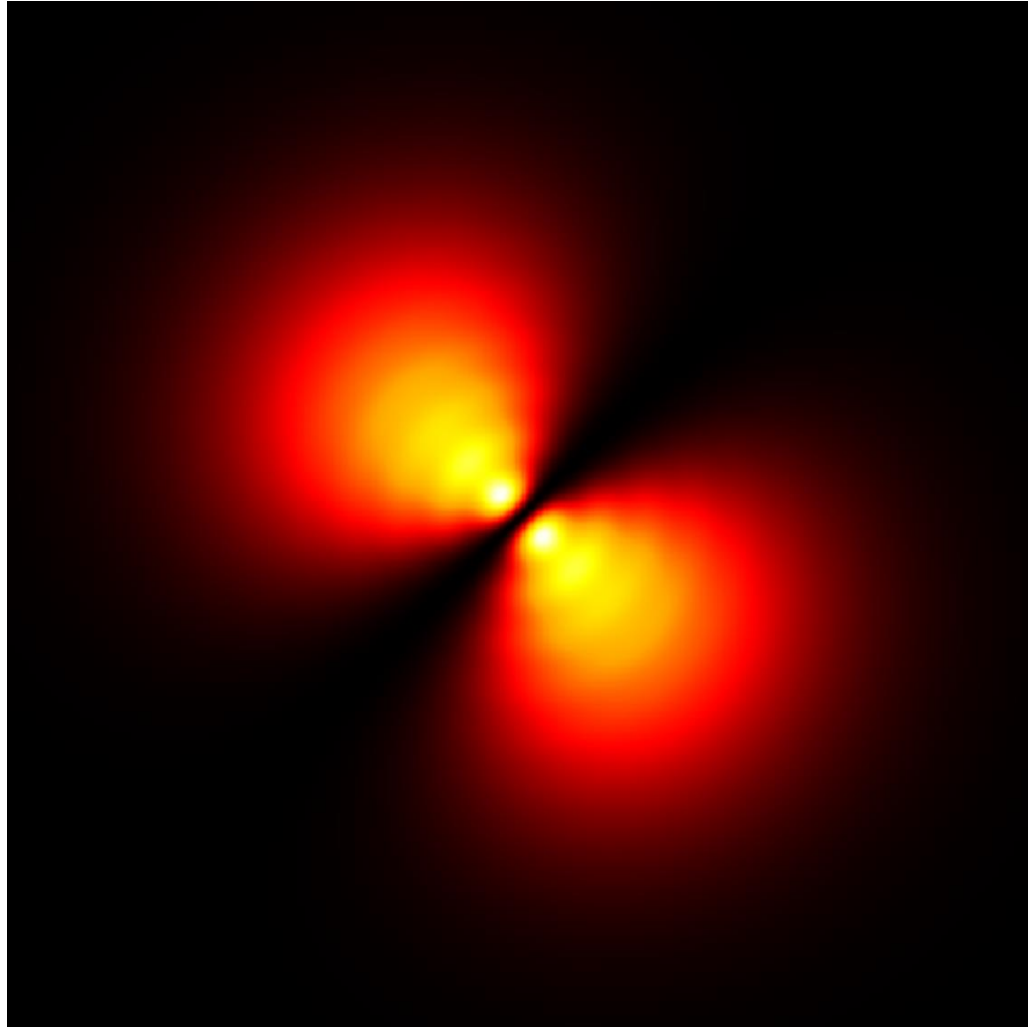


Vector Beam Generation with a SLM and a Common-Path Interferometer

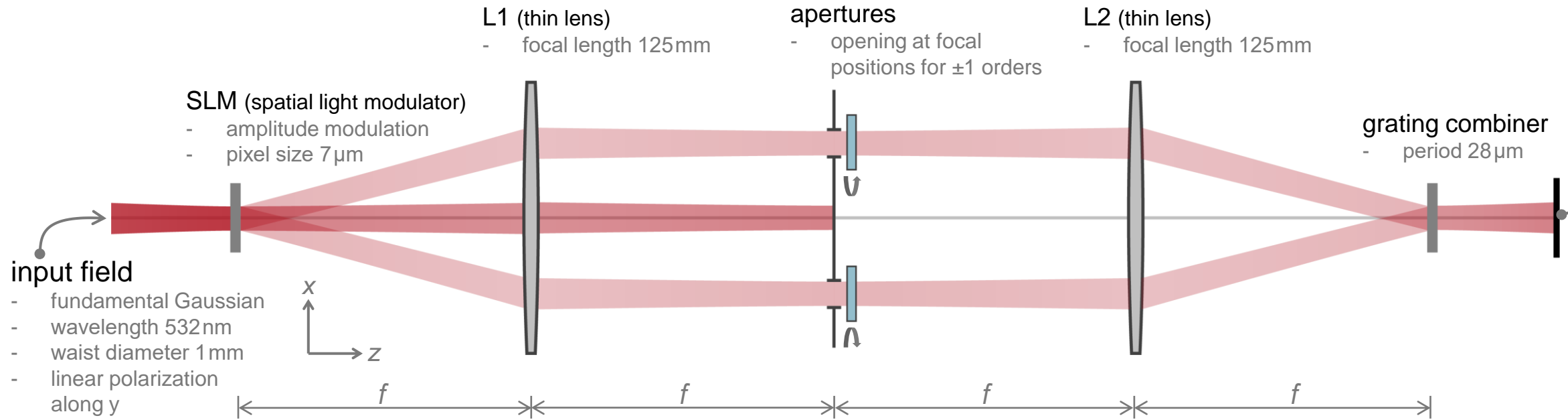
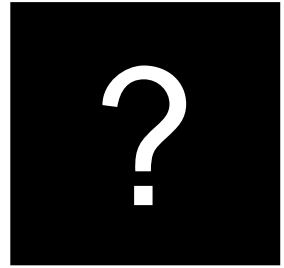
Abstract



Cylindrical vector beams are found to be of help in different applications. In this example, following the work of X.-L. Wang, *et al.* in *Opt. Lett.* 32, 3549-3551 (2007), we build up a common-path interferometric setup. It consists of SLM, apertures, quarter-waveplates, grating combiner, and lenses in a 4f setup. Using this setup, we simulate the generation of cylindrical vector beams. By changing selected parameters for the amplitude transmission loaded on the SLM, we compare the difference in the results as well.

Modeling Task

How to generate vector beams with this setup and to check the polarization of the resulting field?



concept of the setup follows from X.-L. Wang, *et al.*, Opt. Lett. 32, 3549-3551 (2007)

Modeling Task

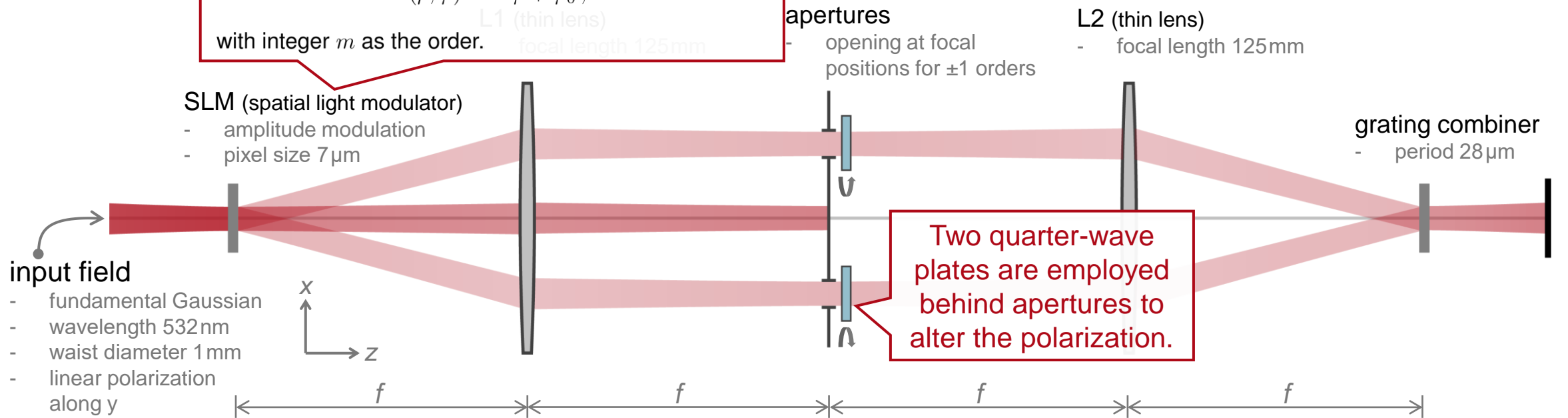
The amplitude modulation of the SLM is defined as

$$t(x, y) = 0.5 [1 + \gamma \cos(2\pi x/d + \delta)] ,$$

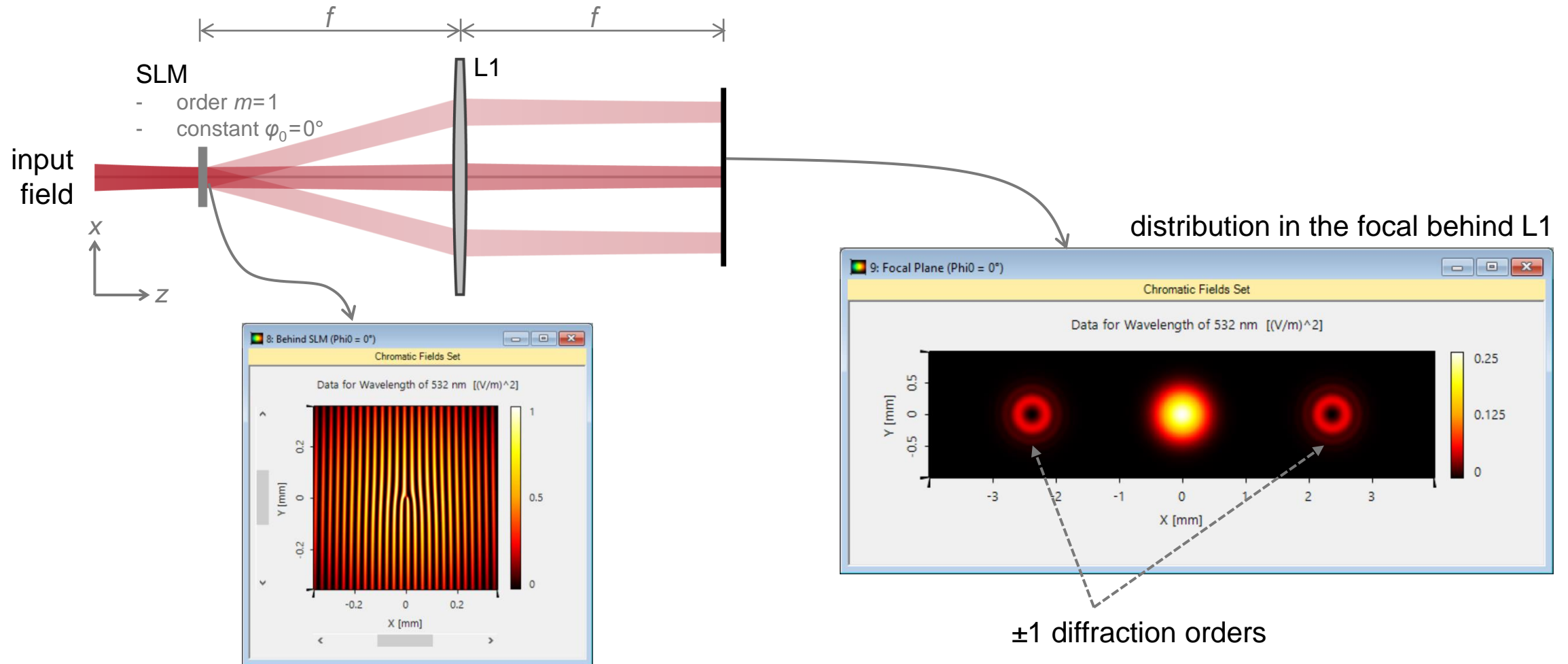
where γ is a constant factor, δ is defined in the polar coordinate system, as

$$\delta(\rho, \varphi) = m\varphi + \varphi_0 ,$$

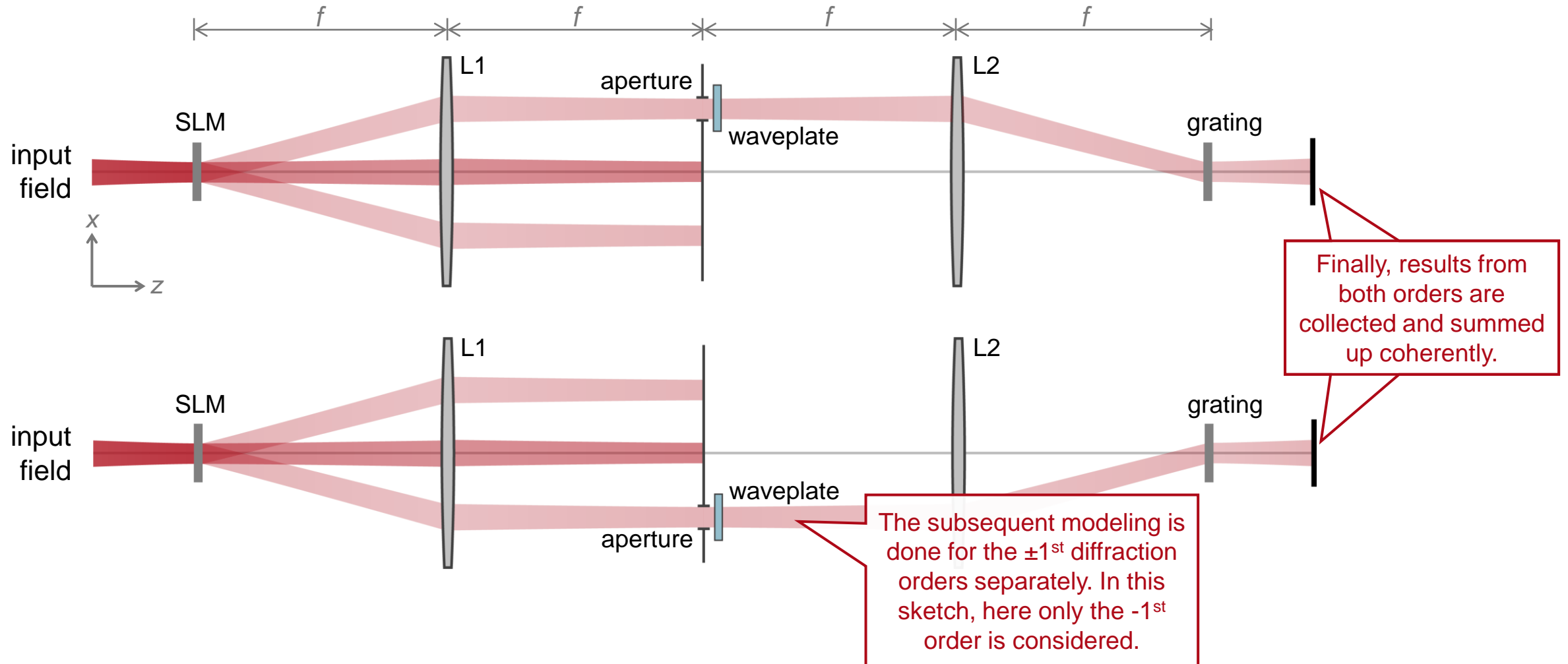
with integer m as the order.



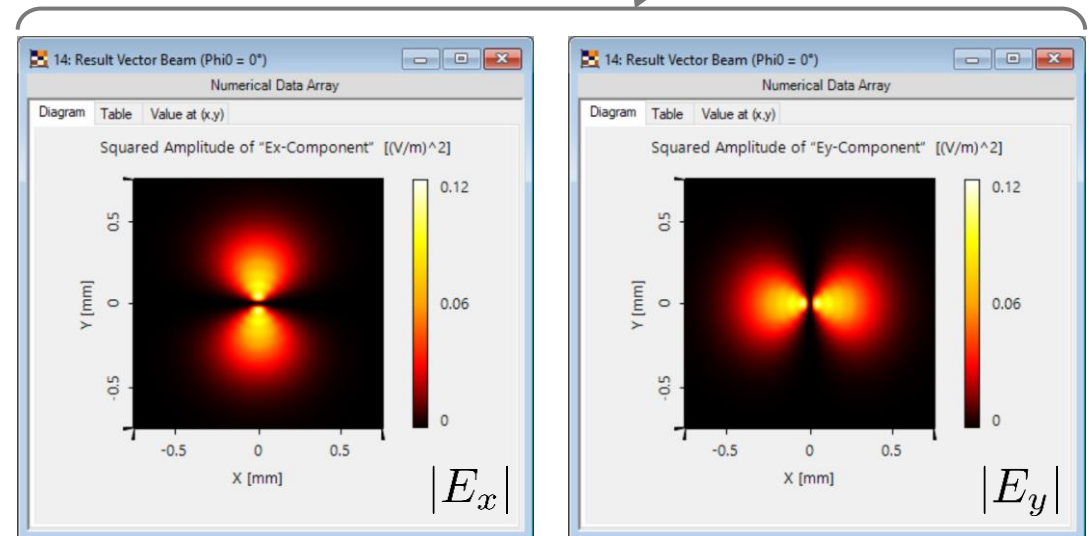
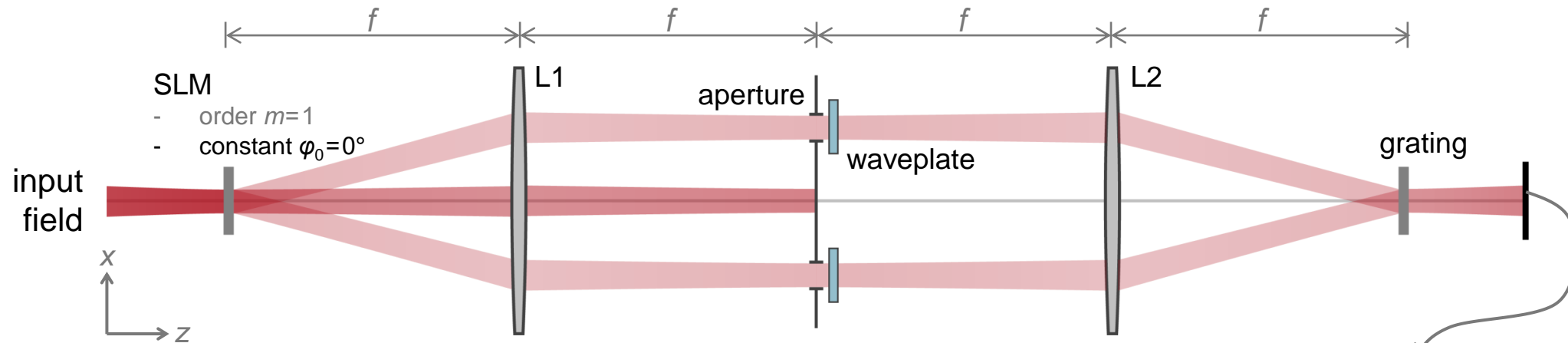
Function of Spatial Light Modulator



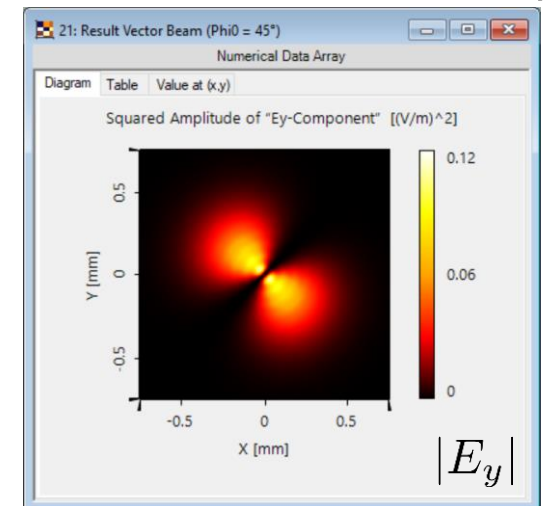
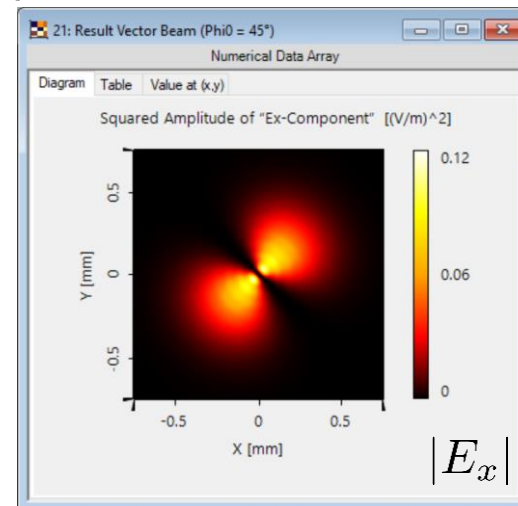
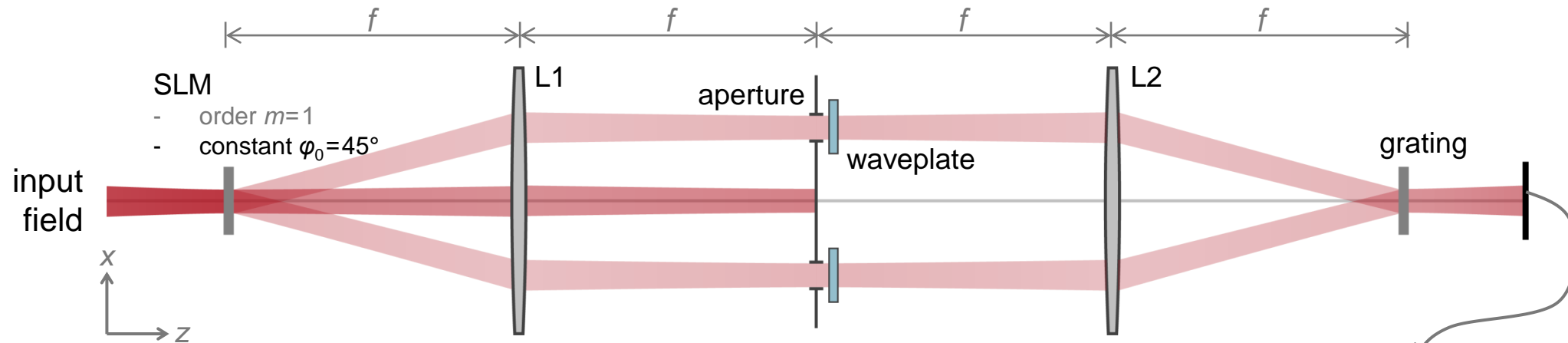
Separate Modeling of $\pm 1^{\text{st}}$ Diffraction Orders



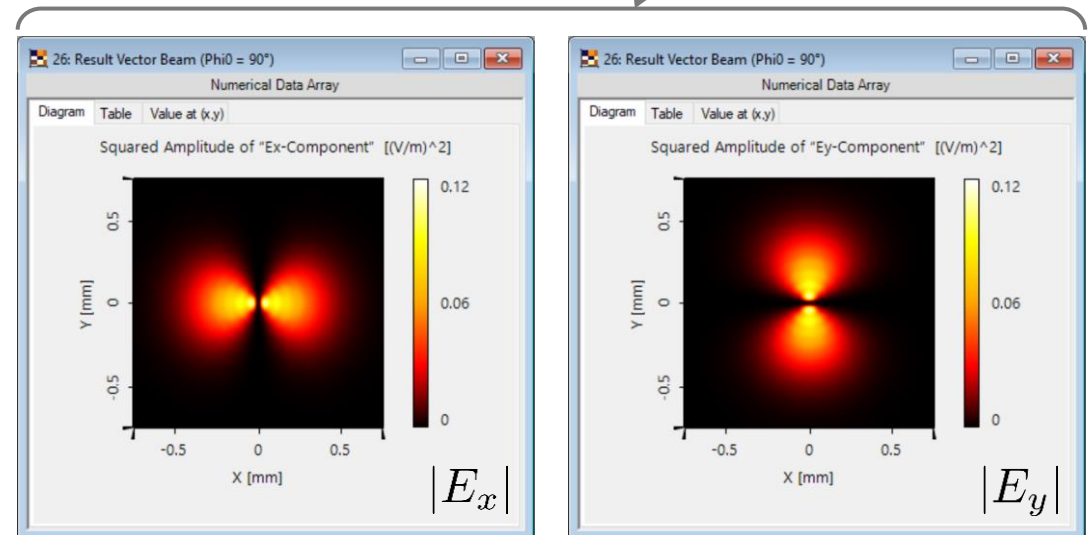
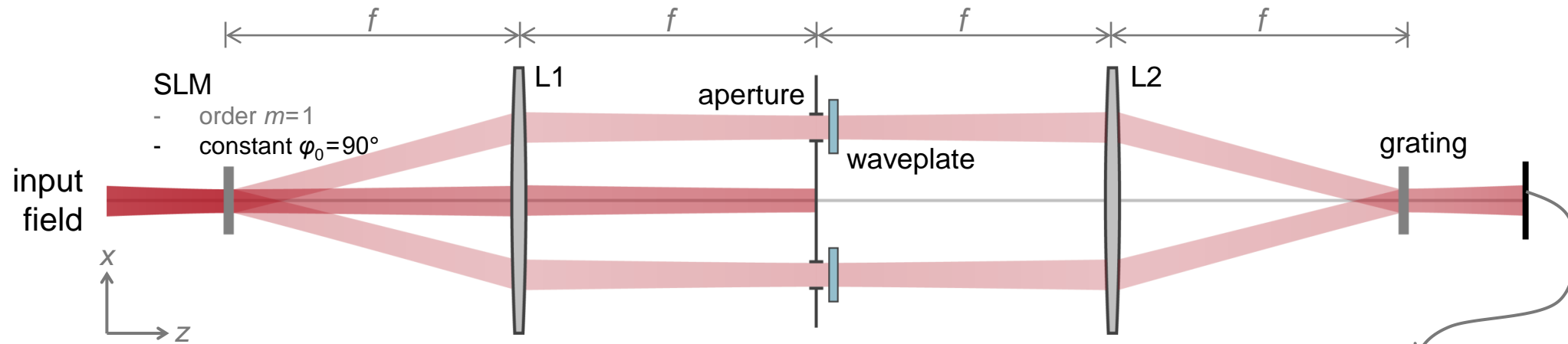
Resulting Vector Beam ($\varphi_0=0^\circ$)



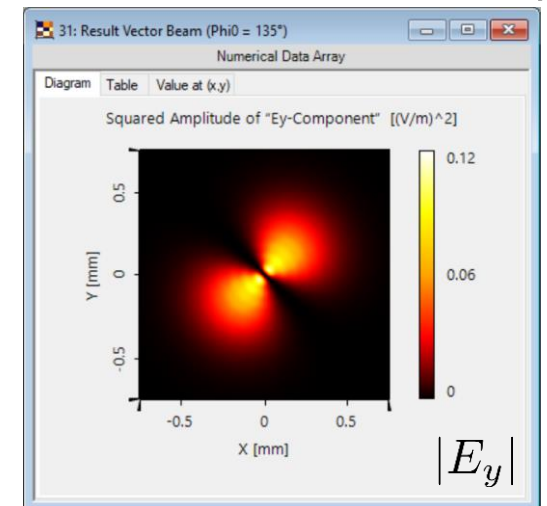
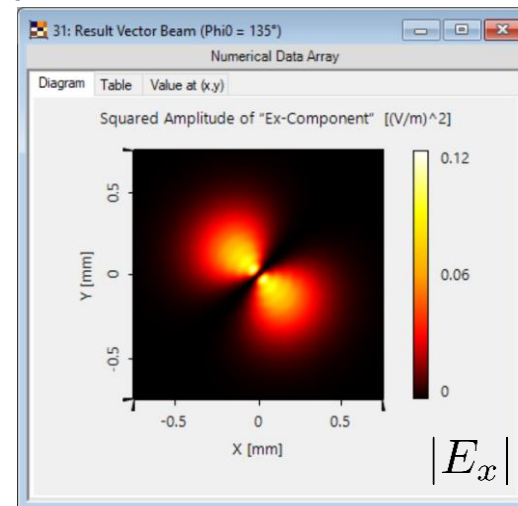
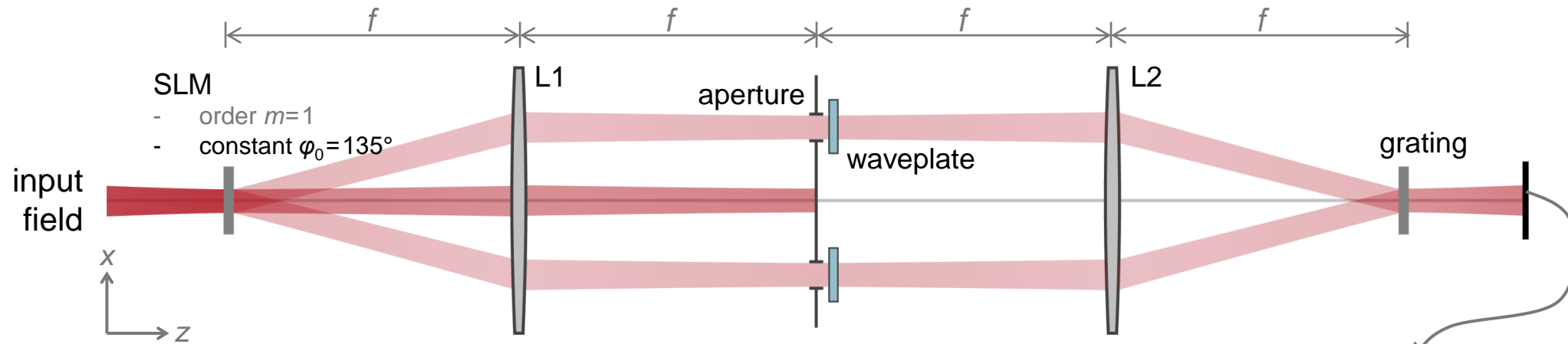
Resulting Vector Beam ($\varphi_0=45^\circ$)



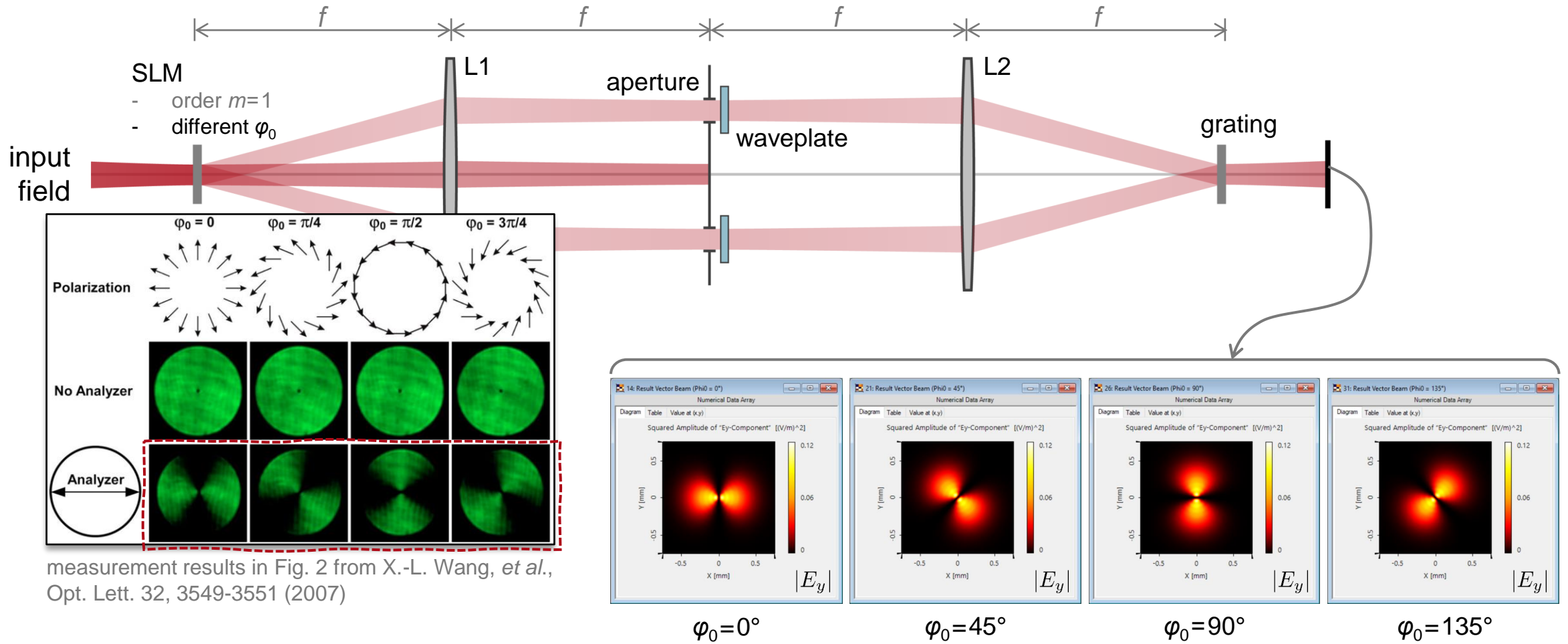
Resulting Vector Beam ($\varphi_0=90^\circ$)



Resulting Vector Beam ($\varphi_0 = 135^\circ$)



Resulting Vector Beams and Comparison



Peek into VirtualLab Fusion

flexible definition of arbitrary transmission functions

Edit Programmable Function

Basic Parameters Physical Parameters Sampling

Definition

Edit

Validity: ✓

Parameters

Gamma 1

GratingPeriod 28 μm

M 1

Phi0

Snippet Help

SLM Transmission Function for Vector Beam Generation

Author: Site Zhang
Last Modified: Tuesday, September 8, 2020

The transmission function follows from the reference paper X. Wang et al., Opt. Lett. 32, 3549-3551 (2007)

PARAMETER	DESCRIPTION
Gamma	Strength of the amplitude modulation
GratingPeriod	Equivalent grating period for a linear phase that is imposed on the SLM
M	Order of phase vortex
Phi0	Additional constant phase term in the polar coordinate

Close

Fourier transform settings for diffraction consideration

Edit Ideal Lens

Coordinate Systems

Position / Orientation

Function

Channel Configuration

Fourier Transforms

Customized Fourier Transform Selection: Component

Fourier Transform

Fast Fourier Transform

Semi-Analytical Fourier Transform

Pointwise Fourier Transform

Use Spherical Phase Only

Inverse Fourier Transform

Fast Fourier Transform

Semi-Analytical Fourier Transform

Pointwise Fourier Transform

Use Spherical Phase Only

Enforce Pointwise Fourier Transform if Numerical Effort is Too High **i**

[Learn more about Fourier transforms.](#)

Customized Fourier Transform Selection: Source Modes

Fourier Transform

Fast Fourier Transform

Semi-Analytical Fourier Transform

Pointwise Fourier Transform

Use Spherical Phase Only

Inverse Fourier Transform

Fast Fourier Transform

Semi-Analytical Fourier Transform

Pointwise Fourier Transform

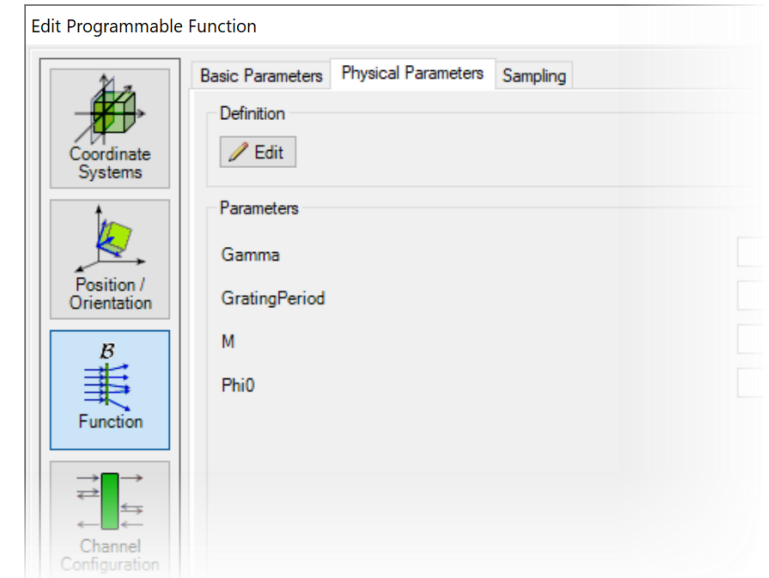
Use Spherical Phase Only

Enforce Pointwise Fourier Transform if Numerical Effort is Too High **i**

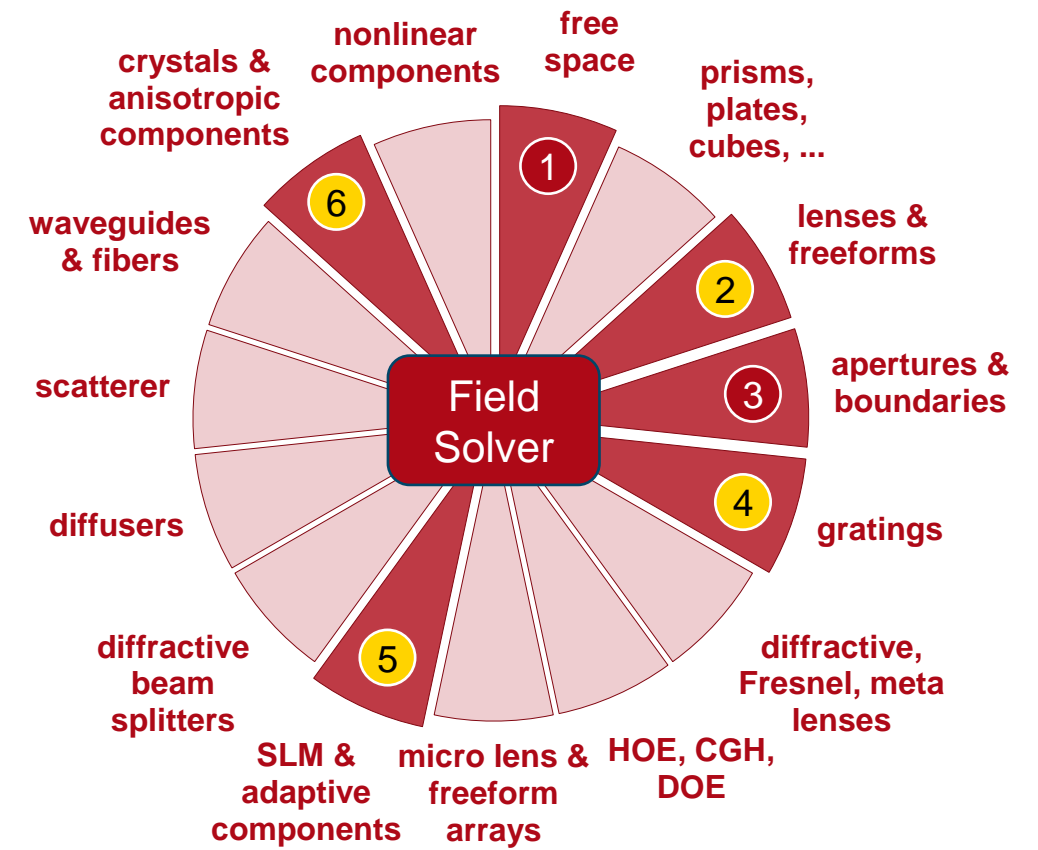
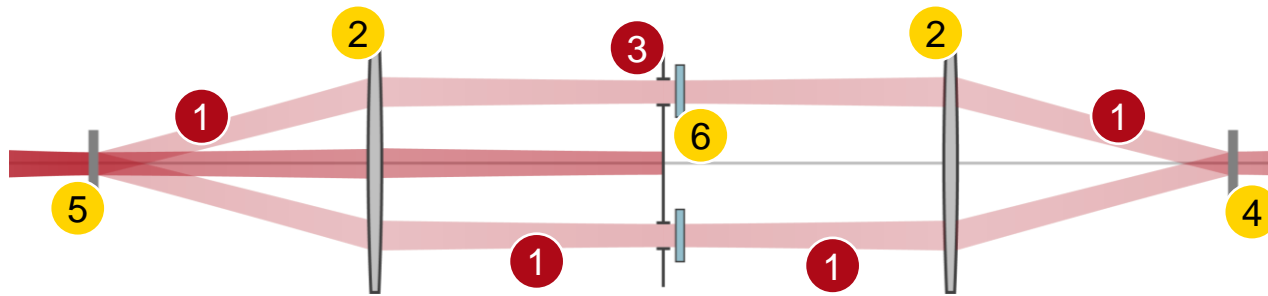
[Learn more about Fourier transforms.](#)

Workflow in VirtualLab Fusion

- Specify or customize transmission functions
 - [How to Work with the Programmable Function & Example \(Cylindrical Lens\)](#) [Use Case]
- Set the Fourier transforms properly
 - [Fourier Transform Settings – Discussion at Examples](#) [Use Case]
- Use idealized grating function in the modeling
 - [VirtualLab Fusion Technology – Idealized Grating Functions](#) [Technology Whitepaper]



VirtualLab Fusion Technologies



idealized component

Document Information

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software version	2020.2 (Build 2.22)
category	Application Use Case
further reading	- <u>Generation of Spatially Varying Polarization by Interference with Polarized Light</u>