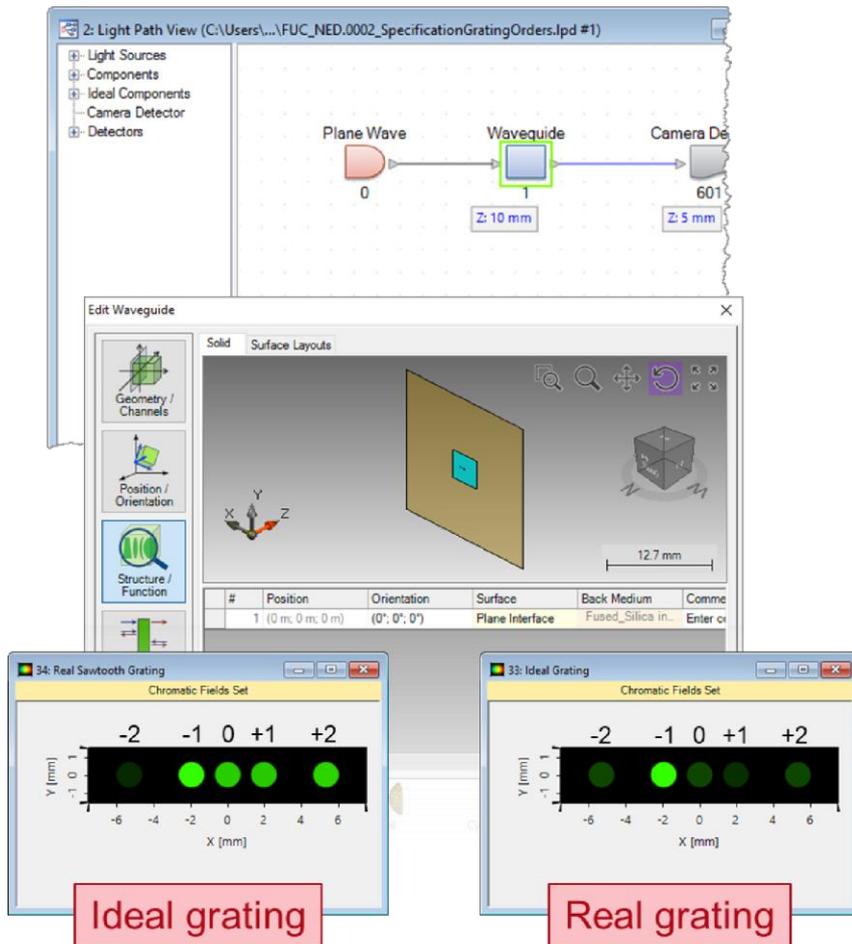


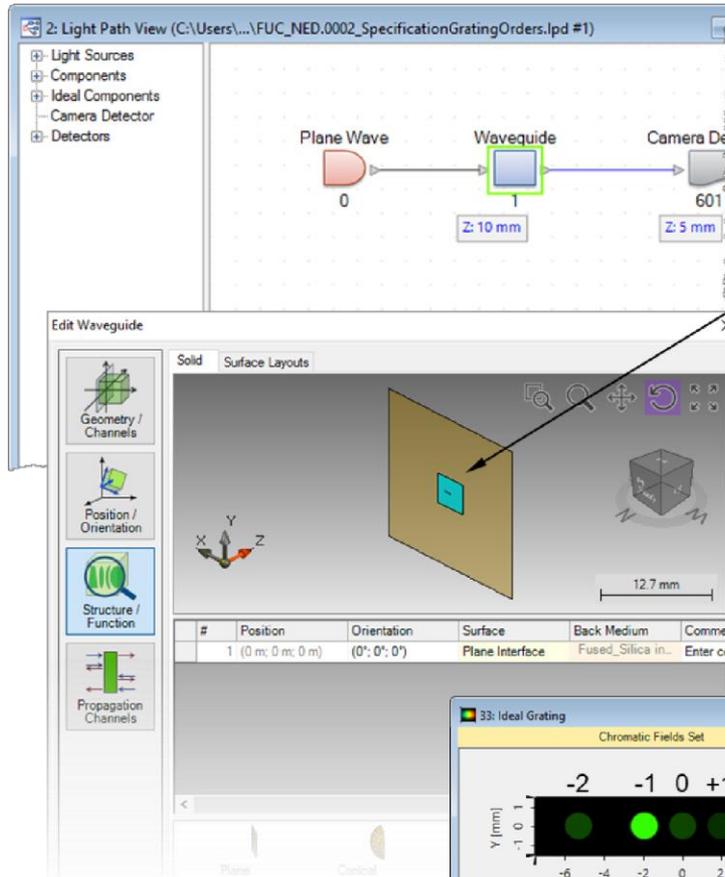
Specification of Diffraction Efficiencies for Grating Regions

Abstract



In modern optical systems, gratings are no longer just components in their own right: they also often appear etched into or deposited onto the surface of other elements. When this is the case, they may cover only part of that surface. This is what we call a “grating region”. When simulating a system which contains such a component in VirtualLab Fusion, the user can choose between modeling the grating rigorously or inputting the values of the efficiencies *ad hoc* when the behaviour of the grating is known, or a good guess is available. Both procedures are illustrated here.

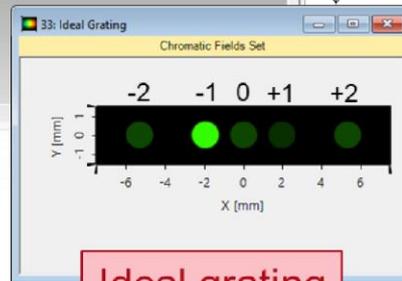
Modeling Task



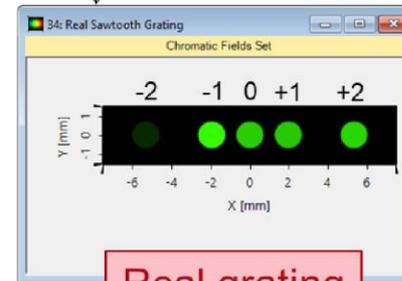
Grating region

How to

How to characterise the efficiencies of a grating region in VirtualLab Fusion? Find out here how to input the values manually, or how to obtain them rigorously (FMM simulation)



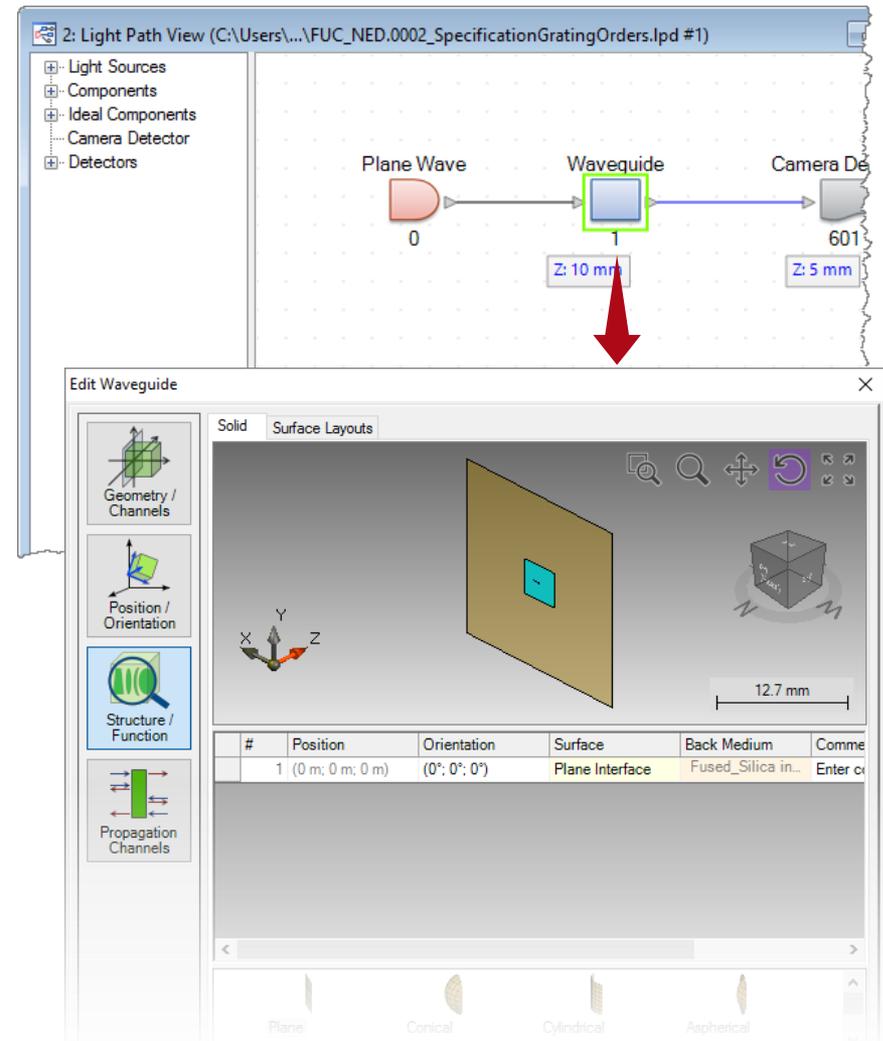
Ideal grating



Real grating

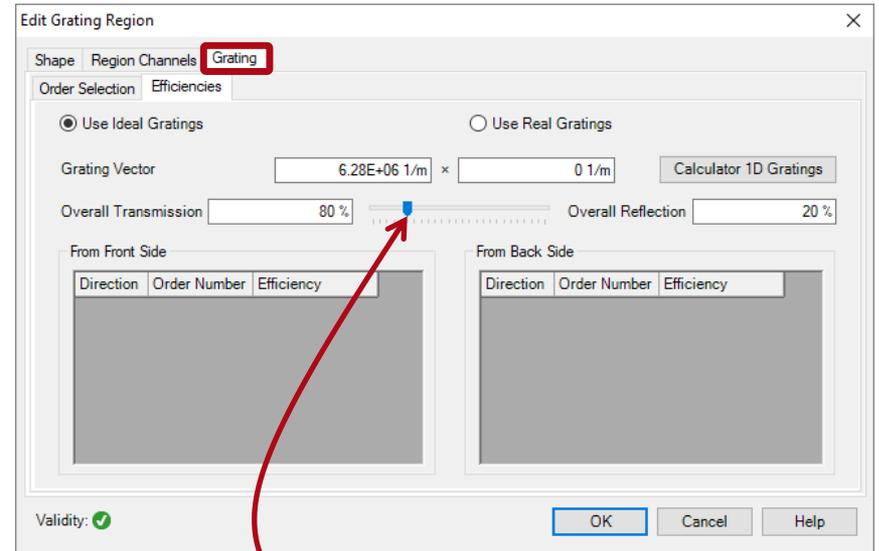
System Construction

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



Diffraction Efficiency Settings

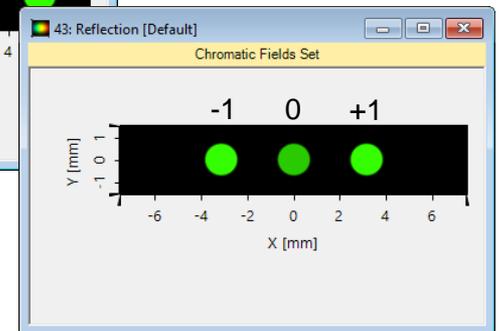
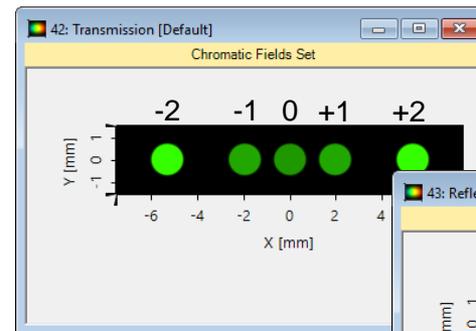
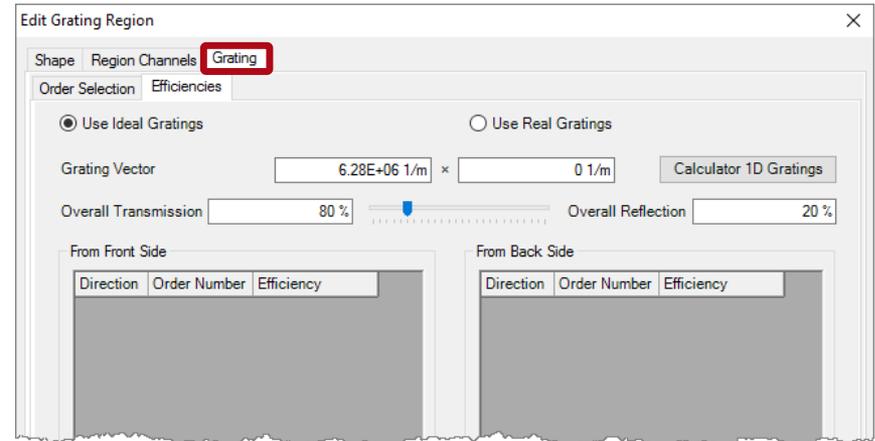
- Grating definition
 - Define an ideal linear grating with period of $1\ \mu\text{m}$.
 - By default, the overall transmission-reflection efficiency is preset at 80-20%, and they are uniformly distributed over all propagating orders.



Drag the slide bar to adjust the overall transmission-reflection efficiency, or type in the values.

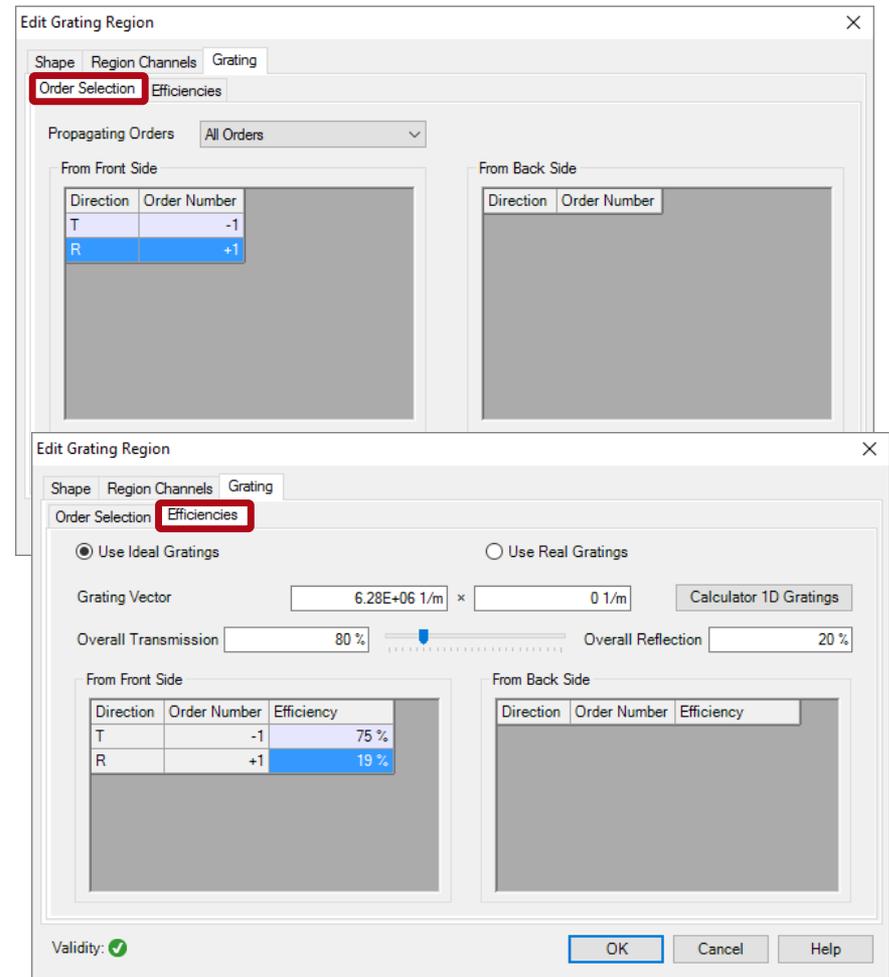
Field Tracing Simulation

- Grating definition
 - Define an ideal linear grating with period of $1\ \mu\text{m}$.
 - 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.



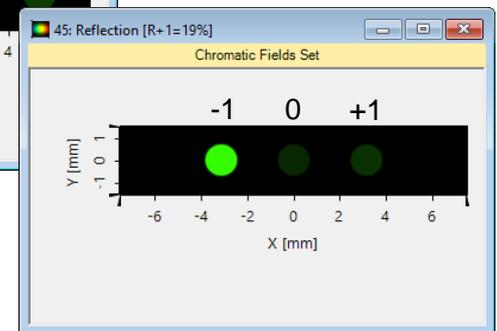
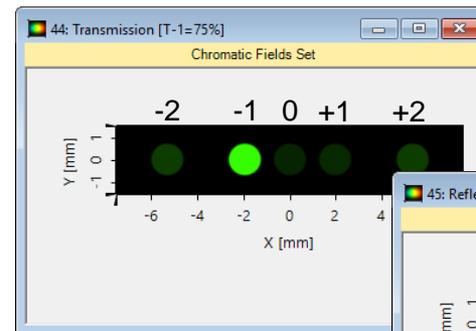
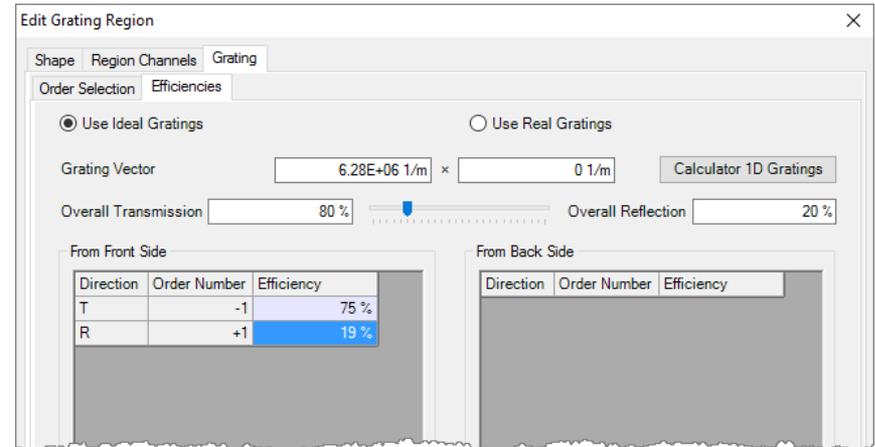
Diffraction Efficiency Settings

- 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.



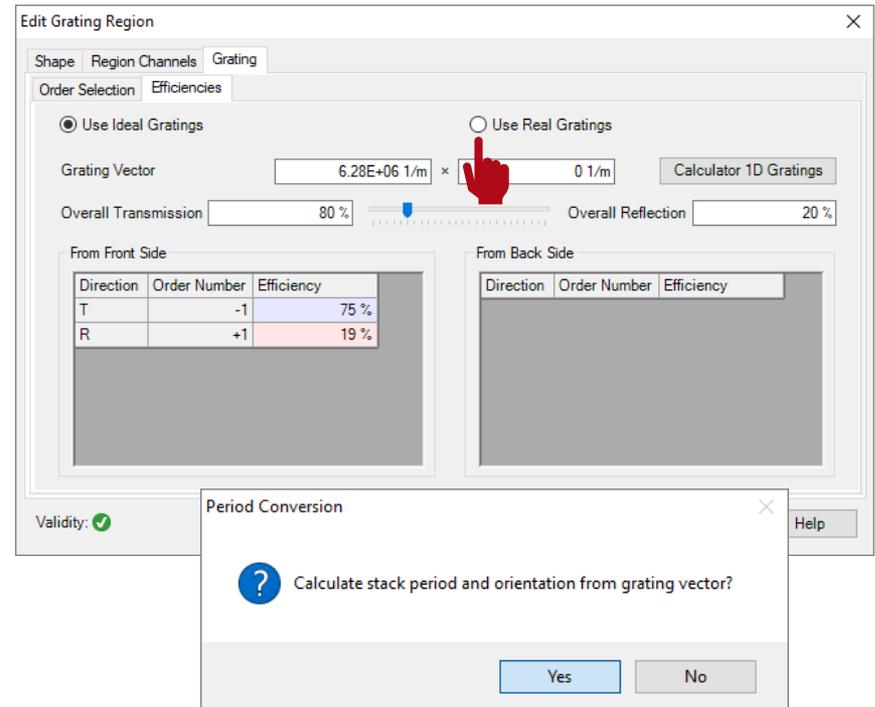
Field Tracing Simulation

- 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.



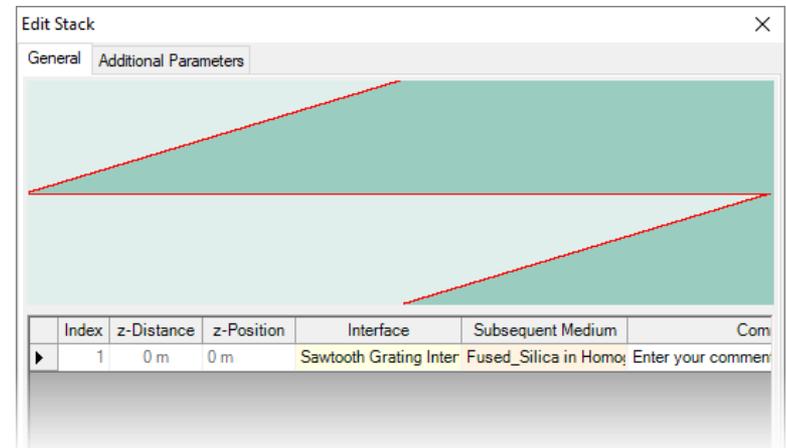
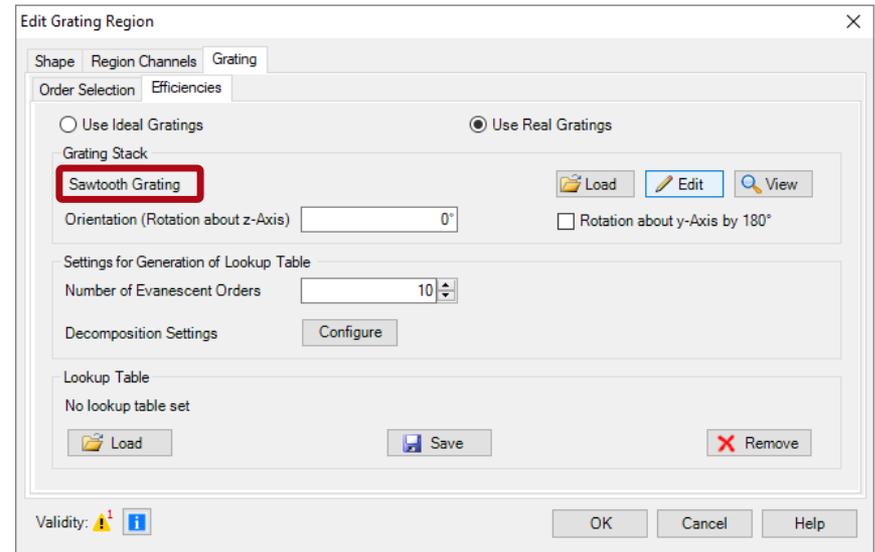
Grating Settings

- 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.



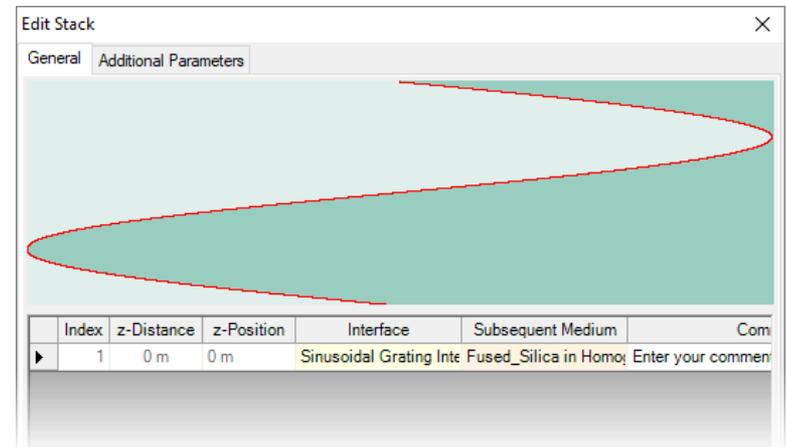
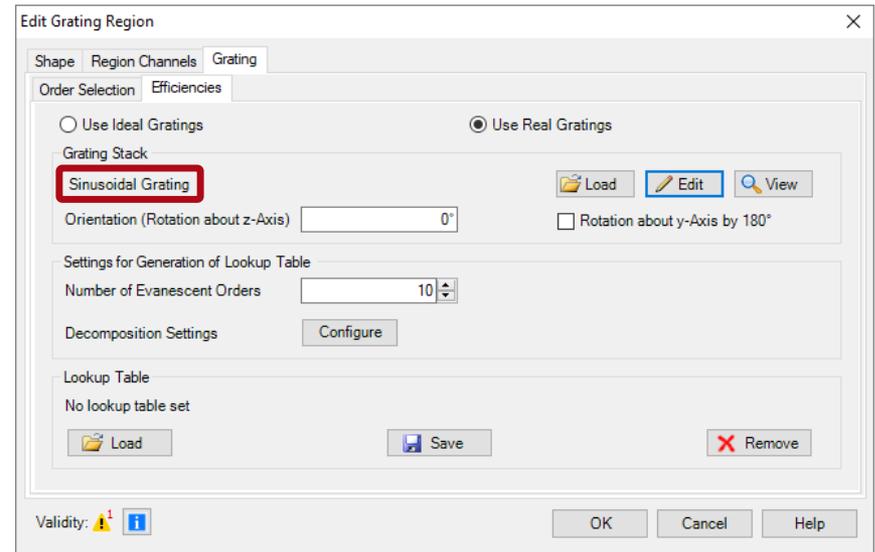
Grating Settings

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



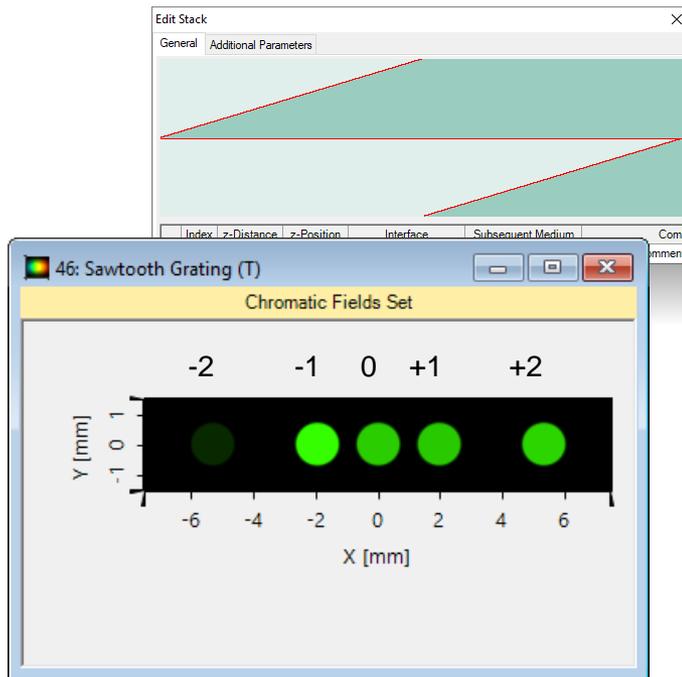
Grating Settings

- Grating definition
 - Set up the default Sawtooth Grating with 1 μm 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.

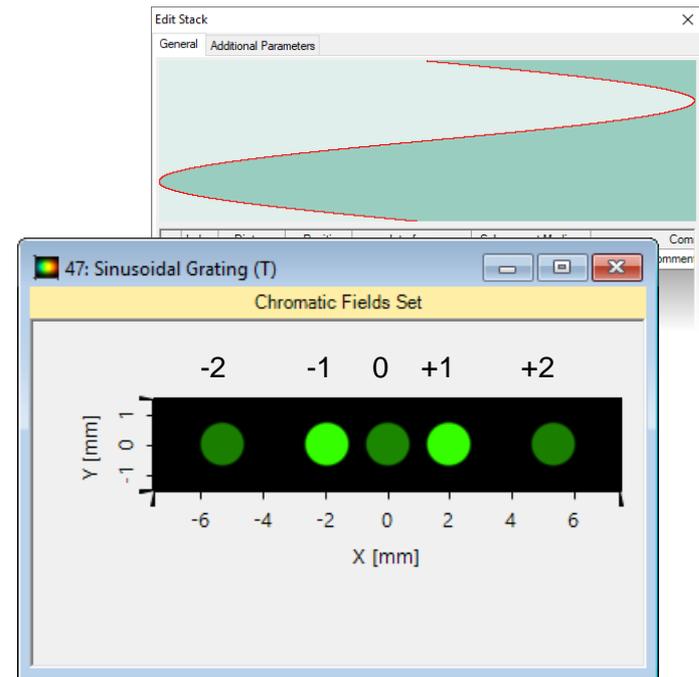


Field Tracing Simulation

- 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 Information

title	Specification of Diffraction Efficiencies for Grating Regions
version	2.0
VL version used for simulations	7.0.3.4
category	Feature Use Case
