WYROWSKI PHOTONICS

Feature.0018

Usage of Distortion Analyzer

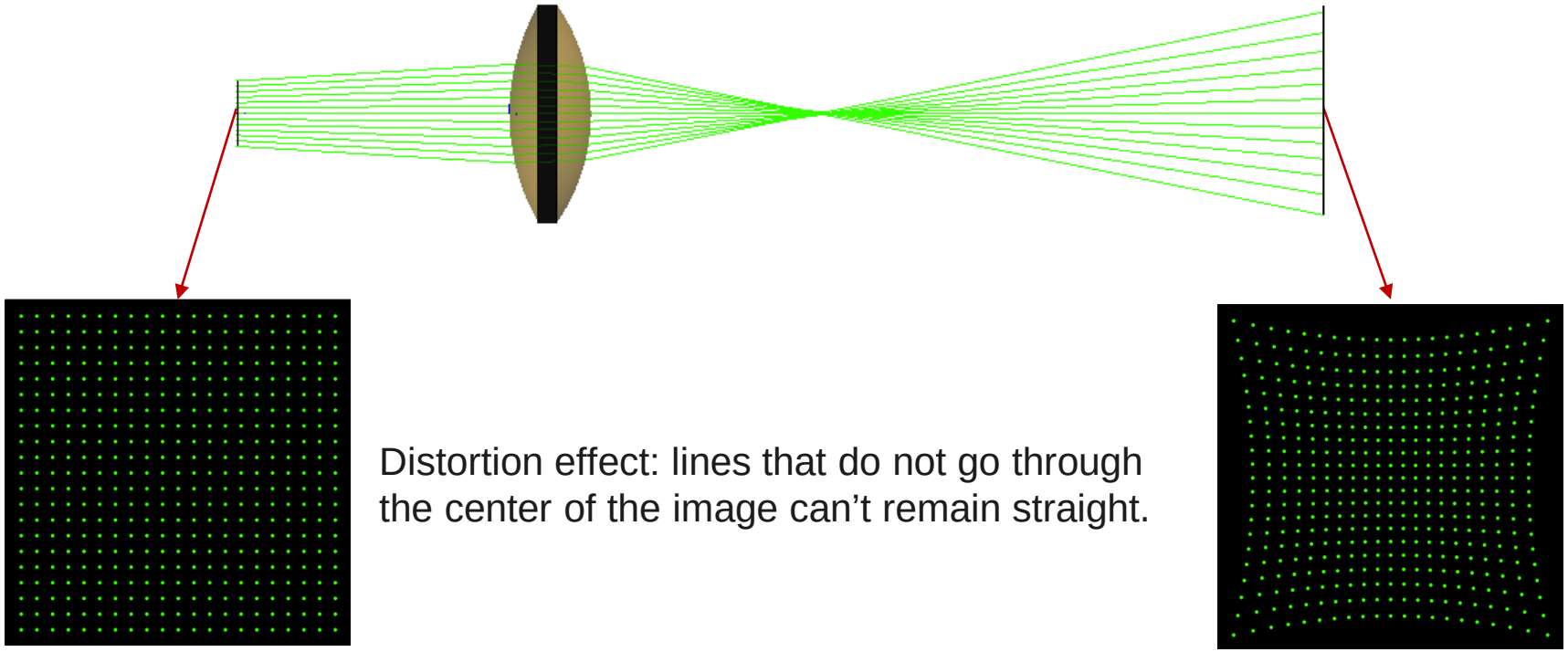
Precise analysis of distortion aberration of a lens component. The plotting of distortion versus angles can be obtained easily. It is very helpful for designing lenses and take the field distortion during a parametric optimization into account.

About This Use Case

- The following toolbox is required:
  - Starter toolbox
- This use case is created by using VirtualLab Fusion (Build 7.0.0.35).
- Get your free Trial Version here!

This Use Case Shows ...

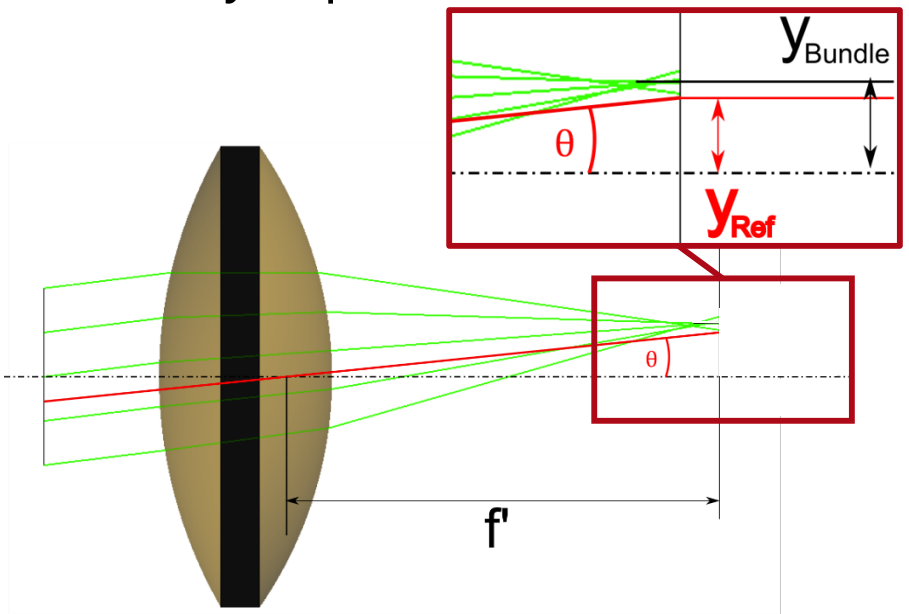
- definition of distortion aberration.
- setting of the distortion analyzer in VirtualLab.
- example: distortion of a spherical lens.



Distortion effect: lines that do not go through the center of the image can’t remain straight.

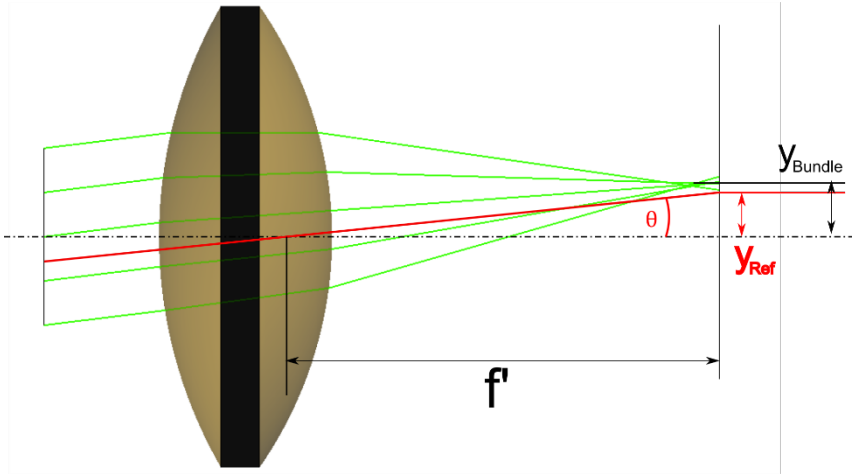
Definition of Distortion

- Distortion corresponds to spherical aberration of the chief ray. It is defined as the deviation of the lateral position of the ray bundle to a reference position at the focal plane.
- Using the effective focal length (f') of the scanning lens, one can calculate the position of reference ray at the focal plane, which mainly depends on the incidence angle.



- f' : effective focal length
- θ: incidence angle
- y_{Bundle}: lateral position of ray bundle
- y_{Ref}: lateral position of reference ray

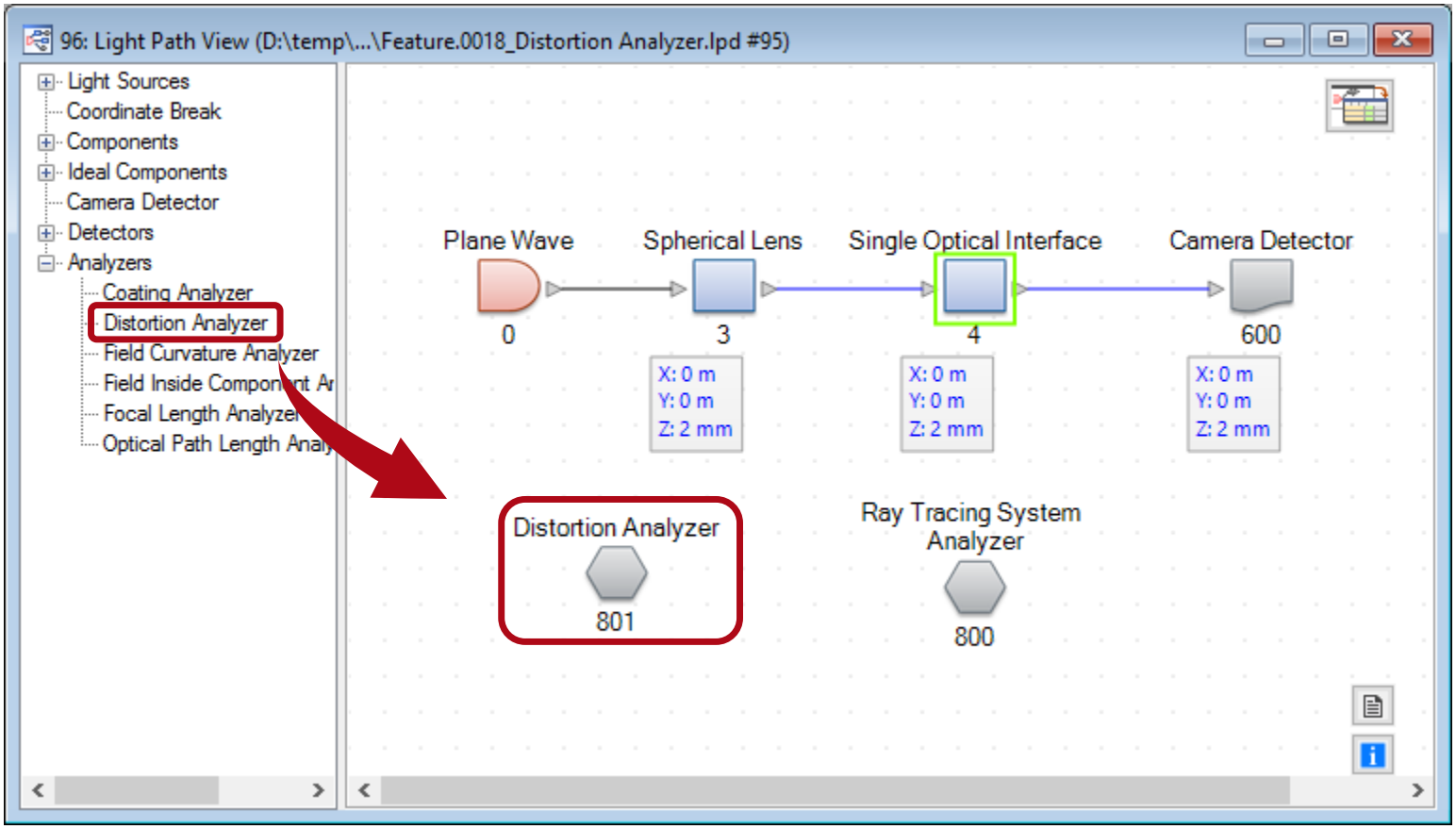
Definition of Distortion



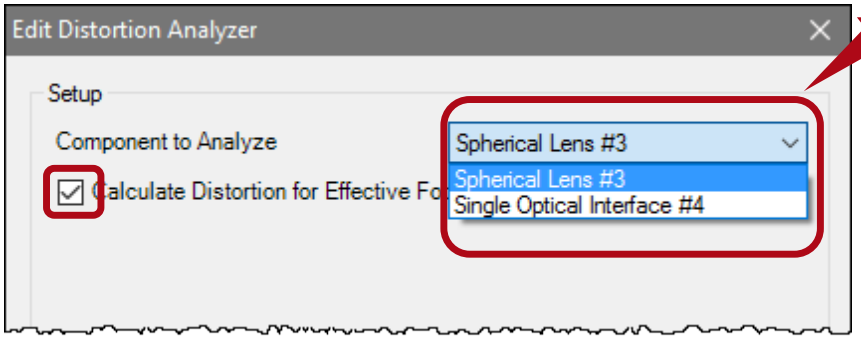
$$\text{Distortion} = \frac{y_{\text{Bundle}} - y_{\text{Ref}}}{y_{\text{Ref}}}$$

- F–Tan(Theta) distortion: $y_{\text{Ref}} = f' \cdot \tan(\theta)$
- F-Theta distortion: $y_{\text{Ref}} = f' \cdot \theta$
- Ray bundle position (y_{Bundle}):
  - Chief ray: the position of the chief ray is used
  - Centroid: physically relevant is the energy centroid

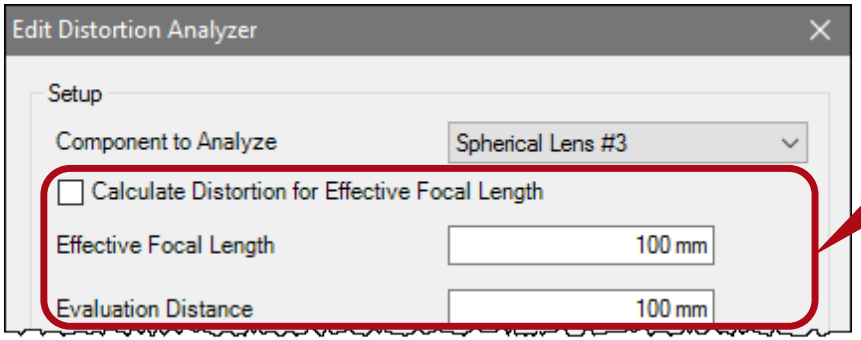
Distortion Analyzer in VLF



Setting of the Analyzer

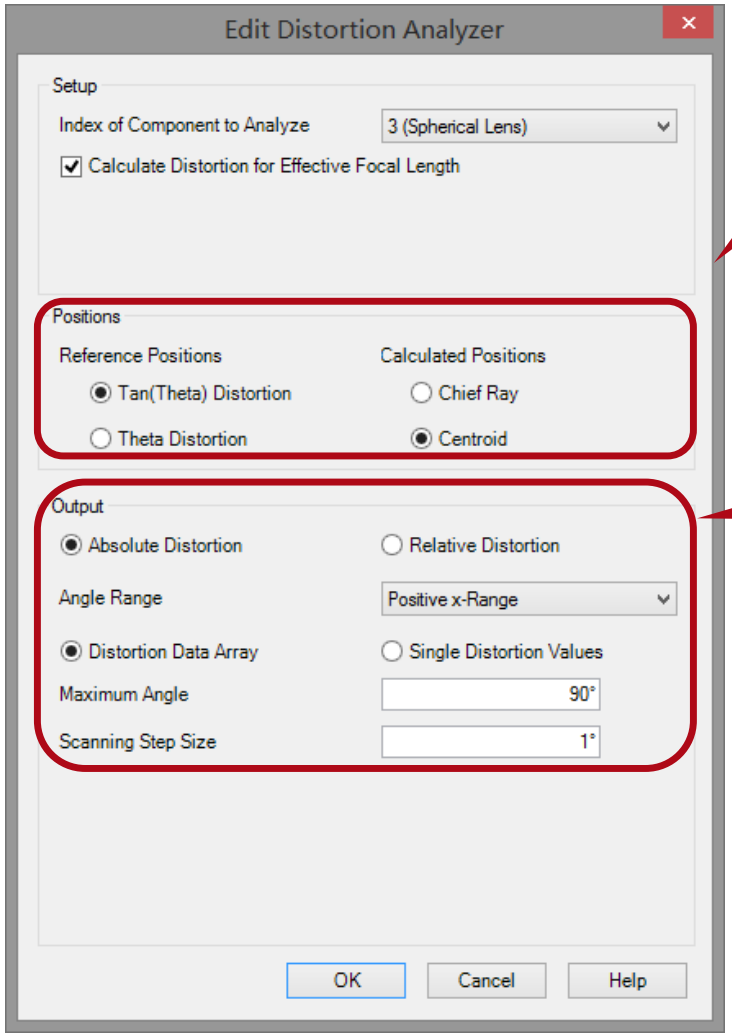


or



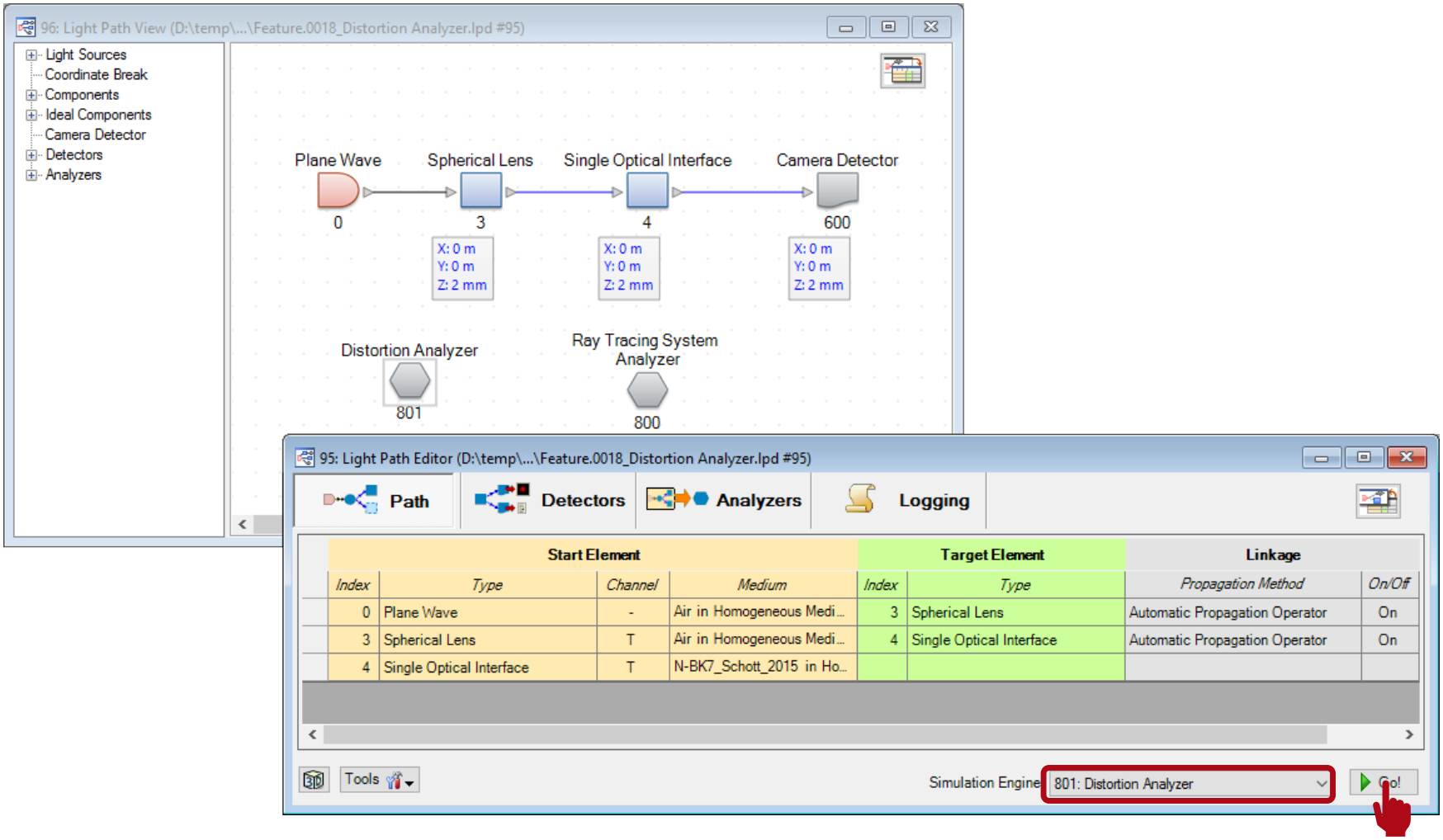
- Select a lens component to be analyzed. The analysis is independent of the system.
- Check the option to set the detector plane at effective focal length
- Determine the *Evaluation Distance* by the user's requirement.

Setting of the Analyzer



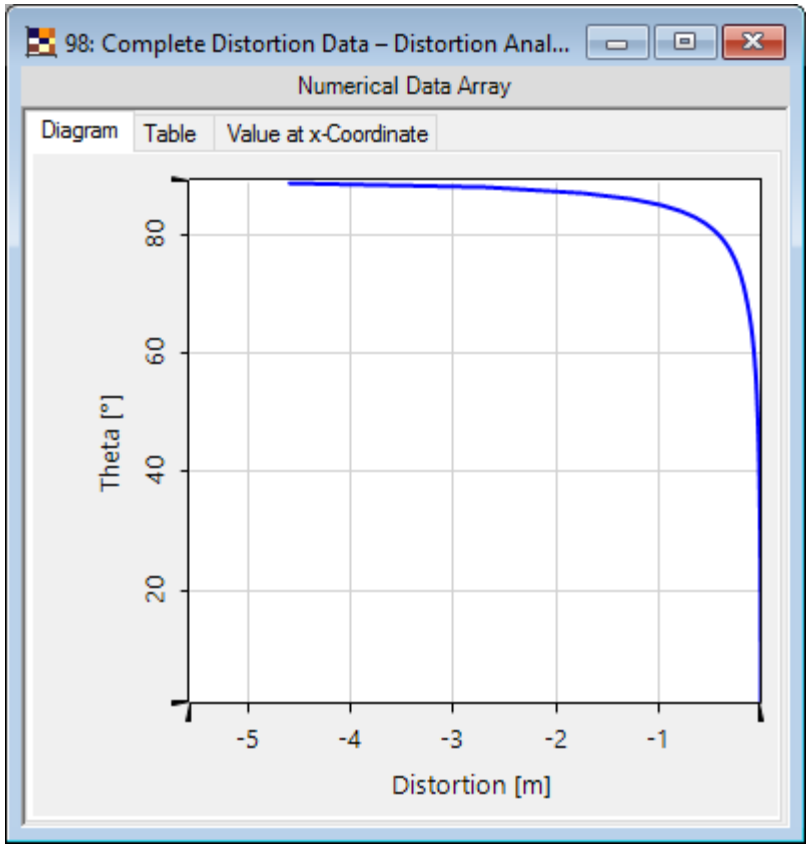
- Positions (distortion type)
  - Reference position
  - Calculated ray bundle position
- Output (Result display)
  - *Absolute Distortion* ([m]) or *Relative Distortion* ([%])
  - *Angle Range*: 4 scan options (x, y, -x, -y)
  - *Distortion Data Array* or *Single Distortion Values*

Distortion of Spherical Lens

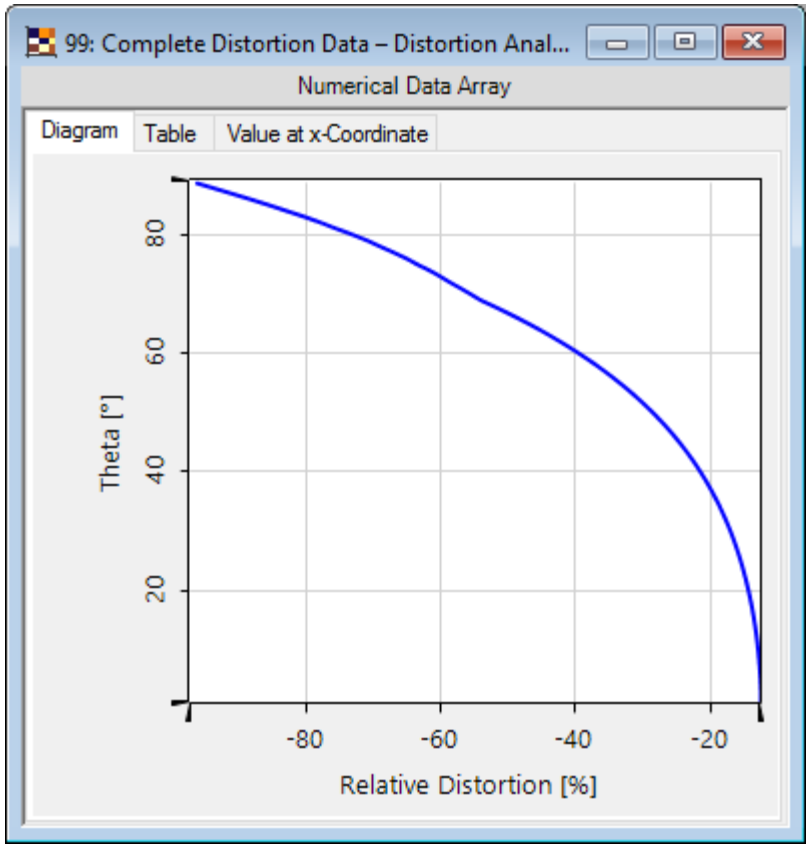


Distortion of Spherical Lens

Absolute Distortion Result



Relative Distortion Result



Document & Technical Info

code	Feature.0018
version of document	1.0
title	Usage of Distortion Analyzer
category	Simulation
author	Zongzhao Wang (LightTrans)
used VL version	7.0.0.35
last modified on	August 25, 2017