

Feature.0009

Specification of Diffraction Orders for Grating Regions

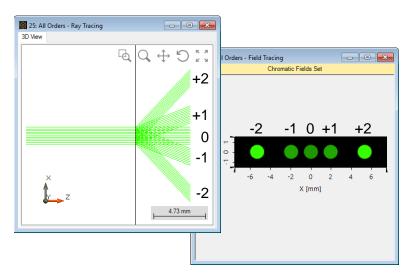
Different ways to specify diffraction orders for the grating regions and the corresponding consequences in ray/field tracing.

About This Use Case

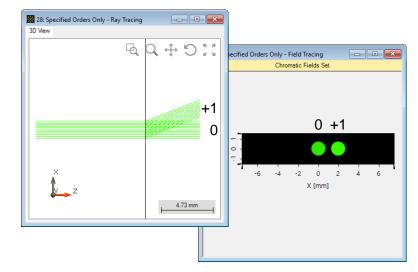
- The following toolbox is required
 - Waveguide toolbox
- This use case was produced with VirtualLab Fusion (Build 7.0.0.35).

This Use Case Shows...

 how to specify the diffraction orders for a grating region and the consequences in ray/field tracing.



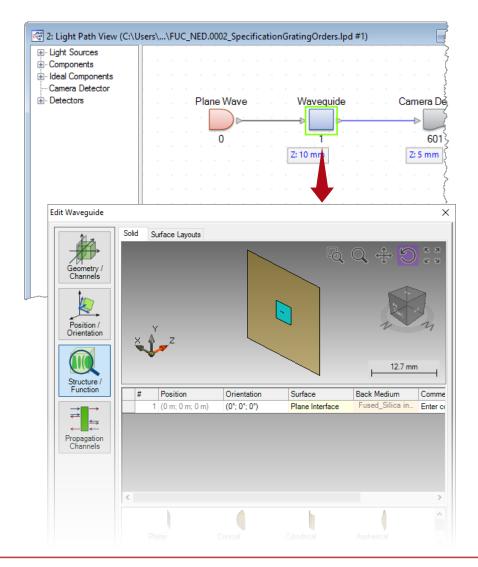
With all propagating orders (left: ray tracing; right: field tracing)



With only specified (0th and +1st) orders (left: ray tracing; right: field tracing)

System Construction

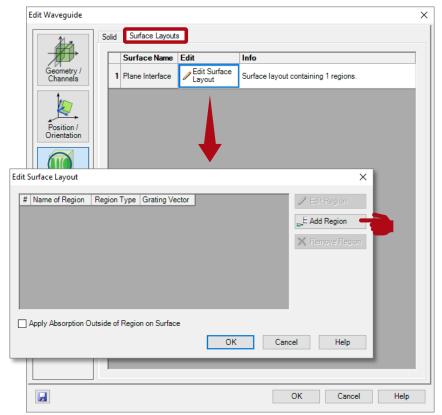
- Initialization
 - For illustration purposes, we work with a single plane interface, i.e., we just consider one surface of the waveguide.



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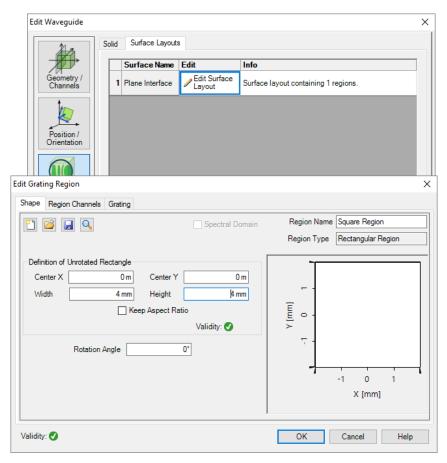
Region Definition

- Initialization
 - For illustration purposes, we work with a single plane interface, i.e., we just consider one surface of the waveguide.
 - Create a rectangular region on the plane interface by clicking on *Add Region*.



Region Definition

- Initialization
 - For illustration purposes, we work with a single plane interface, i.e., we just consider one surface of the waveguide.
 - Create a rectangular region on the plane interface by clicking on Add Region.
 - Define a rectangular region with a size of e.g. 4x4mm.



Grating Configuration

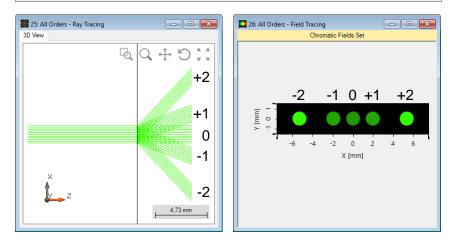
- Grating definition
 - Define an ideal linear grating with period of 1µm by using *Calculator 1D Gratings* (five propagating diffraction orders for 532nm wavelength in fused silica).

| Edit Grating Region | | × |
|----------------------------------------------------------------------------------------------|---------------------------|------------------------------|
| Shape Region Channels Grating Order Selection Efficiencies | | |
| Use Ideal Gratings | 🔿 Use Re | al Gratings |
| Grating Vector | 0 1/m × | 0 1/m Calculator 1D Gratings |
| Overall Transmission 80 % | | Overall Reflection 20 % |
| From Front Side | Calculate k-Vector from 1 | D Grating Parameters X |
| Direction Order Number Efficiency | Grating Period | 1 µm |
| | Rotation Angle | 0 ° |
| | Calculated K-Vector | 6.28E+06 1/m × 0 1/m |
| | | OK Cancel Help |
| | | |
| | | |
| Validity: 🕑 | | OK Cancel Help |

Grating Configuration and Simulation

- Grating definition
 - Define an ideal linear grating with period of 1µm by using Calculator 1D Gratings (five propagating diffraction orders for 532nm wavelength in fused silica).
 - Under the tab Order
 Selection, follow default
 setting with All Orders at
 first.
 - Run ray and field tracing simulations.

| Edit Grating Region | × |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Shape Region Channels Grating | |
| Order Selection Efficiencies | |
| Propagating Orders All Orders From Front Side Specified Orders All but Specified Orders Direction Order Number | From Back Side Direction Order Number |
| Add Order Remove Order | Add Order Remove Order |
| Validity: 🕑 | OK Cancel Help |



Grating Configuration

- Grating definition
 - Define an ideal linear grating with period of 1µm by using Calculator 1D Gratings (five propagating diffraction orders for 532nm wavelength in fused silica).
 - Under the tab Order Selection, change to
 Specified Orders, and click on Add Order to include
 e.g. the 0th and 1st transmission orders.

| Edit Grating Region | × |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Shape Region Channels Grating | |
| Order Selection Efficiencies | |
| Propagating Orders All Orders From Front Side Specified Orders Direction Order Number T 0 T +1 | From Back Side Direction Order Number |
| Add Order Remove Order | Add Order Remove Order |
| Validity: 🕑 | OK Cancel Help |

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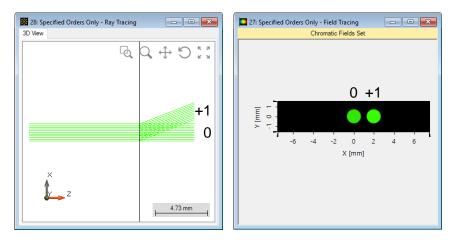
| Edit Grating Region | × |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Shape Region Channels Grating Order Selection Efficiencies Propagating Orders All Orders V From Front Side Direction Order Number T 0 T +1 T | From Back Side Direction Order Number |
| Add Order Remove Order | Add Order Remove Order |
| Validity: 🕑 | OK Cancel Help |

The direction of diffraction orders i.e. transmission (T) or reflection (R) can be specified by using the dropdown option.

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- Grating definition
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 - Under the tab Order Selection, change to
 Specified Orders, and click on Add Order to include
 e.g. the 0th and 1st transmission orders.
 - Run ray and field tracing simulations.

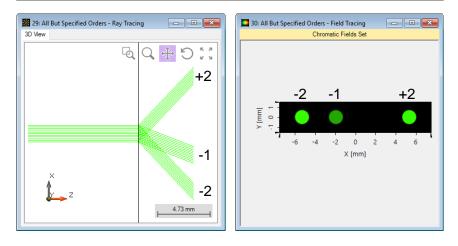
| Edit Grating Region | Х |
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| Shape Region Channels Grating | |
| Order Selection Efficiencies | |
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| Prom Front Side Specified Orders Direction Order Number T 0 T +1 | |
| Add Order Remove Order Remove Order | |
| Validity: OK Cancel Help | |



Grating Configuration and Simulation

- Grating definition
 - Define an ideal linear grating with period of 1µm by using Calculator 1D Gratings (five propagating diffraction orders for 532nm wavelength in fused silica).
 - Next, we change to All but Specified Orders.
 - Run ray and field tracing simulations.

| Edit Grating Region | × |
|---------------------------------------------------------------------------------------------|------------------------|
| Shape Region Channels Grating | |
| Order Selection Efficiencies | |
| Propagating Orders All Orders From Front Side Specified Orders Direction Order Number | From Back Side |
| T 0 | Direction Order Number |
| T +1 | |
| | |
| | |
| | |
| | |
| Add Order Remove Order | Add Order Remove Order |
| Validity: 🖉 | OK Cancel Help |



Document & Technical Info

| code | Feature.0009 |
|---------------------|---------------------------------------------------------|
| version of document | 1.0 |
| title | Specification of Diffraction Orders for Grating Regions |
| category | Configuration |
| author | Site Zhang (LightTrans) |
| used VL version | 7.0.0.35 |
| last modified on | August 25, 2017 |