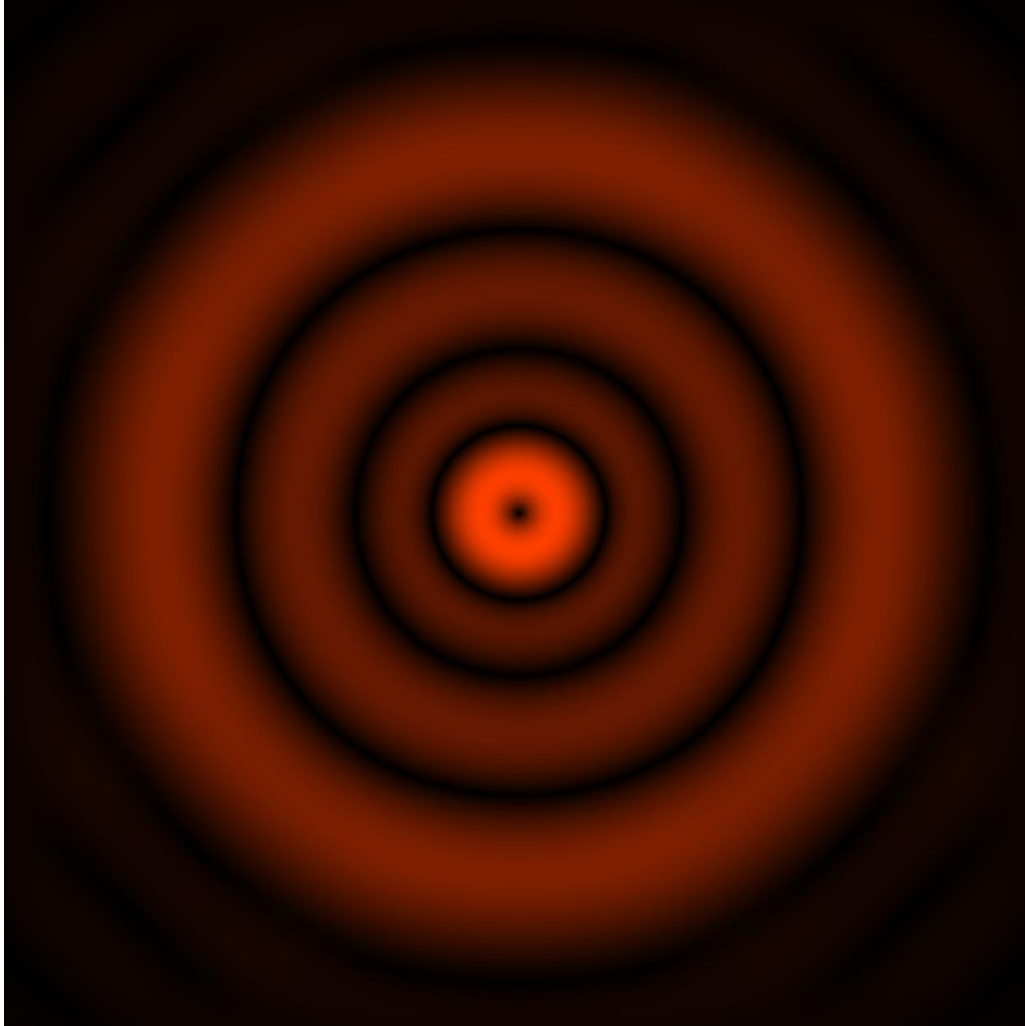


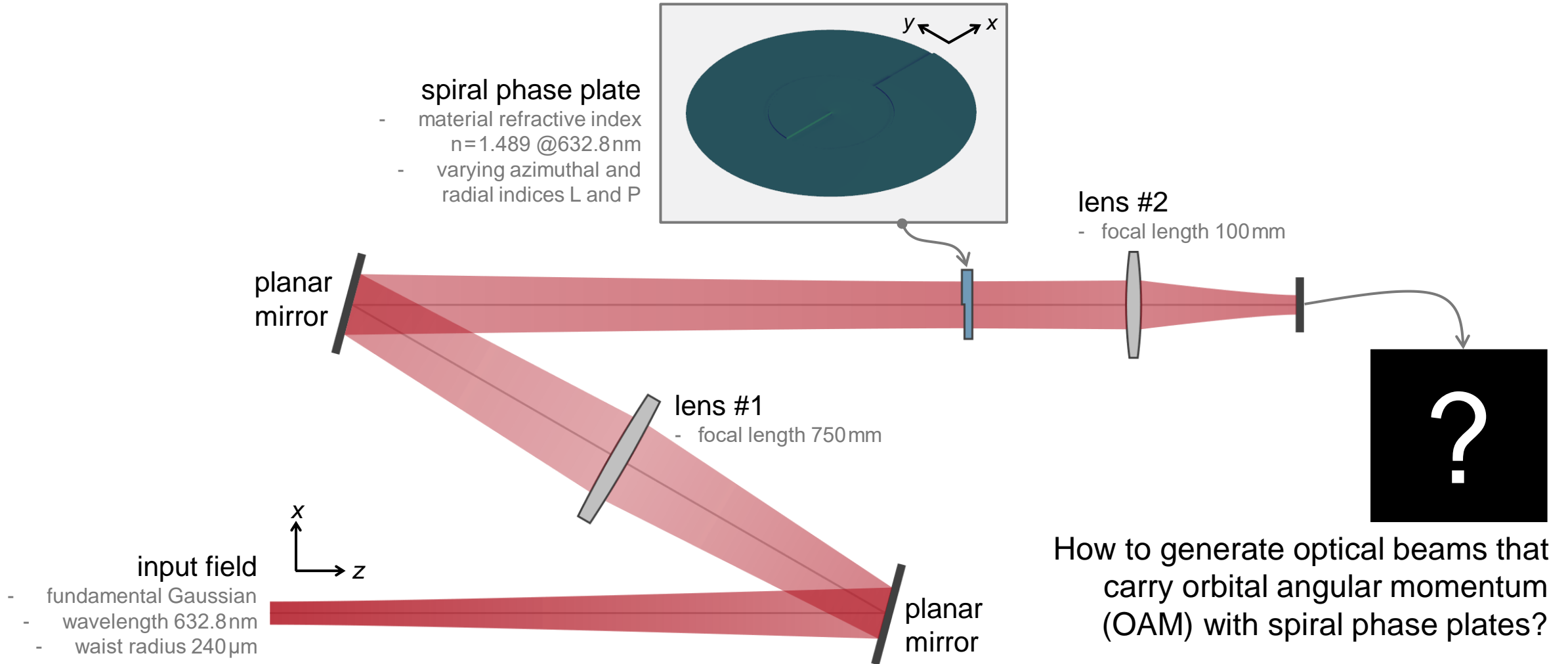
Generation of Optical Beams Carrying Orbital Angular Momentum (OAM)

Abstract



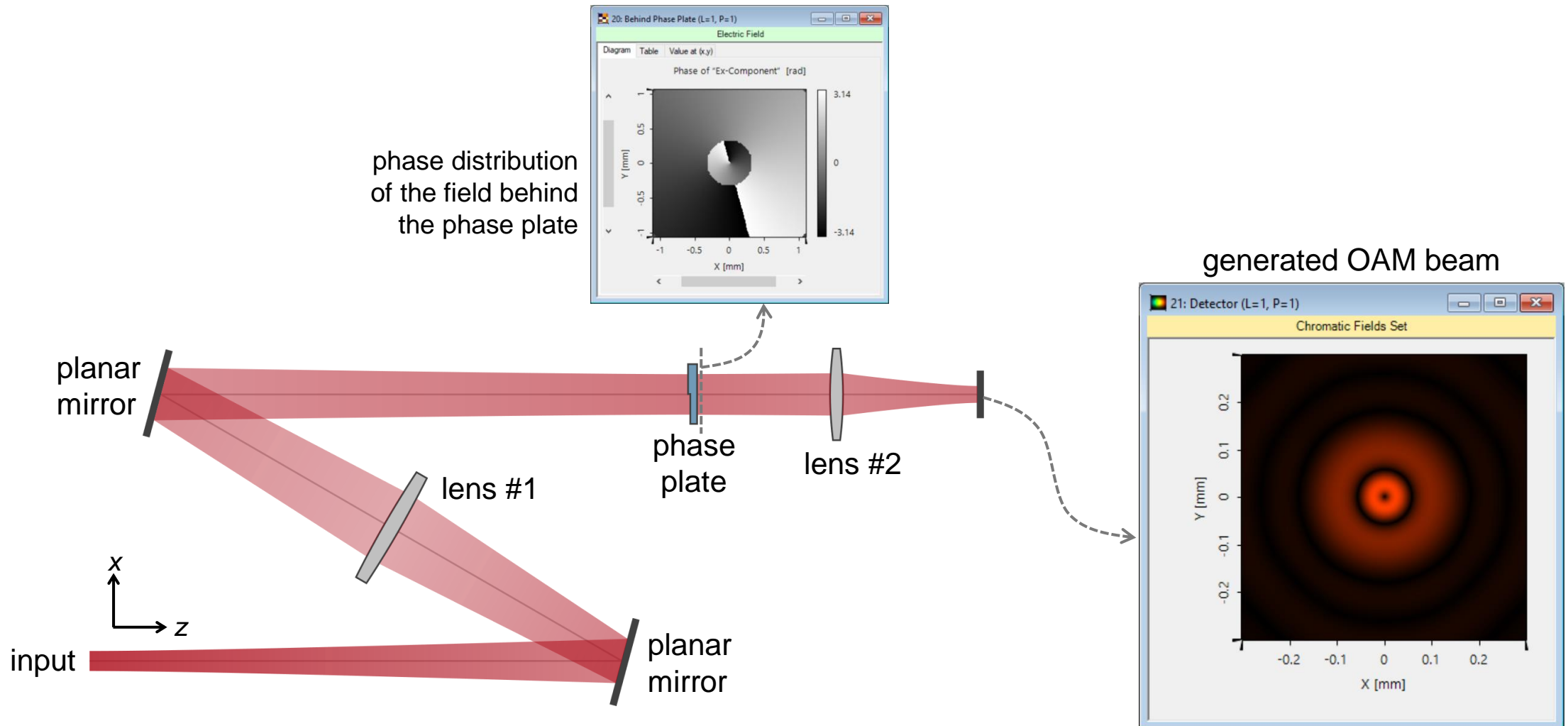
It is known that the orbital angular momentum (OAM) is linked to the helical phase of light. Nowadays, optical beams carrying OAM are shown to be useful for many applications, from quantum optics to optical communication and to biophotonics. Following the work of M. Massari *et al.*, we demonstrate the generation of optical beams with OAM by using spiral phase plates. Three examples with different OAM indices are shown in the simulation with VirtualLab Fusion.

Modeling Task

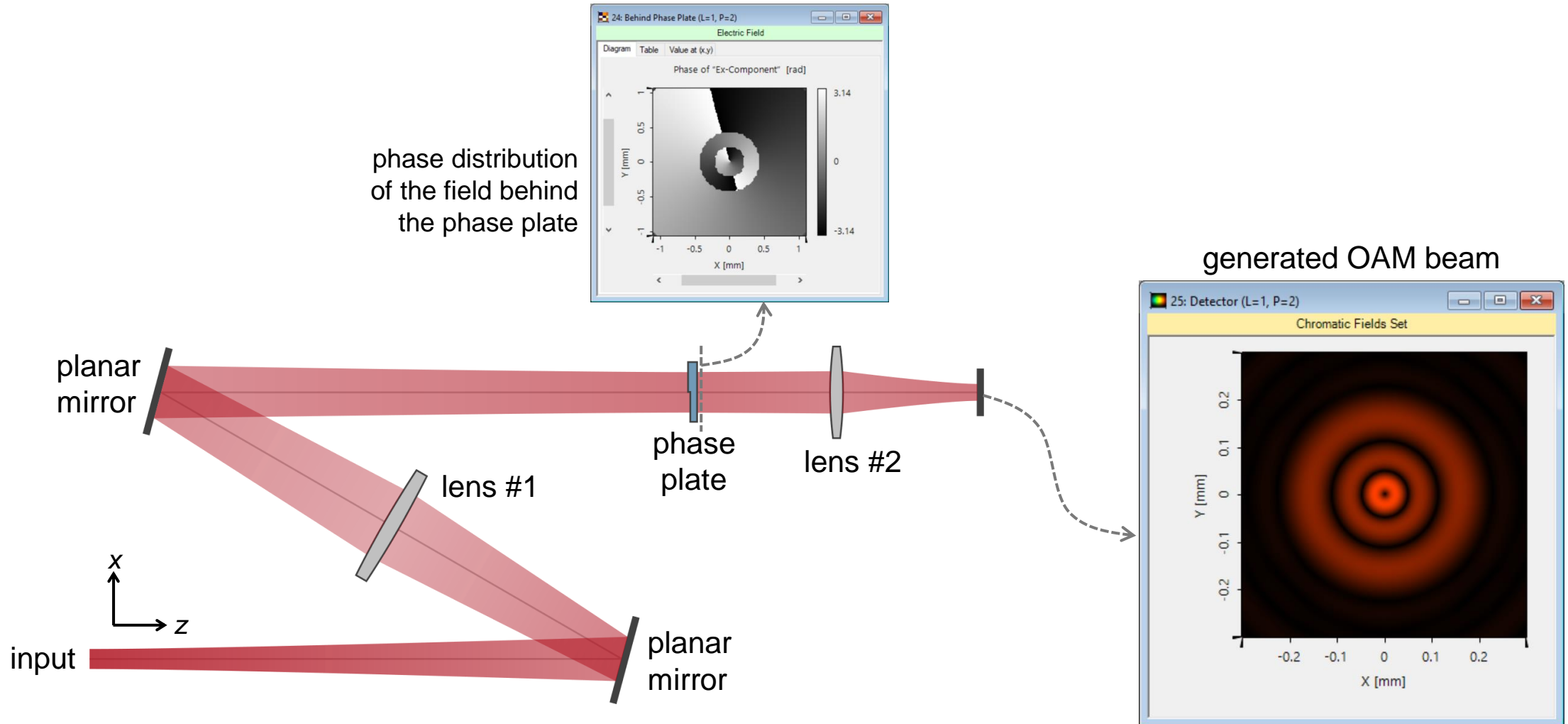


concept of the setup follows from M. Massari, *et al.*, Appl. Opt. 54, 4077-4083 (2015)

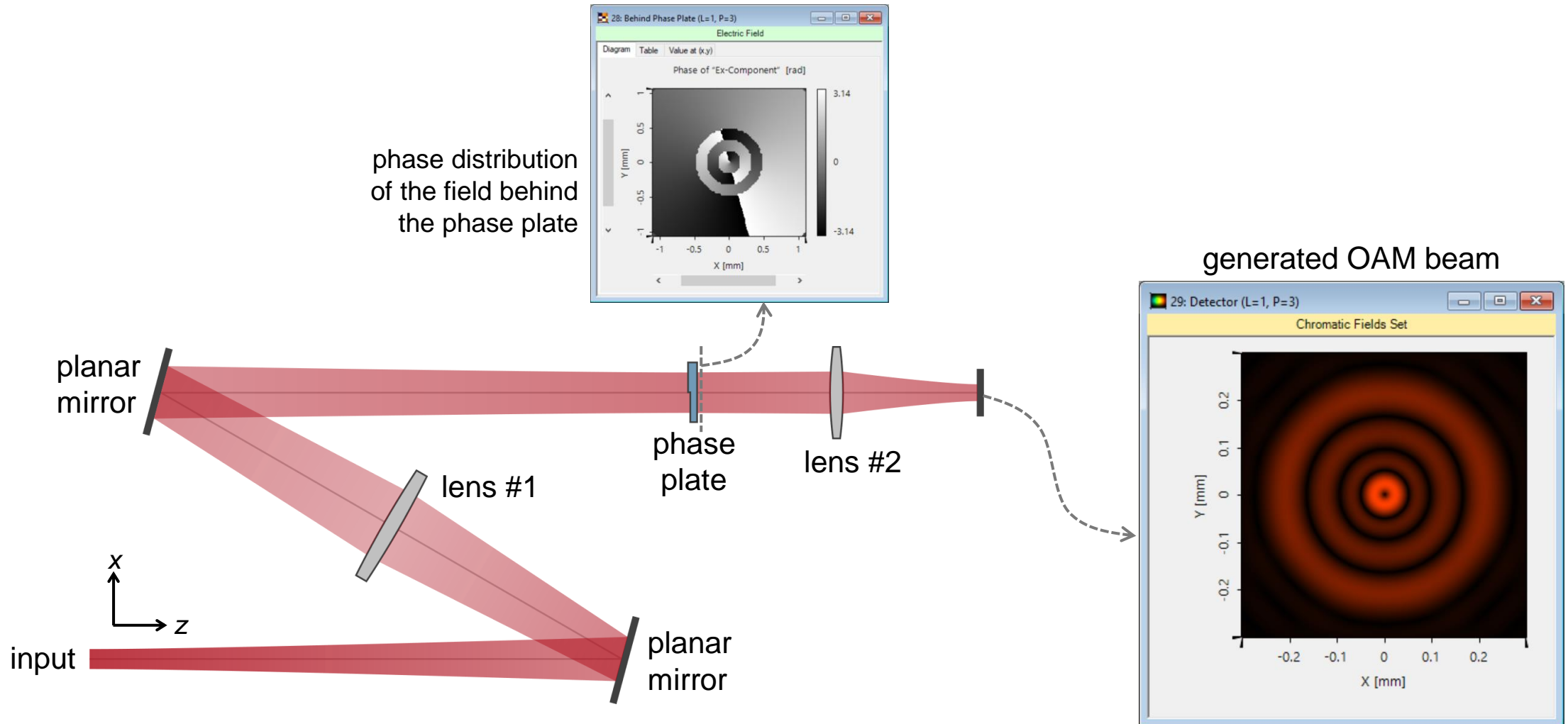
Azimuthal Index $L=1$, Radial Index $P=1$



Azimuthal Index $L=1$, Radial Index $P=2$

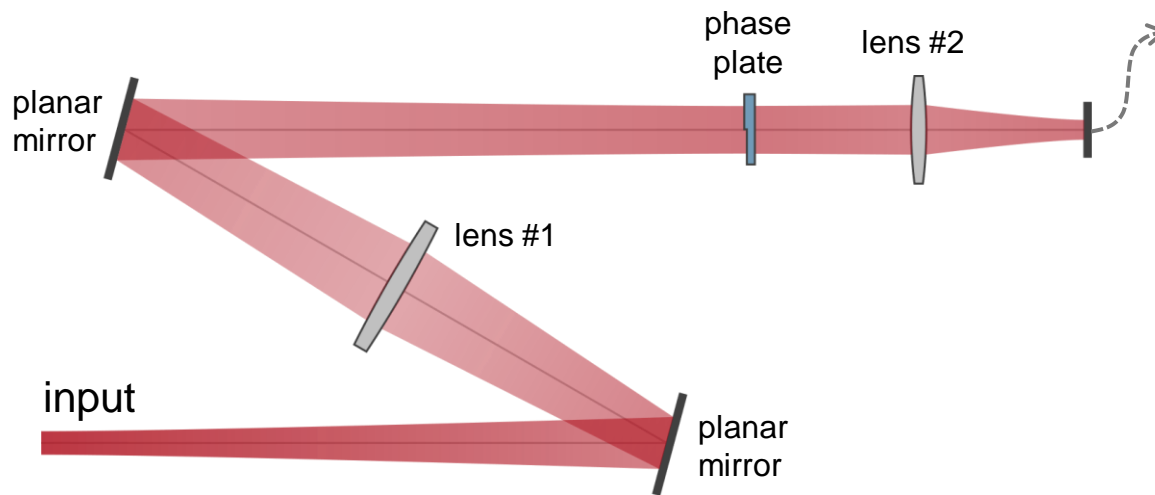


Azimuthal Index $L=1$, Radial Index $P=3$

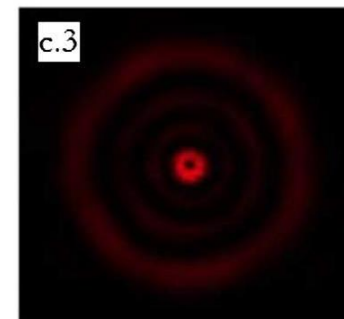
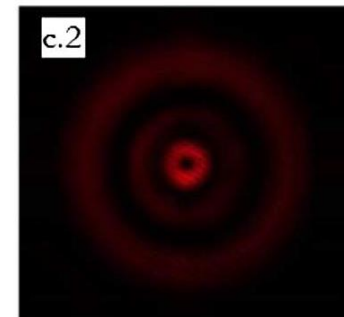
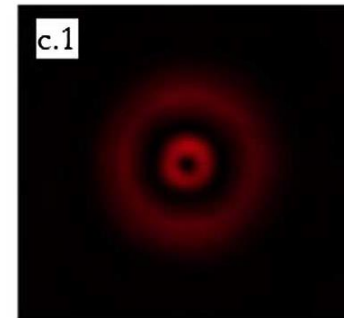
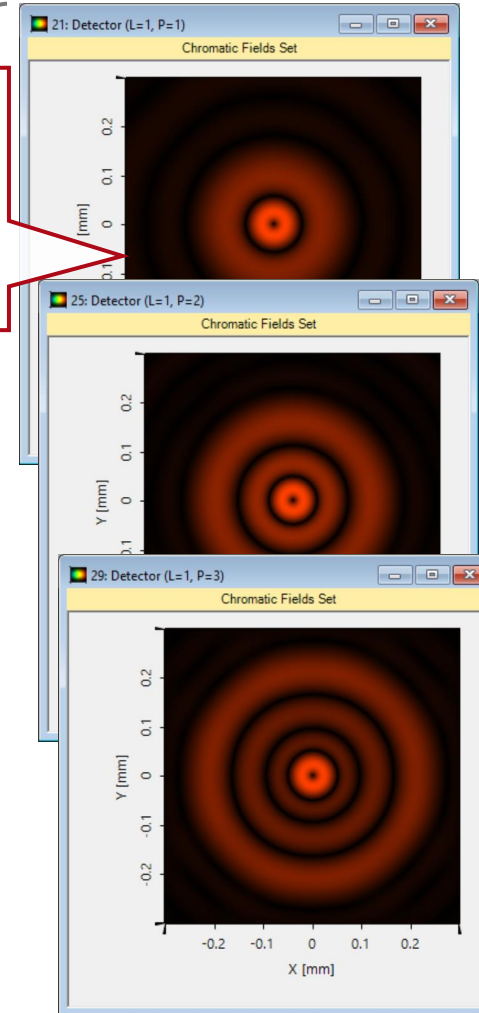


Different Cases in Comparison

We perform the simulation only according to the reference, but not as exact reproduction due to lack of information.



VirtualLab Fusion simulation



experimental results from M. Massari, *et al.*, Appl. Opt. 54, 4077-4083 (2015)

Peek into VirtualLab Fusion

flexible definition of microstructure surfaces

Snippet Help

Spiral Phase Plate Surface

Author: Site Zhang
Last Modified: Monday, October 19, 2020

Spiral phase plate with radial index P and azimuthal index L. See for reference in M. Massari, et al., Appl. Opt. 54, 4077-4083 (2015).

PARAMETER	DESCRIPTION
L	Azimuthal index L
P	Radial index P
RefractiveIndex	Refractive index of the phase plate material at the design wavelength
DesignWavelength	Design wavelength (in vacuum)
RingWidth	Width of the ring-segment along the radial direction

visualization of field quantities (e.g., the phase)

24: Behind Phase Plate (L=1, P=2)

Electric Field

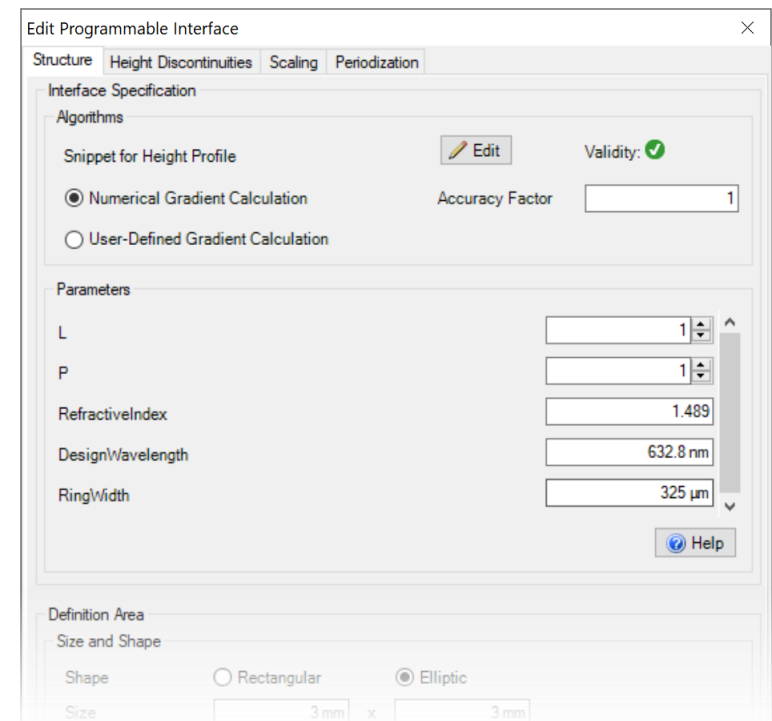
Phase of "Ex-Component" [rad]

Y [mm]

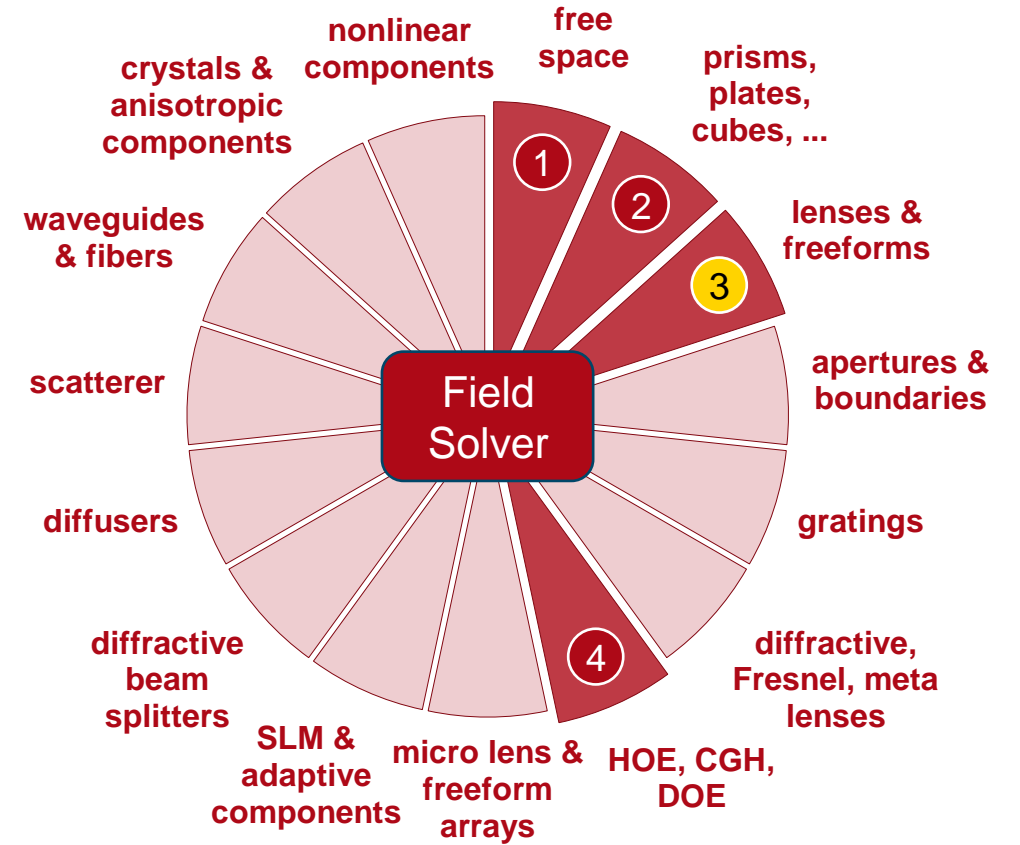
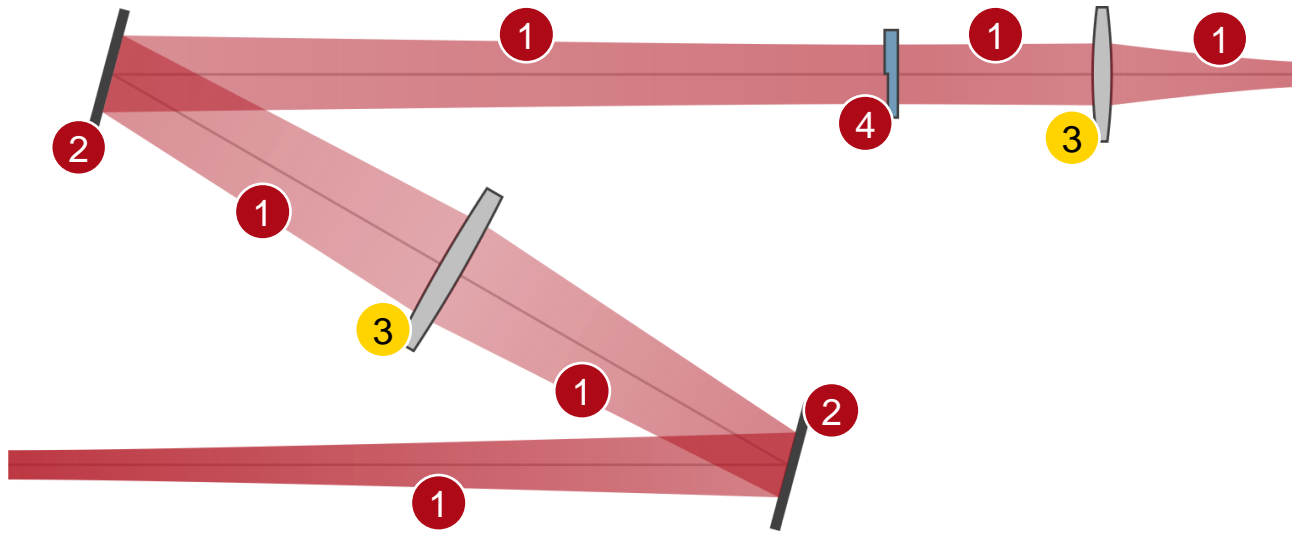
X [mm]

Workflow in VirtualLab Fusion

- Customize microstructure surfaces
 - [How to Work with the Programmable Interface & Example \(Spherical Surface\)](#) [Use Case]
- Set the Fourier transforms properly
 - [Fourier Transform Settings – Discussion at Examples](#) [Use Case]



VirtualLab Fusion Technologies



idealized component

Document Information

title	Generation of Optical Beams Carrying Orbital Angular Momentum (OAM)
document code	MISC.0085
version	1.0
edition	VirtualLab Fusion Basic
software version	2020.1 (Build 3.4)
category	Application Use Case
further reading	<ul style="list-style-type: none">- <u>How to Work with the Programmable Interface & Example (Spherical Surface)</u>- <u>Generation of Spatially Varying Polarization by Interference with Polarized Light</u>