

Feature.0002

Usage of Focal Length Analyzer

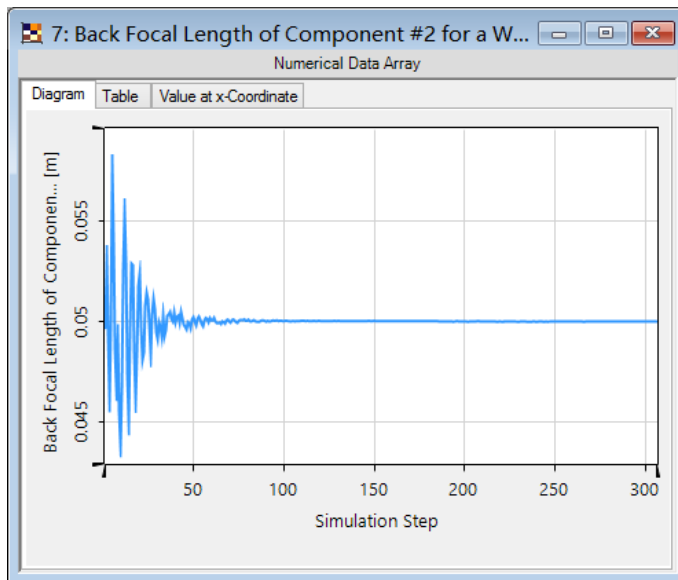
Calculate the effective focal length and the back focal length of a real component in an optical system.

About This Use Case

- The following toolboxes are required:
 - Starter toolbox
- This use case was created using VirtualLab Fusion (Build 7.0.0.35).
- Get your free Trial Version [here!](#)

This Use Case Shows...

- what the *Focal Length Analyzer* is.
- how to apply the *Focal Length Analyzer* in a *Parametric Optimization* task.

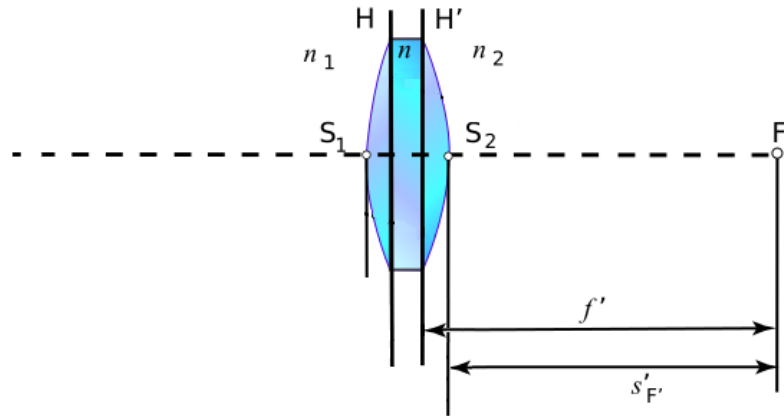


The *Effective Focal Length* converges to the target value in *Parametric Optimization*.

Overview

- The focal length is an important parameter to evaluate an imaging system. But for real thick lenses, or systems consisting of several lenses and mirrors, the effective focal length is not easy to calculate.
- By using the *Focal Length Analyzer*, the effective and back focal length of an *Optical Interface Sequence (OIS)*, a *Single Optical Interface* or a *Spherical Lens* can be obtained.
- The *Focal Length Analyzer* can also be applied in a *Parametric Optimization*. The corresponding result can be configured as a merit function for optimization.

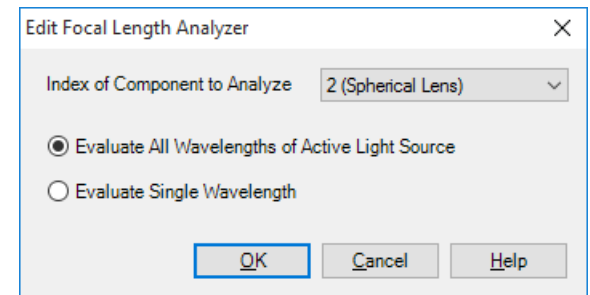
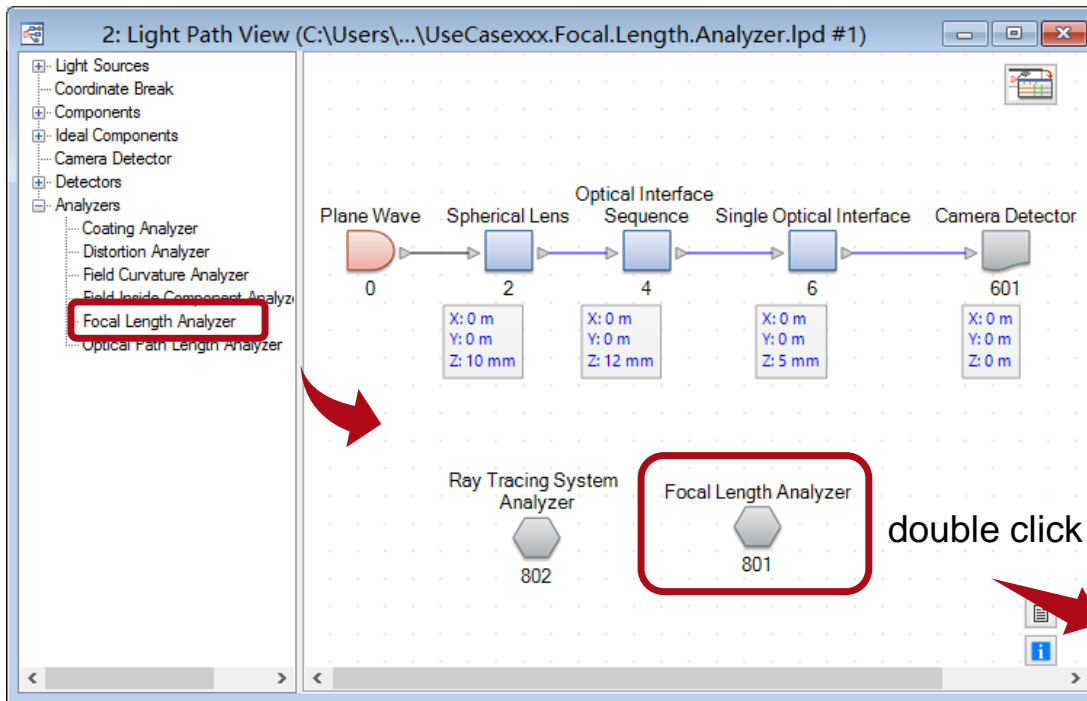
Thick Lens Diagram and Definition



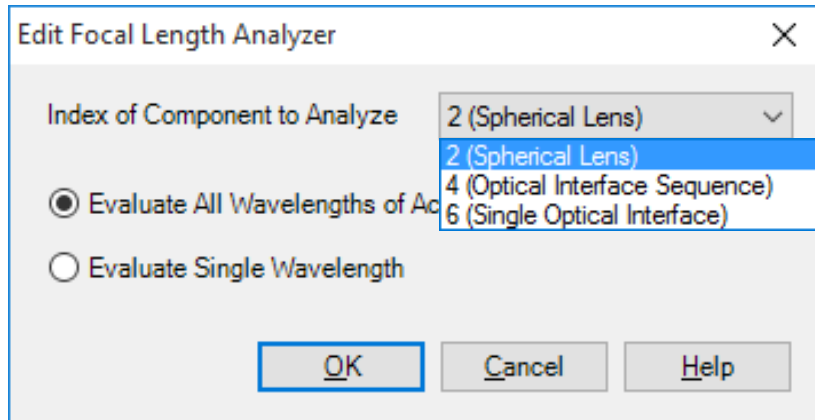
[1]

- **effective focal length (f'):** distance from the rear principal plane (H') to the rear focal point (F')
- **back focal length ($s'_{F'}$):** distance from the vertex of the last optical surface of the system (S_2) to the rear focal point (F')

Focal Length Analyzer in LPD

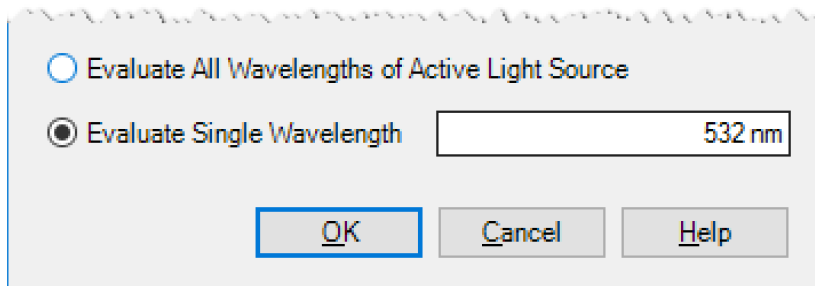


Configuration of Focal Length Analyzer



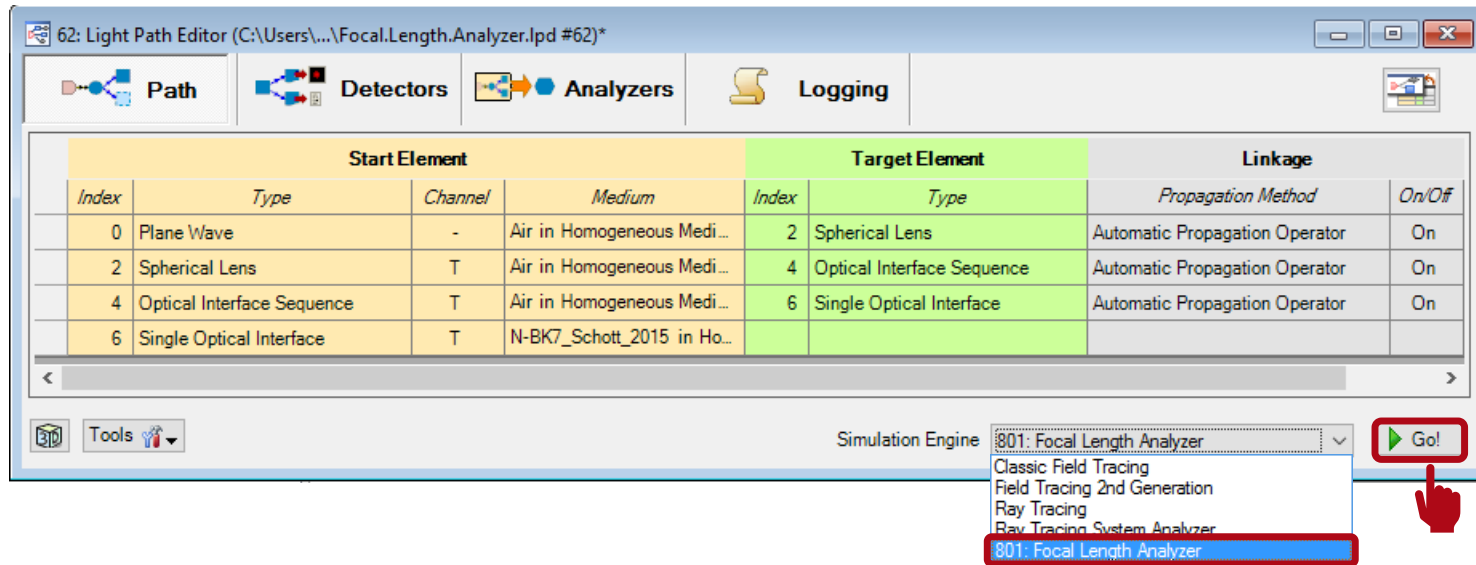
- select the component to be analyzed

and



- choose whether to evaluate all wavelengths or a given single wavelength

Running the Analyzer and Result Display



The results are shown in the tab *Detector Results*.

Date/Time	Detector	Sub - Detector	Result
05/18/2017 21:06:09	Focal Length Analyzer #801	Back Focal Length of Component #2 for a Wavelength of	44.049 mm
		Effective Focal Length of Component #2 for a Wavelength of 532 nm	48.468 mm

Messages: Detector Results

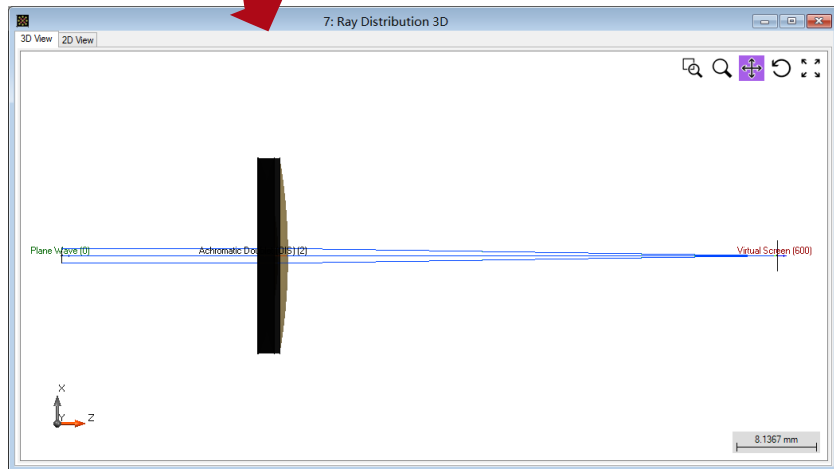
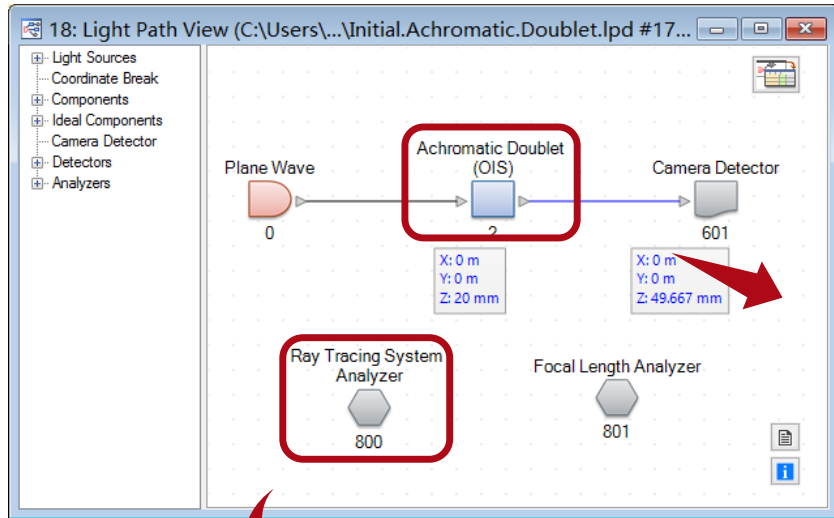
User Exper

Parametric Optimization of An Achromatic Doublet

Task Description

- source
 - plane wave: wavelength 473nm, 532nm and 635nm
- component
 - Optical Interface Sequence (achromatic doublet): four conical interfaces
- detectors and analyzers
 - Camera Detector
 - Ray Tracing Analyzer
 - Focal Length Analyzer

Schematic and Light Path Diagram



Edit Optical Interface Sequence

Index	Distance	Position	Type	Homogeneous Medium	Comment
1	0 m	0 m	Conical Interface	N-BK7_Schott_2015 in F	Enter your comr
2	2 mm	2 mm	Conical Interface	Air in Homogeneous Me	Enter your comr
3	100 μm	2.1 mm	Conical Interface	N-SF10_Schott_2015 in	Enter your comr
4	1 mm	3.1 mm	Conical Interface	Air in Homogeneous Me	Enter your comr

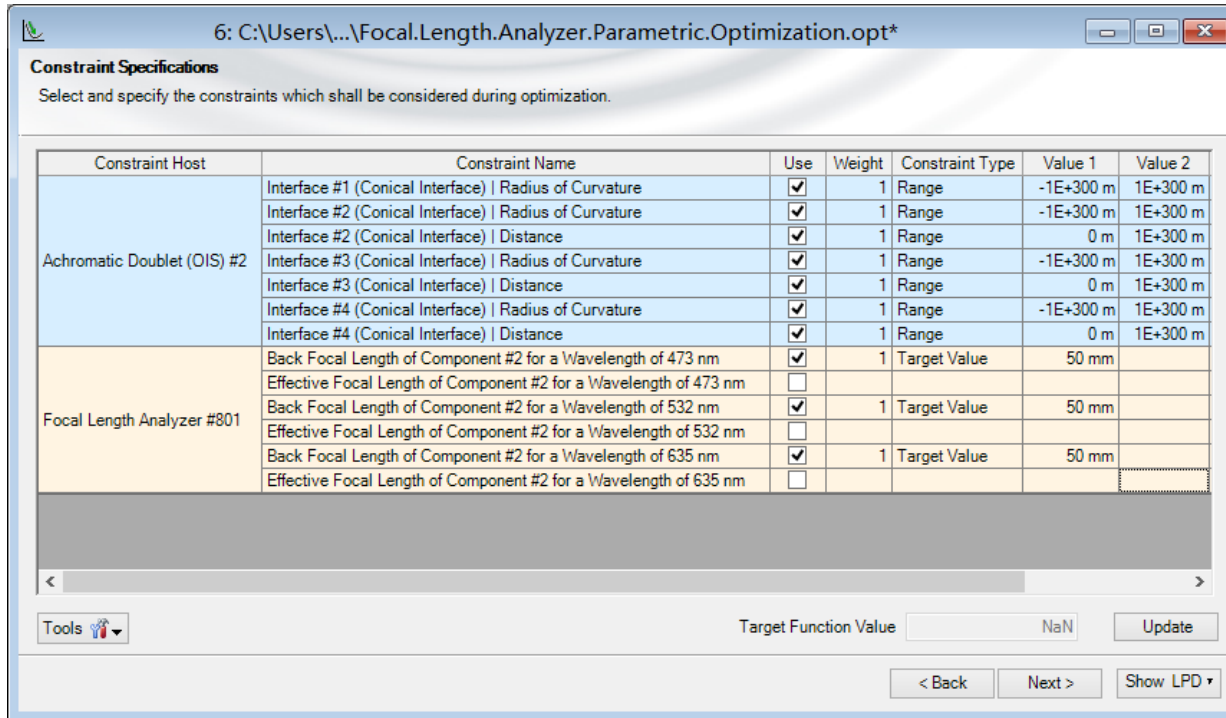
Geometry / Channels
Position / Orientation
Structure / Function
Propagation

Plane Conical Cylindrical

Tools Add Insert Delete

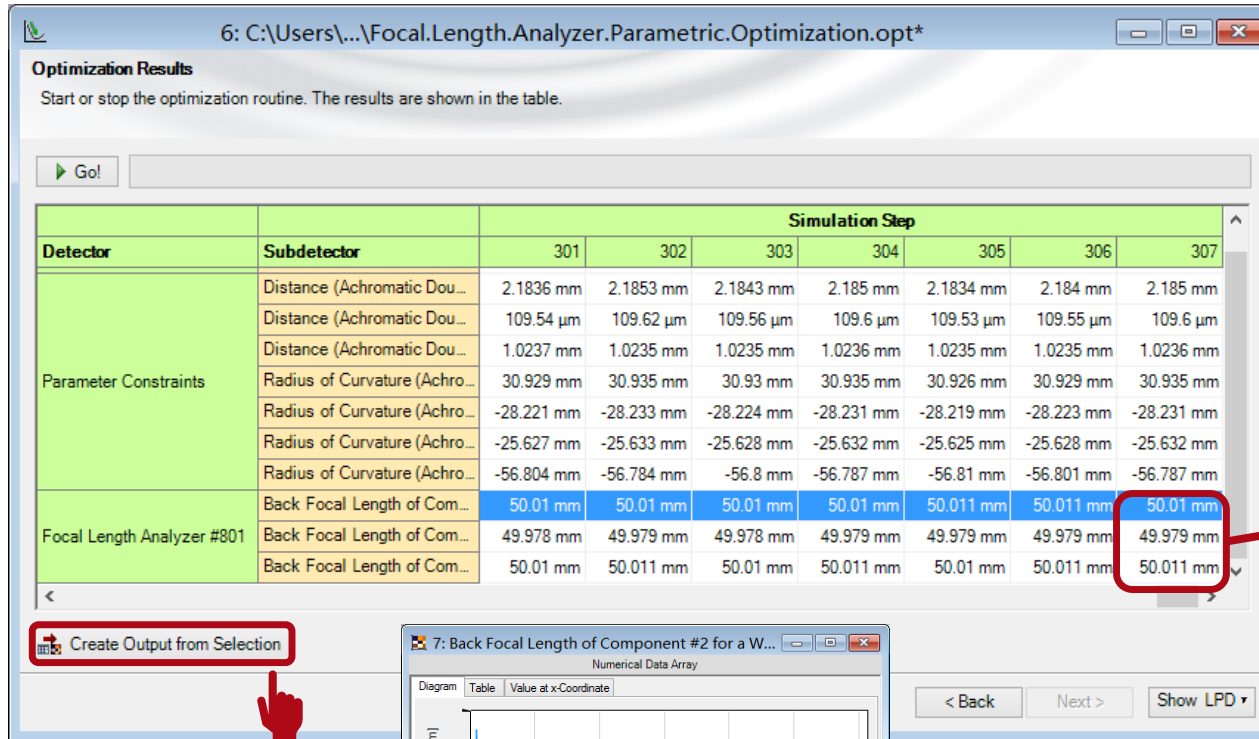
OK Cancel Help

Set Optimization Target



- Focal Length Analyzer
 - Effective Focal Length is set to 50mm: for all chosen wavelengths

Optimization Result

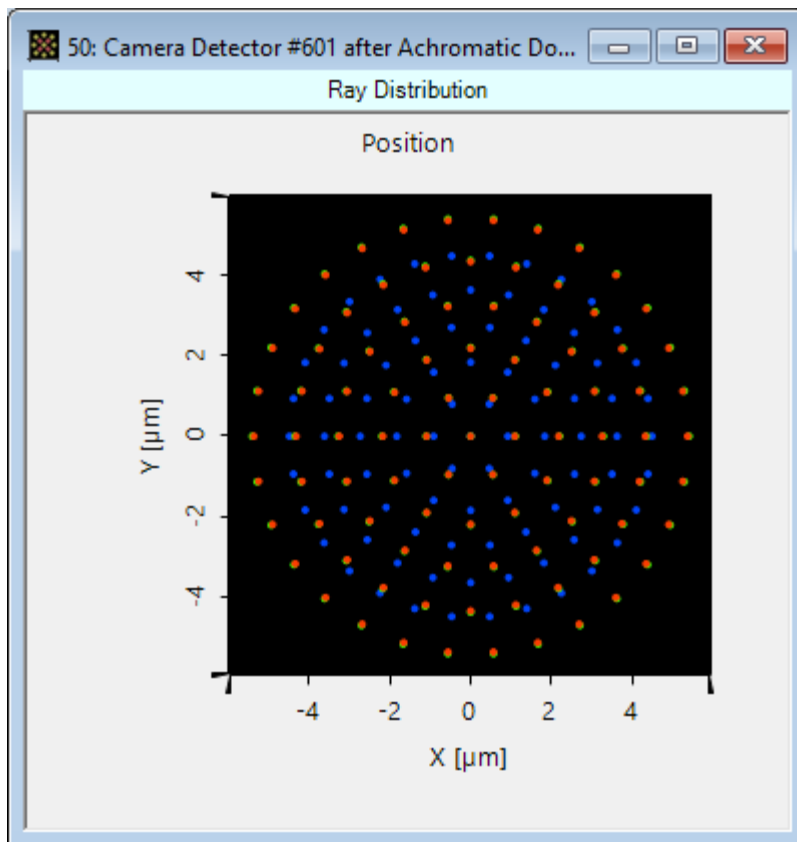


focal length
after optimization

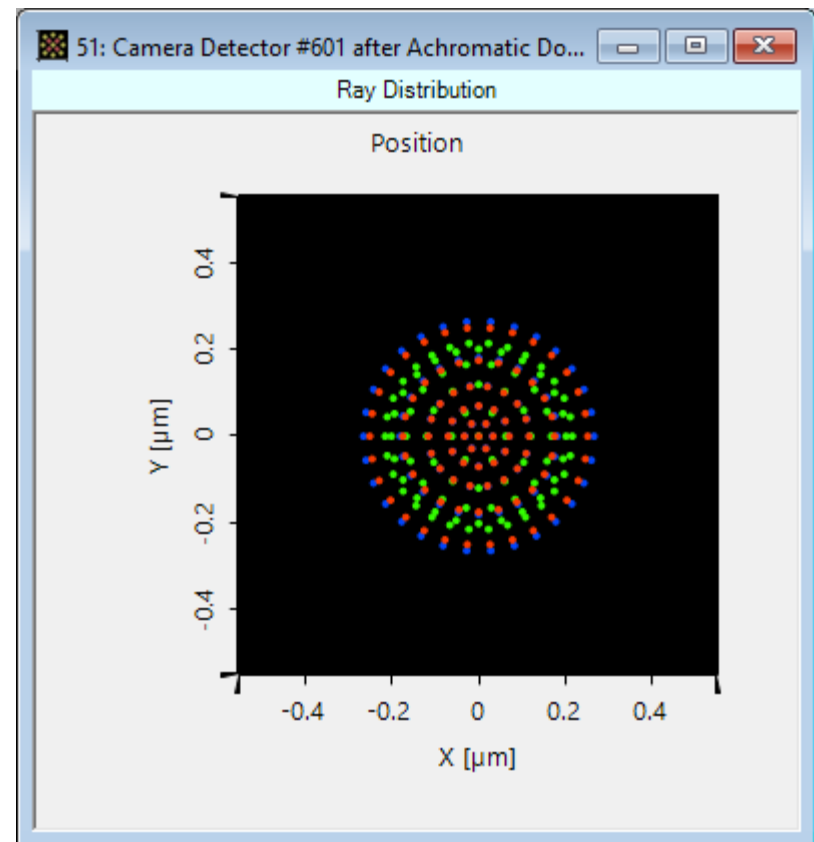
50.01 mm
49.979 mm
50.011 mm

Comparison of Results

Dot Diagram (initial setup)



Dot Diagram (optimized)



Document & Technical Info

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