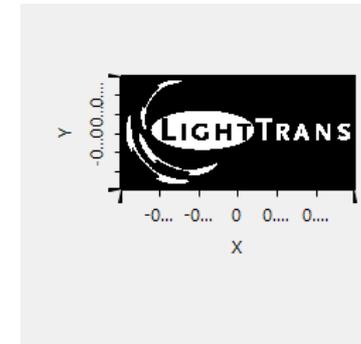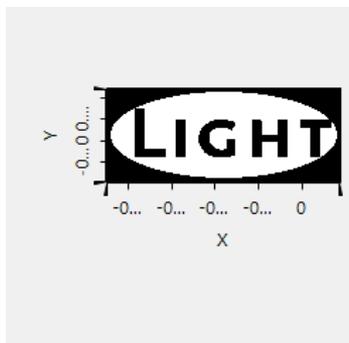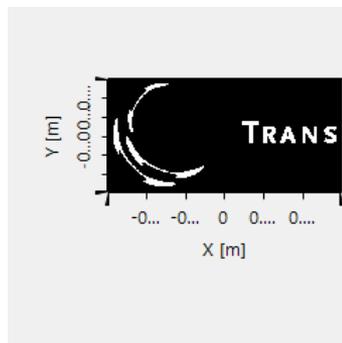
Intersection (AND)
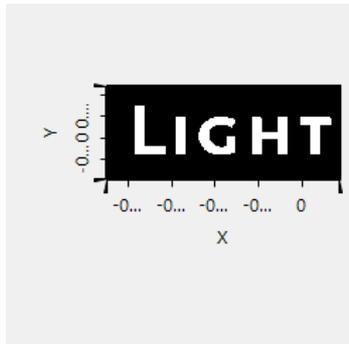
Union (OR)

Antivalence (XOR)

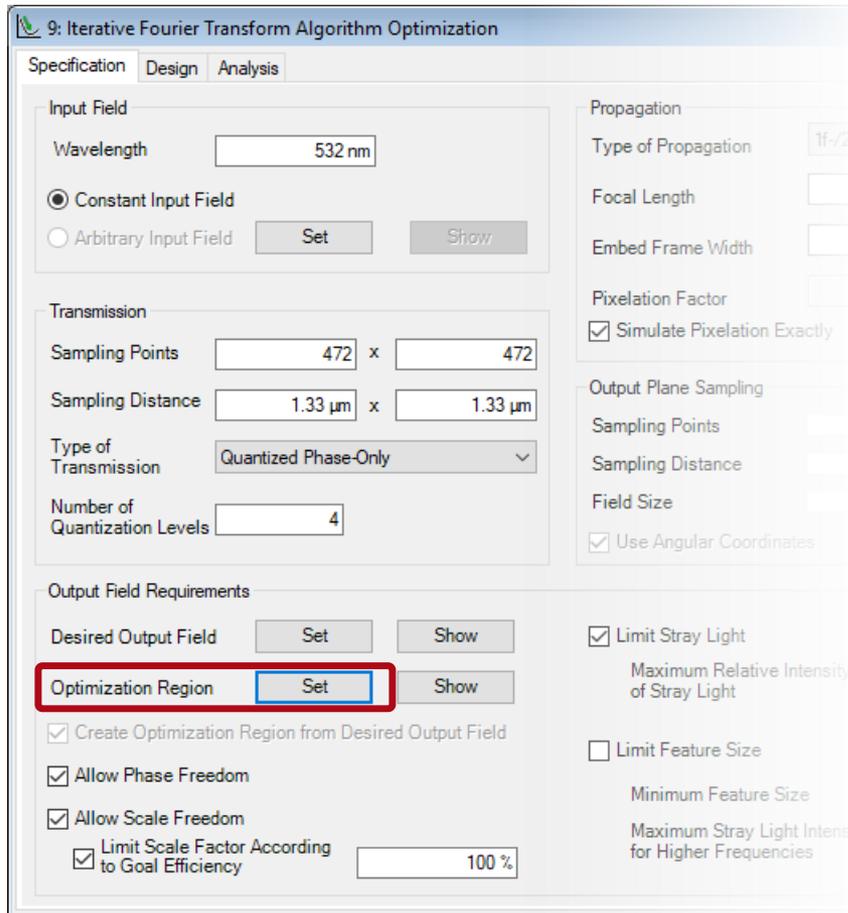### Difference A-B

Difference B-A

The result of the Difference mode depends on the order of the subregions. This can be changed using Move Up and Move Down
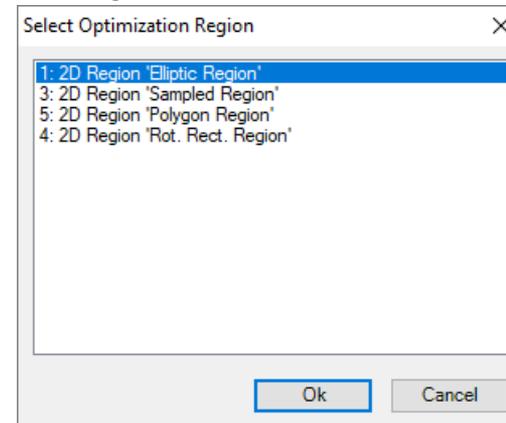
Used as Optimization Region

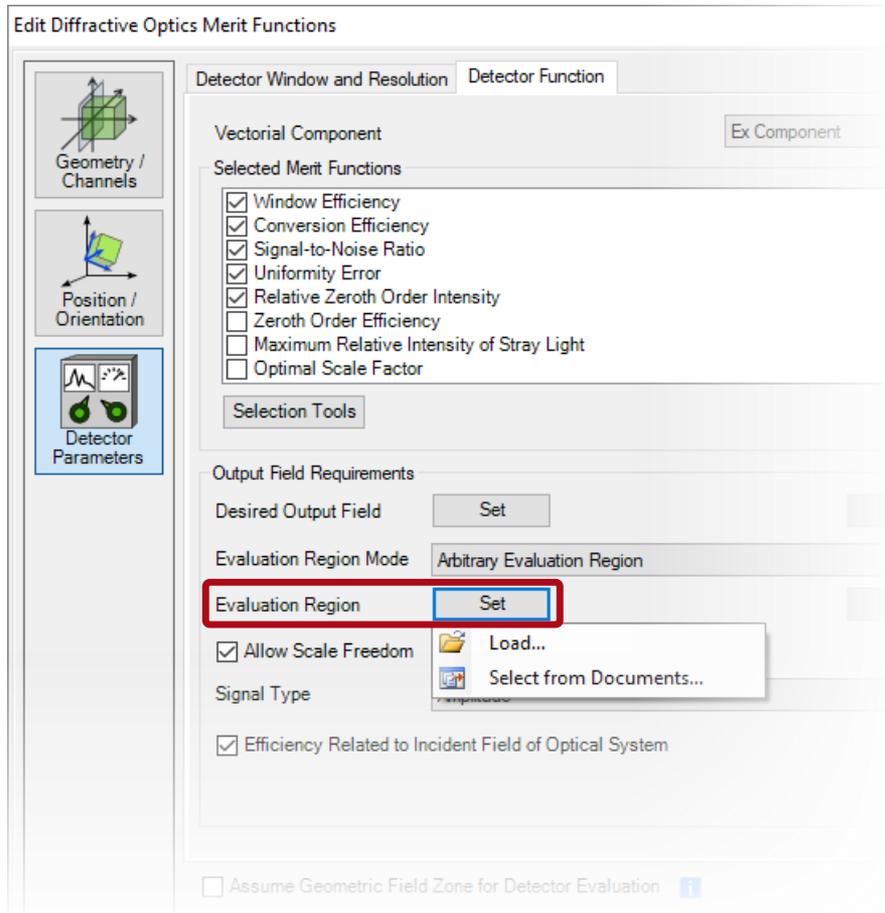- Iterative Fourier transform algorithm (IFTA) optimization

One can select any active region documents as *Optimization Region* for the design.
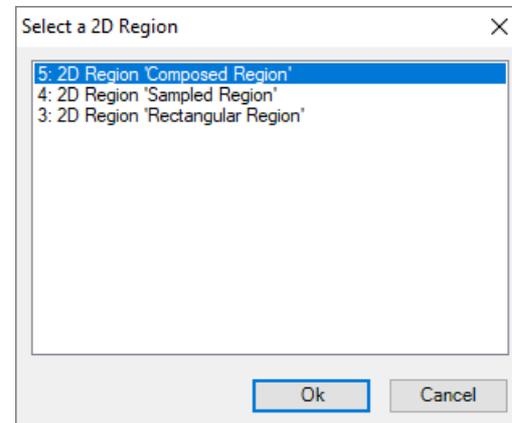
Used as Evaluation Region
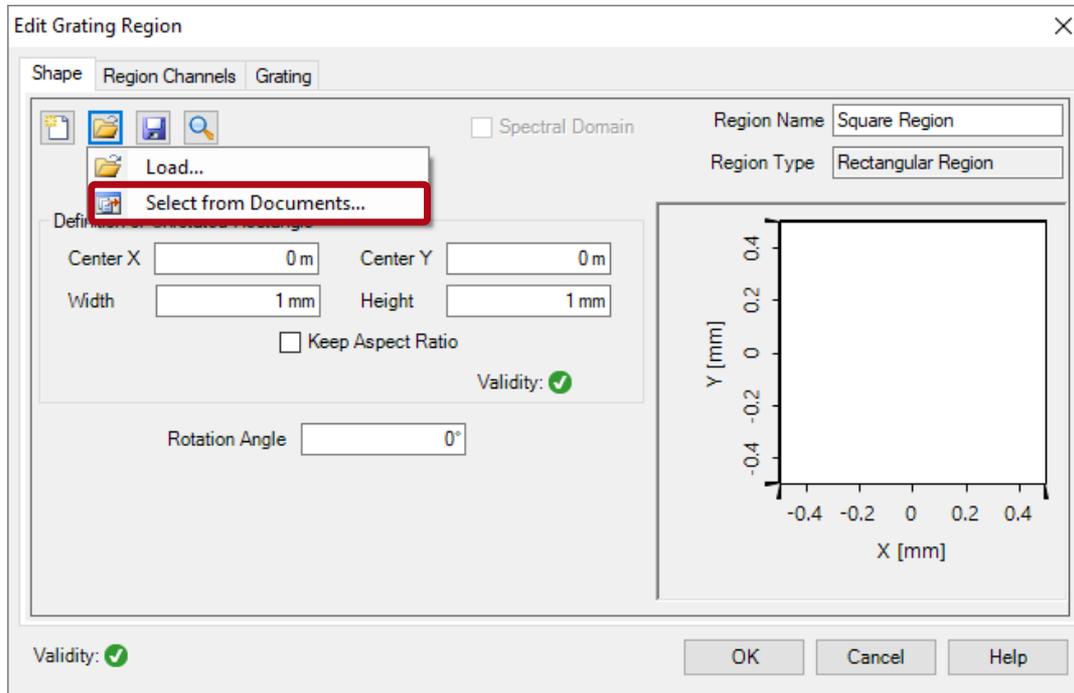
- Diffractive optics merit functions detector

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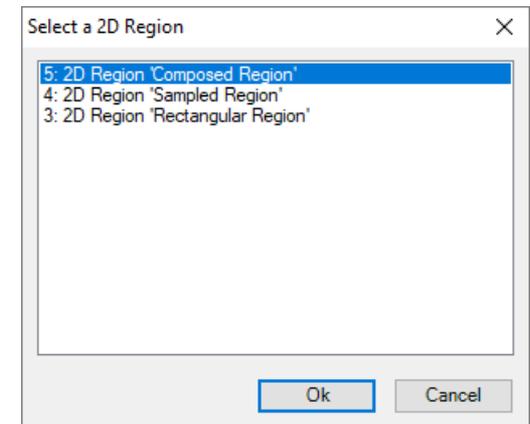
Used as Grating Region

- Grating region configuration in waveguide toolbox

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

Document Information

title	Flexible Region Configuration
version	1.0
VL version used for simulations	7.0.3.4
category	Feature Use Case