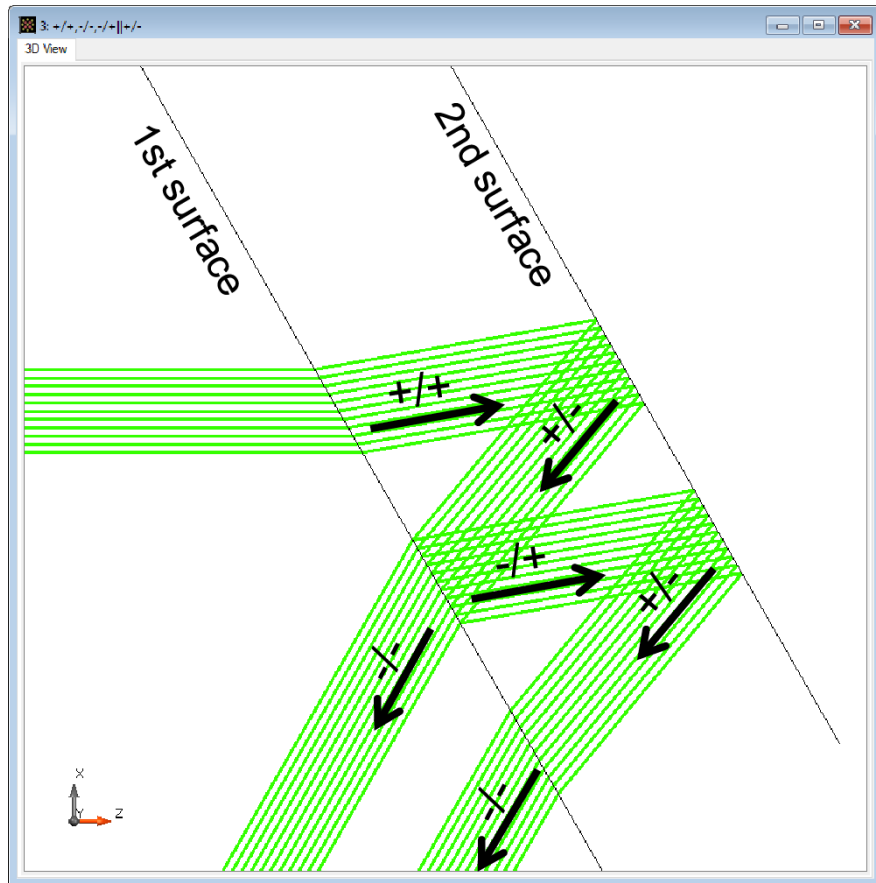


Channel Settings for Non-Sequential Tracing

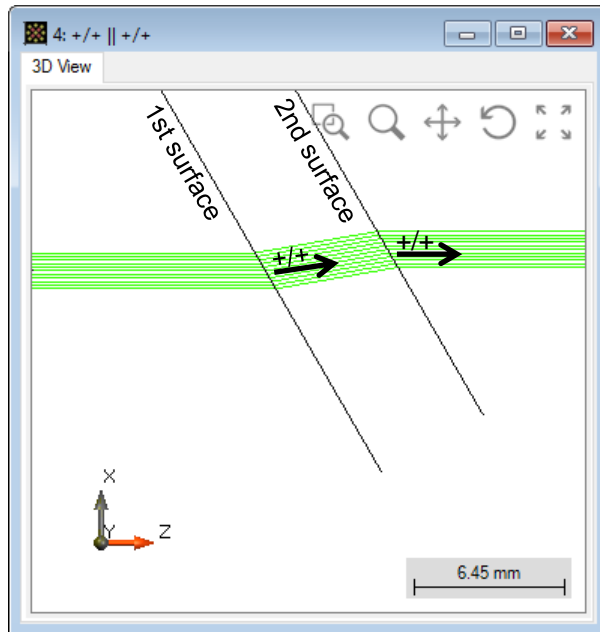
Abstract



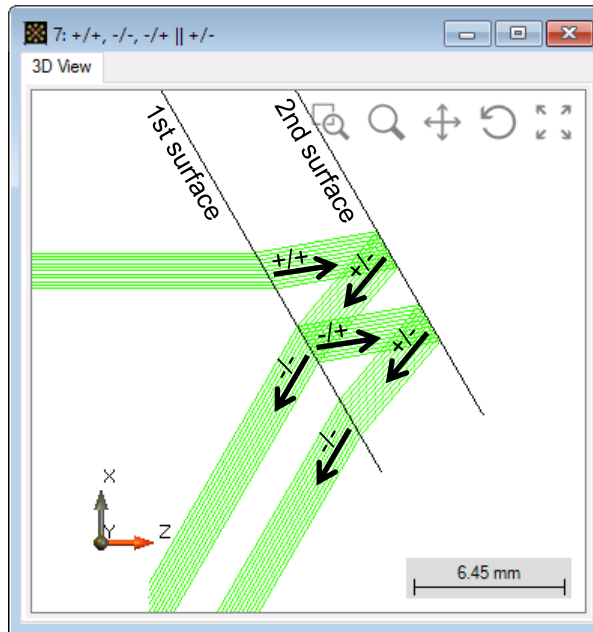
VirtualLab Fusion enables flexible configuration of channels for surfaces and (grating) regions. By adjusting the channel configurations, one can realize desired modeling schemes easily. We demonstrate the configuration of channels using an example of a lightguide with two surfaces. The resulting light paths generated by different combinations of settings are shown. Furthermore, we add grating regions on the light guide surfaces and demonstrate the configuration of channels for regions, as well as the grating parameters of such regions.

Modeling Task

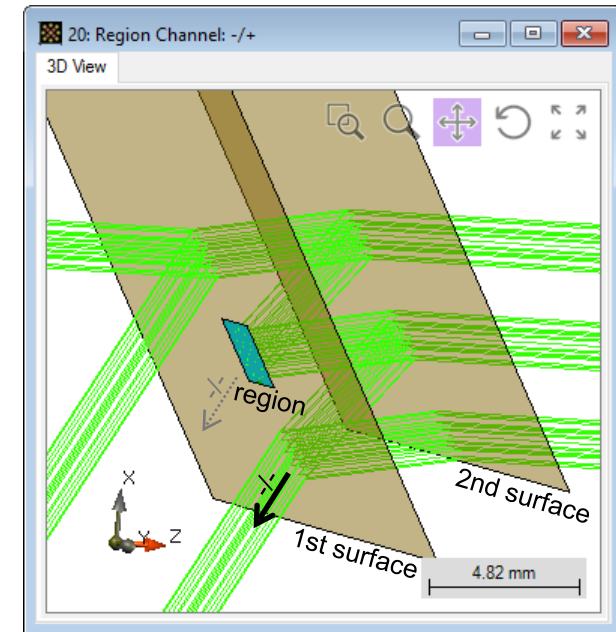
How to adjust the channels on surfaces and any potential grating regions on them, and how to control the simulation with these settings.



sequential channel configuration for surfaces



non-sequential channel configuration for surfaces

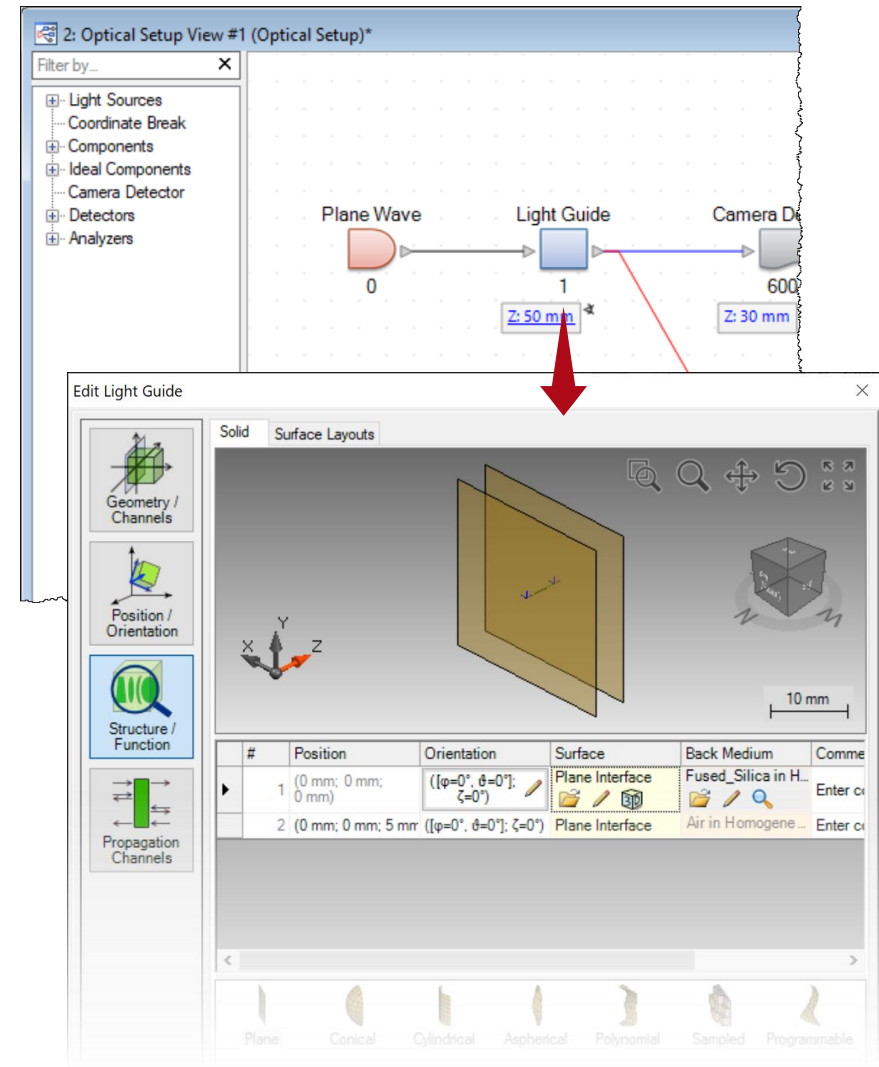


additional channel control for region(s) on surface(s)

Surface Channels

Initialization

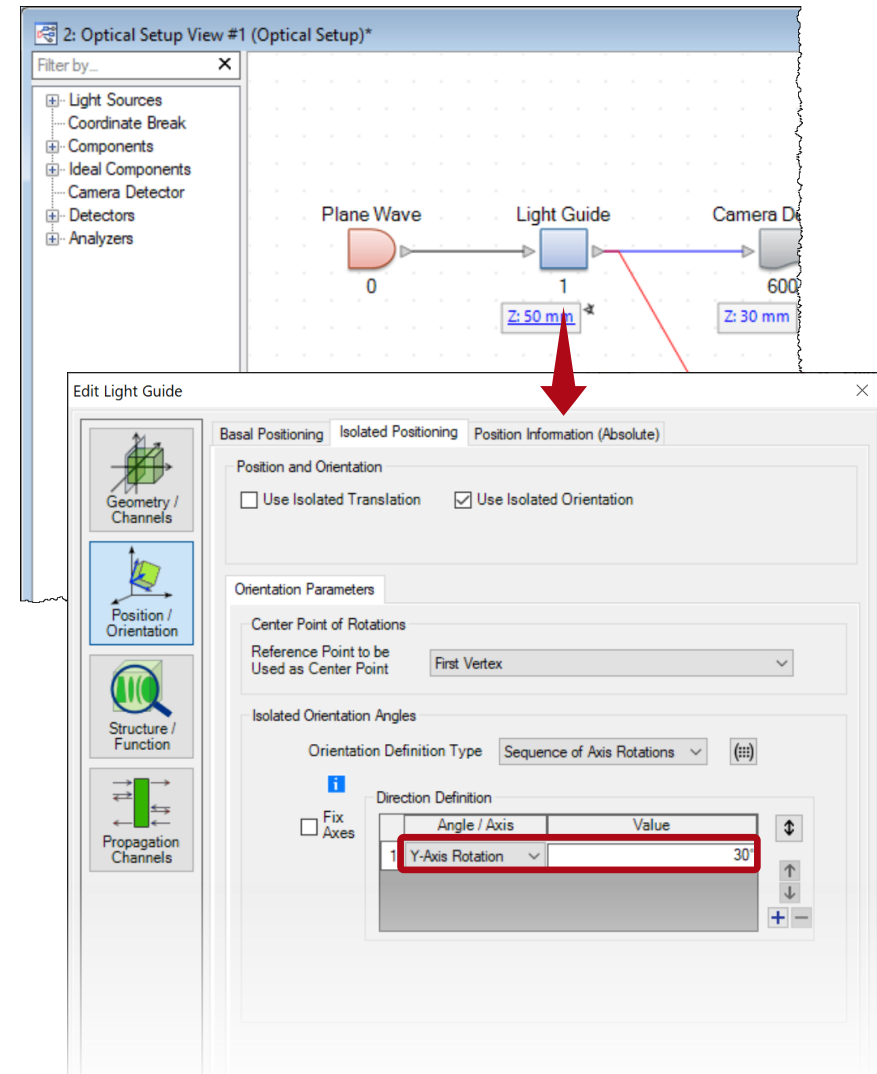
- Create a planar light guide made of fused silica, with a thickness of 5 mm, using two plane surfaces.



Surface Channels

Initialization

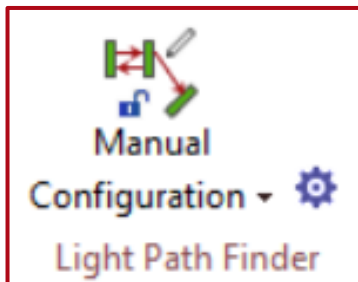
- Create a planar light guide made of fused silica, with a thickness of 5 mm, using two plane surfaces.
- For better illustration, define an isolated Y-Axis Rotation of 30° for the waveguide.



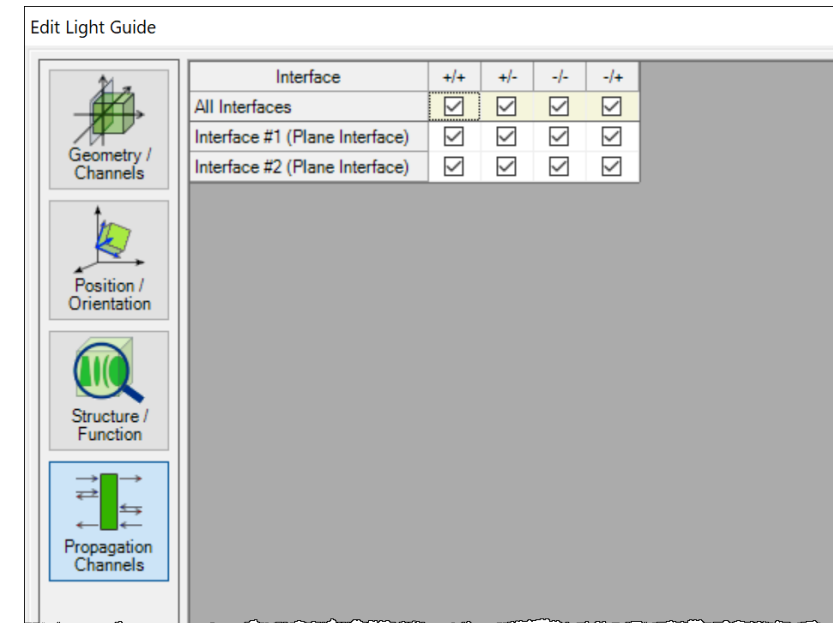
Surface Channels

Channel definition

- There are four possible channels for each surface, at least one should be activated for the tracing.
- Channels can be defined for each surface individually.
- Different settings on channels lead to different modeling schemes.



To change the channels in an element of the *General Optical Setup*, change the settings of the *Light Path Finder* section in the main menu to *Manual Configuration*.

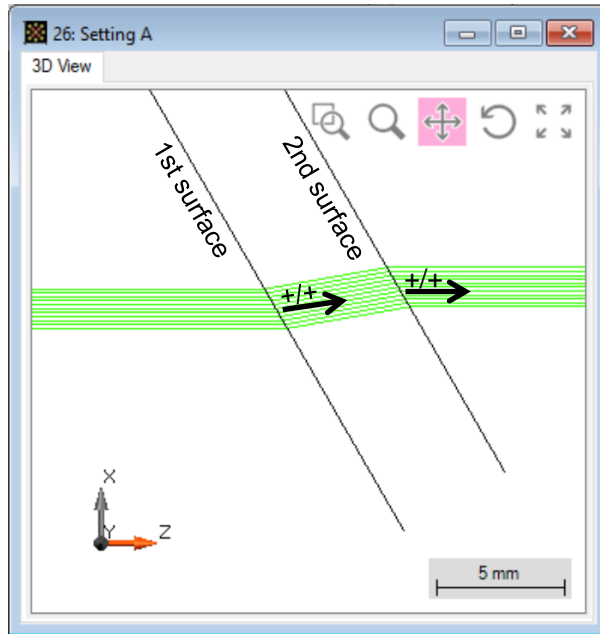


Channel Description

+/+	transmission (forward)
+/-	reflection (forward)
-/+	reflection (backward)
-/-	transmission (backward)

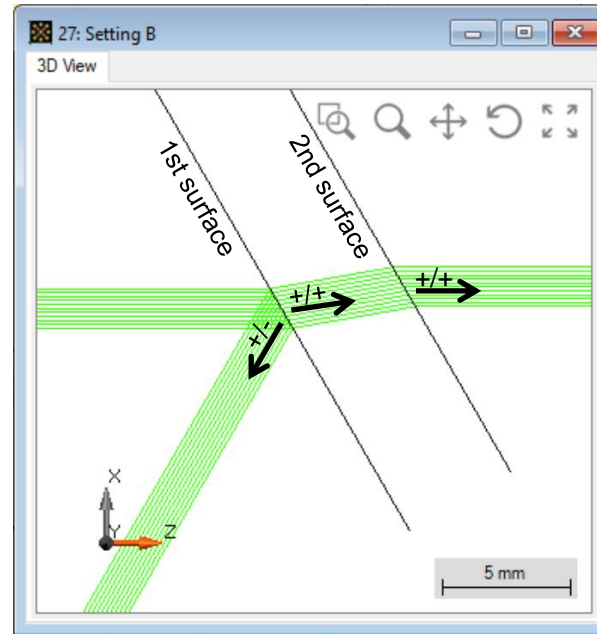
Surface Channels

Setting A



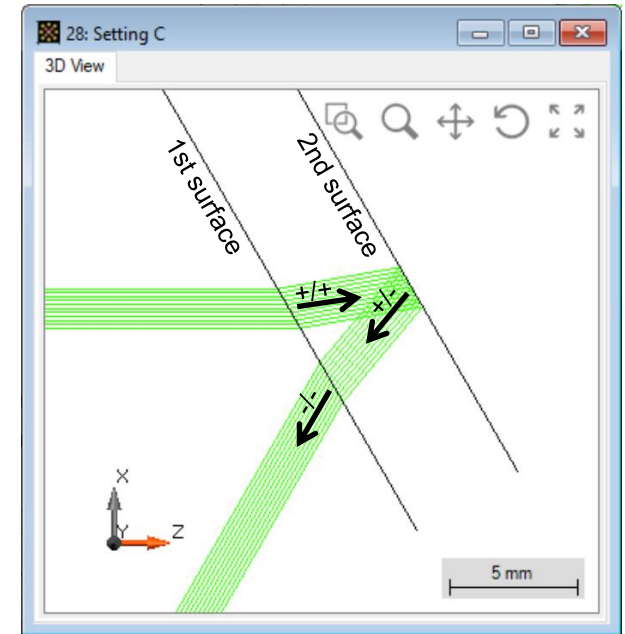
Surface	+/+	+/-	-/-	-/+
1st	×			
2nd	×			

Setting B



Surface	+/+	+/-	-/-	-/+
1st	×	×		
2nd	×			

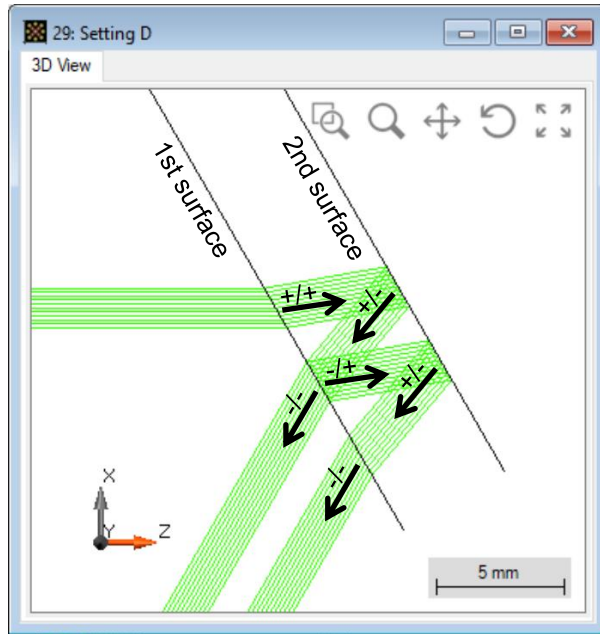
Setting C



Surface	+/+	+/-	-/-	-/+
1st	×		×	
2nd		×		

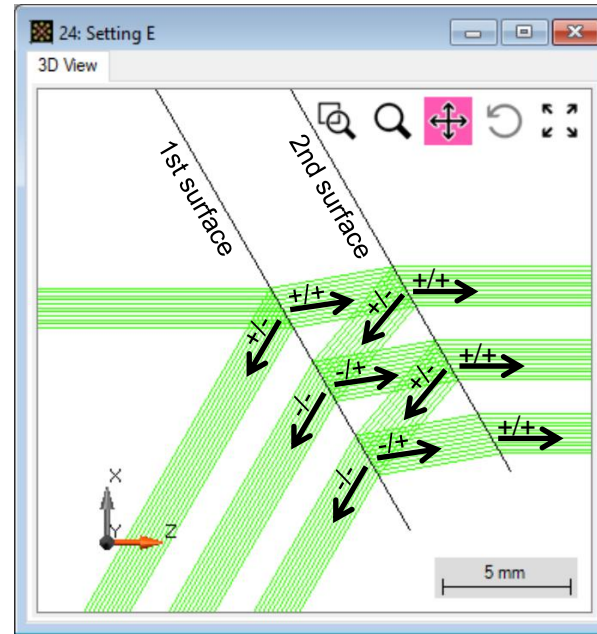
Surface Channels

Setting D



Surface	+/+	+/-	-/-	-/+
1st	×		×	×
2nd		×		

Setting E



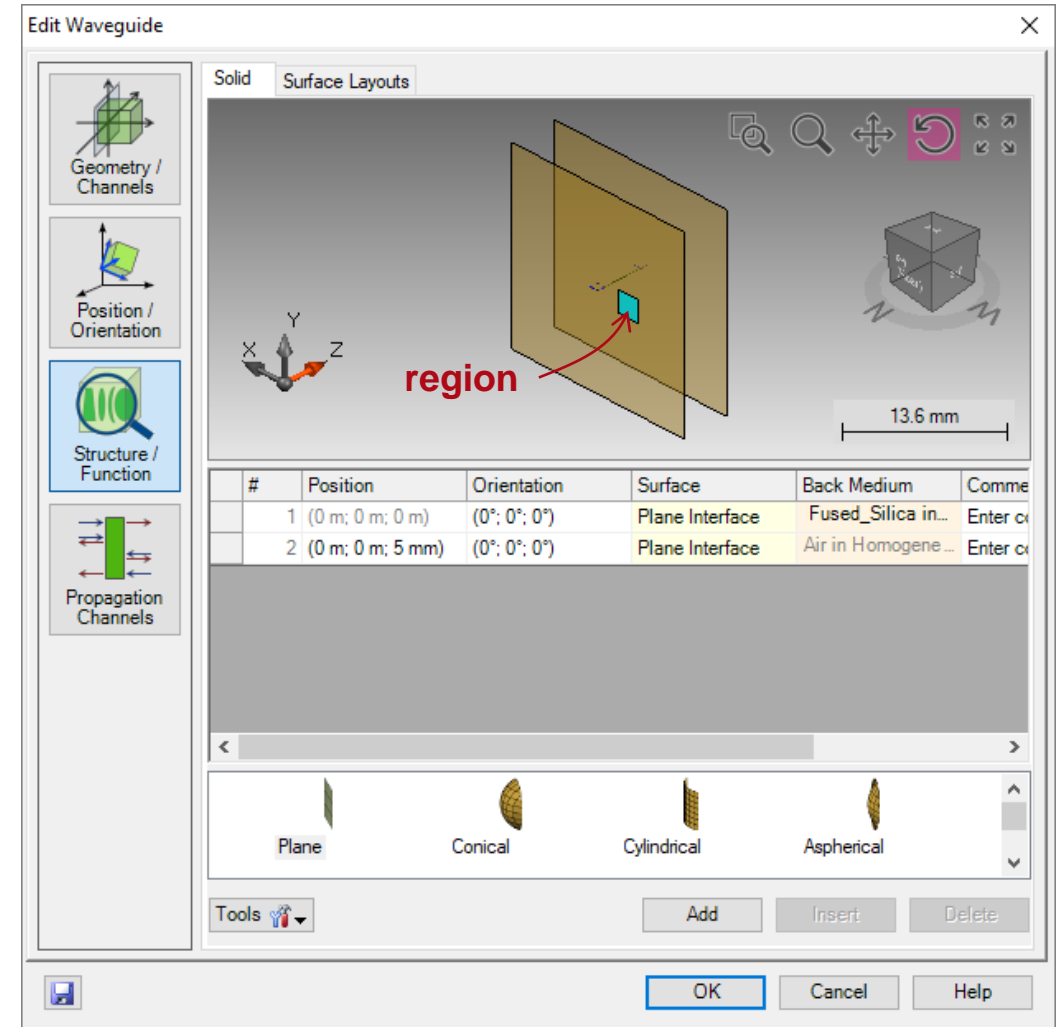
Surface	+/+	+/-	-/-	-/+
1st	×	×	×	×
2nd	×	×	×	×

Note: an active channel does not necessarily lead to corresponding light path(s). E.g., the -/- and -/+ channel of the 2nd interface do not influence the tracing, because there is no backward incidence.

Region Channels

Region(s) on surface

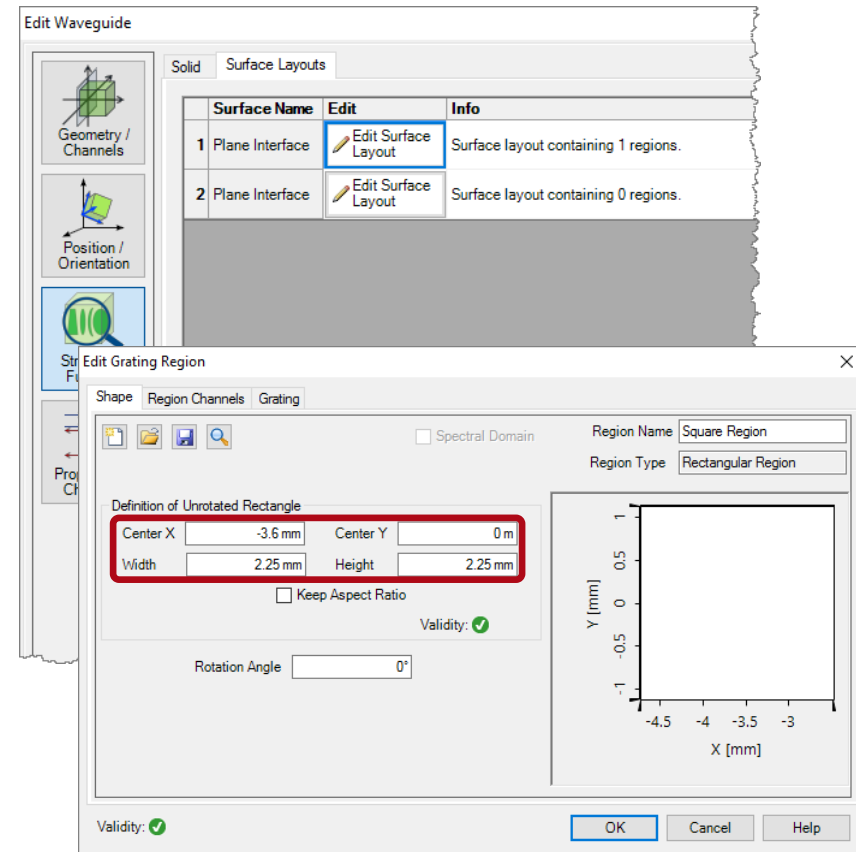
- It is possible to define individual Regions on a surface and define their optical properties individually, including the channel settings.



Region Channels

Region definition

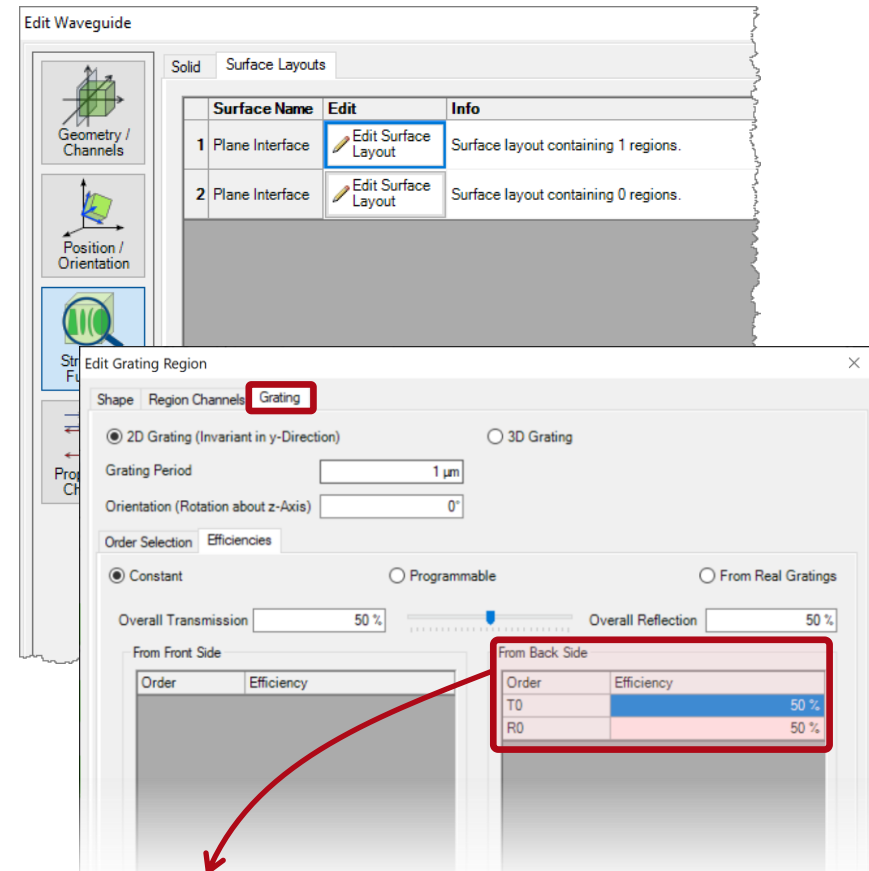
- Create a rectangular region on 1st surface.
- Set the region size to 2.25mm×2.25mm, and its center at -3.6mm along x-direction.



Region Channels

Region definition

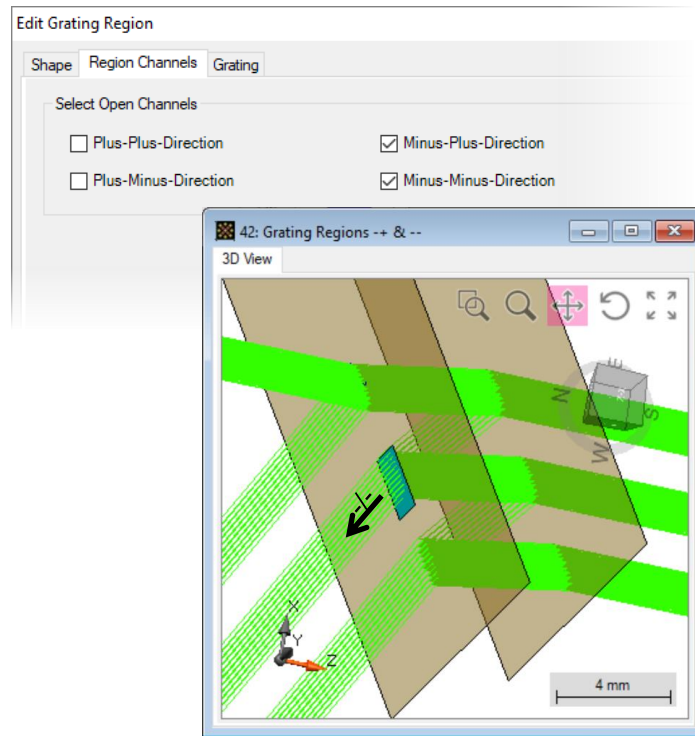
- Create a rectangular region on 1st surface.
- Set the region size to $2.25\text{mm} \times 2.25\text{mm}$, and its center at -3.6mm along x-direction.
- Define this region as a grating with one single transmission order $T0 = 50\%$, and one single reflection order $R0 = 50\%$, which makes a semi-reflective mirror.
- Here we work with zeroth diffraction orders only, which is identical to the usual transmission or reflection due to refraction.



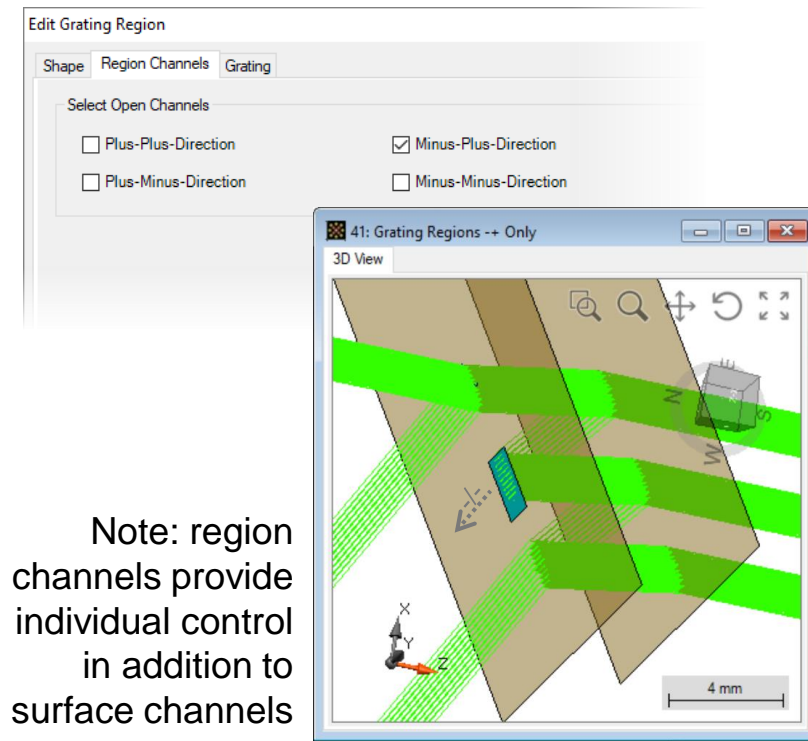
Efficiencies are given with respect to incidence from back side; in this example, T and R corresponds to $-/-$ and $-/+$ channels, respectively.

Region Channels

- Region definition
 - Set up the channels for this region, following the same rule as for the surfaces.



region channels -/+ , -/- on



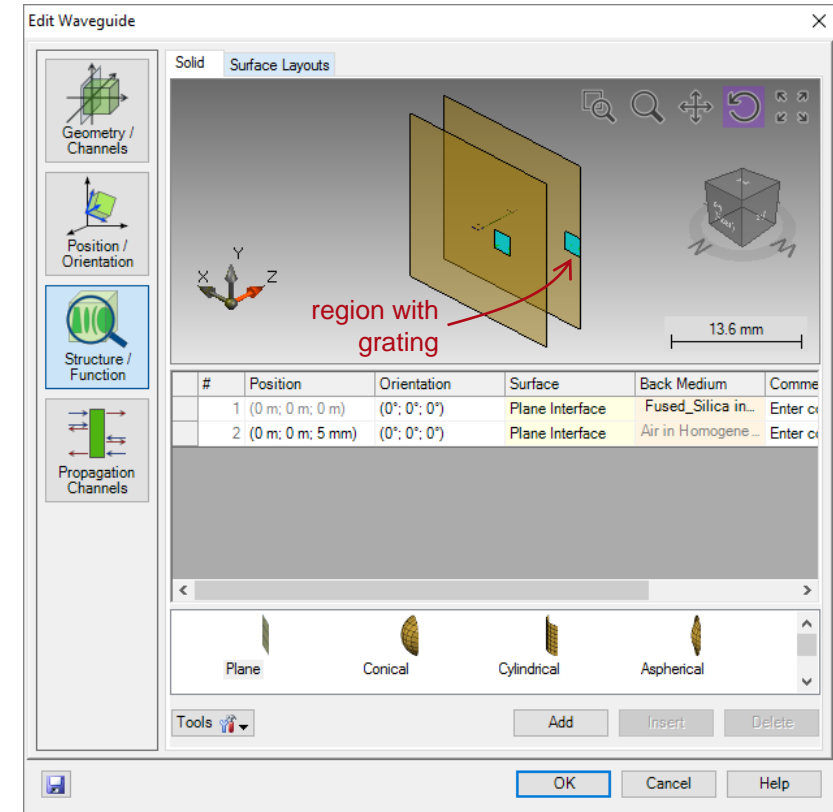
Note: region channels provide individual control in addition to surface channels

region channel -/+ on

Region Channels with Grating

Region definition

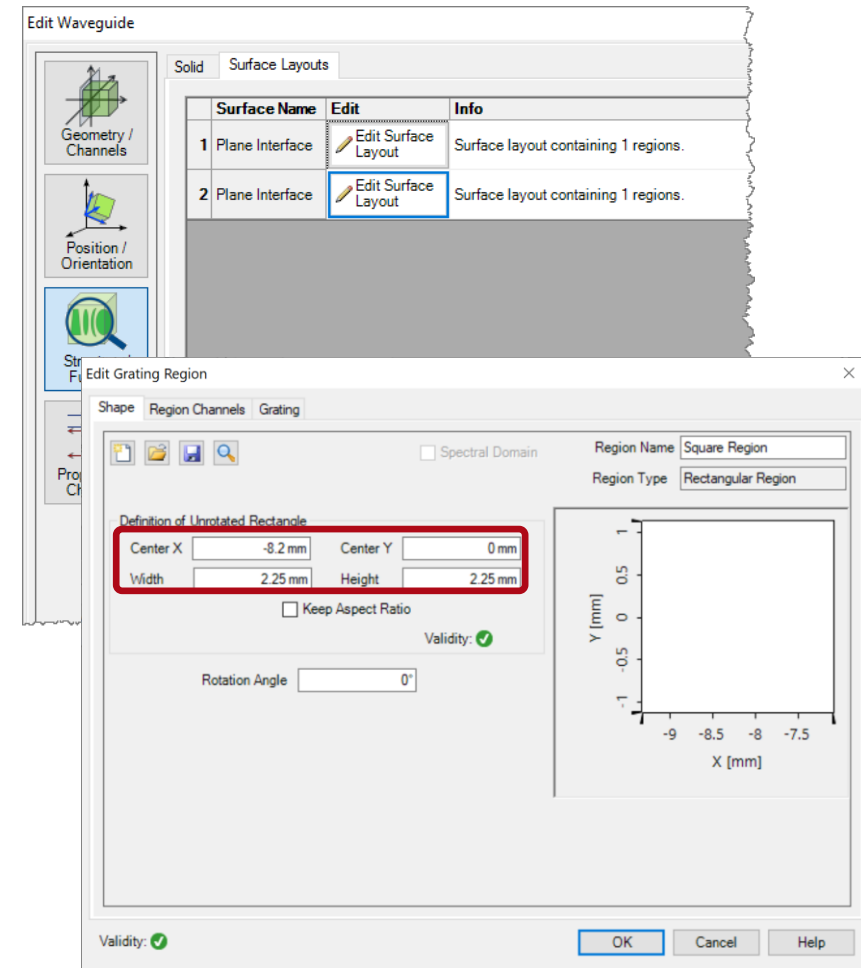
- It is possible to define a diffractive grating on a given region.



Region Channels with Grating

Region definition

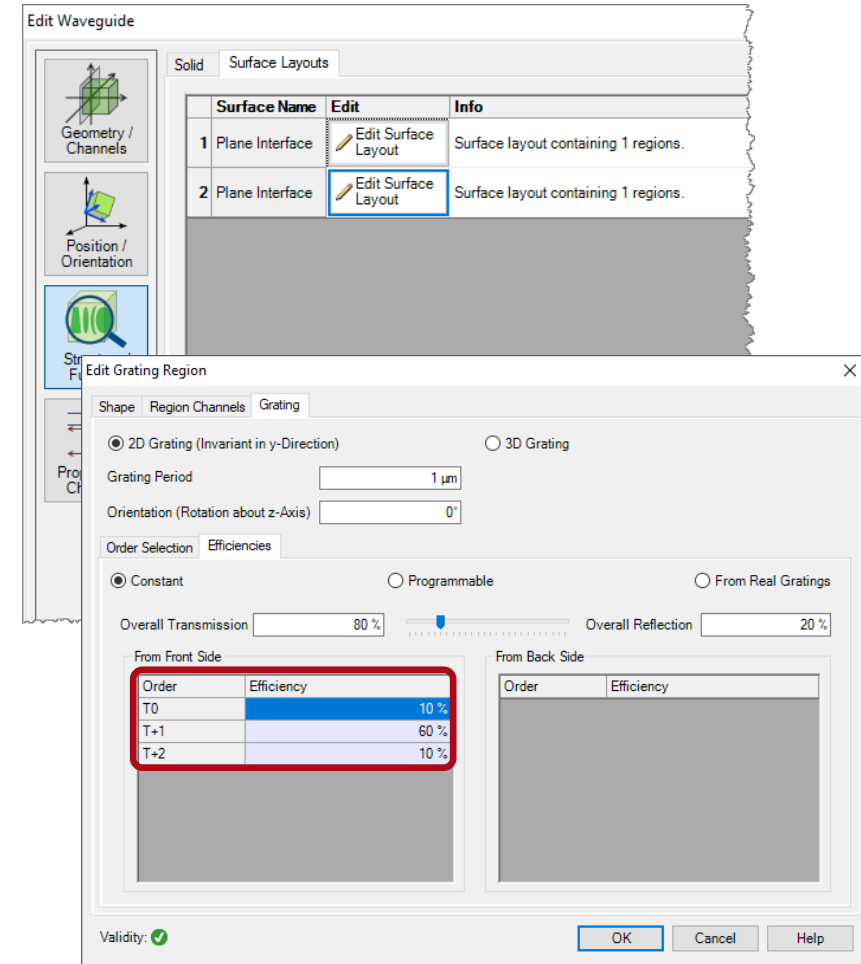
- It is possible to define a diffractive grating on a given region.
- We add a rectangular region (2.25mm side length) on 2nd surface, centered at -8.2mm along x-direction.



Region Channels with Grating

Region definition

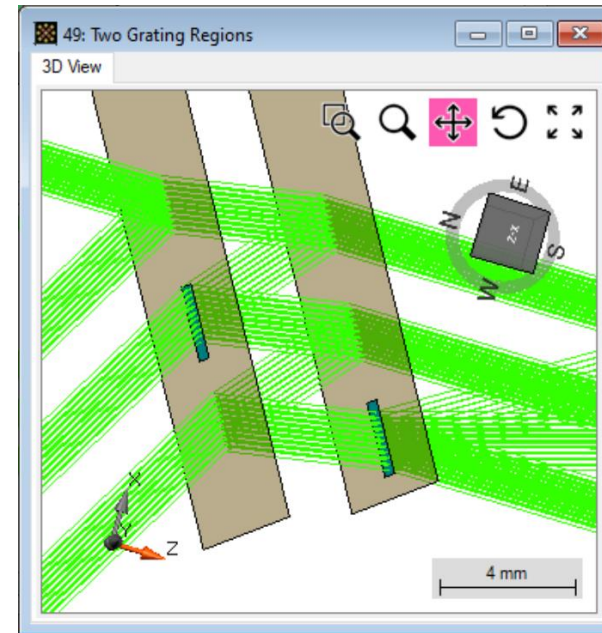
- It is possible to define a diffractive grating on a given region.
- We add another rectangular region (2.25mm side length) on 2nd surface, centered at -8.2mm along x-direction.
- Define an ideal grating with 2 μm period, and diffraction efficiencies
 - $T_0 = 10\%$
 - $T_{+1} = 60\%$
 - $T_{+2} = 10\%$.



Region Channels with Grating

Region definition

- It is possible to define a diffractive grating on a given region.
- We add another rectangular region (2.25mm side length) on 2nd surface, centered at -8.2mm along x-direction.
- Define an ideal grating with $2\mu\text{m}$ period, and diffraction efficiencies
 - $T_0 = 10\%$
 - $T_{+1} = 60\%$
 - $T_{+2} = 10\%$.



Region on surface 1: -/+ channel on
Region on surface 2: +/+ channel on
[with T_0 , T_{+1} , T_{+2} diffraction orders]

Document Information

title	Channel Settings for Non-Sequential Tracing
document code	MISC.0013
document version	2.1
software edition	VirtualLab Fusion Advanced
software version	2021.1 (Build 1.180)
category	Feature Use Case
further reading	<ul style="list-style-type: none">• <u>Non-Sequential Ray Tracing Analysis of Glass Plate</u>• <u>Modeling of Etalon with Planar or Curved Surfaces</u>• <u>Optimizing Waveguide Outcoupling Gratings for Uniform Multiple Channels</u>