UseCase.0087 (1.0)

Conical Incidence

Keywords: Grating Order Analyzer, Order Collection, Conical incidence, Rayleigh Expansion Propagation, Far field propagation, Far Field Operator

Description

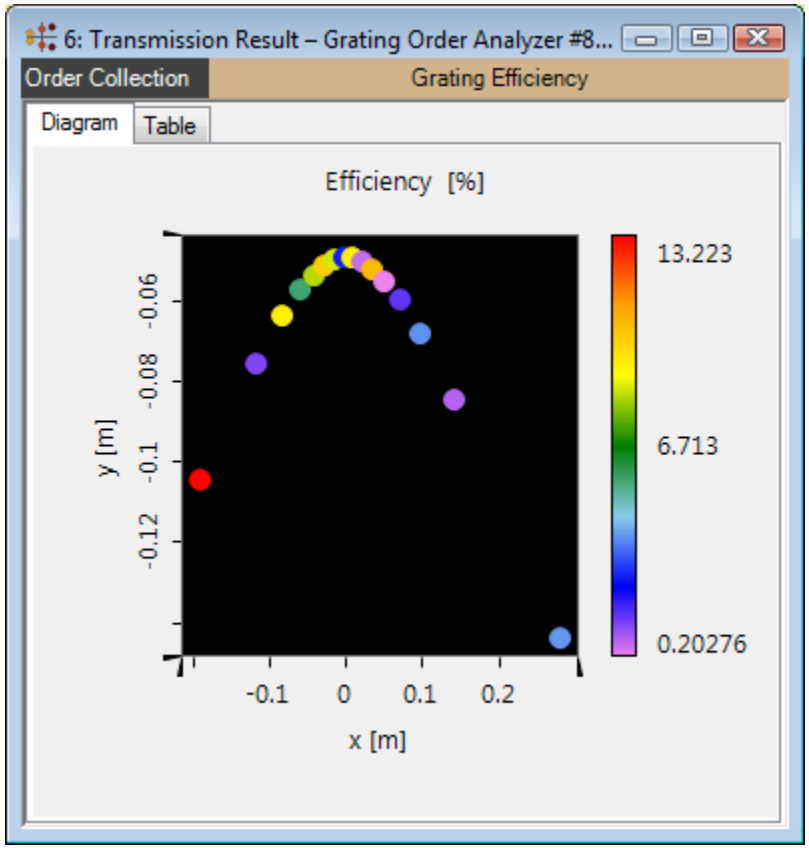
- This use case demonstrates VirtualLab's capabilities in handling and visualizing conical incidence on y-invariant gratings.
- Two approaches are shown, one via the Grating Order Analyzer, one via Classic Field Tracing.
- Conical incidence means that the direction of the incident light has a non-vanishing y-component. In this case the grating orders are no longer distributed simply on a plane.

Via the Grating Order Analyzer

Introduction

- The Order Collections output by the Grating Order Efficiency Analyzer comprises the efficiencies, Rayleigh coefficients and the complete direction information for either all transmitted or all reflected orders.
- Thus an Order Collection allows you to plot the efficiencies versus their positions to get an impression of the effect of conical incidence.

Result



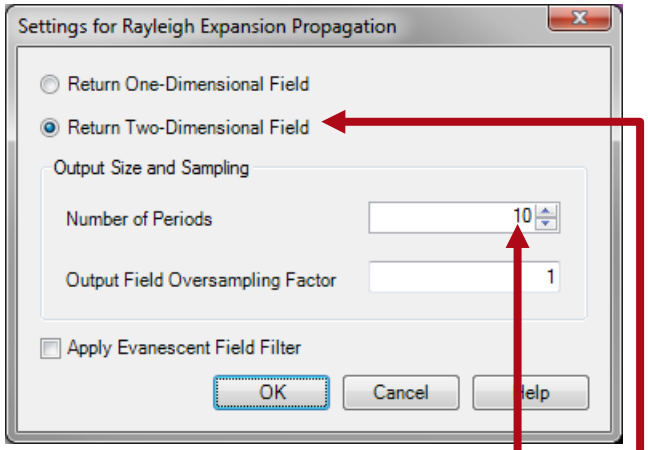
- The efficiencies of the sample grating (UseCase.0087.lpd) plotted versus their positions at a distance of 100 mm.
- Reverse Rainbow is used as color lookup table.
- This file has been saved as UseCase.0087.oc.

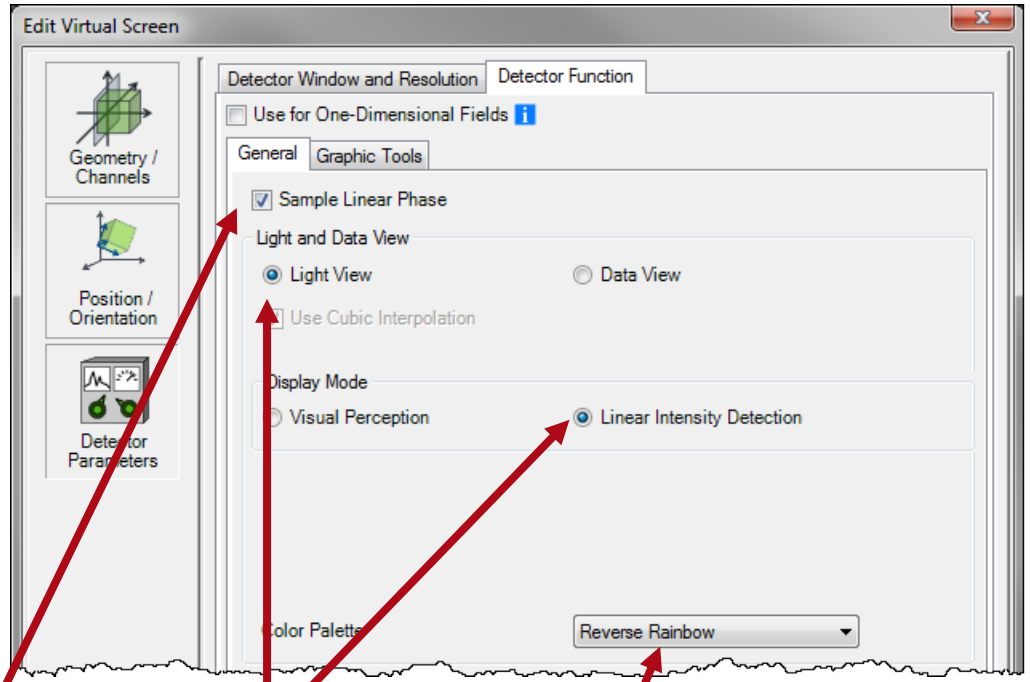
Via Classic Field Tracing

Introduction

- If you want to see the real light distribution behind a grating you have to use Classic Field Tracing (with the Rayleigh Expansion Propagation) instead of the Grating Order Analyzer.
- Note that grating components have an infinite extension in both x- and y-direction and are illuminated by an Ideal Plane Wave which has an infinite extension too. Thus the resulting field always represents the near field – no separate orders are shown.
- Therefore you would have to propagate the resulting near field to the far field in a consecutive step.

Configuration of the Light Path Diagram





Increase the number of periods to obtain smaller spots and reduced sinc effects due to diffraction at the border of the field.

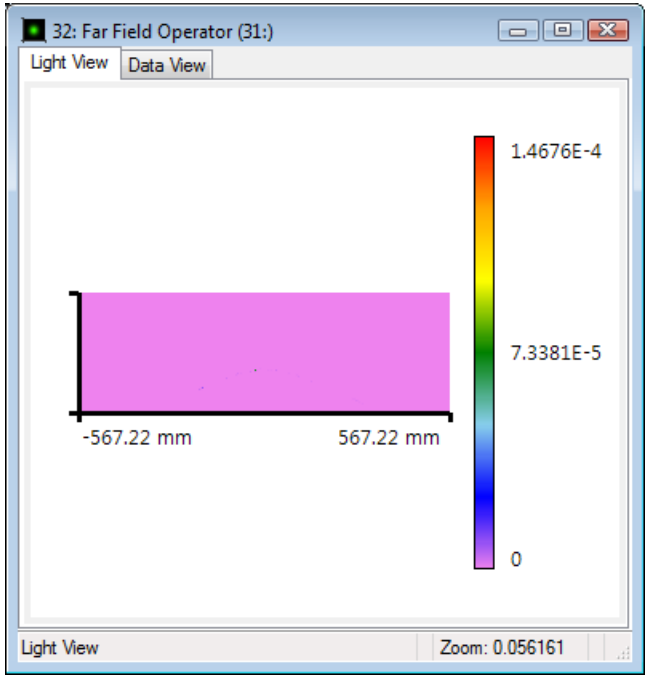
Otherwise you won't see the effects of conical incidence.

To be able to compare the resulting field with the calculated efficiencies

To see also faint orders.

Propagation to the Far Field

- On the resulting near field, apply Propagations > Far Field Operator (default settings and a propagation distance of 100 mm).



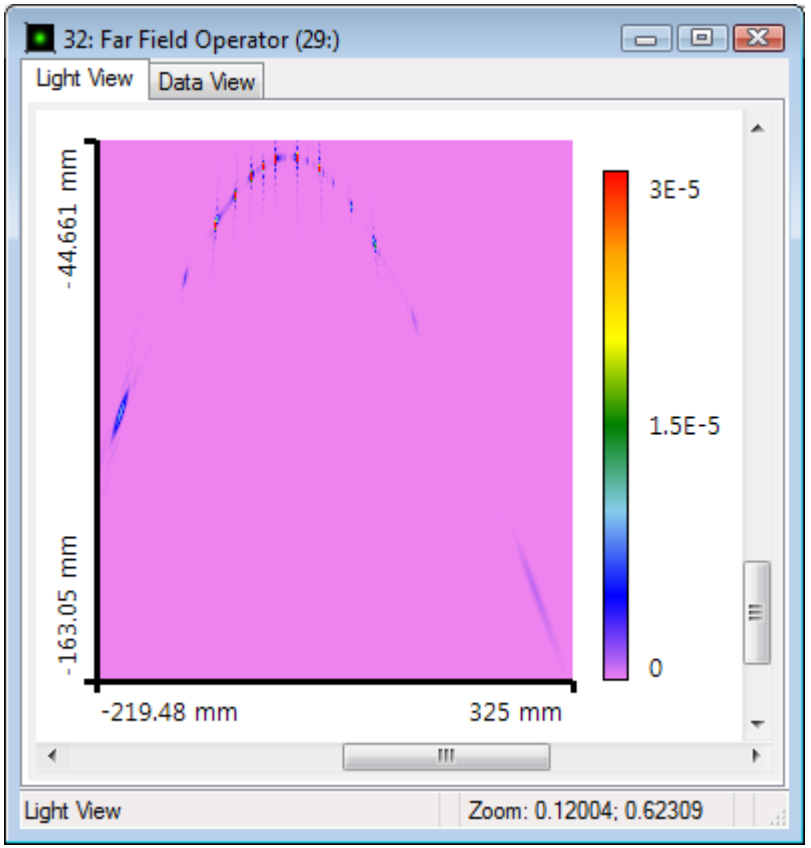
View Settings

Property Browser

Light | View | Point Manipulation

General	
Window Size	**400, 420**
Norm and Power	
Norm of Whole Component	0.035371
Power of Whole Field	3.5232 pW
Profile Line	
Display Profile Line	**False**
Selection	
Display Selection Marker	**False**
Value Range	
Color Palette	**Reverse Rainbow**
Max	**3E-05**
Min	**1.4328E-26**
Value Range	**User-Defined Scaling**
Zoom	
Aspect Ratio	**Free Aspect Ratio**
Zoom Factor	**(0.12004; 0.62309)**
Zoom Rectangle (in Physical Coordinates)	**(-215.3 mm; -163.93 mm); (5**
Location	**(-215.3 mm; -163.93 mm)**
Size	**(544.48 mm; 118.39 mm)**

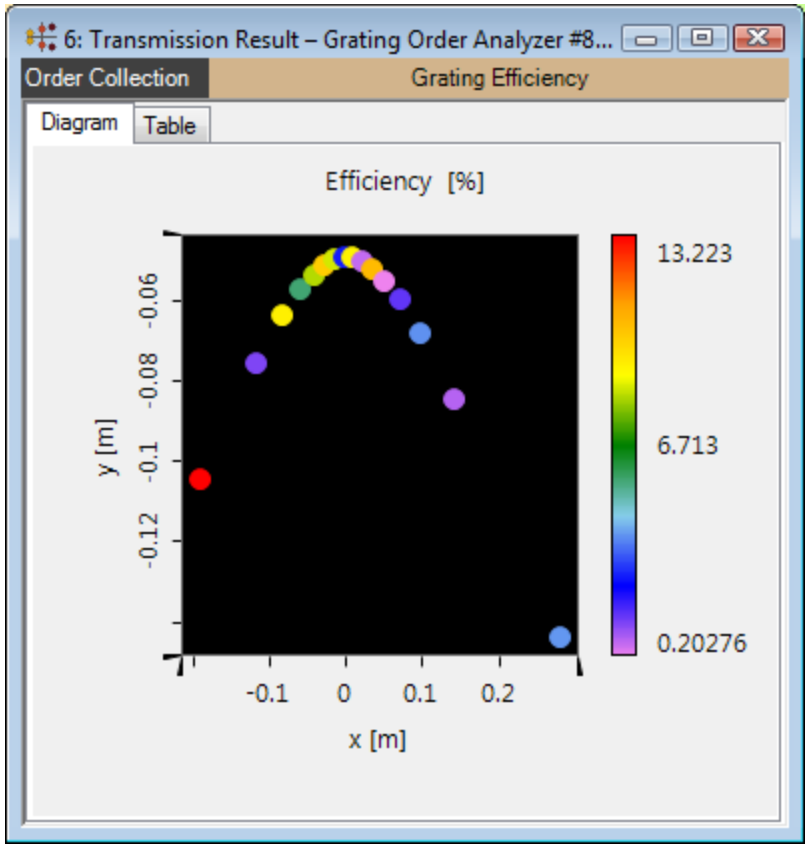
Results in



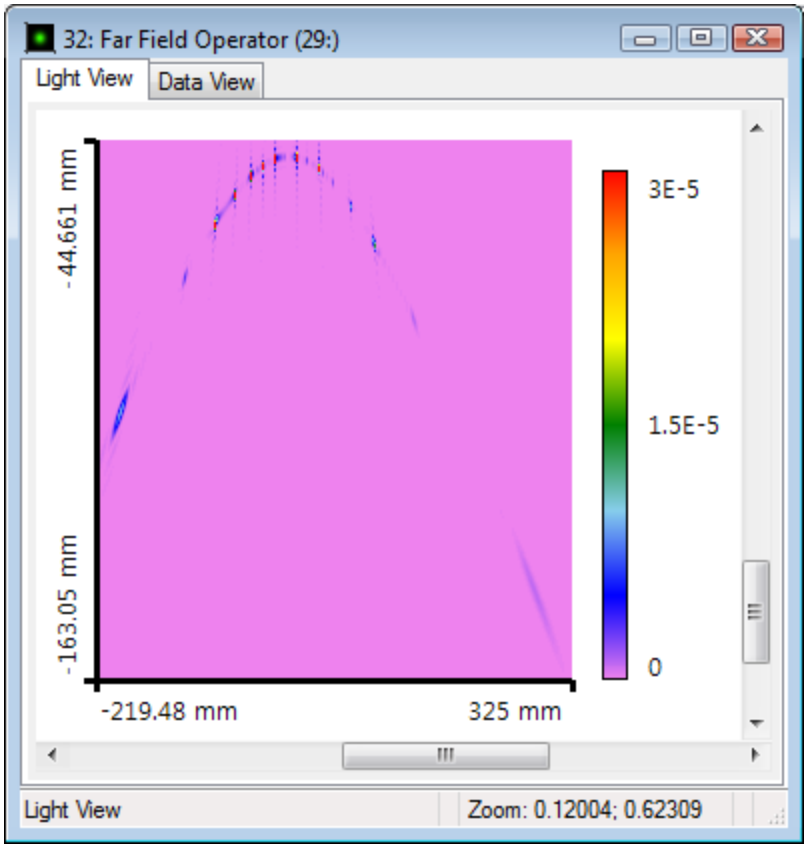
Conclusion

Comparison (Screenshots)

Grating Order Analyzer



Classic Field Tracing



Comparison (-4th Order)

Grating Order Analyzer

- Position:
  (-119.0 mm; -74.7 mm)
- Efficiency:
  1.21 %
  (related to incident field)

Classic Field Tracing

- Position:
  (-118.6 mm; -74.6 mm)
- Power:
  1.33 %
  (related to overall power of transmitted field)

Summary

- VirtualLab offers two ways to handle and visualize conical incidence on y-invariant gratings: one via the Grating Order Analyzer and one via the Rayleigh Expansion Propagation and a subsequent far field propagation.
- The former is more simple to use, the latter also shows diffraction and distortion effects.