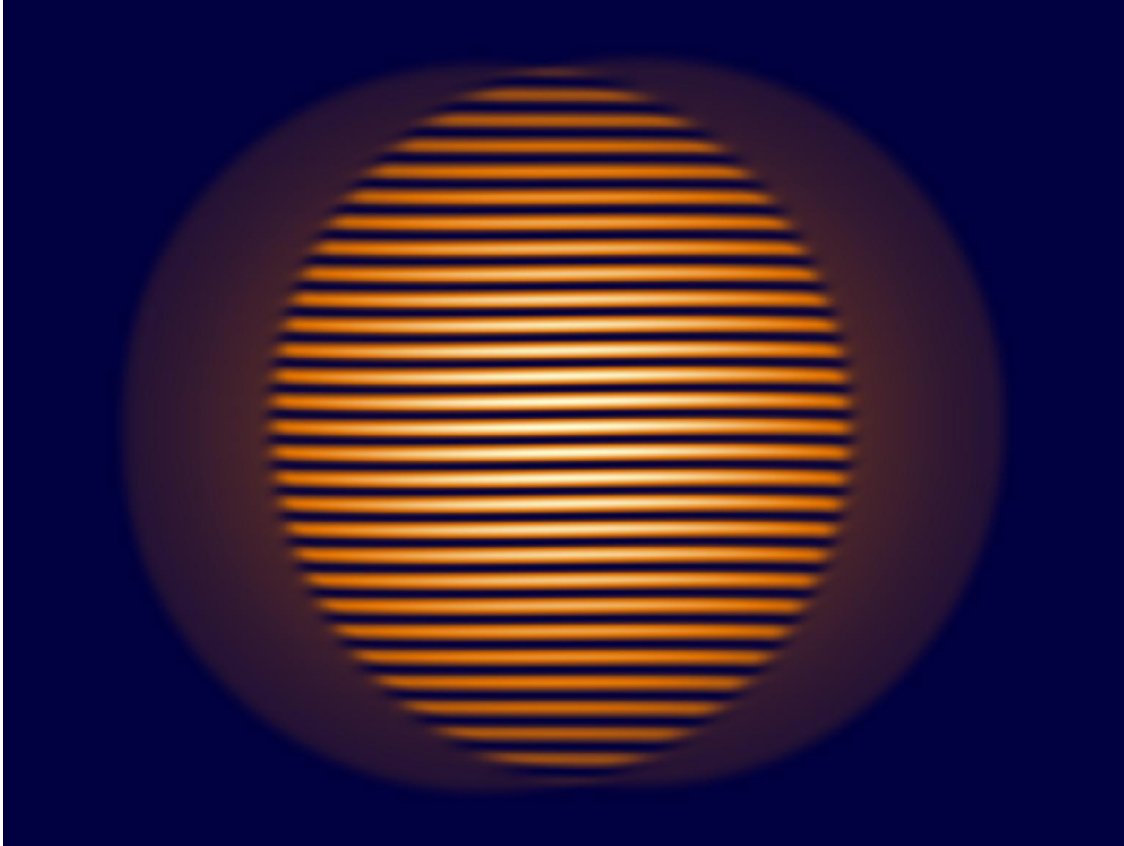


Collimation Testing with Shearing Interferometry

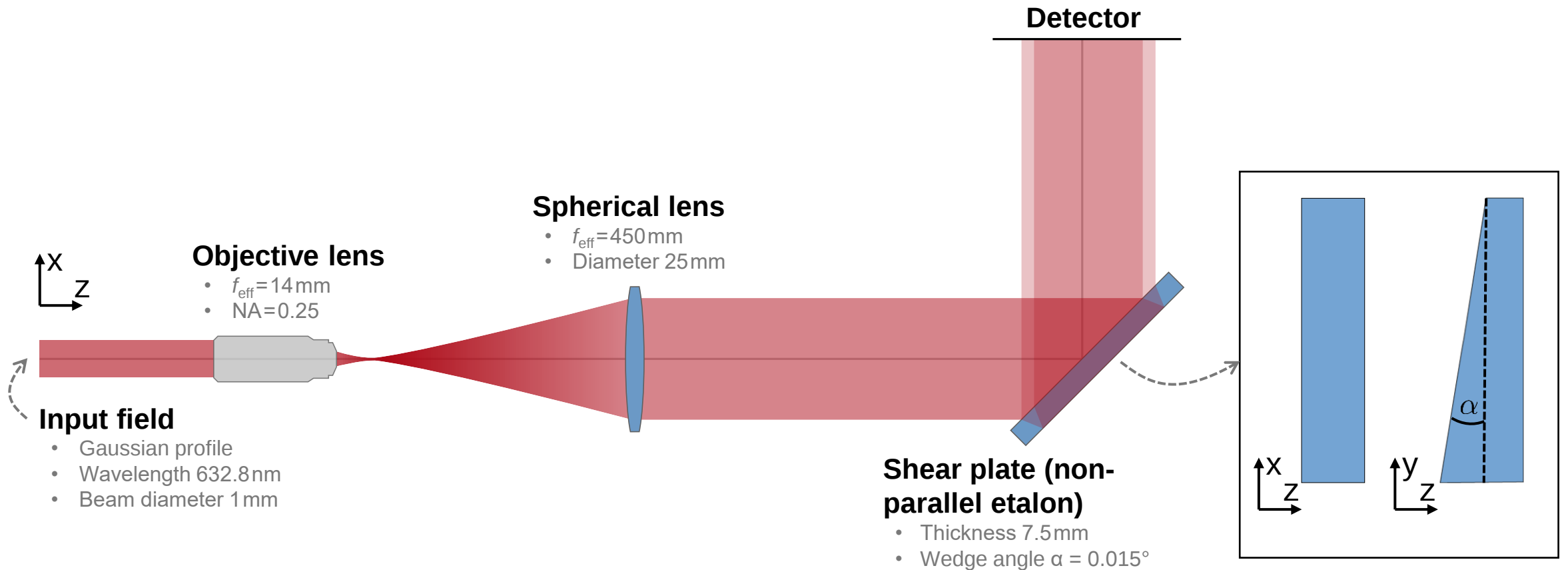
Abstract



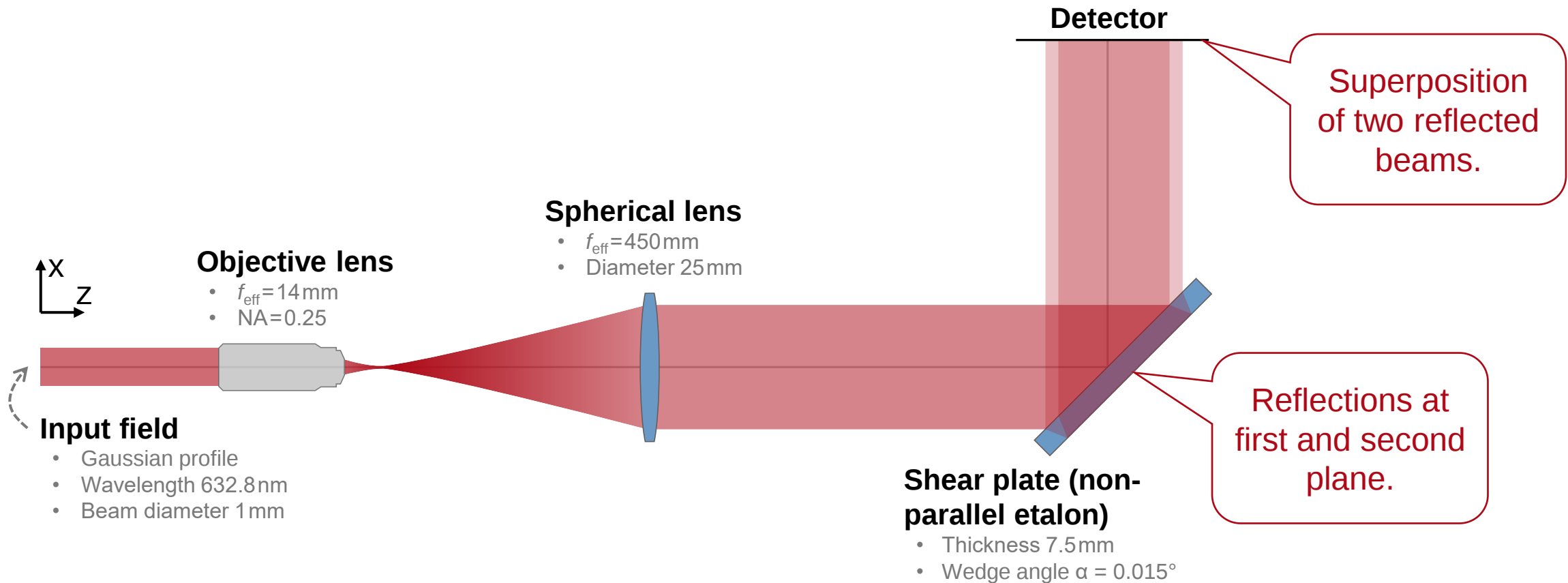
In this use case, we demonstrate the functionality of a shearing interferometer and its use for testing collimation. By varying the beam collimation system – in this example, the distance between the two lenses – we observe the interference fringes from the shearing interferometry.

Application Scenario

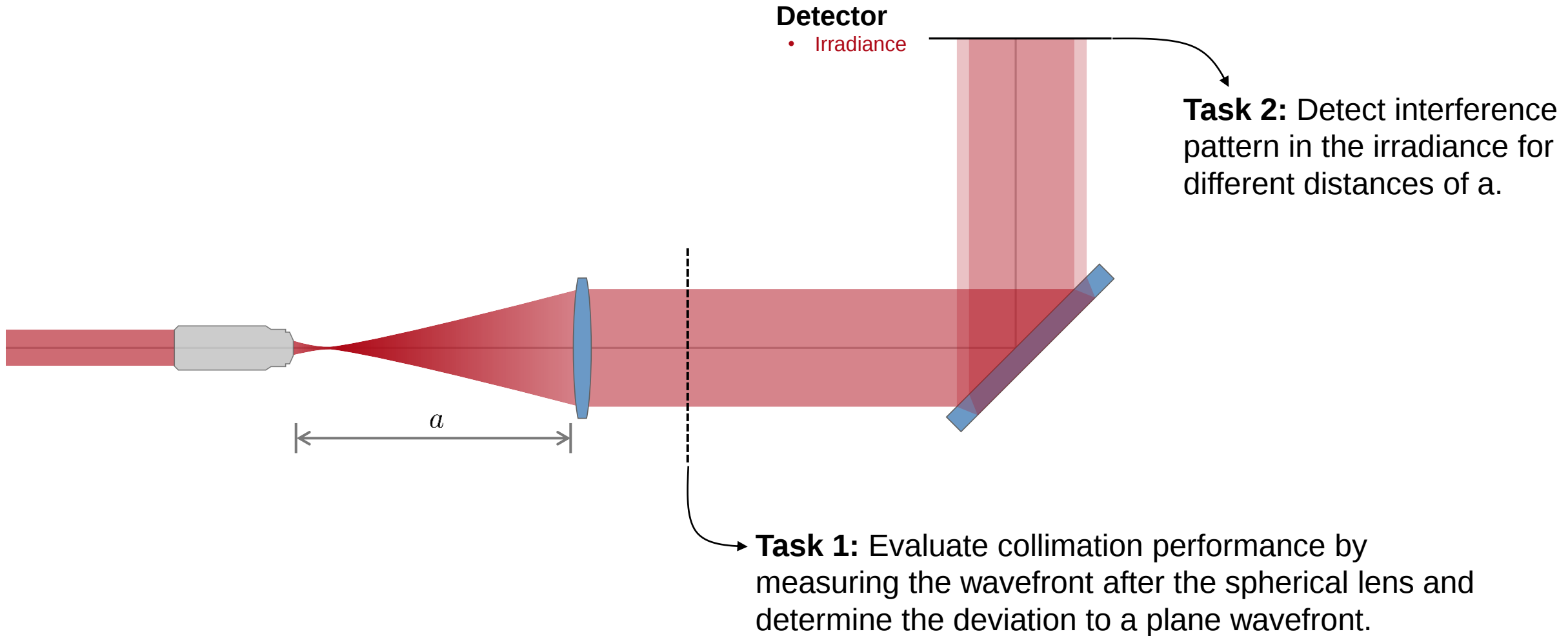
Application Scenario: System



Application Scenario: System

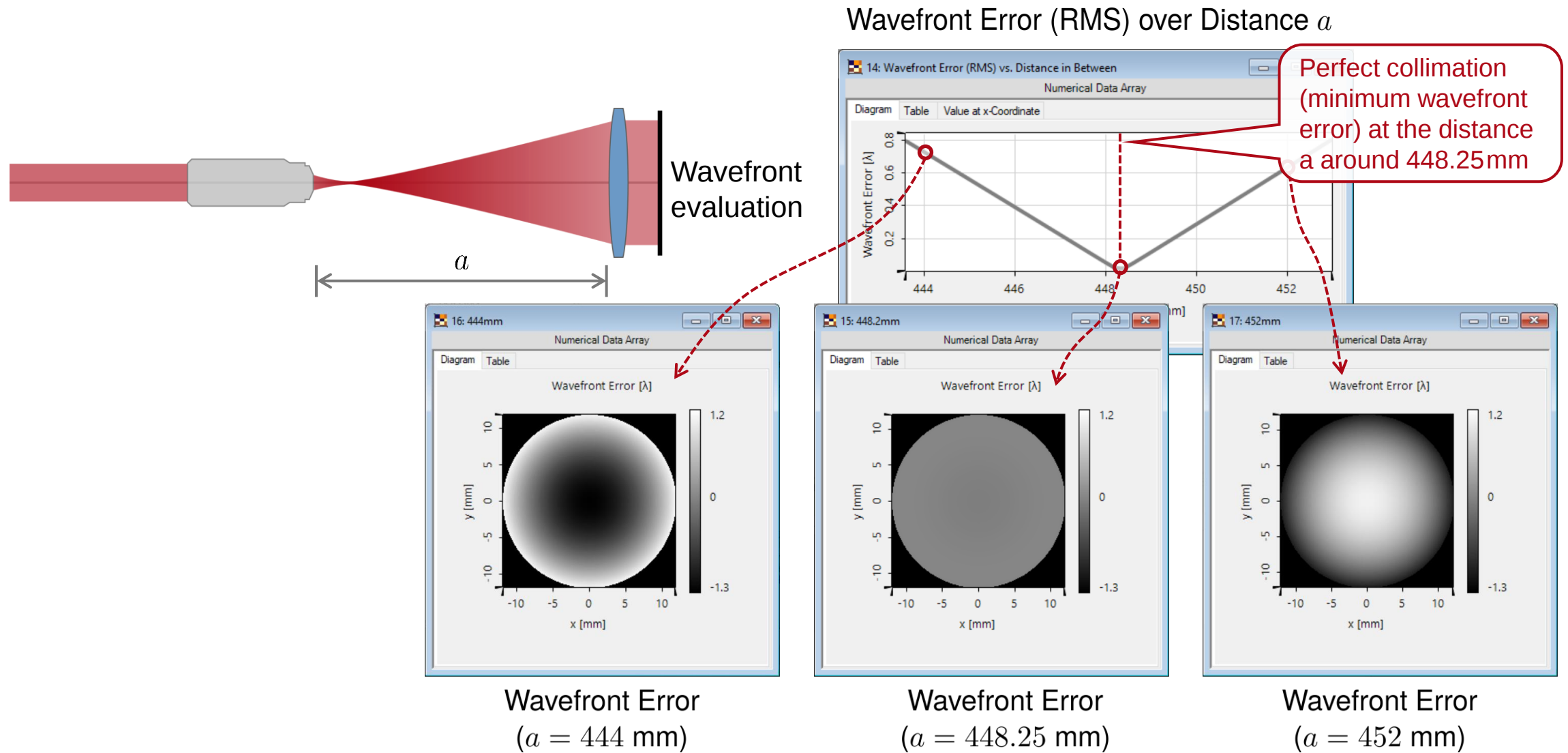


Application Scenario: Simulation Tasks



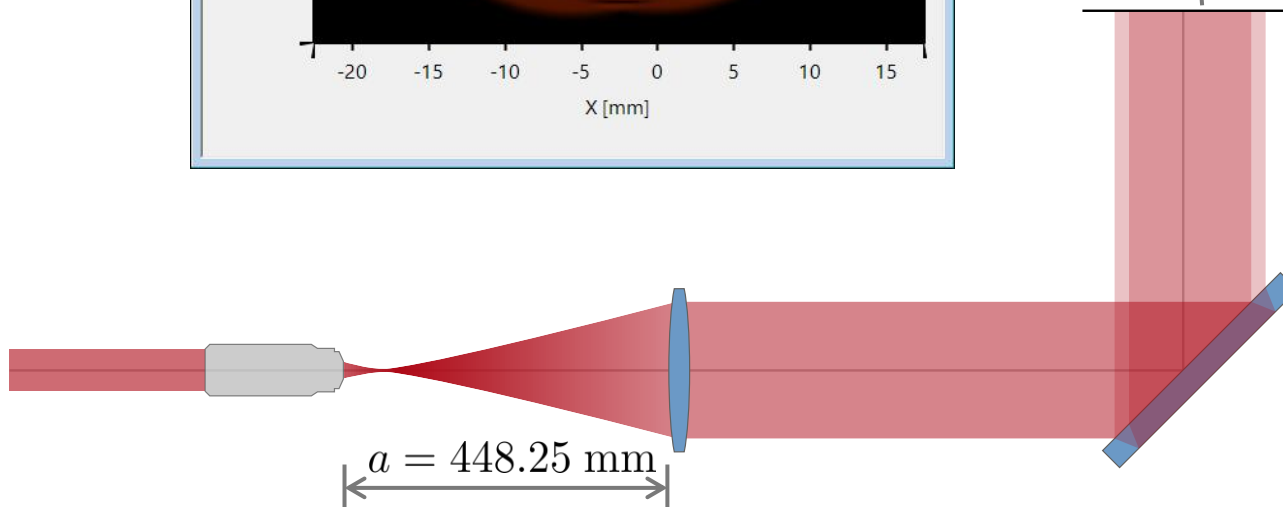
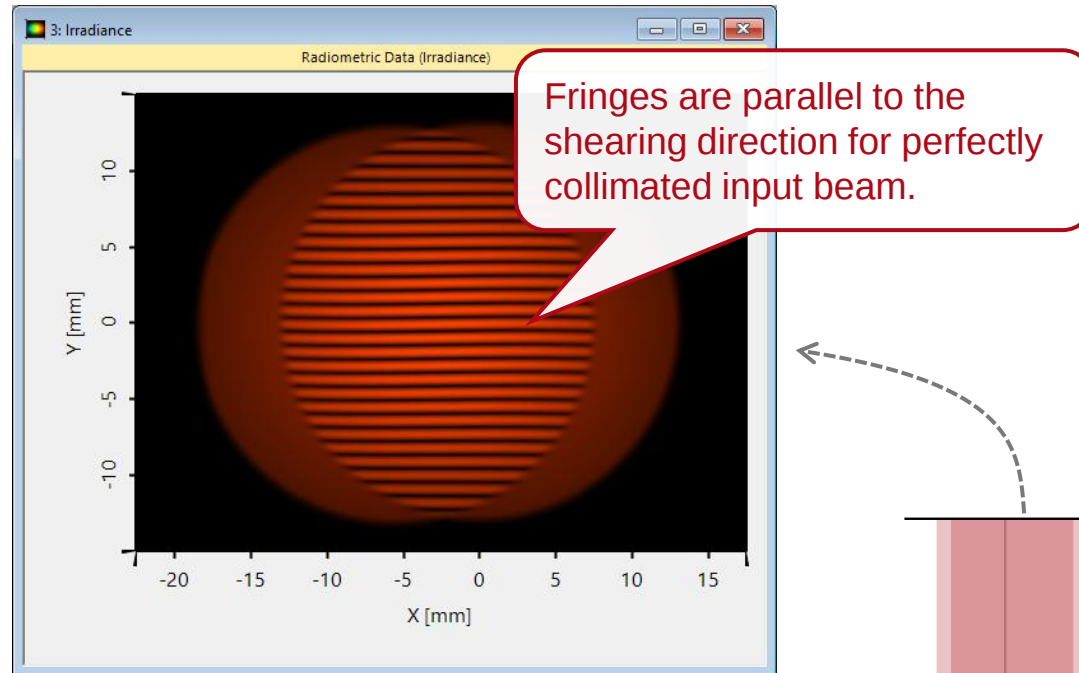
Simulation Results

Task 1: Wavefront Evaluation after Expansion and Collimation

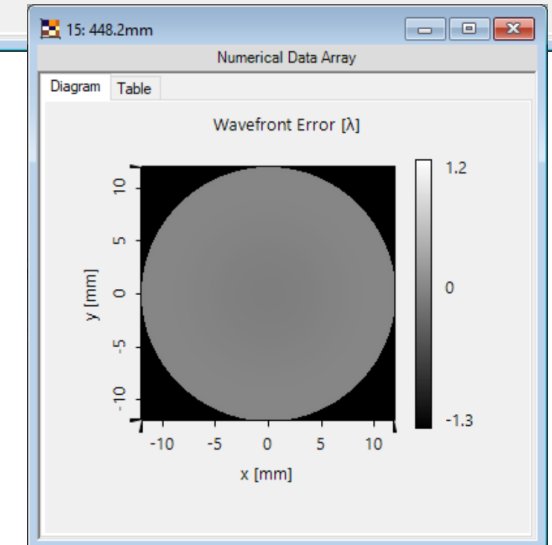
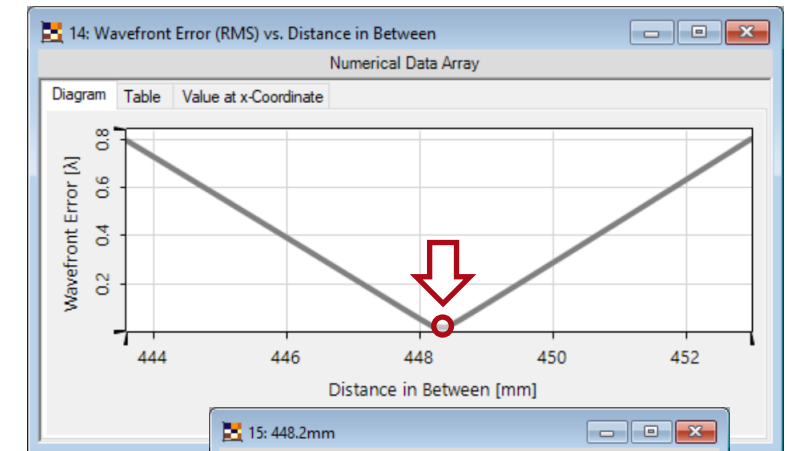


Task 2: Shear Interference Fringe - Distance: 448.25mm

Irradiance

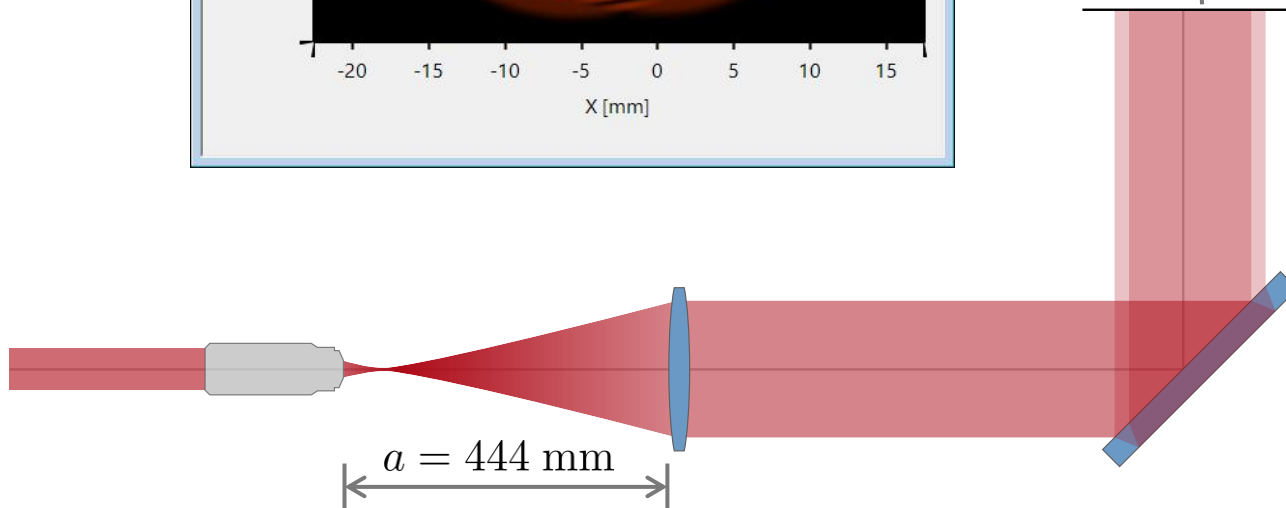
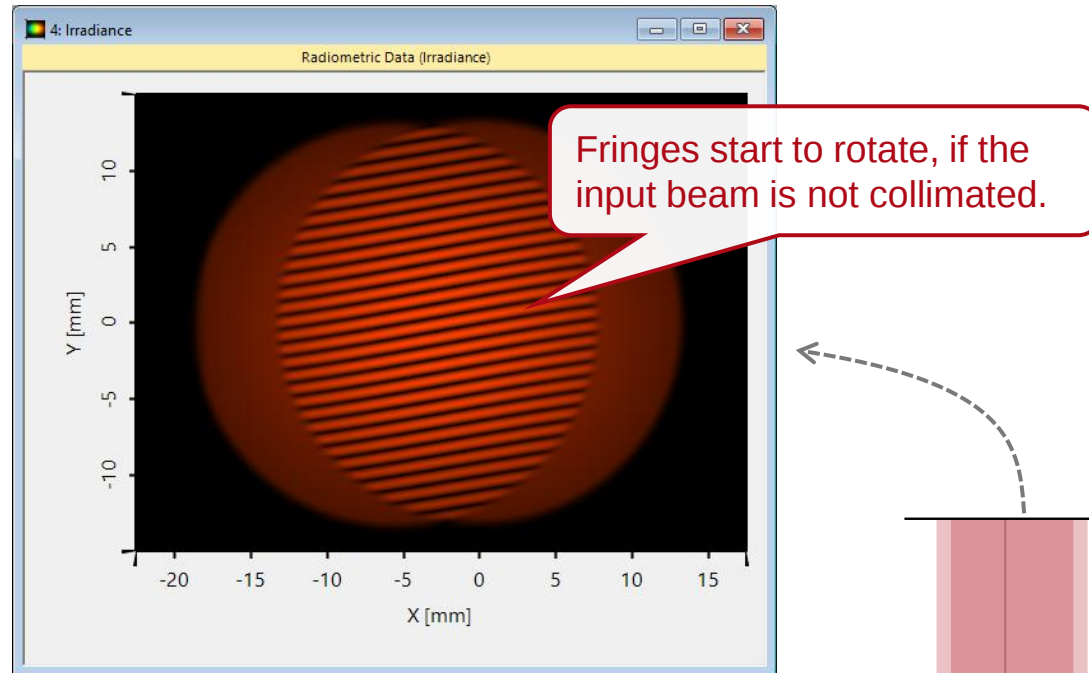


Wavefront Error (RMS) Behind Spherical Lens

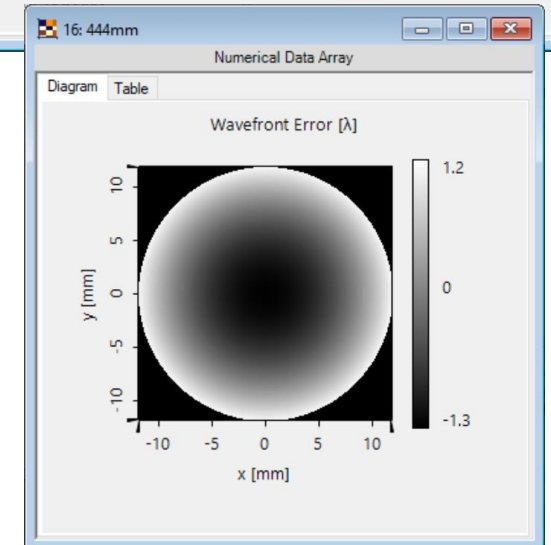
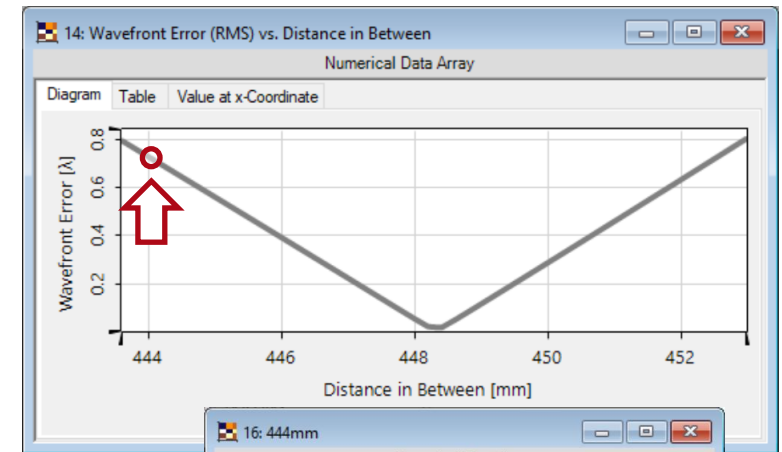


Task 2: Shear Interference Fringe - Distance: 444 mm

Irradiance

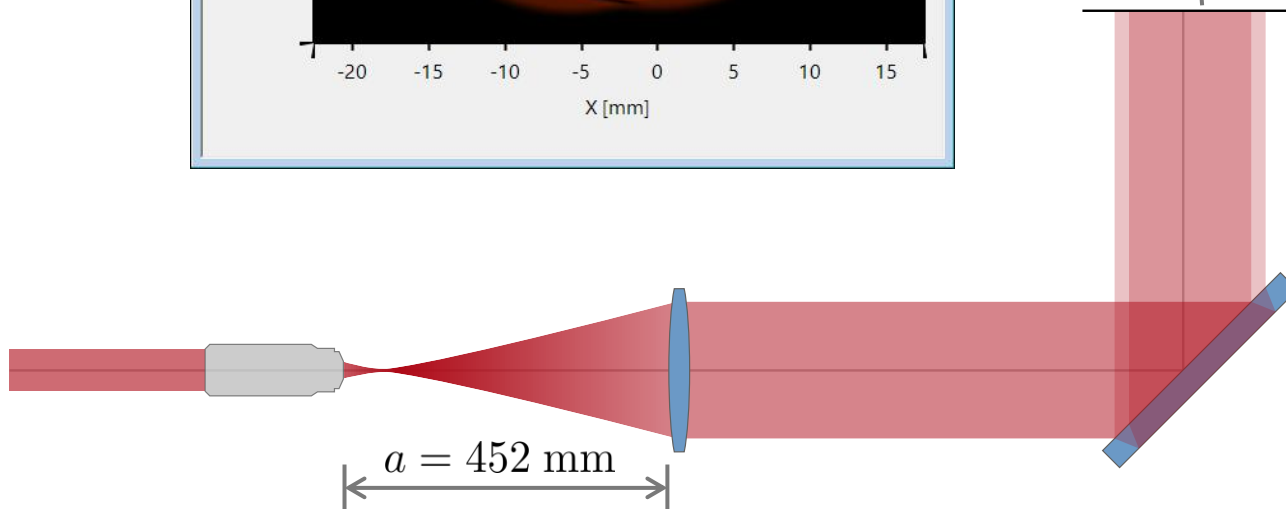
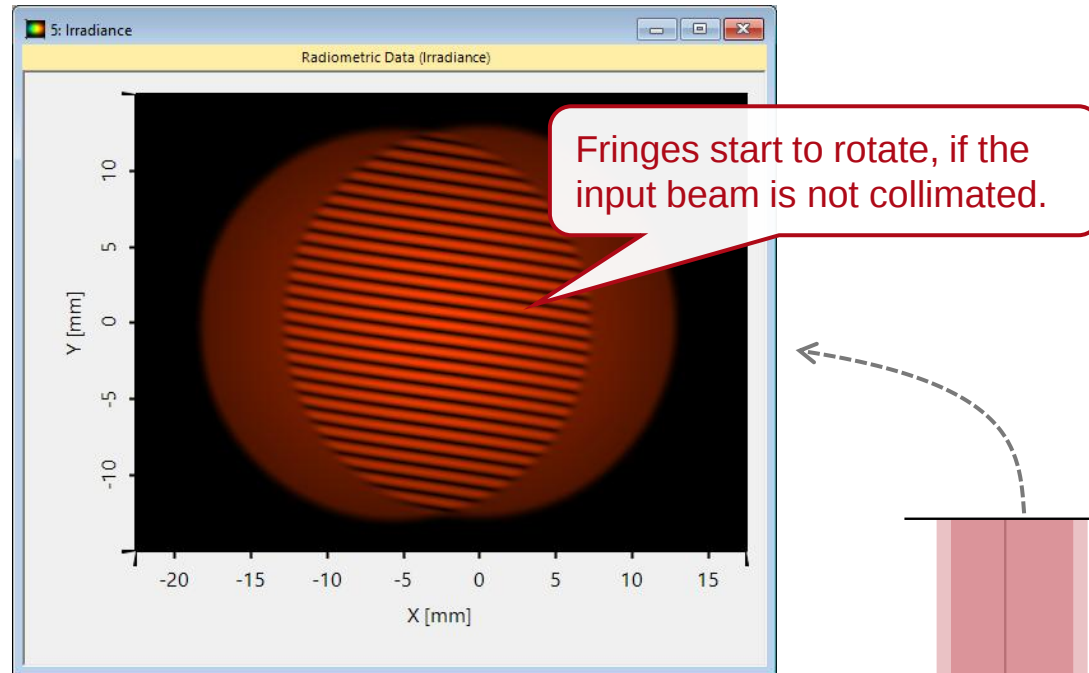


Wavefront Error (RMS) Behind Spherical Lens

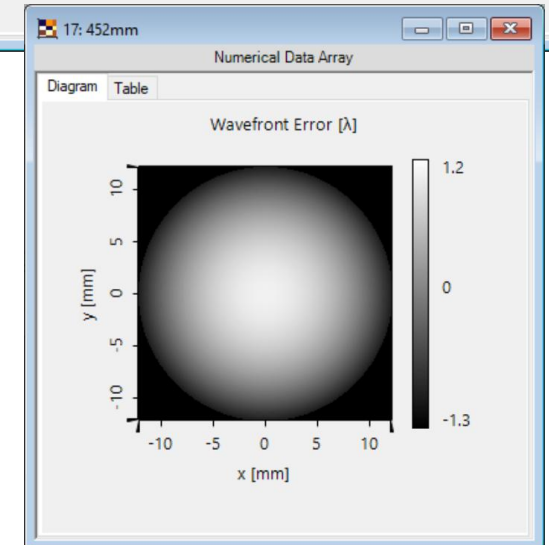
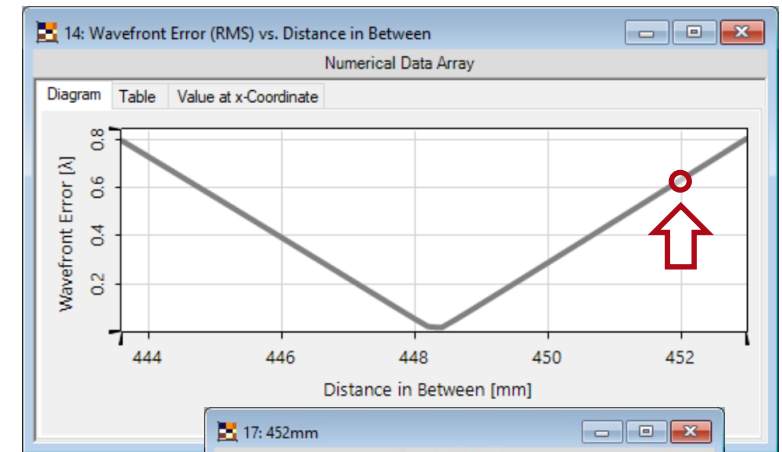


Task 2: Shear Interference Fringe - Distance: 452mm

Irradiance



Wavefront Error (RMS) Behind Spherical Lens



Workflow Steps

Basic Workflow Steps

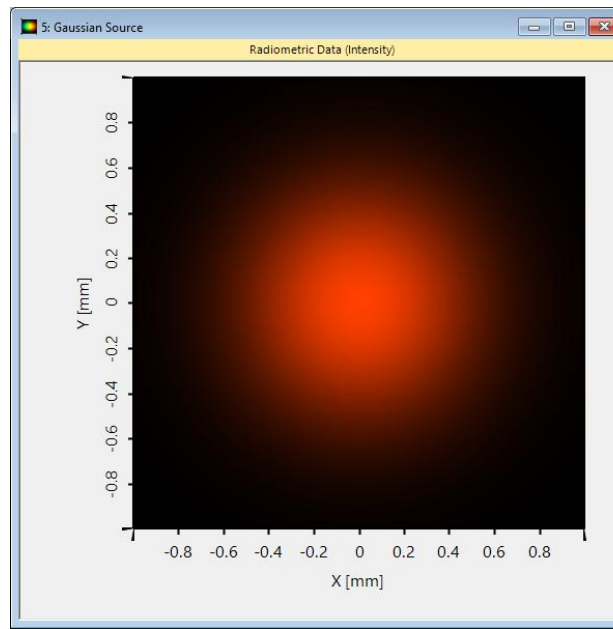
Source selection

System setup

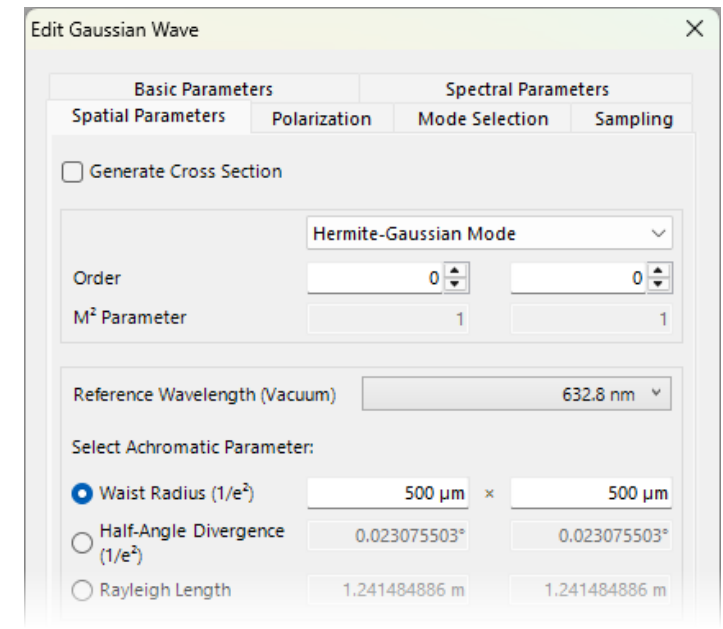
Detector selection

Getting it done in VirtualLab Fusion:

➤ Gaussian Wave



Irradiance of source



Source settings

Basic Workflow Steps

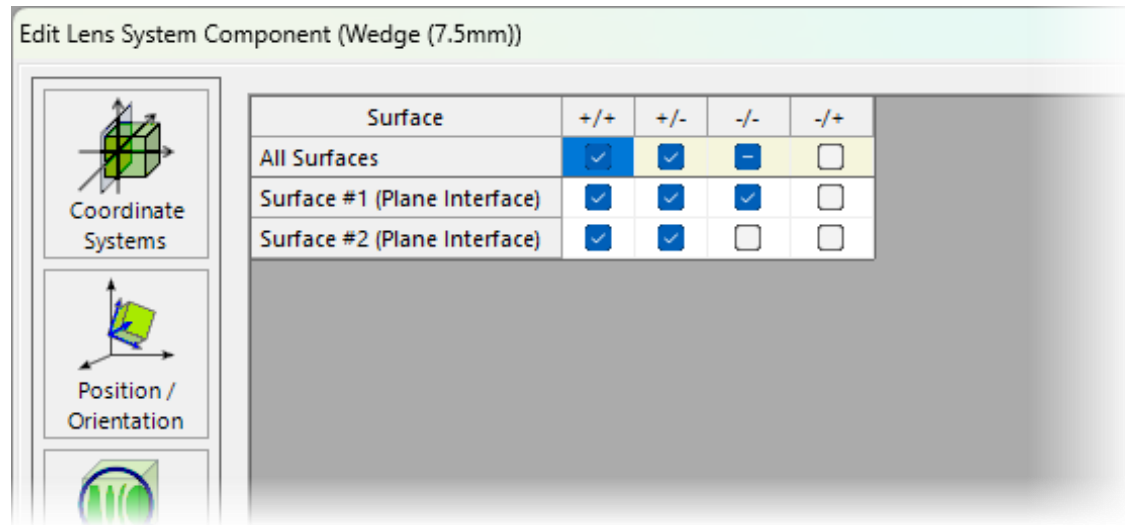
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

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



Shear
plate
channel
settings

Basic Workflow Steps

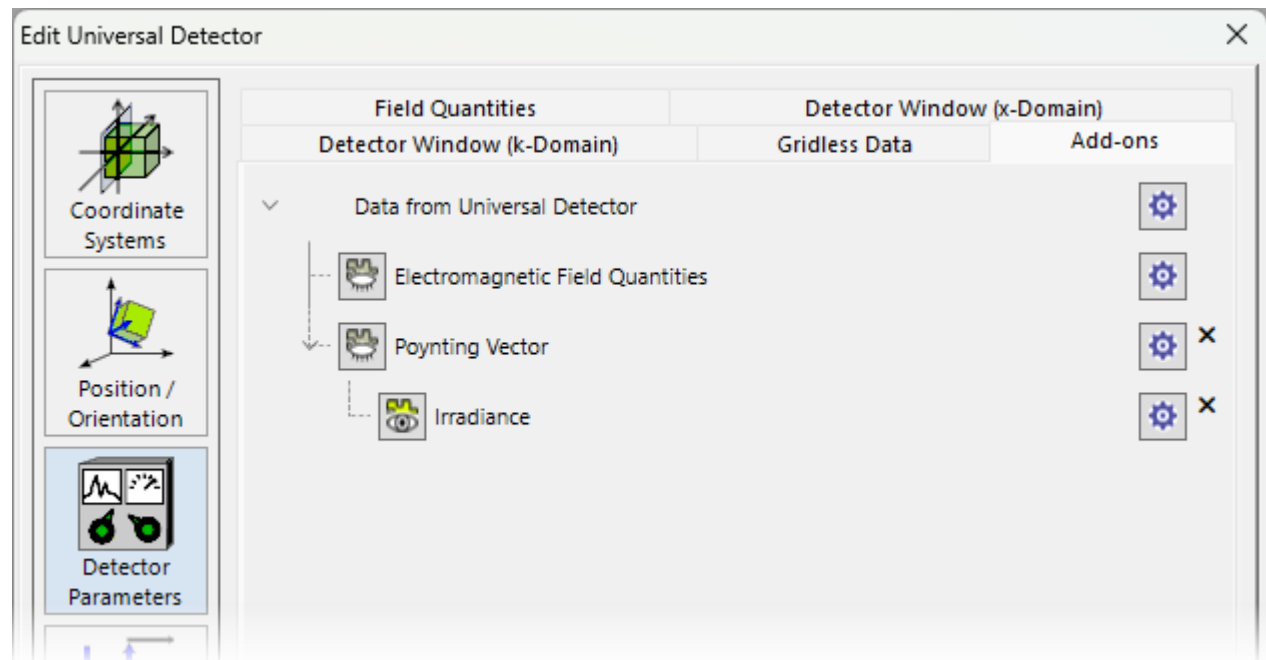
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

- Universal Detector
- Wavefront Error Detector



Detector
add-on
selection

Specific Workflow Steps Related to Use Case

Perform parameter
sweep

Getting it done in VirtualLab Fusion:

➤ Parameter Run document

7: Parameter Run

Parameter Specification
Set up the parameter(s) to be varied.

You can select one or more parameters which shall be varied as well as the resulting number of iterations. Several [modes](#) are available specifying how the parameters are varied per iteration.

Usage Mode: Standard

Filter by...

☒ Show Only Varied Parameters

1	2	*	Parameter	Vary	From	To	Steps	Step Size	Original Value
"Spherical Lens" (# 2)									
Basal Positioning (Relative)									
			Distance Before	☒	443.6 mm	453 mm	48	200 µm	448.2 mm

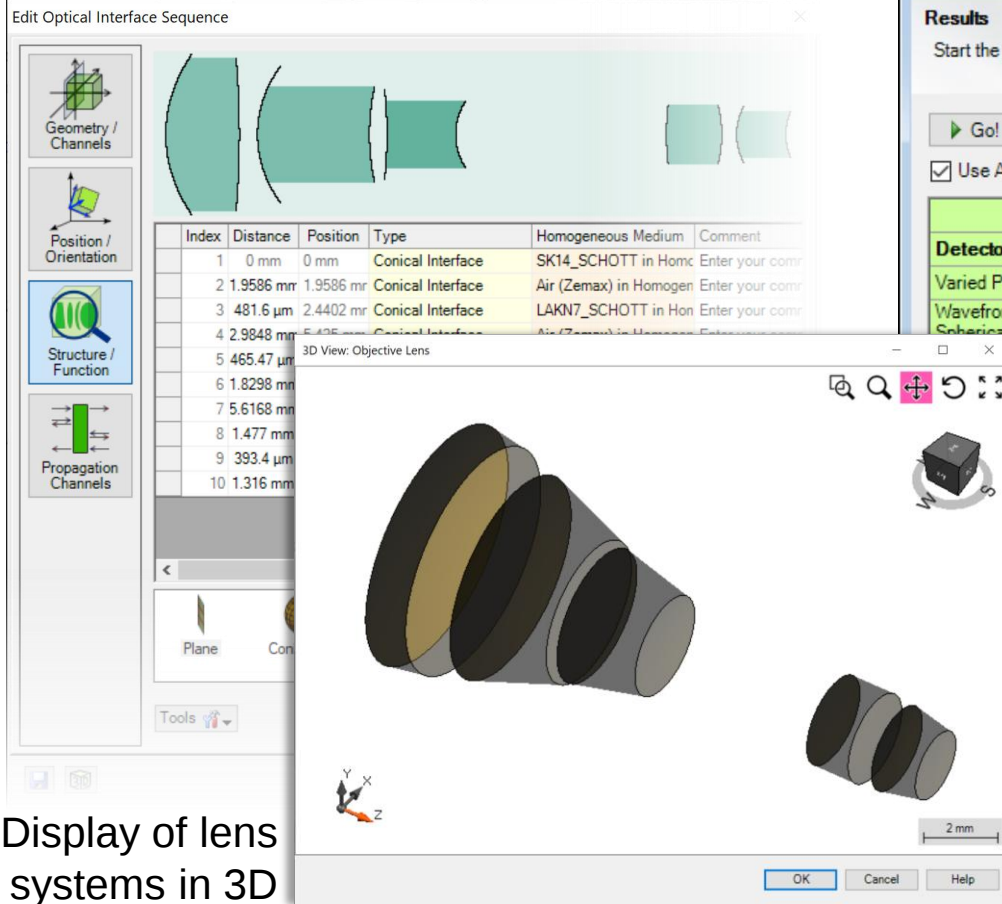
< Back Next > Show ▾

Parameter
Run
document

Peek into VirtualLab Fusion

Convenient definition of lens systems

Edit Optical Interface Sequence



The screenshot shows the 'Edit Optical Interface Sequence' window. On the left is a toolbar with icons for Geometry / Channels, Position / Orientation, Structure / Function, and Propagation Channels. The main area contains a table with 10 rows of optical interfaces. Below the table is a 3D view of the lens system, showing a series of lenses and a detector. A scale bar indicates 2 mm.

Index	Distance	Position	Type	Homogeneous Medium	Comment
1	0 mm	0 mm	Conical Interface	SK14_SCHOTT in Hom	Enter your comment
2	1.9586 mm	1.9586 mm	Conical Interface	Air (Zemax) in Homogen	Enter your comment
3	481.6 μ m	2.4402 mm	Conical Interface	LAKN7_SCHOTT in Hom	Enter your comment
4	2.9848 mm	5.425 mm	Conical Interface	Air (Zemax) in Homogen	Enter your comment
5	465.47 μ m				
6	1.8298 mm				
7	5.6168 mm				
8	1.477 mm				
9	393.4 μ m				
10	1.316 mm				

3D View: Objective Lens

OK Cancel Help

Display of lens systems in 3D

16: C:\Users\...\Collimation Testing_02_Collimation Lenses Setup_Scanning Distance.run

Results

Start the parameter run and analyze its results

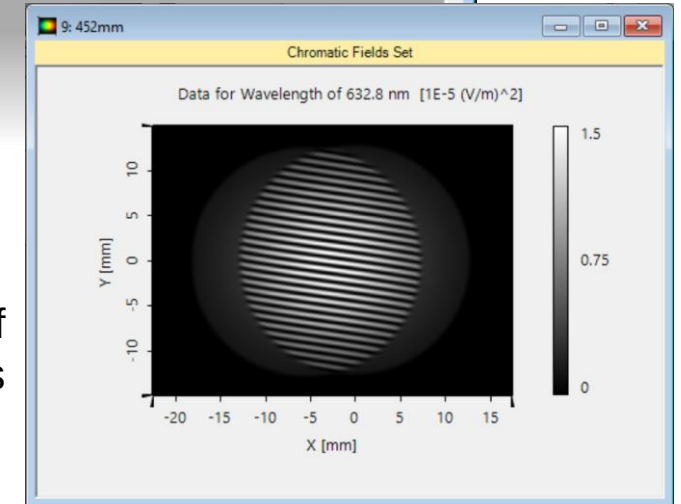
Go!

☒ Use Already Calculated Results for Next Run

Detector	Subdetector	Combined Output	Iteration Step		
			46	47	
Varied Parameters	Distance Before (Spherical...	Data Array	452 mm	452.2 mm	452.4
Wavefront Error #600 after Spherical Lens #2 (T) (Field and Generation)	Data Arrays	Animation	Gridless Data Array	Gridless Data Array	Gridless Data A
	RMS [λ] of Wavefront Error	Data Array	0.77464	0.81632	0.8

Parameter sweep

Calculation of interference fringes



Document Information

Title	Collimation Testing with Shearing Interferometry
Document code	USC.0147
Publication date	01.04.2025
Required packages	-
Software version	2024.1 (Build 2.74)*
Category	Use Case
Further reading	- Laser-Based Michelson Interferometer and Interference Fringe Exploration - Fizeau Interferometer for Optical Testing

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