

Feature.0010

#### **Specification of Diffraction Efficiencies for Grating Regions**

Diffraction efficiencies for a grating region can be either specified ideally with given values or calculated from real grating structures.

#### **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 efficiencies for a grating region by either defining their values manually or calculating them from real grating structures.



#### **System Construction**

- Initialization
  - Pre-define a grating region on a single plane interface.



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# **Diffraction Efficiency Settings**

- Grating definition
  - Define an ideal linear grating with period of 1µm.
  - By default, the overall transmission-reflection efficiency is preset at 80-20%, and they are uniformly distributed over all propagating orders.



overall transmission-reflection efficiency, or type in the values.

# **Field Tracing Simulation**

- Grating definition
  - Define an ideal linear grating with period of 1µm.
  - By default, the overall transmission-reflection efficiency is preset at 80-20%, and they are uniformly distributed over all propagating orders.
  - Run field tracing simulation.

dit Grating Region	×
Shape Region Channels Grating	
Order Selection Efficiencies	
Use Ideal Gratings	O Use Real Gratings
Grating Vector 6.28E+06 1/m × [	0 1/m Calculator 1D Gratings
Overall Transmission 80 %	Overall Reflection 20 %
From Front Side	From Back Side
Direction Order Number Efficiency	Direction Order Number Efficiency



### **Diffraction Efficiency Settings**

- Grating definition
  - To define certain orders with given efficiencies, one must specify these orders first under the Order Selection tab.
  - Then define the efficiency for the specified diffraction orders, e.g., T-1=75% and R+1=19%, under the *Efficiencies* tab.

dit Grating Region			×
Shape Region Channels Grating			
Order Selection Efficiencies			
Propagating Orders All Orders	~		
From Front Side		From Back Side	
Direction Order Number T -1 R +1		Direction Order Number	
Edit Grating Region			×
Shape Region Channels Grating			
Order Selection Efficiencies			
Use Ideal Gratings		O Use Real Gratings	
Grating Vector	6.28E+06 1/m ×	0 1/m	Calculator 1D Gratings
Overall Transmission	80 %	Overall Reflec	ction 20 %
From Front Side		From Back Side	
Direction Order Number Ef	ficiency	Direction Order Number	Efficiency
R +1	75 % 19 %		
Validity: 🕑		ОК	Cancel Help

# **Field Tracing Simulation**

- Grating definition
  - To define certain orders with given efficiencies, one must specify these orders first under the Order Selection tab.
  - Then define the efficiency for the specified diffraction orders, e.g., T-1=75% and R+1=19%, under the *Efficiencies* tab.
  - Run field tracing simulation.





# **Grating Configuration**

- Grating definition
  - Next we Use Real Gratings instead of ideal ones.
  - VirtualLab can calculate automatically the real grating period according to the ideal grating vector.
  - To keep the grating period as defined ideally, we choose Yes in the pop-up window.

Edit Grating Region		×
Shape Region Channels Order Selection Efficien	g Grating Incies	
Use Ideal Grating	us O Use Real Gratings	
Grating Vector	6.28E+06 1/m × 0 1/m Calculator 1D Grating	S
Overall Transmission	n 80 %	%
From Front Side	From Back Side	
Direction Order T R	Number     Efficiency       -1     75 %       +1     19 %	
Validity: 🕑	Period Conversion × Hel	p
	Calculate stack period and orientation from grating vector?	
	Yes No	

## **Grating Configuration**

- Grating definition
  - Set up the default
     Sawtooth Grating with 1µm modulation depth (check Grating Toolbox for more info).

Edit Grating Region	×
Shape         Region Channels         Grating           Order Selection         Efficiencies	
O Use Ideal Gratings	Use Real Gratings
Sawtooth Grating Orientation (Rotation about z-Avis)	Call Color Point Avia by 190°
Settings for Generation of Lookup Table Number of Evanescent Orders 10	
Decomposition Settings Configure	
Lookup Table No lookup table set	X Remove
Validity: 🔥	OK Cancel Help



# **Grating Configuration**

- Grating definition
  - Set up the default Sawtooth Grating with 1µm modulation depth (check Grating Toolbox for more info).
  - Following the same way, we also set up a Sinusoidal Grating with the same period and modulation depth, for comparison.

Edit Grating Region		$\times$
Shape Region Channels Grating		
Order Selection Efficiencies		
◯ Use Ideal Gratings	<ul> <li>Use Real Gratings</li> </ul>	
Grating Stack		
Sinusoidal Grating	🖾 Load 🥒 Edit 🔍 View	
Orientation (Rotation about z-Axis)	0° Rotation about y-Axis by 180°	
Settings for Generation of Lookup Table		
Number of Evanescent Orders	10 ≑	
Decomposition Settings	Configure	
Lookup Table		
No lookup table set		
🚰 Load	Save X Remove	
Validity: 🛕	OK Cancel Help	



# **Field Tracing Simulation**

- Grating simulation
  - Run field tracing simulation for both the sawtooth and the sinusoidal gratings.



Sawtooth grating shows asymmetry in diffraction efficiencies



Sinusoidal grating provides symmetric efficiencies around zeroth order

#### **Document & Technical Info**

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