

UseCase.0082 (1.0)

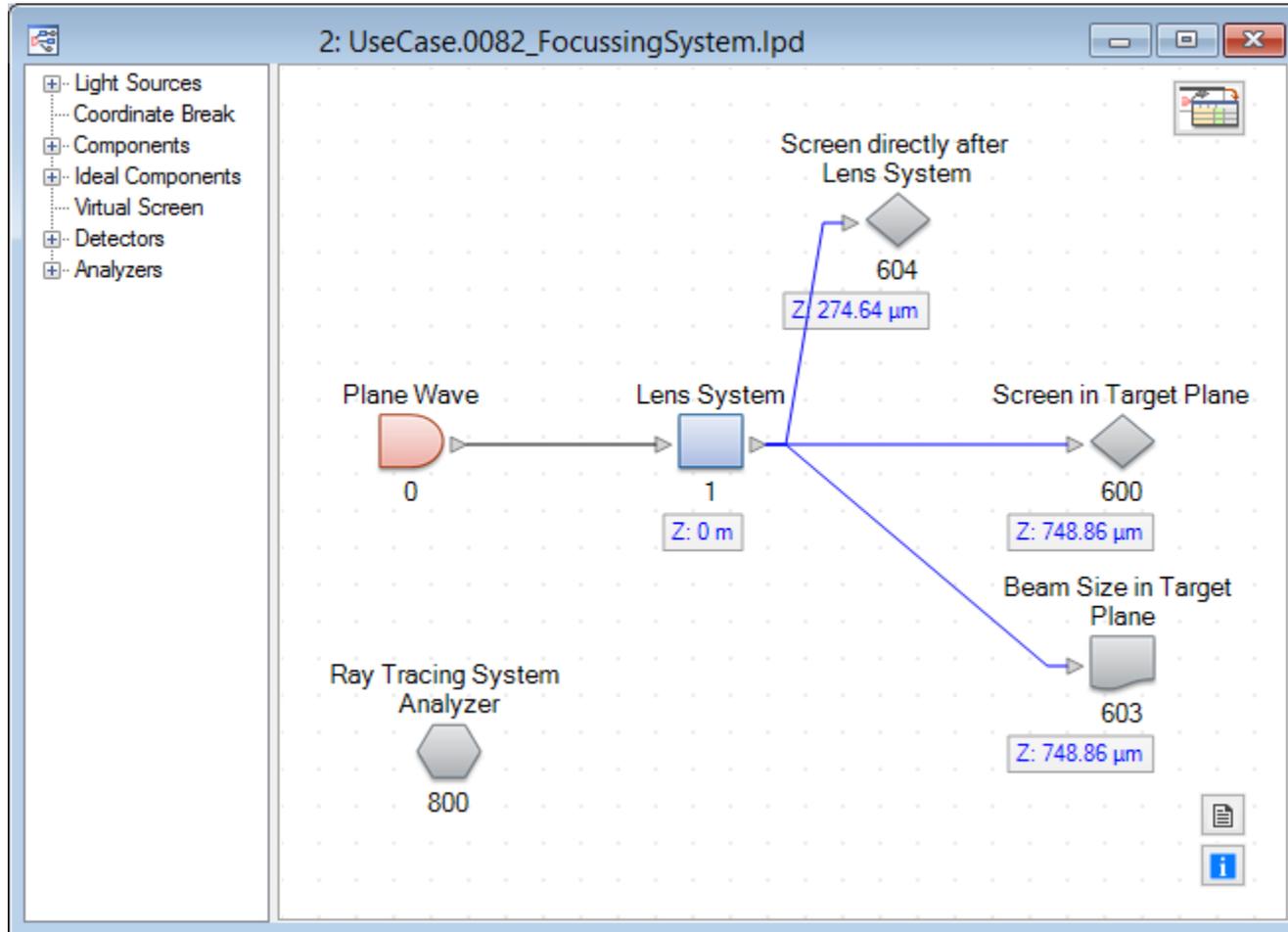
High NA Lens System – Analysis by Ray Tracing

Keywords: ray tracing, high numerical aperture, dot diagram, spot size

Description

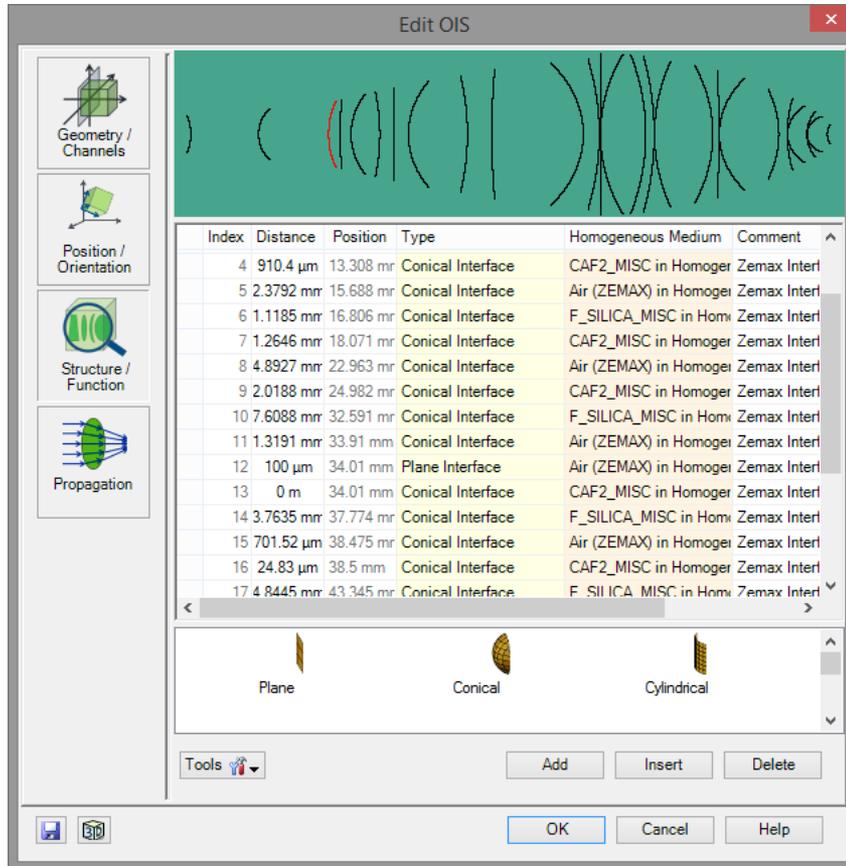
- This use case demonstrates how VirtualLab can be used to analyze a lens system with a high numerical aperture.
- We will discuss the 3D ray skeleton as well as the two dimensional dot diagrams before and directly in the focus.
- In addition VirtualLab can be used to measure the size of the spot in the focal plane.

The System



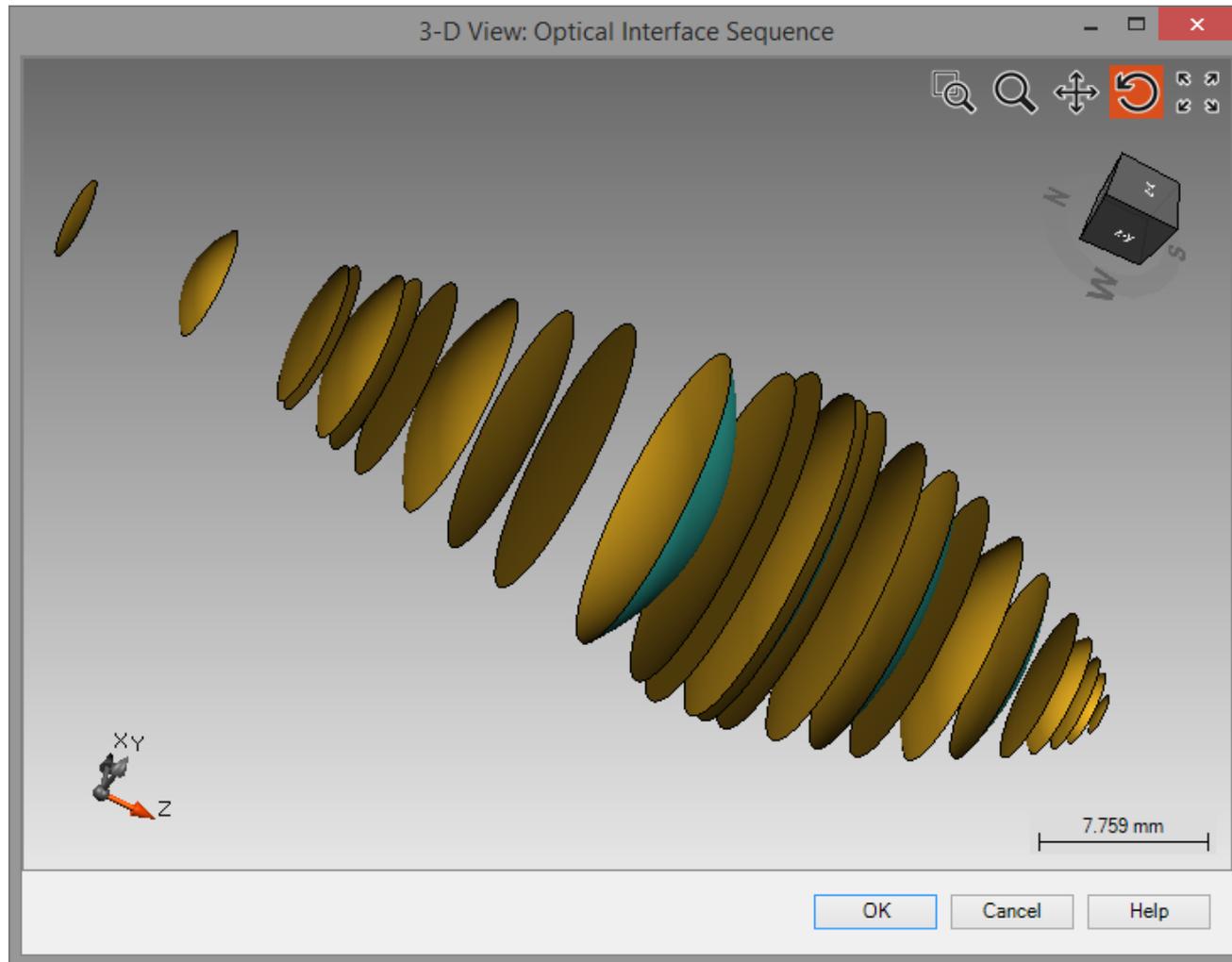
Filename: UseCase.0082_FocussingSystem.Ipd

Edit the Lens System Component



- By double clicking the lens system element within the light path view, the editor of the element is shown.
- The lens system is defined by an optical interface sequence (OIS).
- It contains a sequence of optical interfaces and optical media.

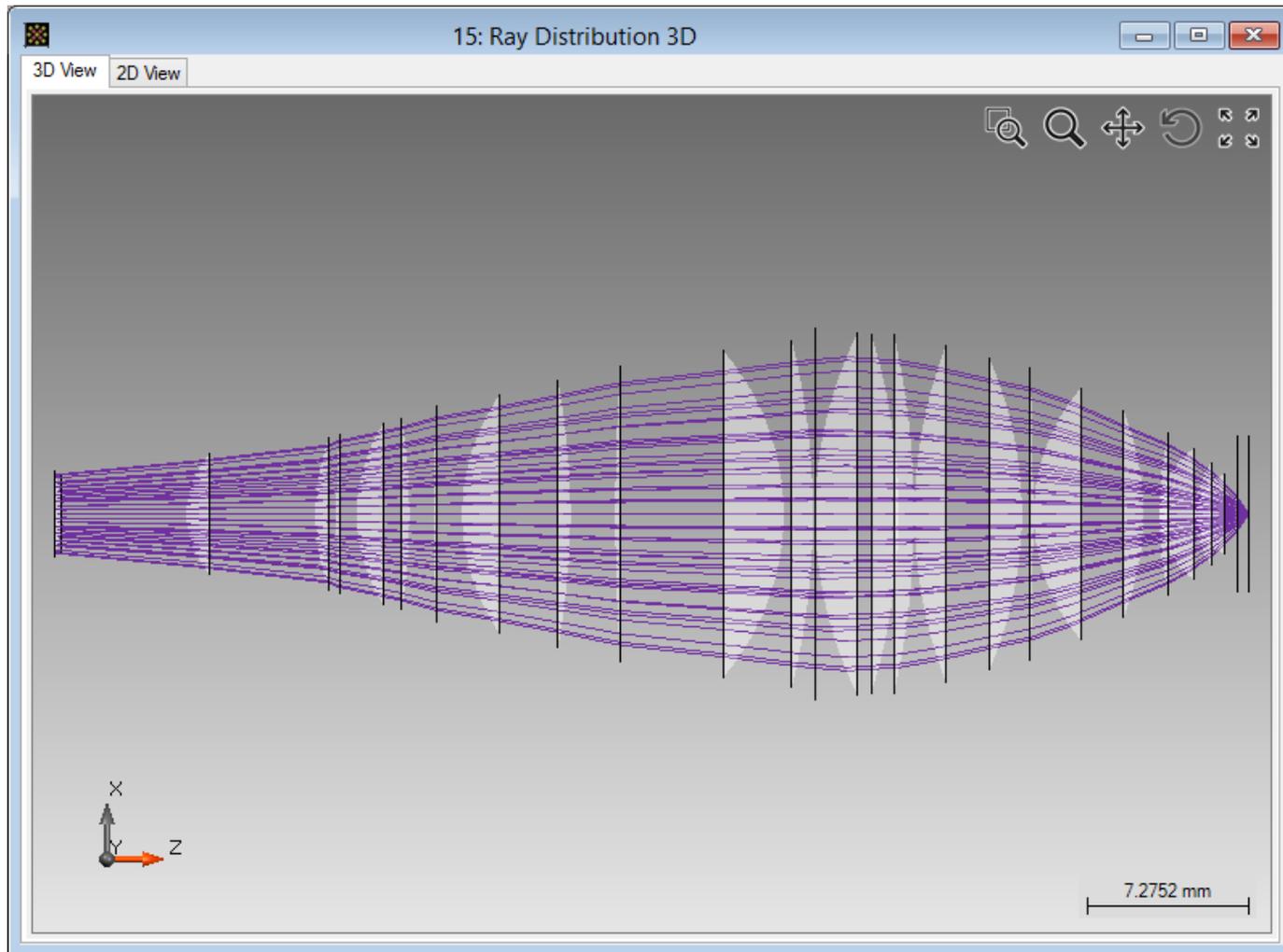
3D View of the Lens System



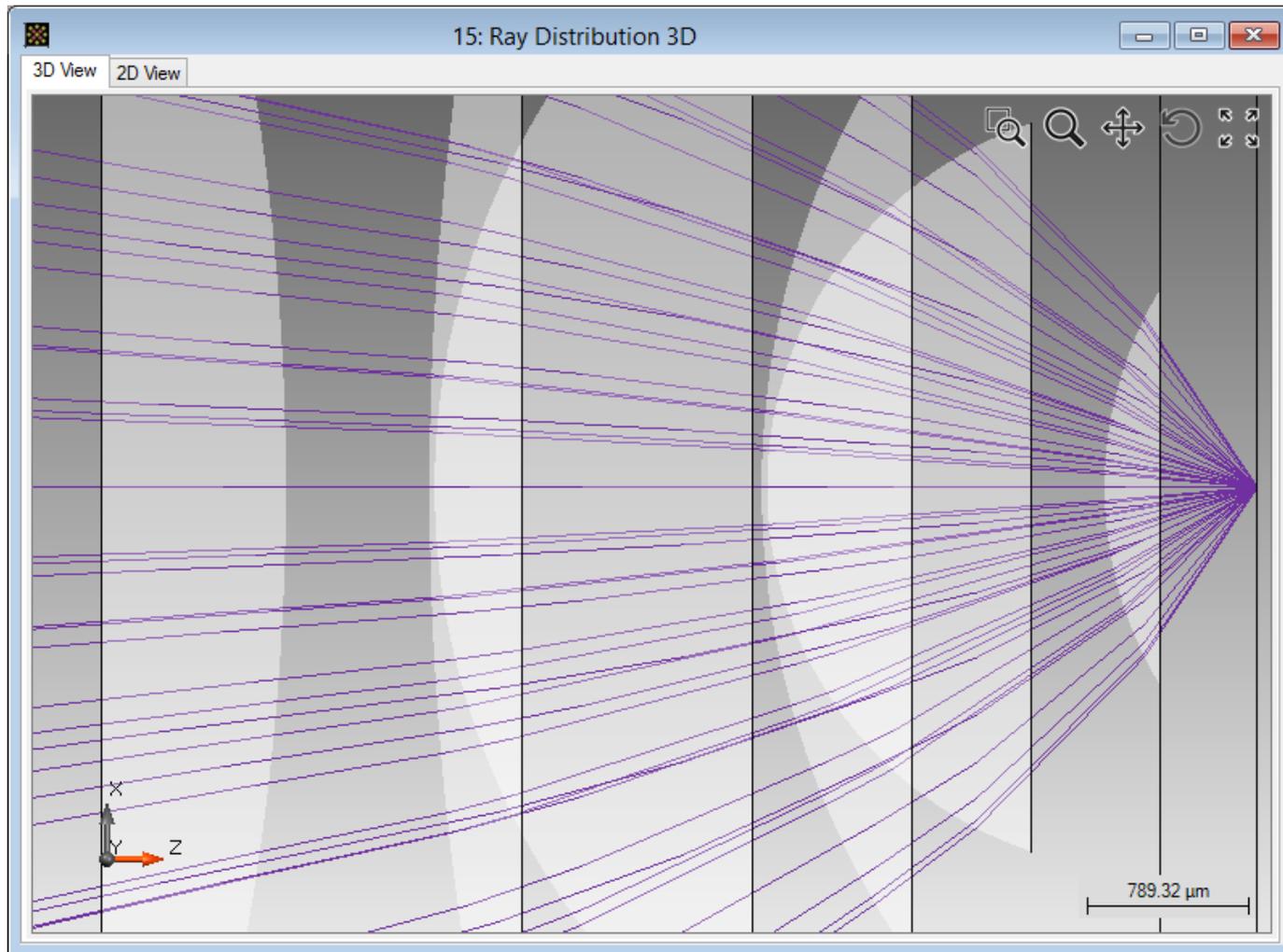
Additional System Parameters

- The lens system is illuminated with a monochromatic plane wave.
- The wavelength of the illuminating light source is 266.08nm.
- The following detectors are used to analyze the performance of the lens system:
 - Virtual Screen directly behind the lens system
 - Virtual Screen in the focal plane
 - Beam Size detector in the focal plane
- The focal plane is to be situated 748.86 μ m behind the lens system.

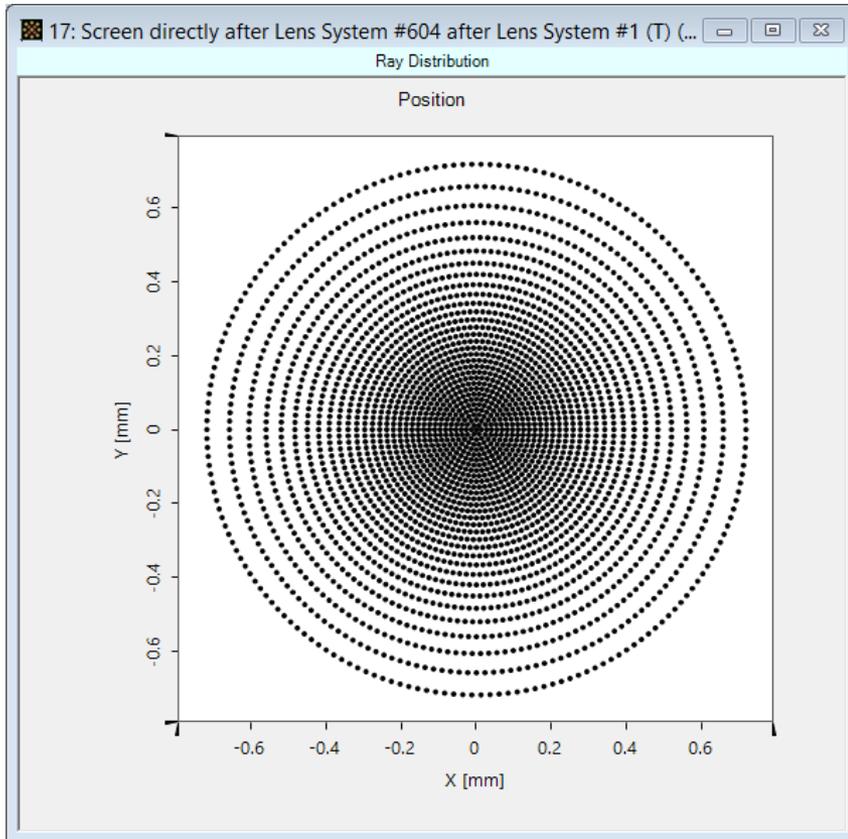
Result of the Ray Tracing System Analyzer



Result of the Ray Tracing System Analyzer

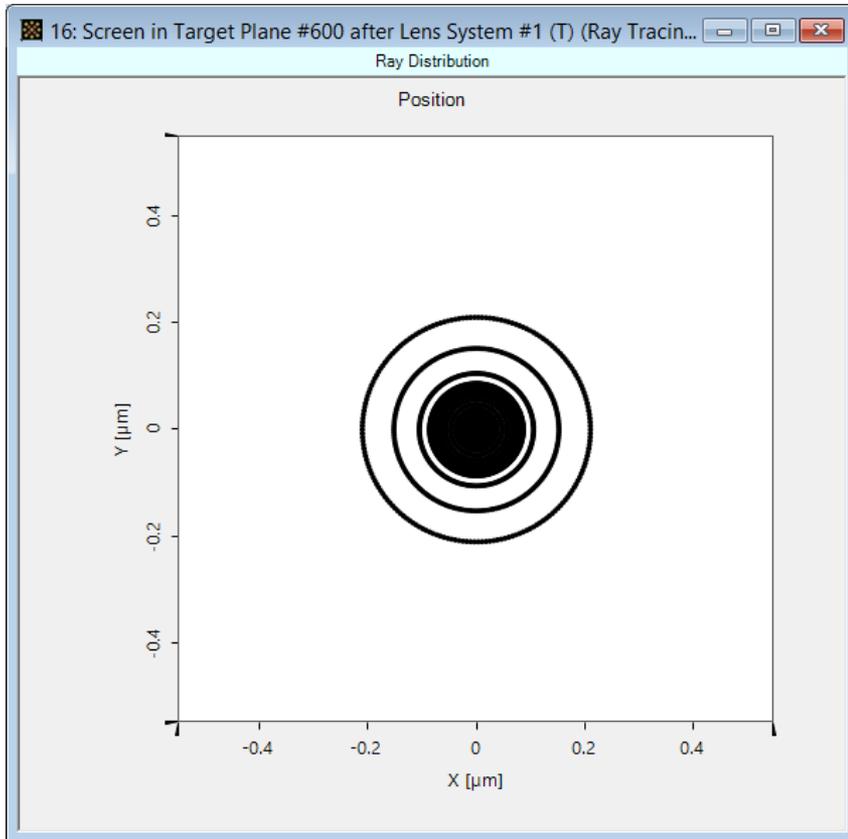


Result of Virtual Screen behind Lens System



- VirtualLab can be used to calculate dot diagrams.
- The picture on the left shows the dot diagram directly after the lens system.
- By default the rays are colored by wavelength. In this example we use non-visible light.
- You can simply change the background color to white: 

Results in the Focal Plane



- On the left you can see the dot diagram calculated in the focal plane.
- The beam size is logged in the detector result window.
- The measured spot size in the focal plane is 183nm.
- The method used for this measurement is RMS calculation.

Summary

- VirtualLab Fusion can be used to analyze complex lens systems using the new Ray Tracing engine.
- We allow the analysis of the system by 3D ray tracing in order to get a quick overview of the positioning within your system.
- In addition the system can be analyzed directly with the Ray Tracing engine.
- This allows the evaluation of the dot diagrams and additional detectors (e.g. spot size detection).