UseCase.0066 (1.0)

# Calculators in VirtualLab

**Keywords:** Calculator, grating equation, Fresnel coefficient, Cartesian angle, spherical angle, Euler angle, Gaussian beam, ABCD matrix, wave number

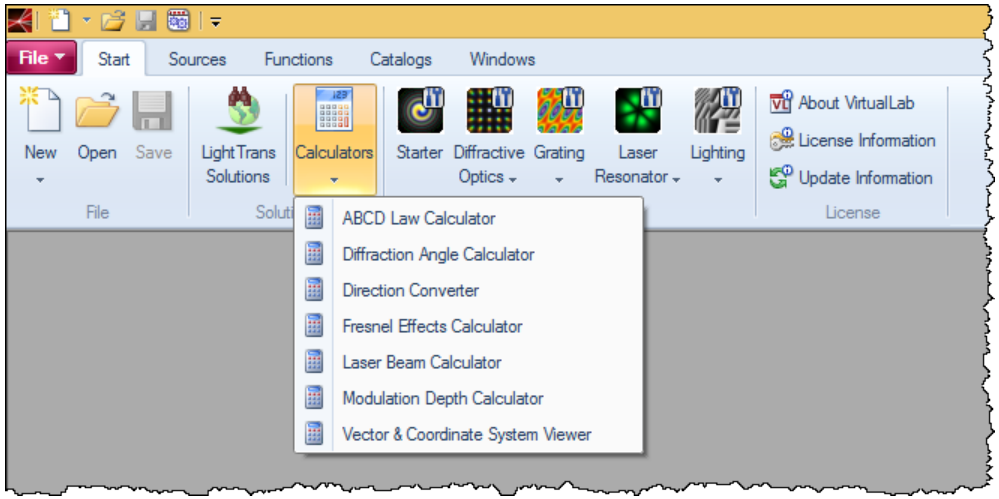
# Description

- This use case introduces the so-called calculators of VirtualLab.

- These calculators represent helping tools for diverse computations and visualizations.

# Introduction

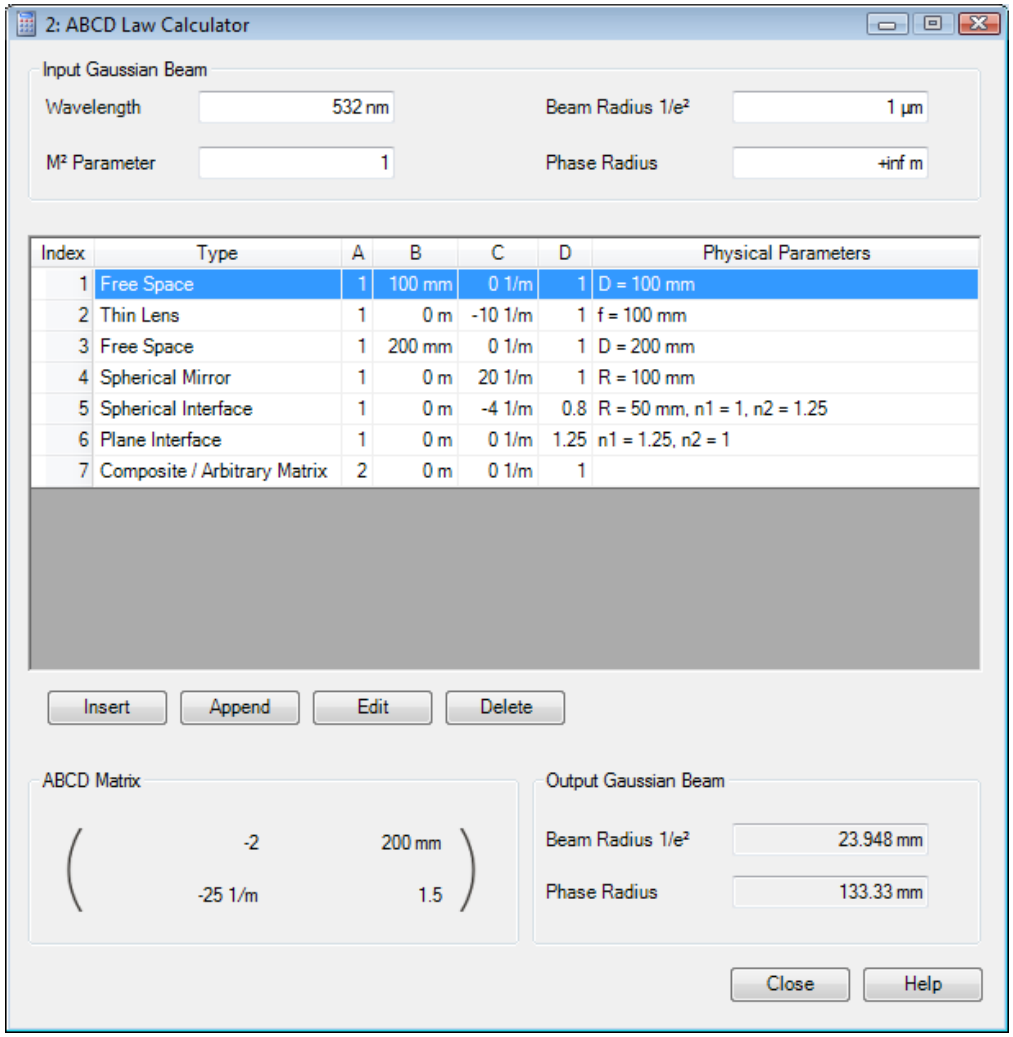
- Calculators can evaluate and visualize several basic equations and in this way help to interpret more complex simulations.
- They are documents which means that you can
  - Rename them
  - Activate them via the VirtualLab Explorer
  - And, most important, save them with their last settings and results.



# ABCD Law Calculator

- Allows you to build a simple system out of ABCD matrix elements.
- Then, the effect of this system on an arbitrary Gaussian beam is calculated.
- The system can be copied afterwards to the Ideal Component “ABCD Matrix Setup” to evaluate the effect of this system on arbitrary fields.

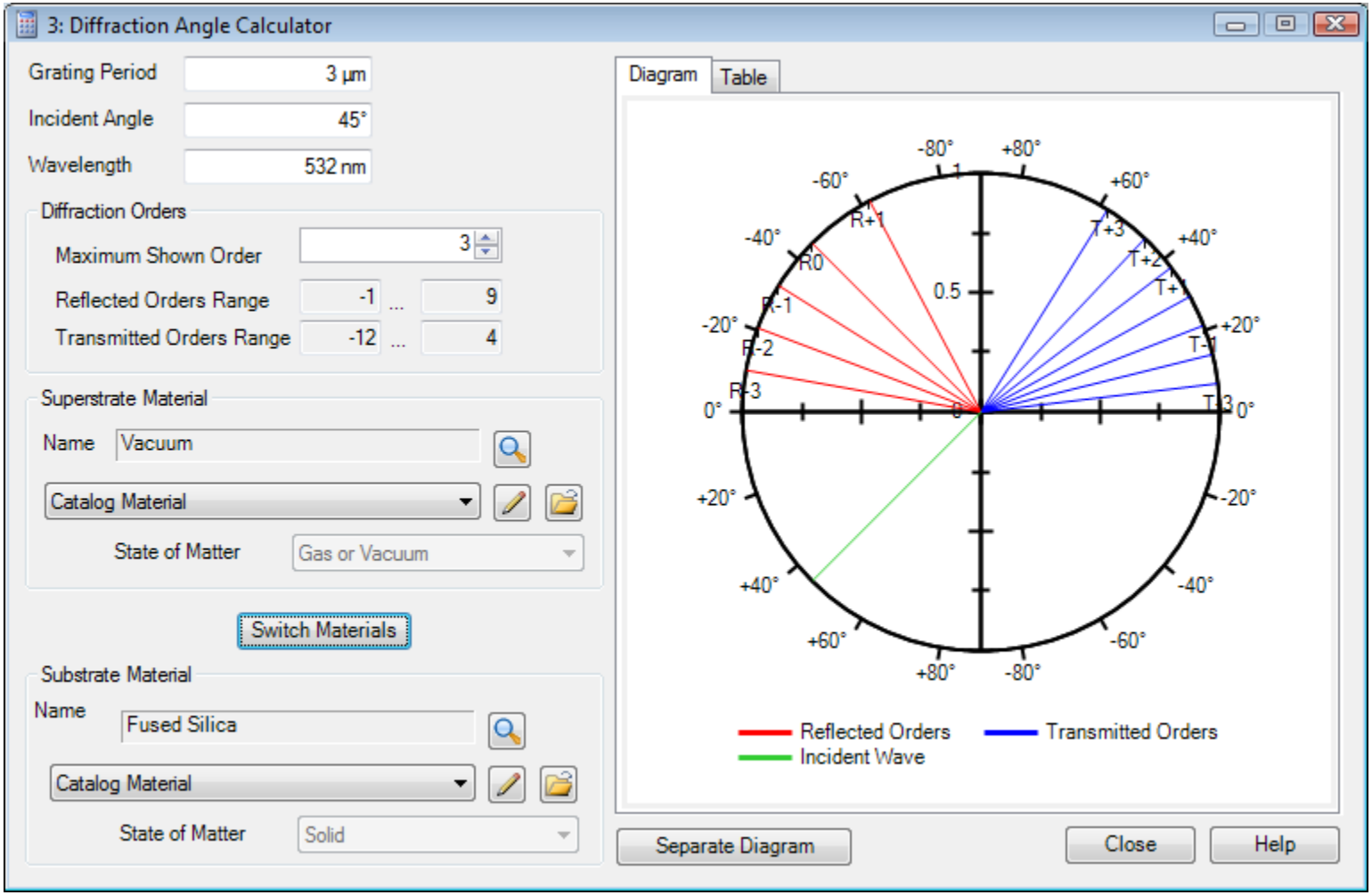
# ABCD Law Calculator (Demo View)



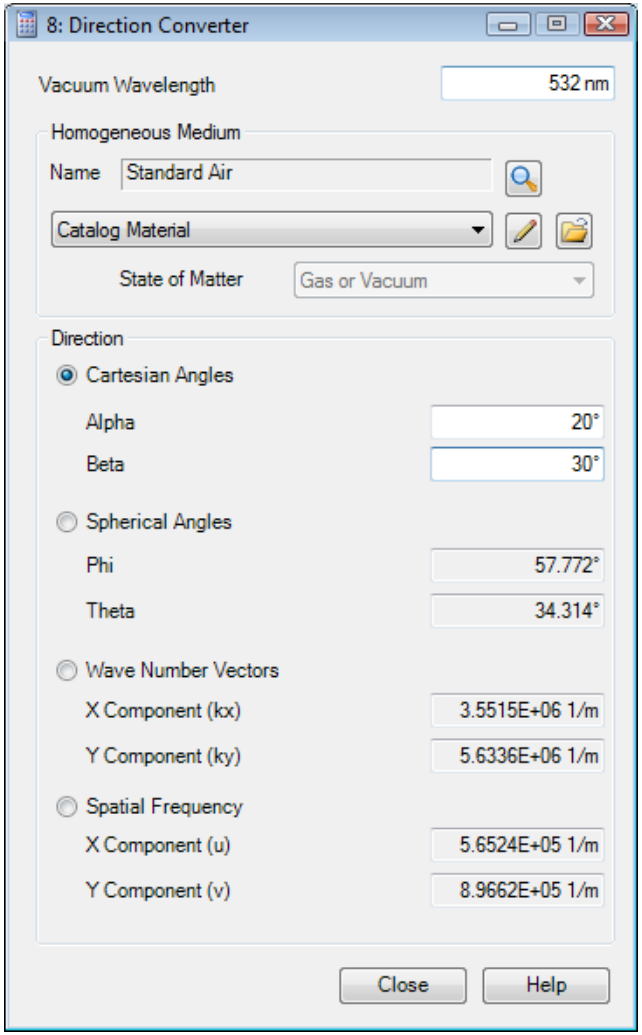
# Diffraction Angle Calculator

- Allows you to visualize the angles of the diffraction orders of a grating with a certain period.
- Both transmitted and reflected orders are shown.

# Diffraction Angle Calculator



# Direction Converter

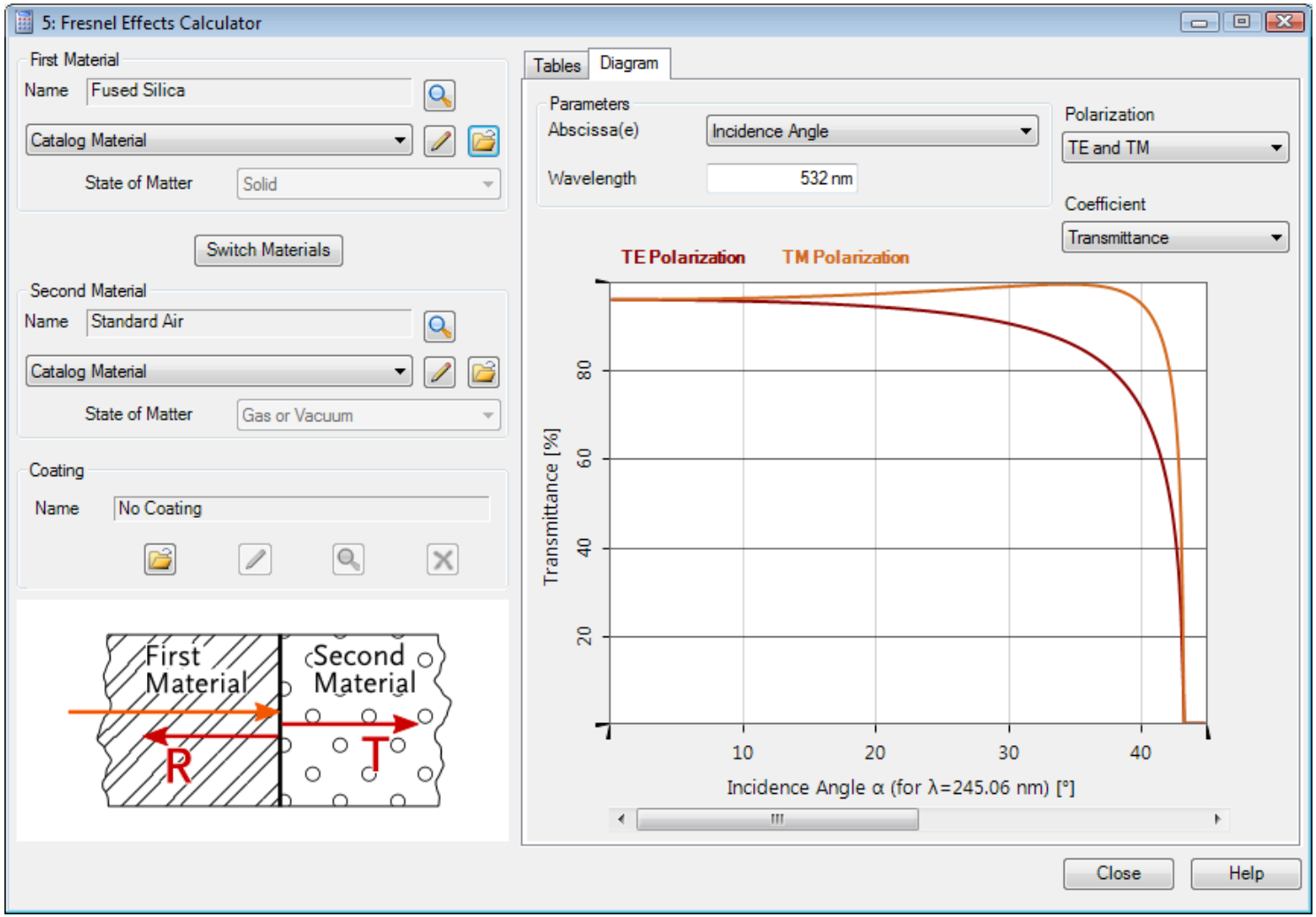



Converts between Cartesian angles, spherical angles, wave numbers, and spatial frequencies.

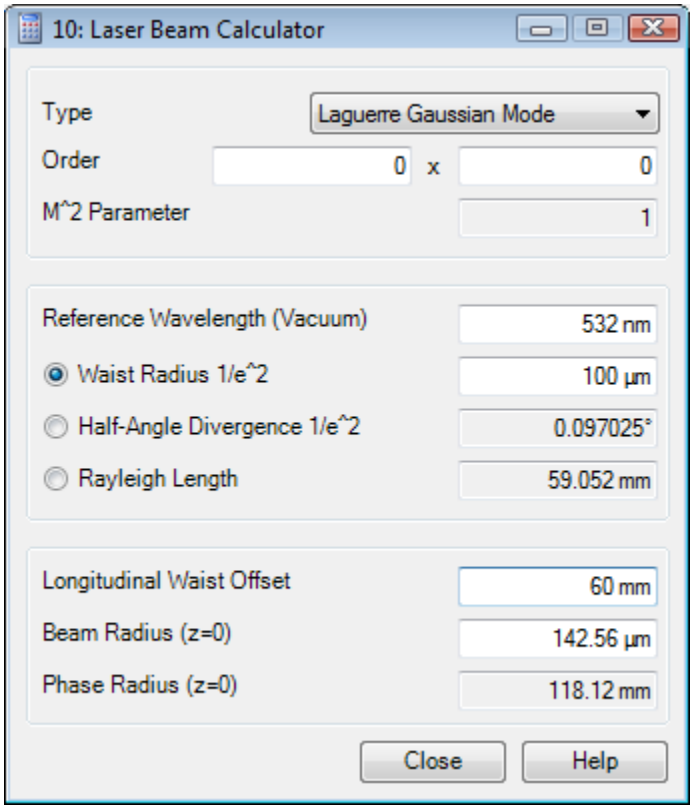
# Fresnel Effects Calculator

- Calculates the Fresnel coefficients for a certain medium transition.
- The coefficients can be plotted versus incidence angle, wavelength, or both.
- The results can be view either in table form or as diagram.

# Fresnel Effects Calculator

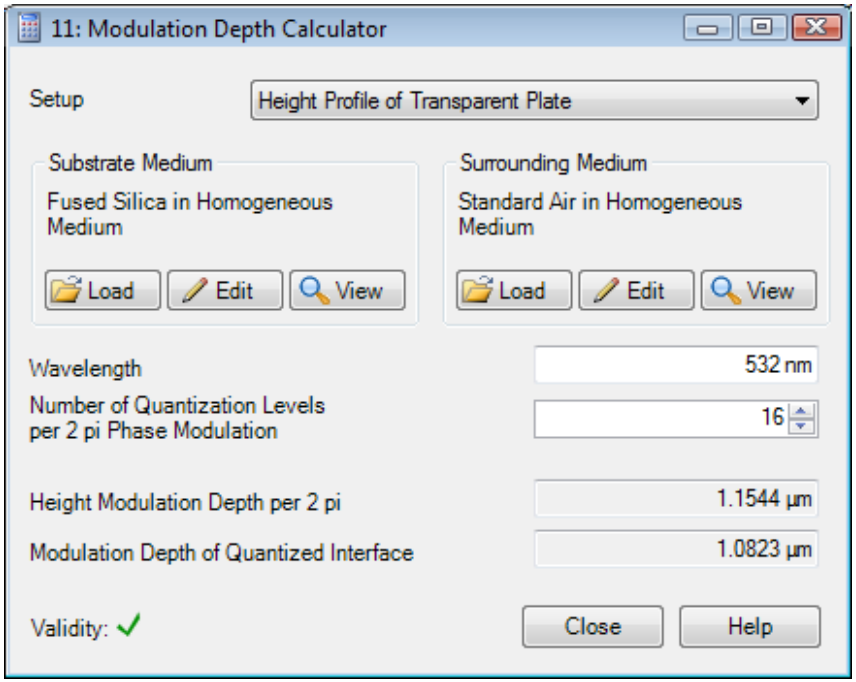


# Laser Beam Calculator




- Allows you to enter some of the characteristic parameters of a Gaussian beam with arbitrary $M^2$-value.
- The remaining parameters are calculated instantly.
- The parameters can be copied afterwards to a “Gaussian Wave” light source.

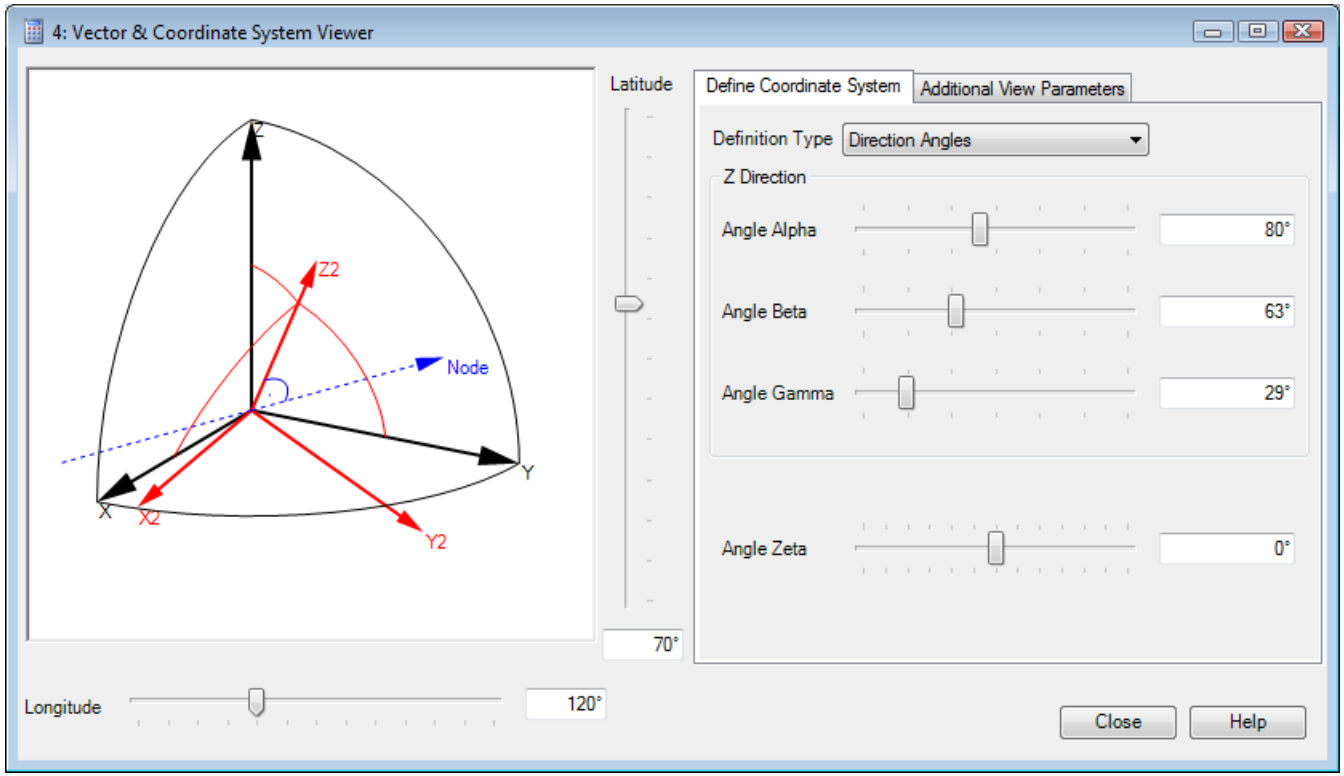
# Modulation Depth Calculator




- Allows you to calculate the modulation depth a diffractive optical element (DOE) must have for a certain wavelength.
- The calculation is based on the thin element approximation (TEA) theory.

# Vector & Coordinate System Viewer

Can be used to visualizes how a coordinate system or direction vector is rotated according to different angle definitions.



# Summary

- The shortly introduced calculator documents are very helpful for diverse calculations e.g. during design and simulations projects.

- At the moment VirtualLab provides seven calculators:
  - ABCD Law Calculator
  - Diffraction Angle Calculator
  - Direction Converter
  - Fresnel Effects Calculator
  - Laser Beam Calculator
  - Modulation Depth Calculator
  - Vector & Coordinate System Viewer