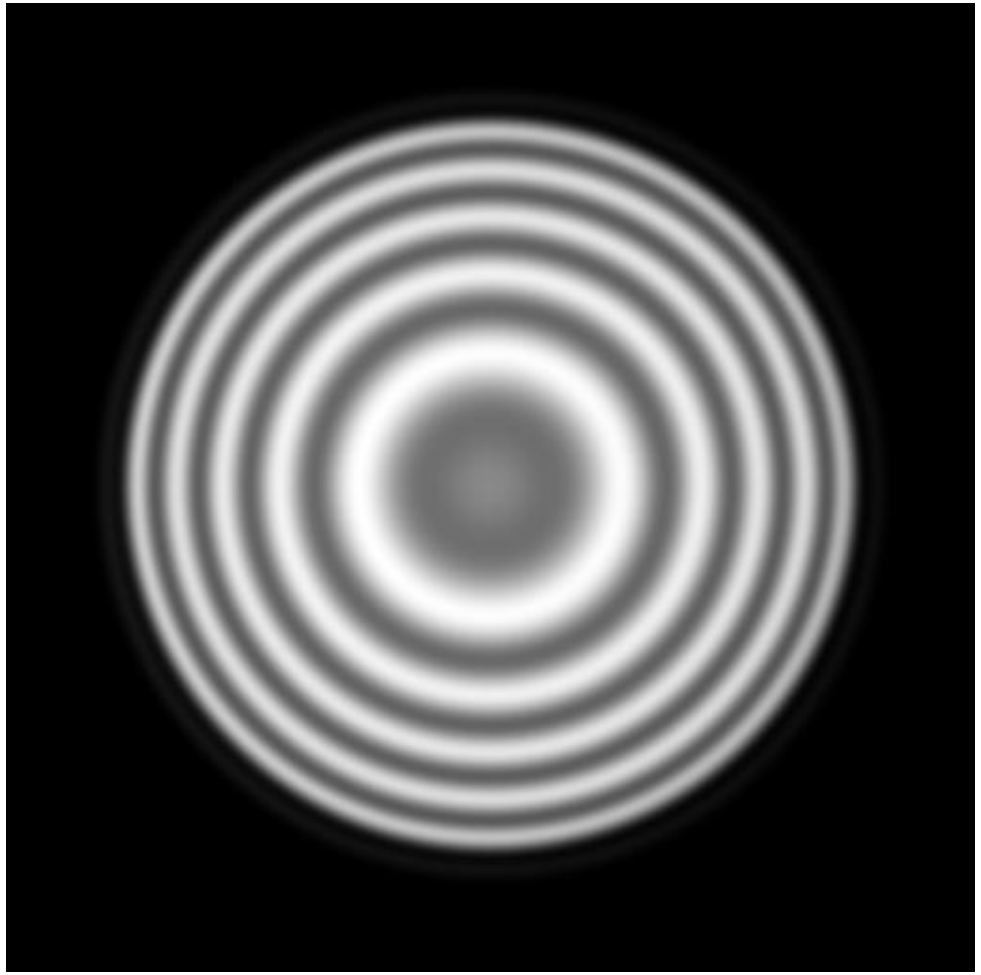
Fizeau Interferometer for Optical Testing

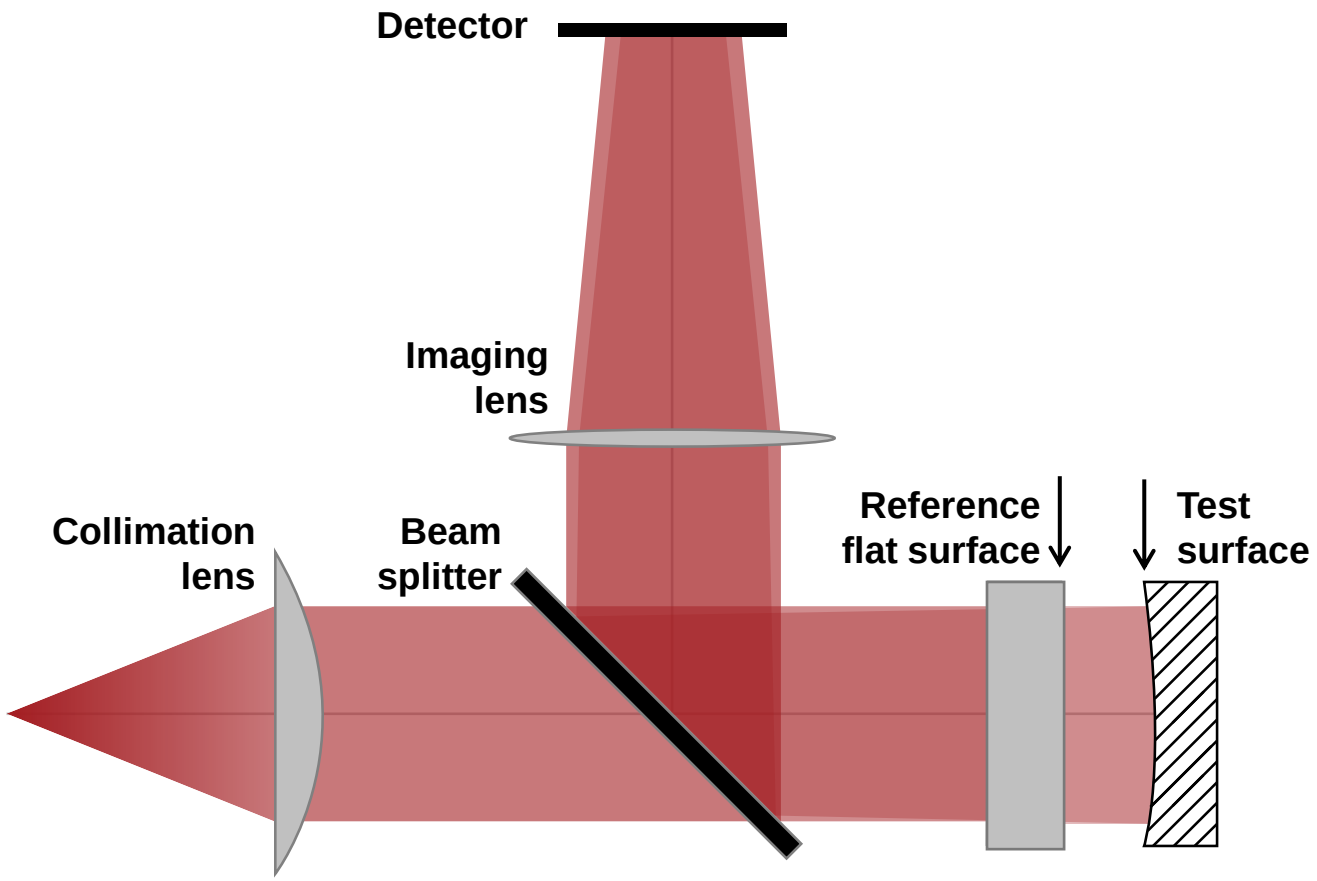
Abstract



Fizeau interferometers are a common type of optical metrology device in industry, and they are often used to test the quality of optical surfaces with high precision. With the help of the channel configuration in VirtualLab Fusion, we build up a Fizeau interferometer and use it for testing different optical surfaces e.g. cylindrical and spherical ones. It is shown that the resulting interference fringes are sensitive to the surface profile.

Application Scenario

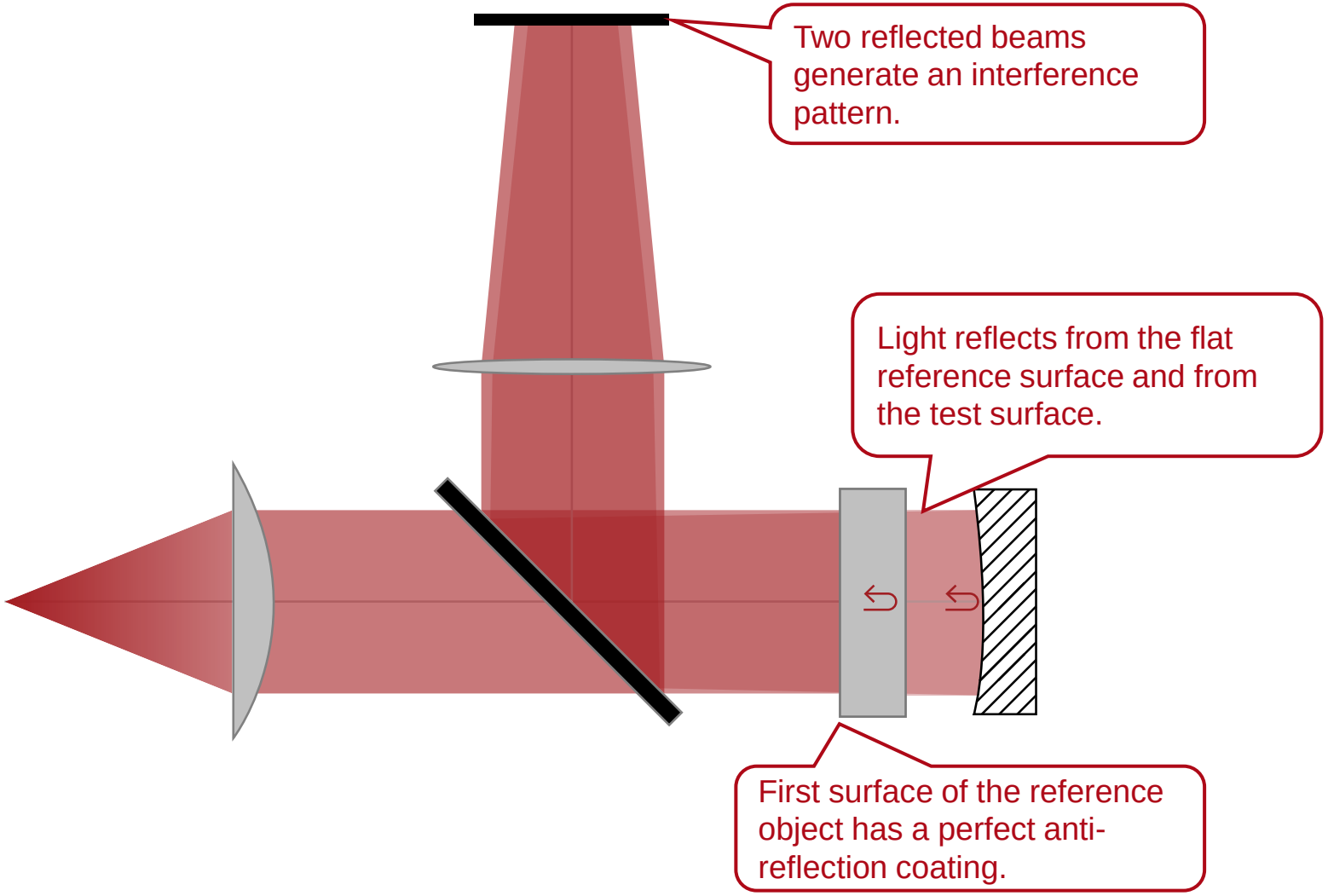
Application Scenario: System



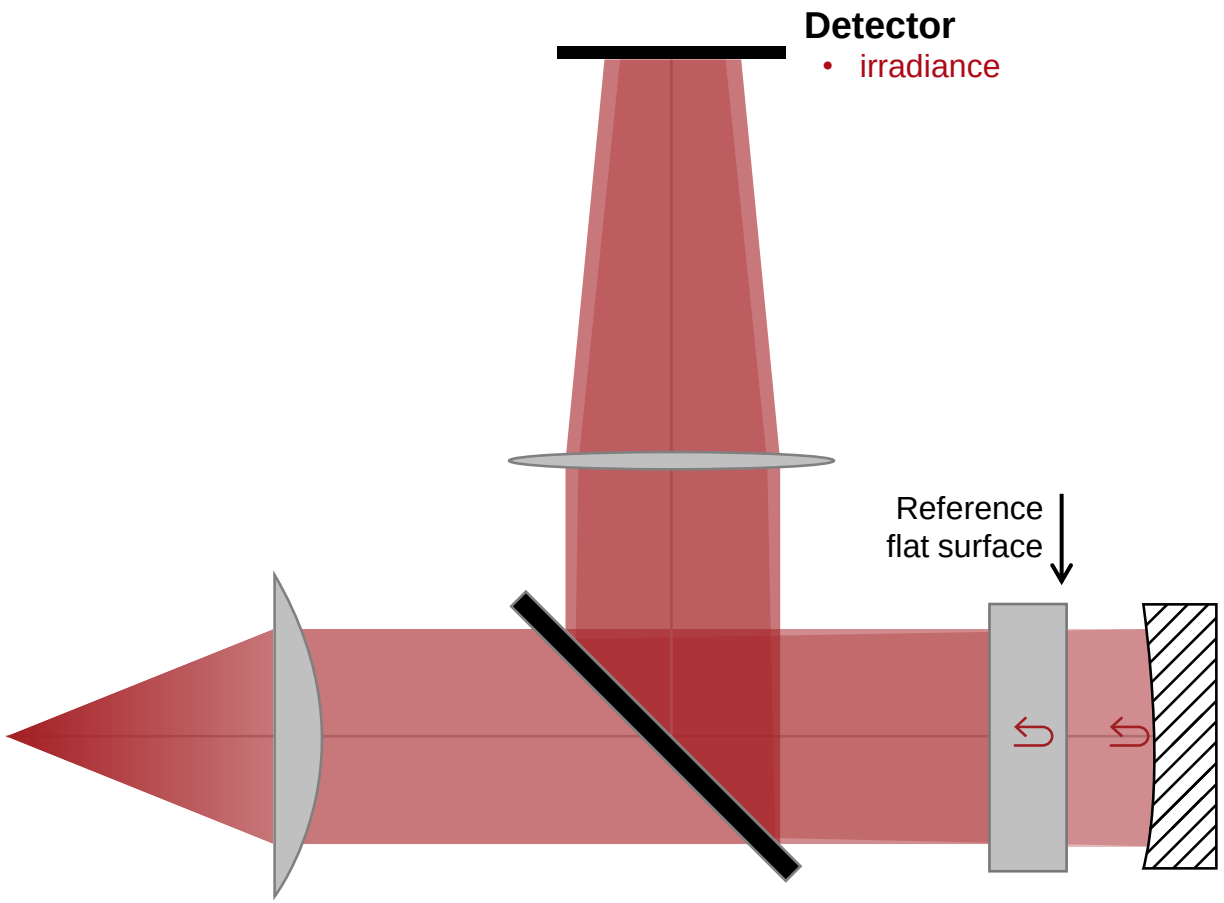
Spherical wave

- Wavelength 532 nm
- Half-opening angle 26.6°

Application Scenario: System



Application Scenario: Task



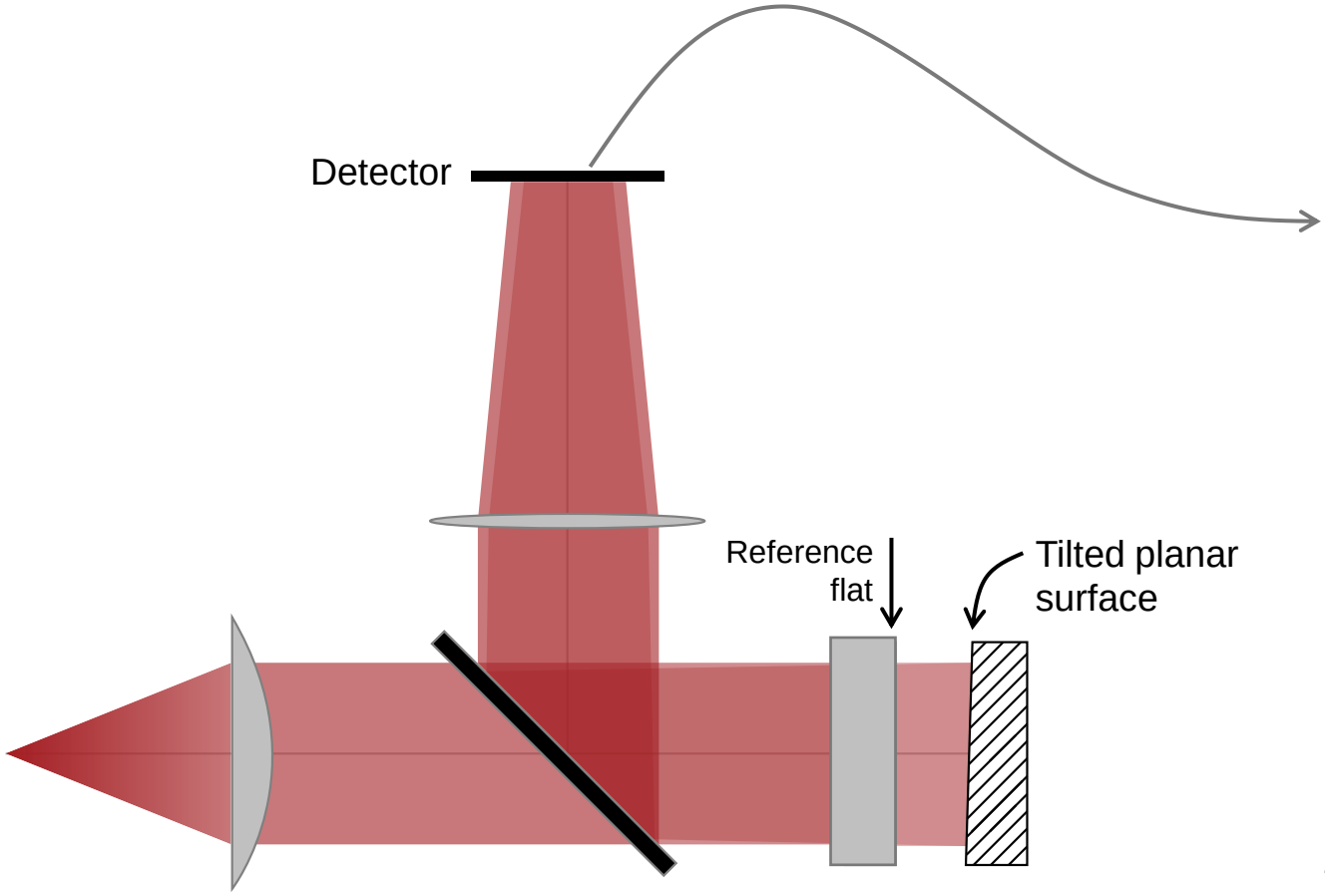
Task: Detect irradiance interference fringes for different test surfaces.

Test surface

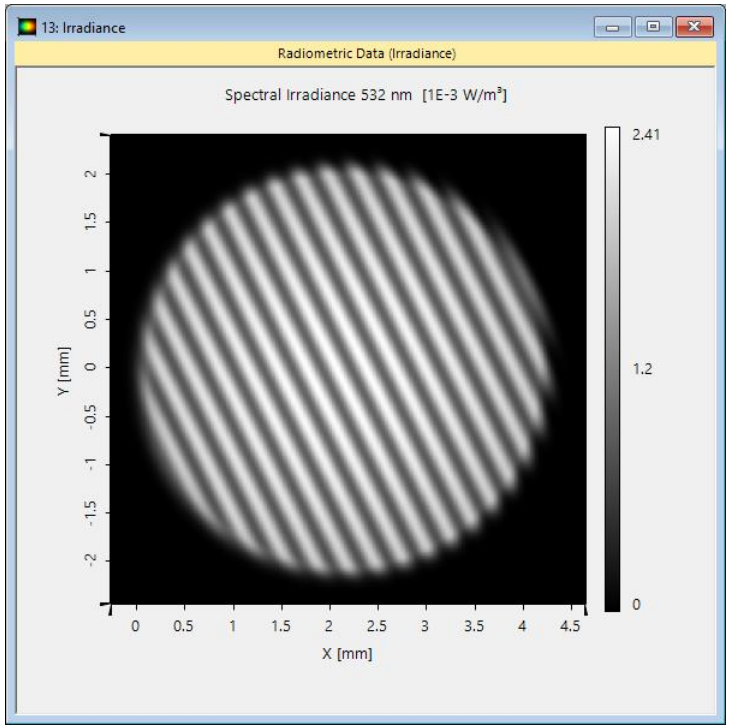
- Tilted planar surface
- Cylindrical surface
- Spherical surface

Simulation Results

Tilted Planar Surface under Observation

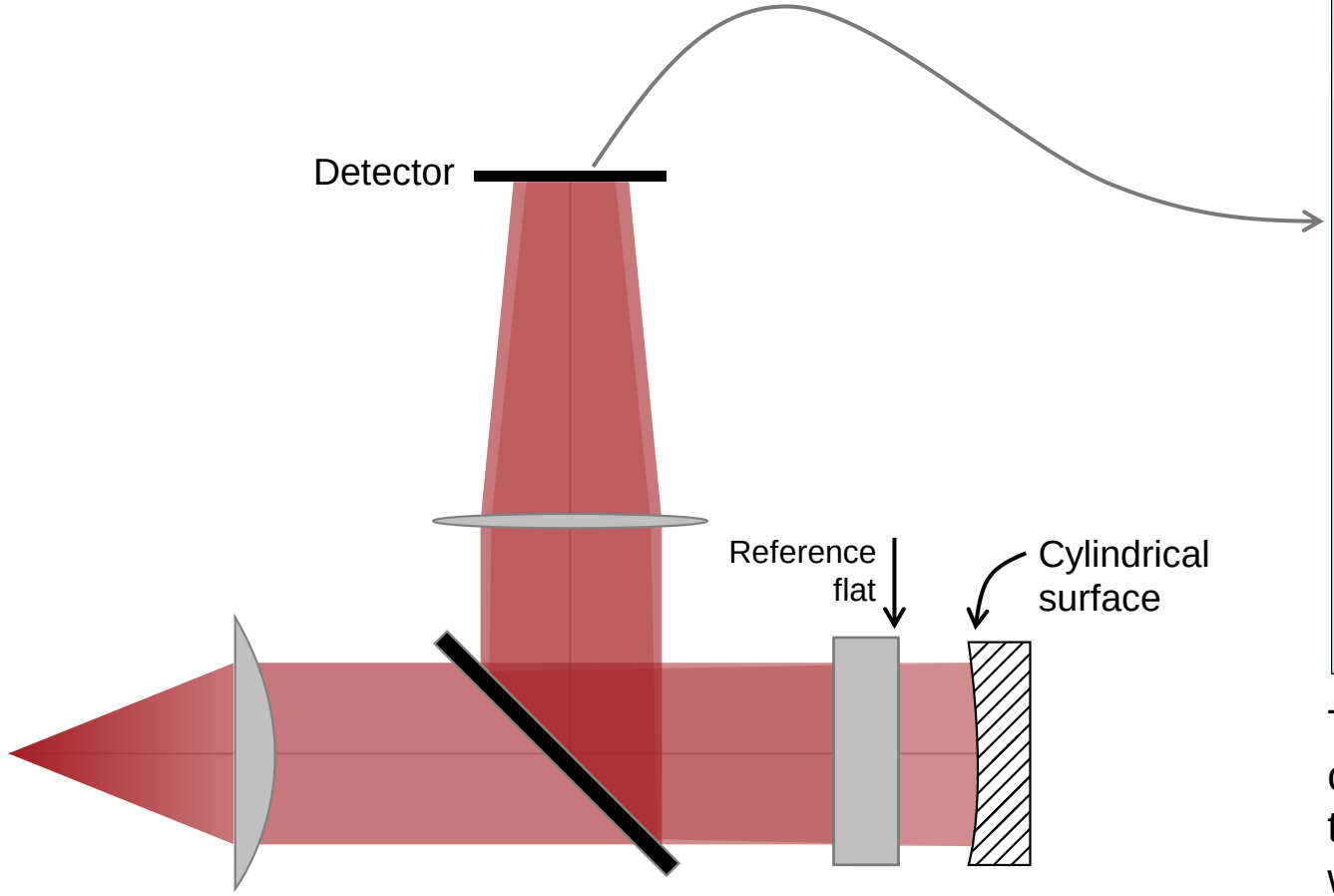


Irradiance

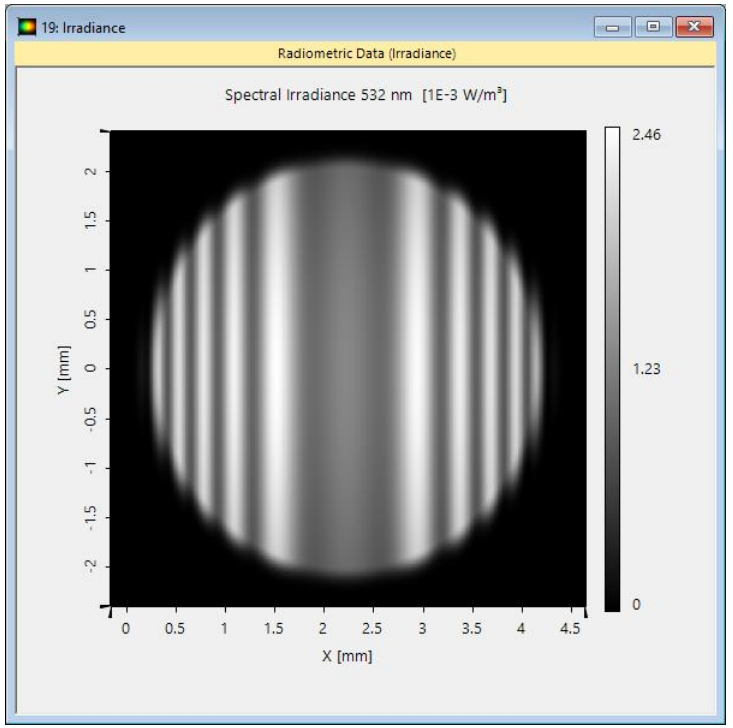


Reflections from the test planar surface are still plane waves, but with slightly different direction, therefore leading to parallel striped fringes.

Cylindrical Surface under Observation

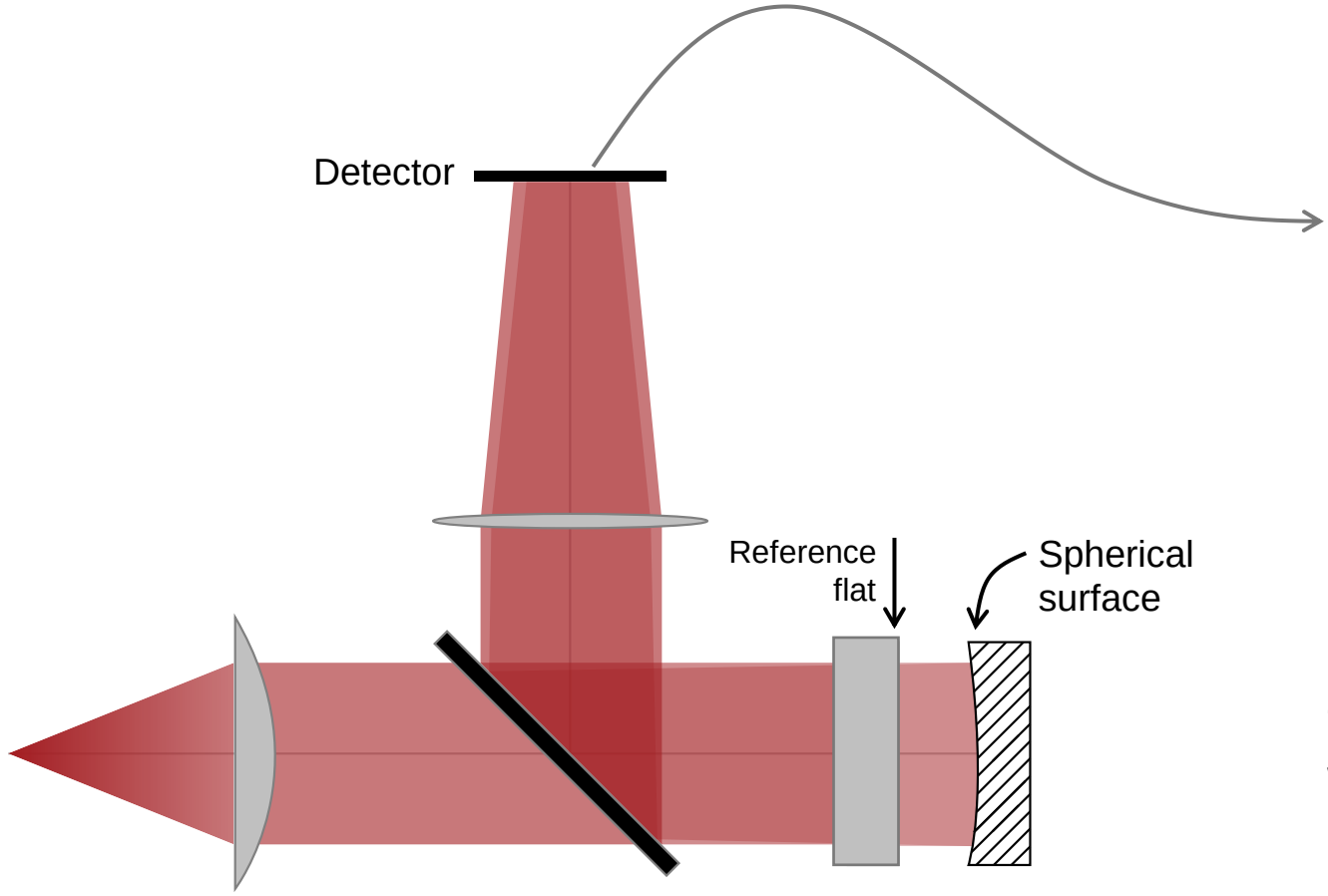


Irradiance

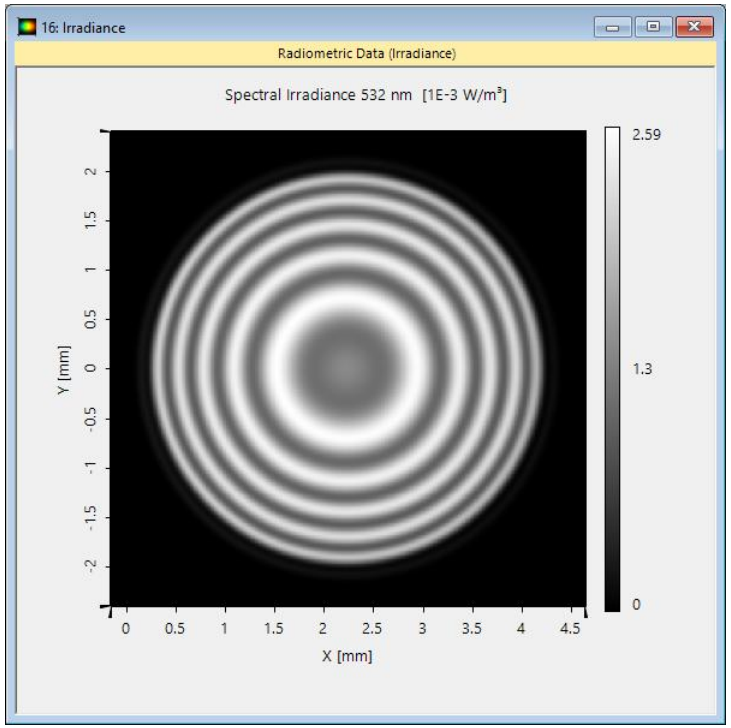


The reflected wavefront from the test cylindrical surface gets curved in one direction, therefore leading to parallel striped fringes but with varying pitch.

Spherical Surface under Observation



Irradiance



The spherical surface changes the reflected wavefront radially, thus the interference fringes appear as concentric rings.

Workflow Steps

Basic Workflow Steps

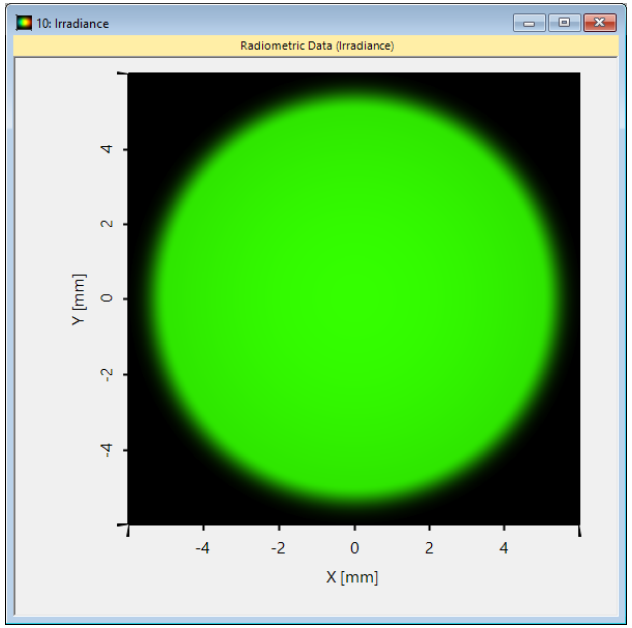
Source selection

System setup

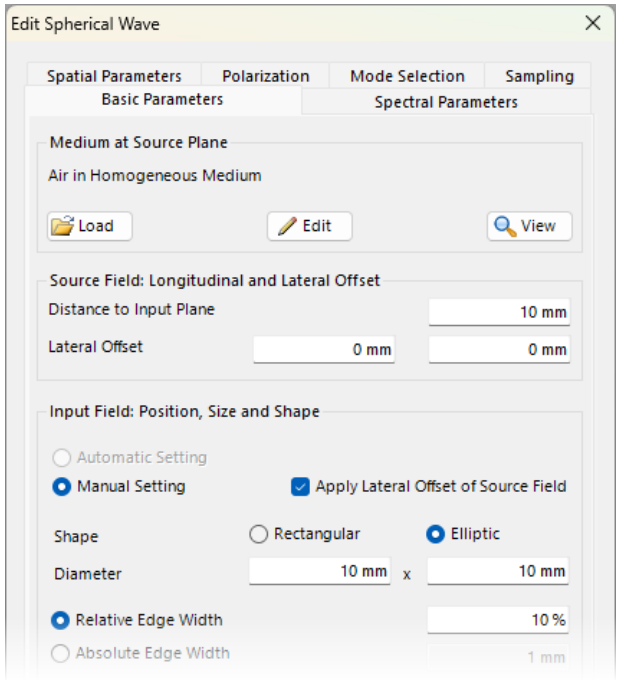
Detector selection

Getting it done in VirtualLab Fusion:

- Spherical Wave



Irradiance of source



Source settings

Basic Workflow Steps

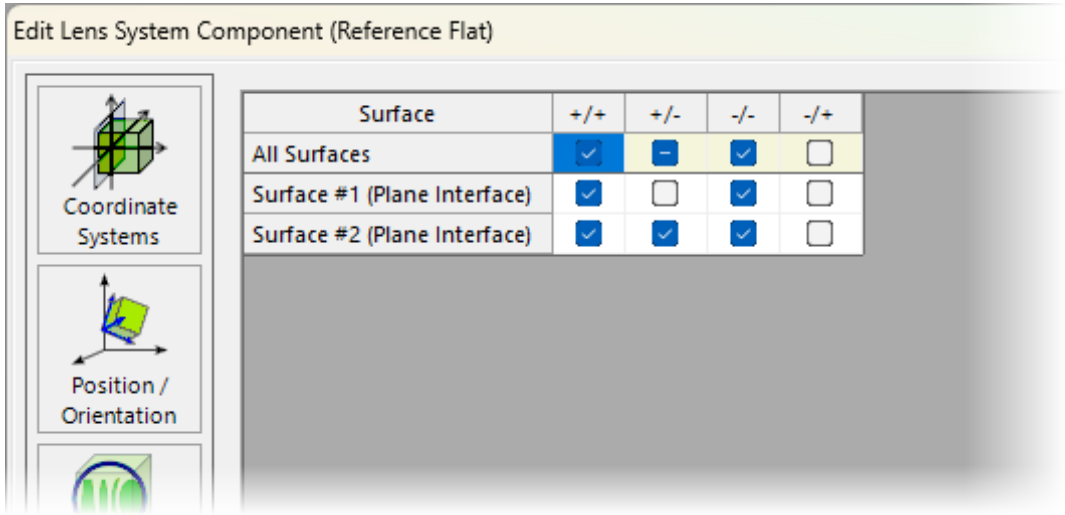
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

- Position and orientation of elements in the optical setup
- Channel configuration for surfaces and grating regions



Reference object channel settings

Basic Workflow Steps

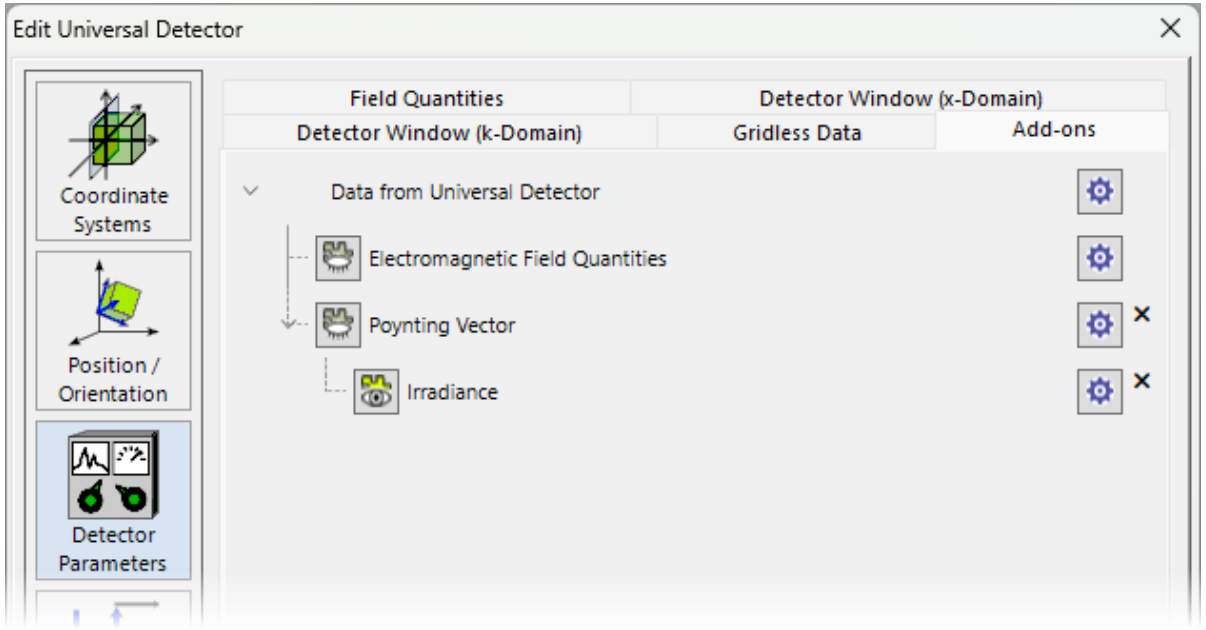
Source selection

System setup

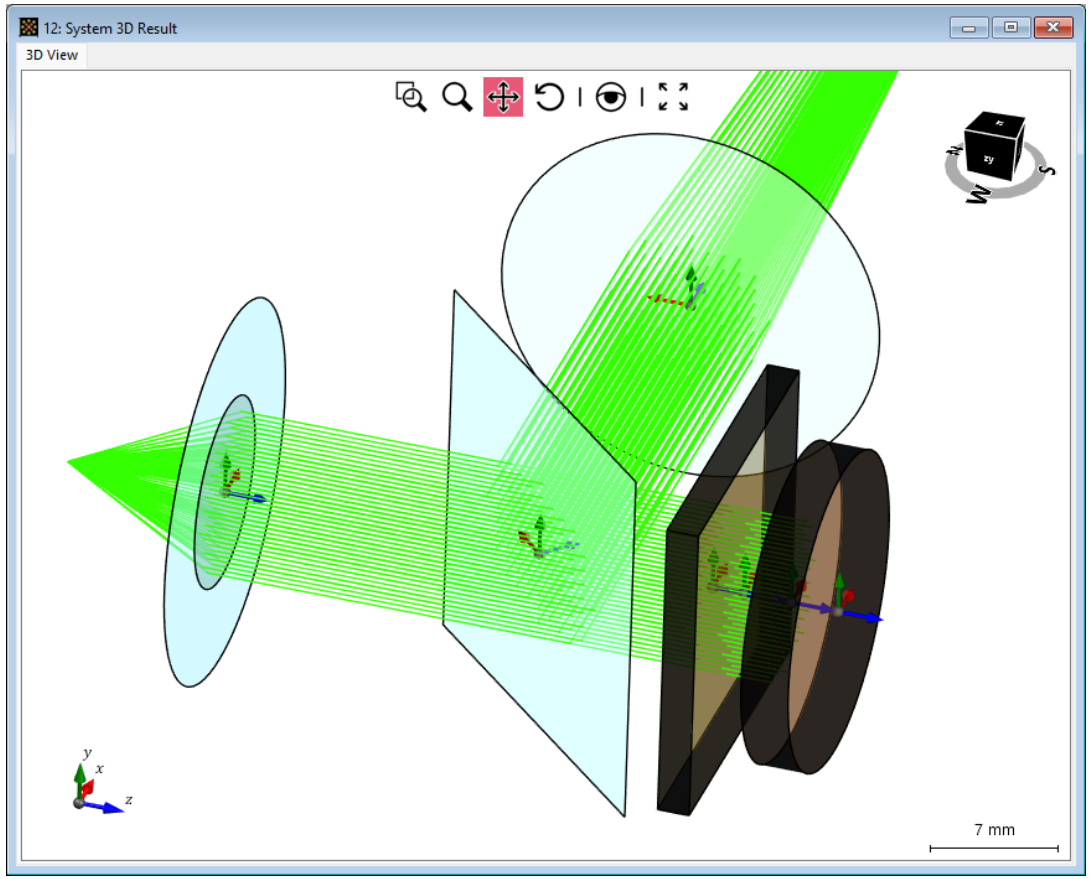
Detector selection

Getting it done in VirtualLab Fusion:

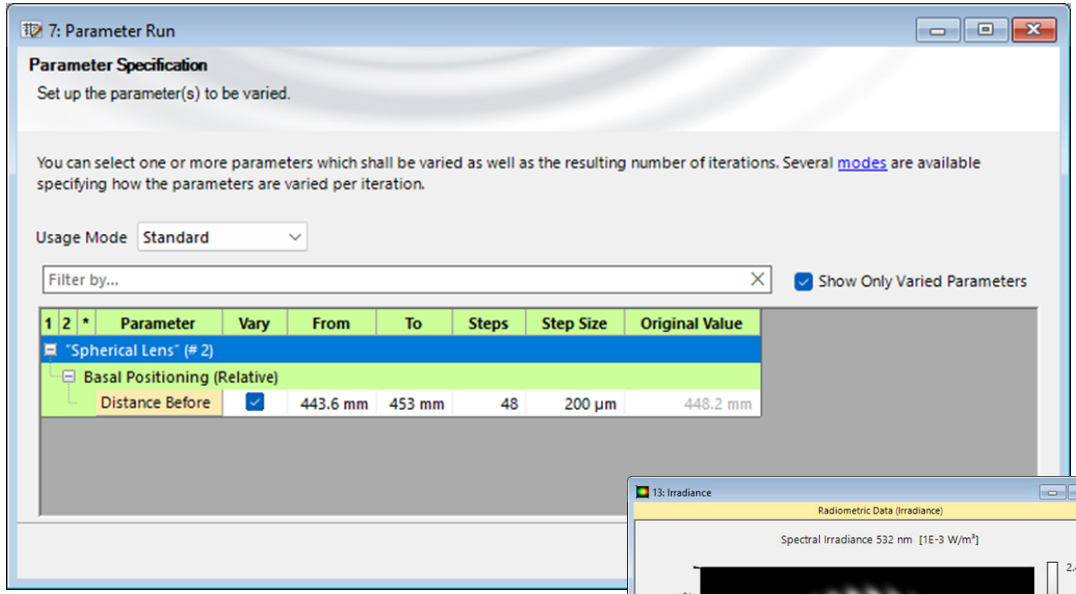
- Universal Detector



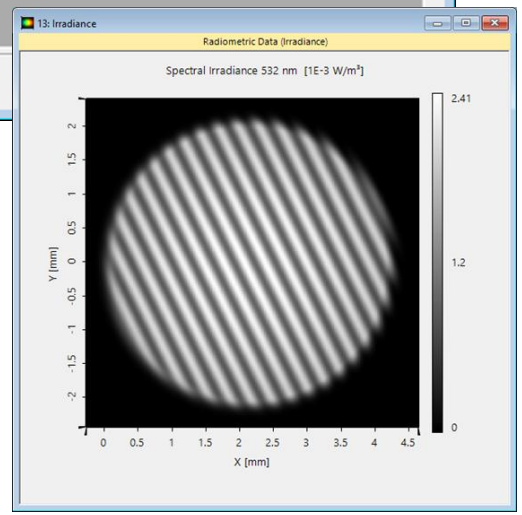
Peek into VirtualLab Fusion



3D system visualization



parameter sweep



calculation of interference fringes

Document Information

Title	Fizeau Interferometer for Optical Testing
Document code	USC.0101
Publication date	01.04.2025
Required packages	-
Software version	2024.1 (Build 2.74)*
Category	Use Case
Further reading	• Universal Detector • Channel Setting for Non-Sequential Tracing • Laser-Based Michelson Interferometer and Interference Fringe Exploration • Mach-Zehnder Interferometer

* *The files attached to this document require the specific version or later.*