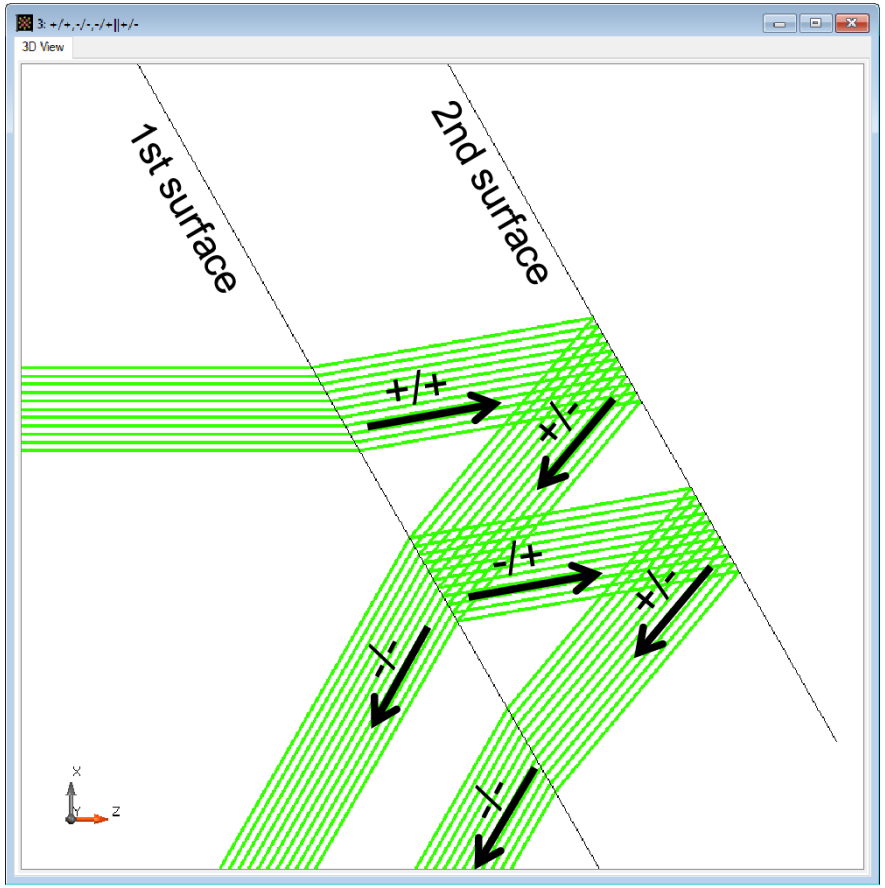
Channel Setting for Non-Sequential Tracing

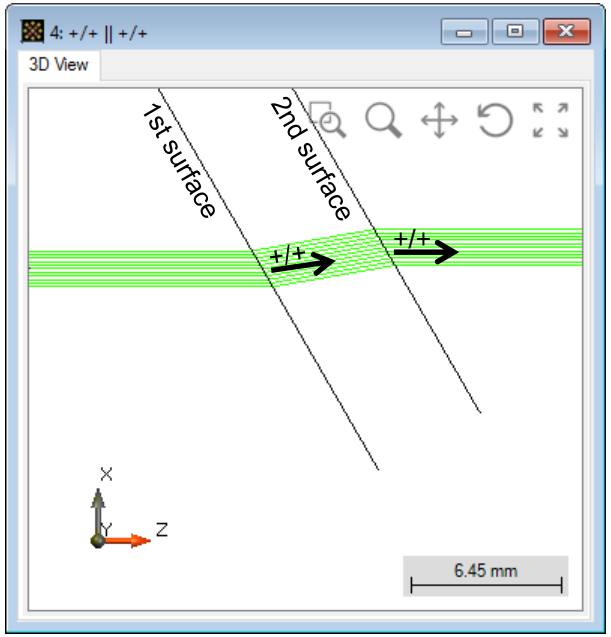
Abstract



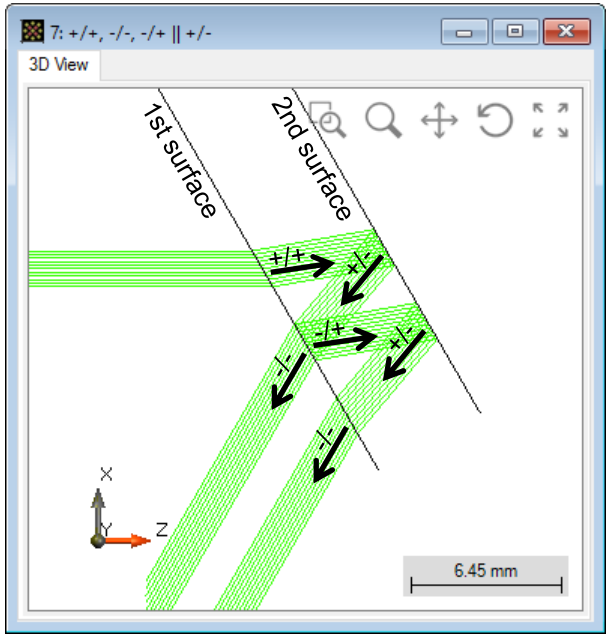
In VirtualLab Fusion, non-sequential tracing is enabled by adjusting the channels of each surface. This use case shows the definition of channels by using an example of a waveguide with two surfaces. Channels of each surface are adjusted and the consequences of the settings are shown. Furthermore, on a surface, grating regions can be defined. Setting of the region channels are not necessary to be identical with the surface channels. This use case shows how to set regions on a surface and how to adjust the channel configuration of a region.

Modeling Task

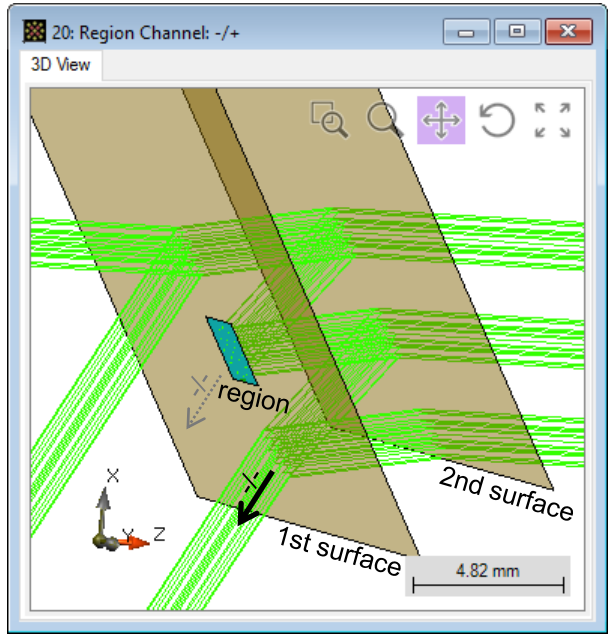
- how to adjust the channels on surface and region levels, and the consequences from these settings.



sequential channel setting for surfaces



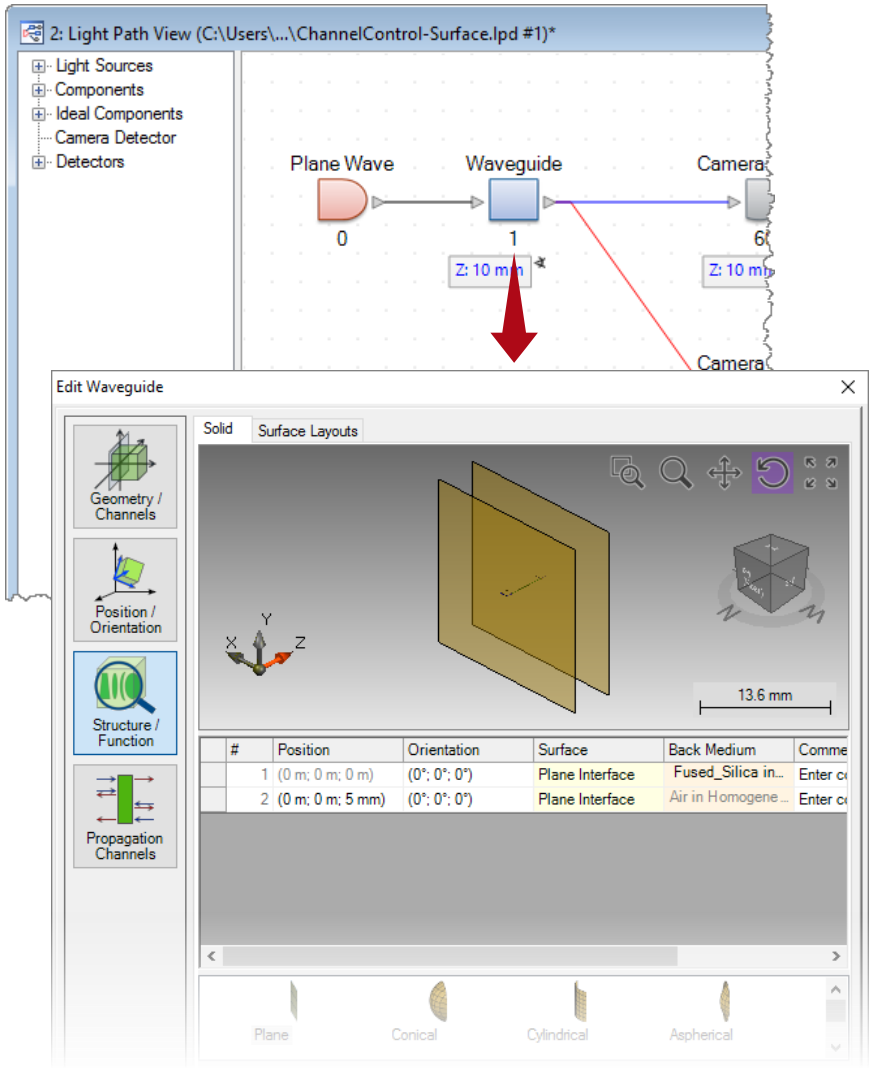
non-sequential channel setting for surfaces



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

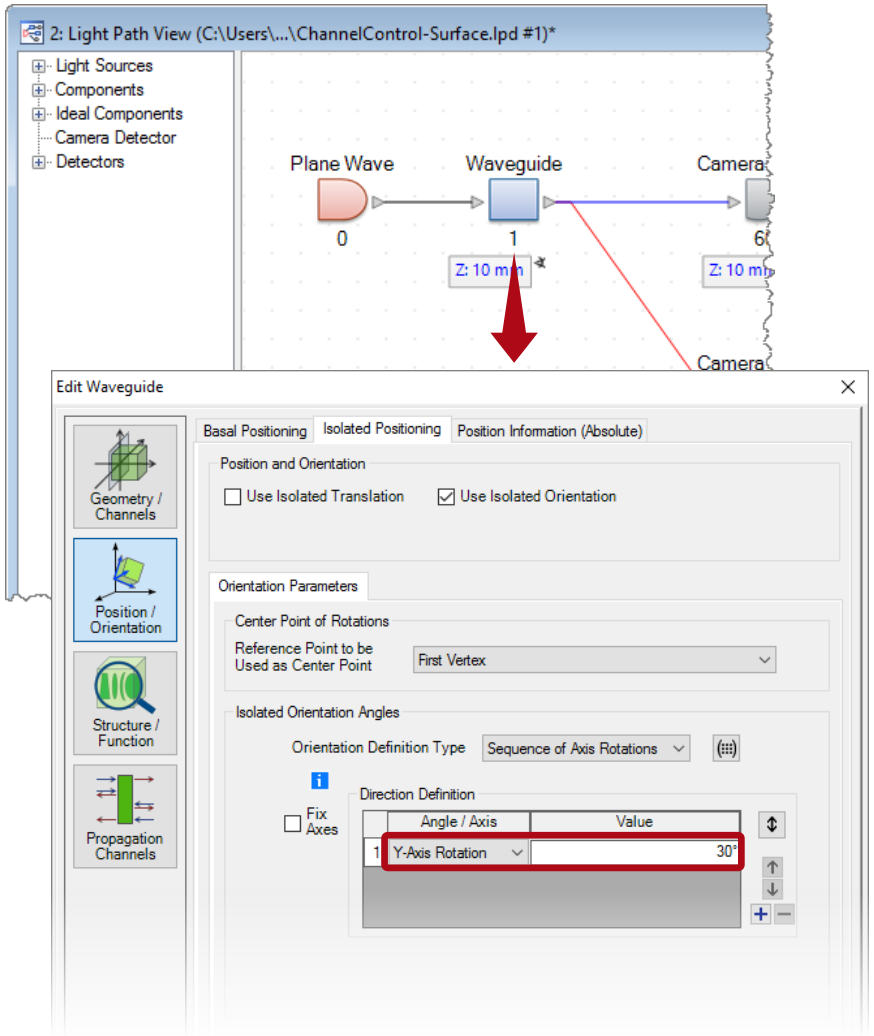
Surface Channels

- Initialization
  - Create a planar waveguide made of fused silica, with a thickness of 5mm, by using two plane interfaces without regions on them.



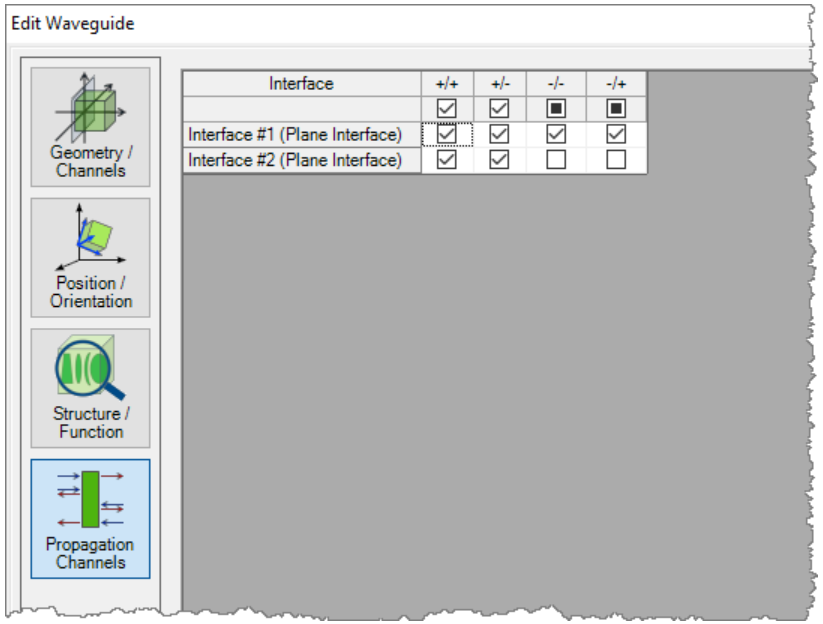
Surface Channels

- Initialization
  - Create a planar waveguide made of fused silica, with a thickness of 5mm, by using two plane interfaces without regions on them.
  - For better illustration, define an isolated Y-Axis Rotation of 30° for the waveguide.



Surface Channels

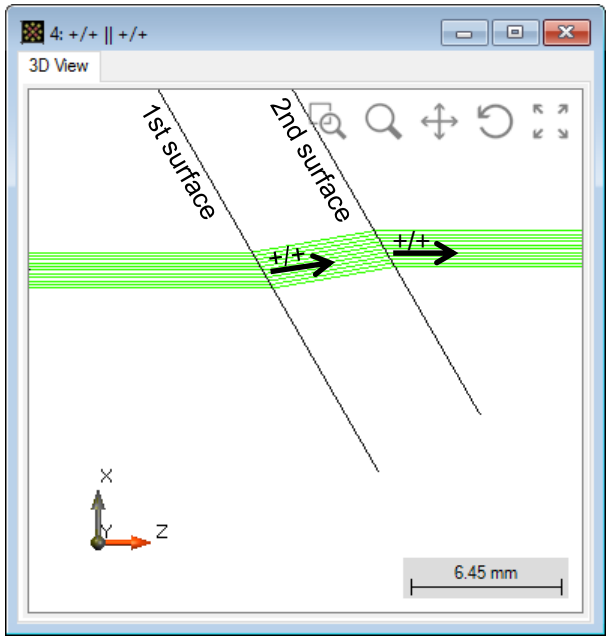
- Channel definition
  - There are four possible channels for each surface, at least one should be activated for the tracing.
  - Channels can be defined for each surface individually.
  - Different settings on channels leads to different tracing logic in VirtualLab.



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

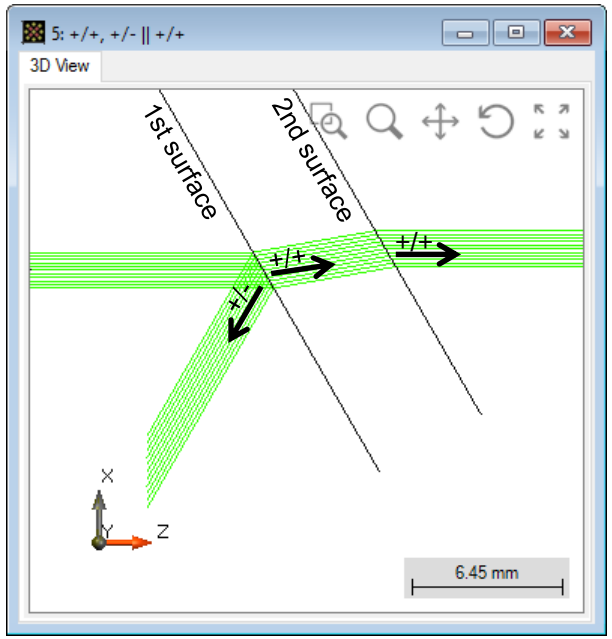
Surface Channels

Setting A



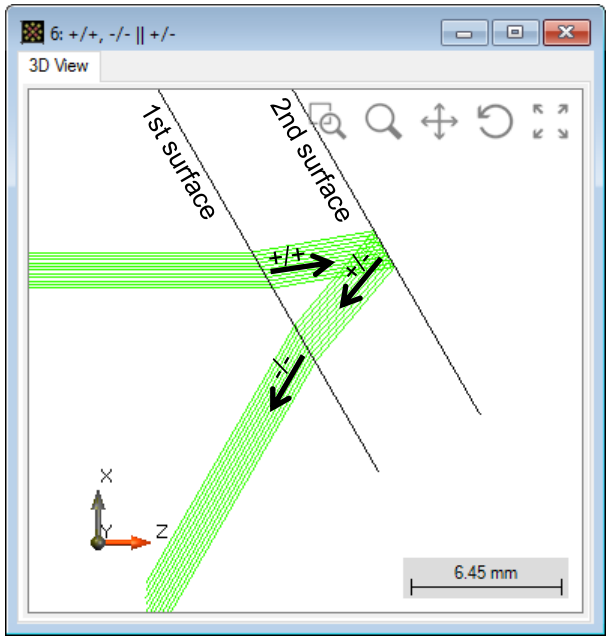
Surface	+/+	+/-	-/-	-/+
1st	×			
2nd	×			

Setting B



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

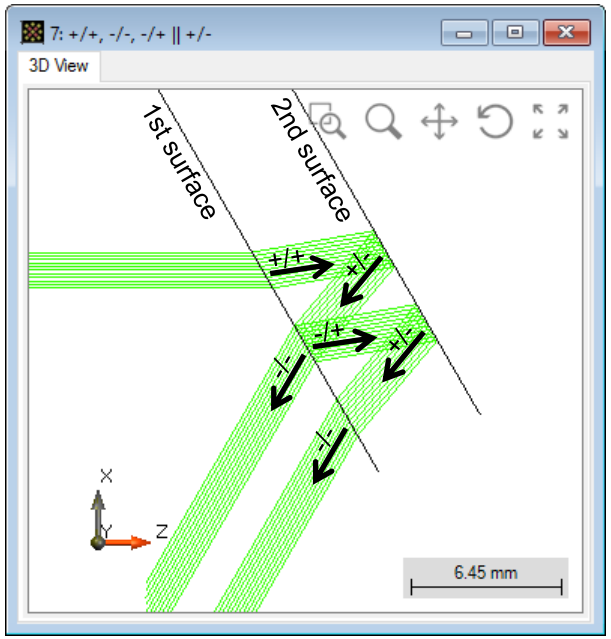
Setting C



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

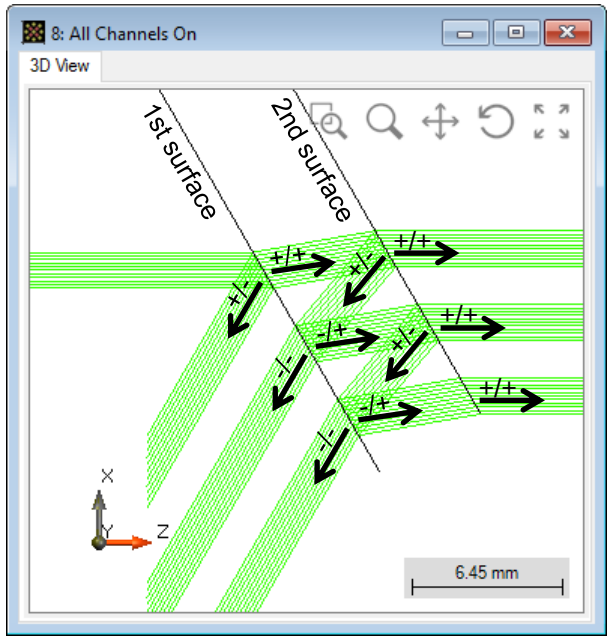
Surface Channels

Setting D



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

Setting E

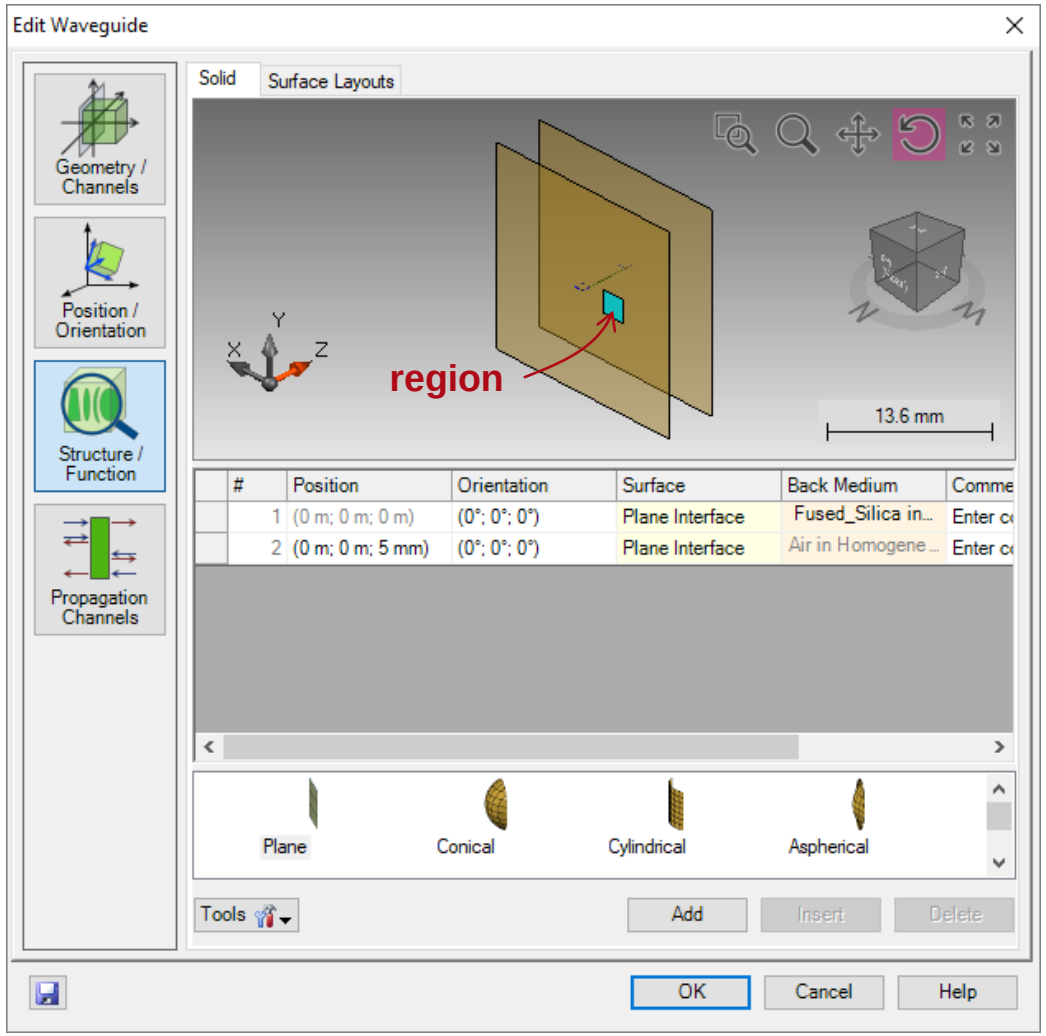


Surface	+/+	+/-	-/-	-/+
1st	×	×	×	×
2nd	×	×	×	×

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

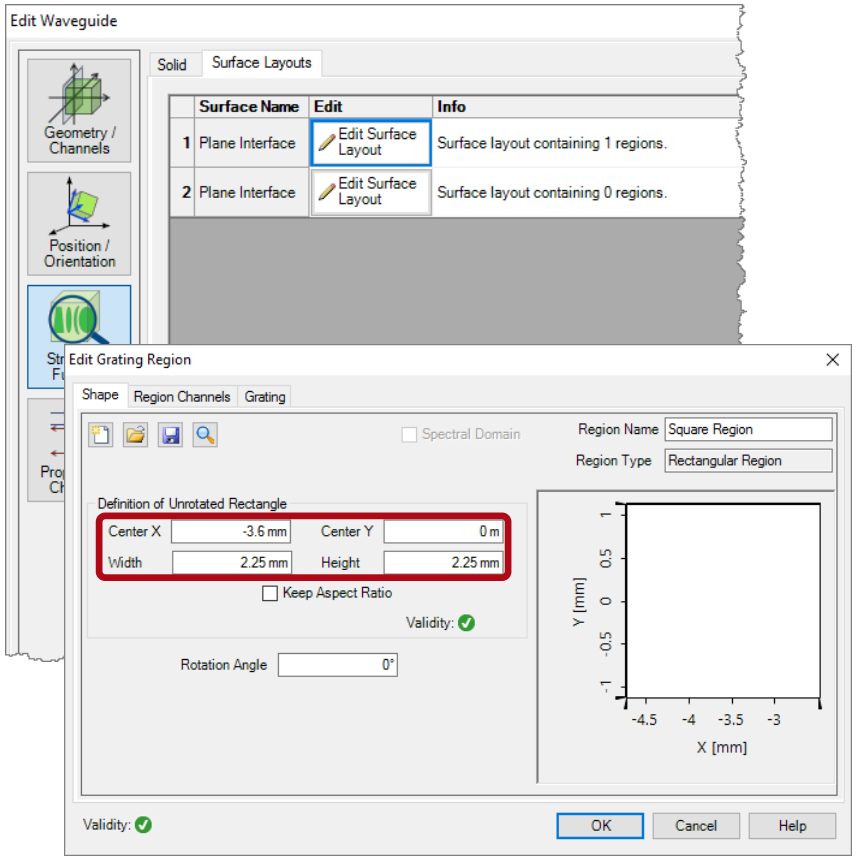
Region Channels

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



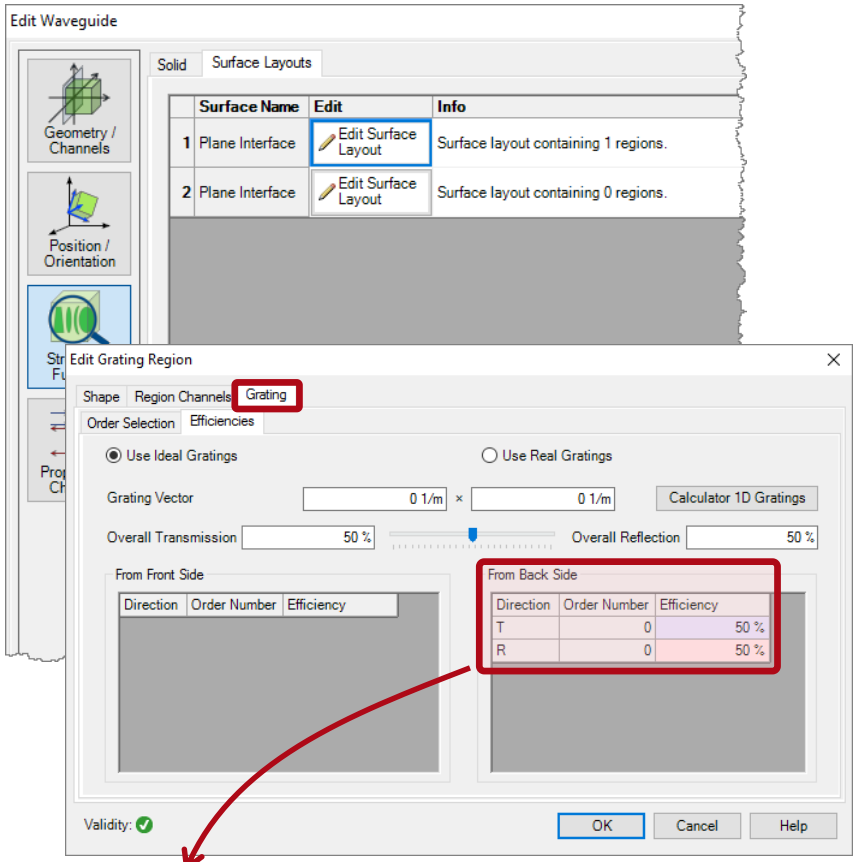
Region Channels

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



Region Channels

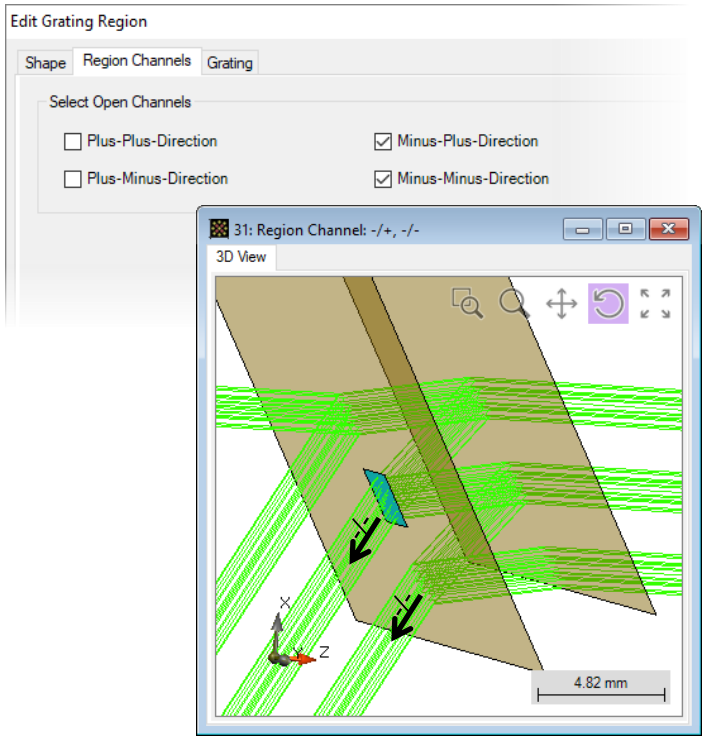
- Region definition
  - Create a rectangular region on 1st surface.
  - Set the region size as 2.25 mm × 2.25 mm, and its center at -3.6 mm along x-direction.
  - Define this region as grating with single transmission order T0 = 50 %, and single reflection order R0 = 50 %, which makes a semi-reflective mirror.



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

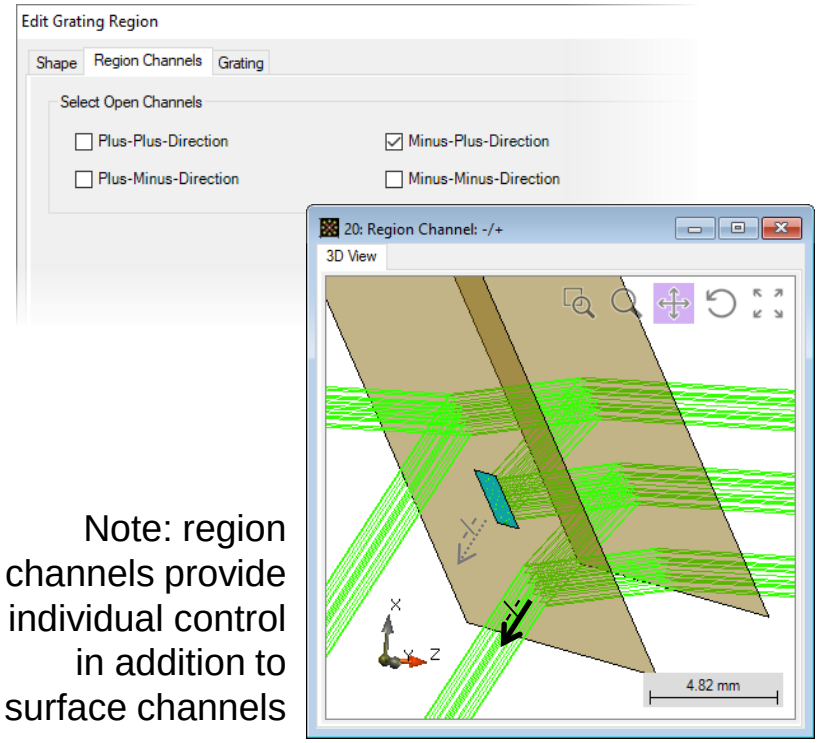
Region Channels

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



region channels -/+, -/- on

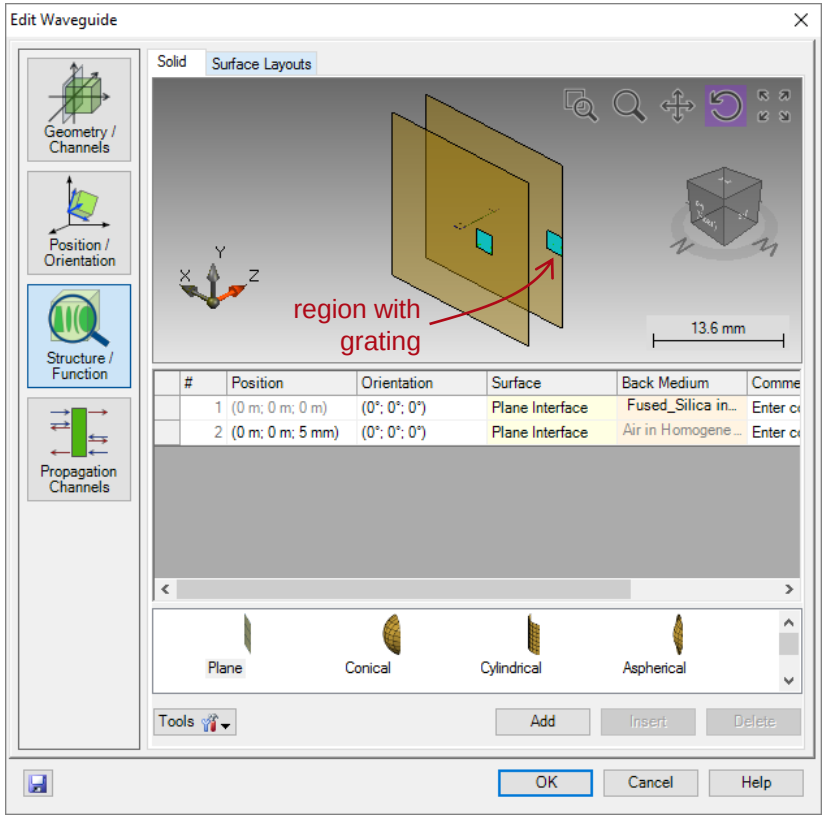
Note: region channels provide individual control in addition to surface channels



region channel -/+ on

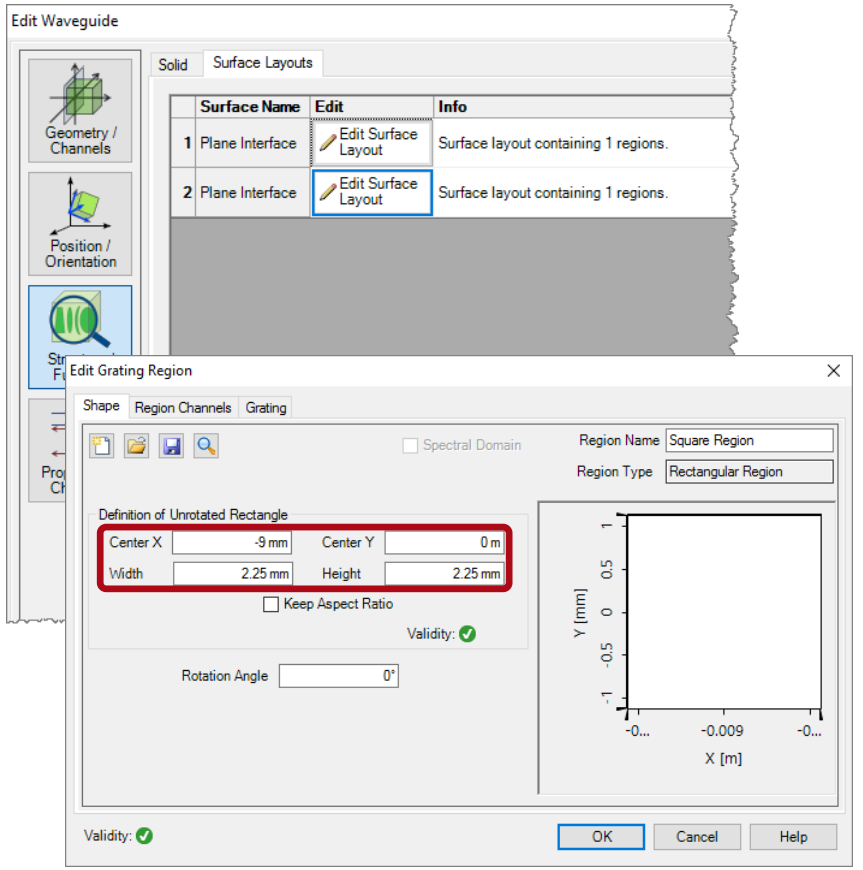
Region Channels with Grating

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



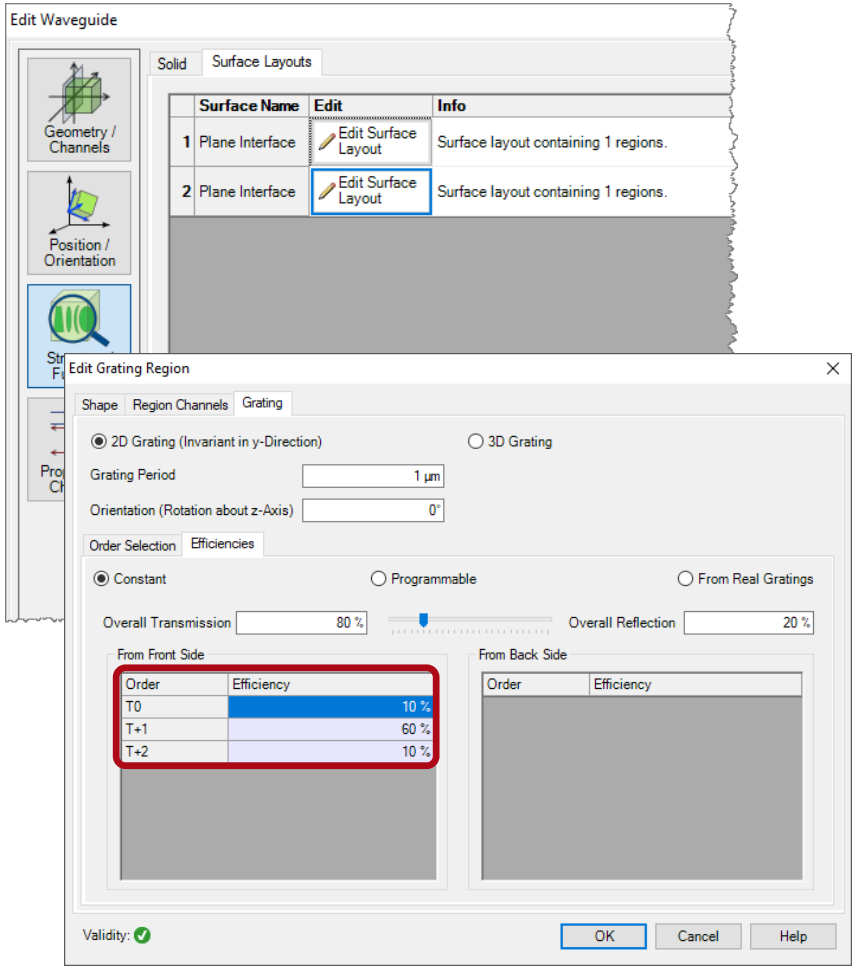
Region Channels with Grating

- Region definition
  - It is possible to define a diffractive grating on a given region.
  - We add a rectangular region (2.25 mm side length) on 2nd surface, centered at -9 mm along x-direction.



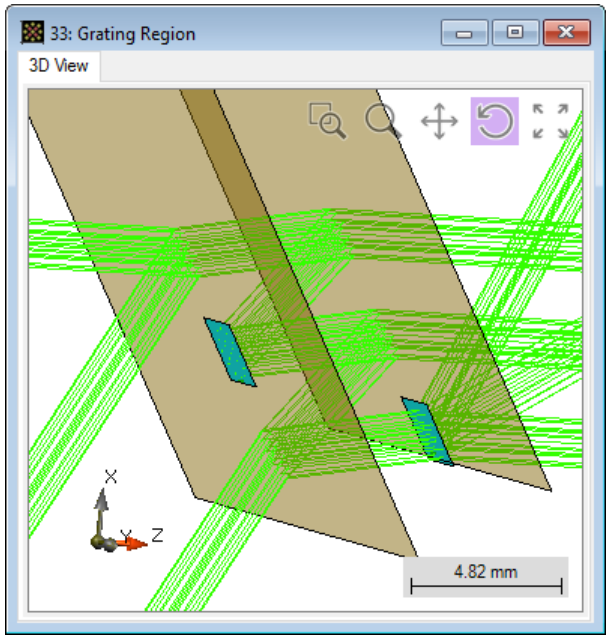
Region Channels with Grating

- Region definition
  - It is possible to define a diffractive grating on a given region.
  - We add a rectangular region (2.25 mm side length) on 2nd surface, centered at -9 mm along x-direction.
  - Define an ideal grating with 1 µm period, and specified diffraction coefficients as
    T0 = 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 a rectangular region (2.25mm side length) on 2nd surface, centered at -9mm along x-direction.
  - Define an ideal grating with 1μm period, and specified diffraction coefficients as T0 = 10%, T+1 = 60%, T+2 = 10%.



Region on surface 1: -/+ channel on
Region on surface 2: +/+ channel on
[with T0, T+1, T+2 diffraction orders]

Document Information

title	Channel Setting for Non-Sequential Tracing
document code	MISC.0013
version	1.1
toolbox(es)	Starter Toolbox (Non-Sequential Extension), Waveguide Toolbox
VL version used for simulations	7.4.0.49
category	Feature Use Case
further reading	- Non-Sequential Ray Tracing Analysis of Glass Plate - Modeling of Etalon with Planar or Curved Surfaces - Optimizing Waveguide Outcoupling Gratings for Uniform Multiple Channels