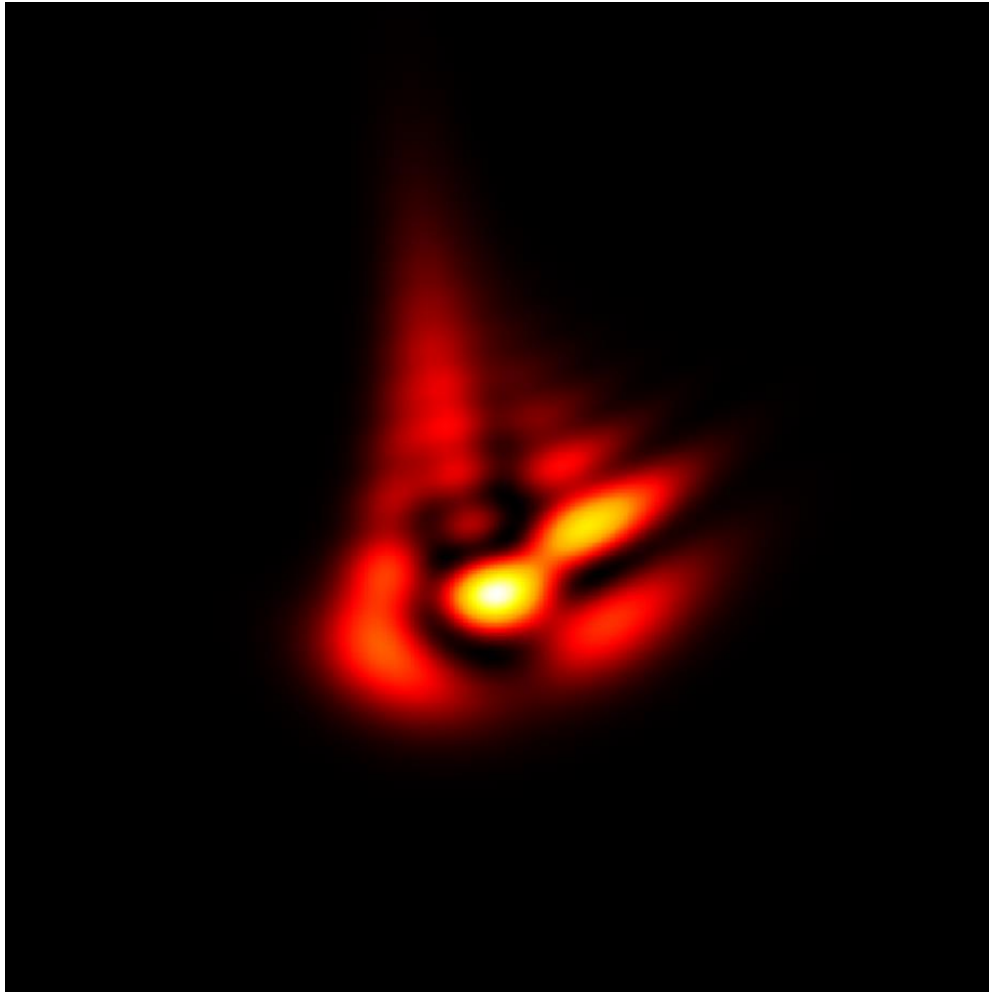


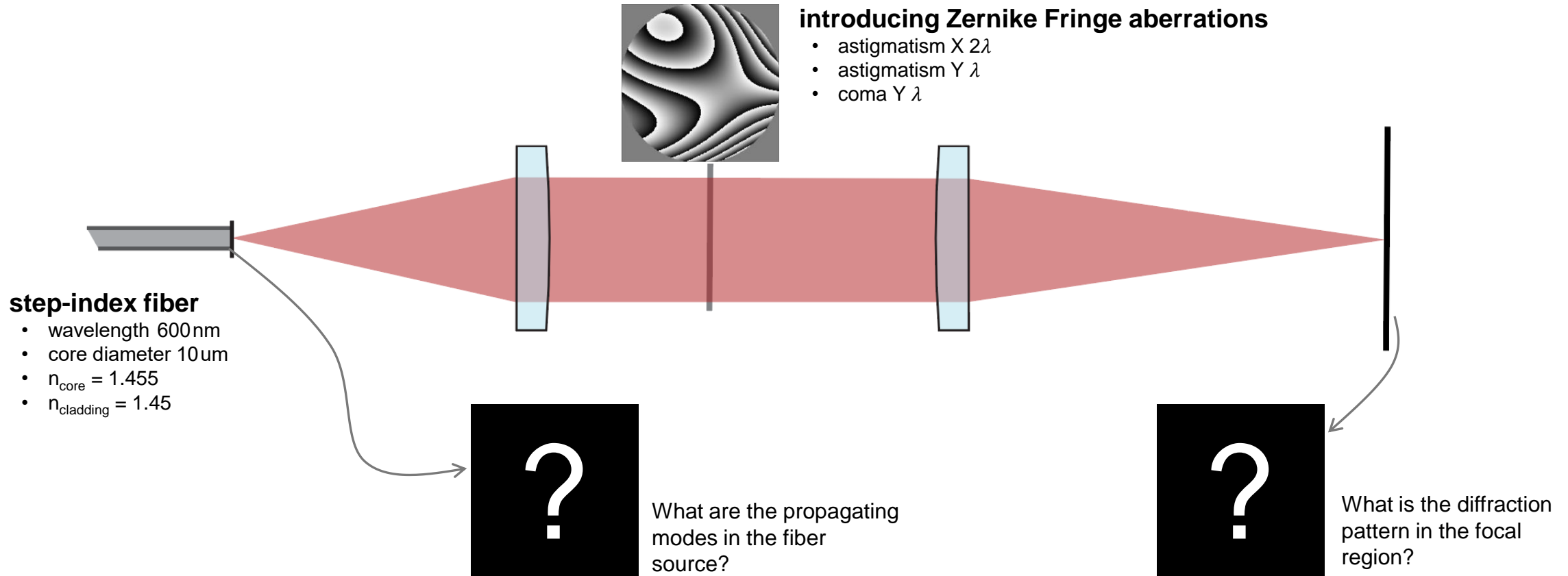
Aberration Effects on Focused Modes from a Fiber Source

Abstract

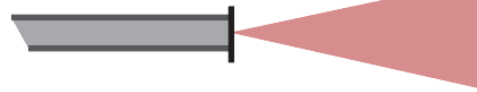


Fibers are widely used as sources in optical systems. Investigating the aberration effects of an optical system on the propagation of the fiber modes is therefore of interest. In this use case we employ the fast physical optics engine in VirtualLab Fusion to demonstrate how the shape of a set of modes generated by either a step- or graded-index fiber, and the total field resulting from their combination, is affected by propagation through an aberrated optical system.

Modeling Task with a Step-Index Fiber



Linearly Polarized Mode Calculator

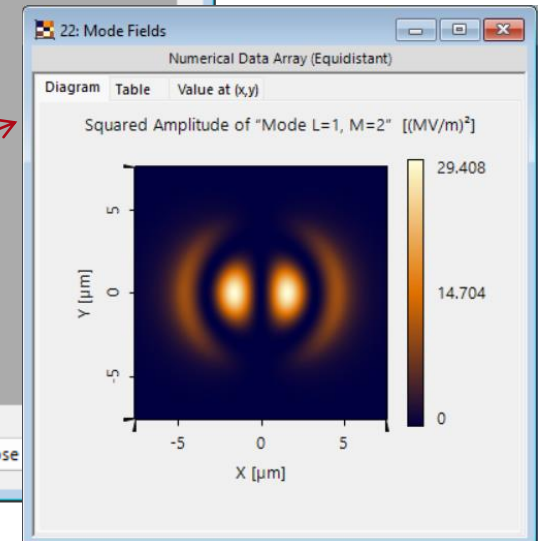


step-index fiber

- wavelength 600 nm
- core diameter 10 μm
- $n_{\text{core}} = 1.455$
- $n_{\text{cladding}} = 1.45$

This calculator gives the propagation constants and mode fields of all existing linearly polarized (LP) modes.

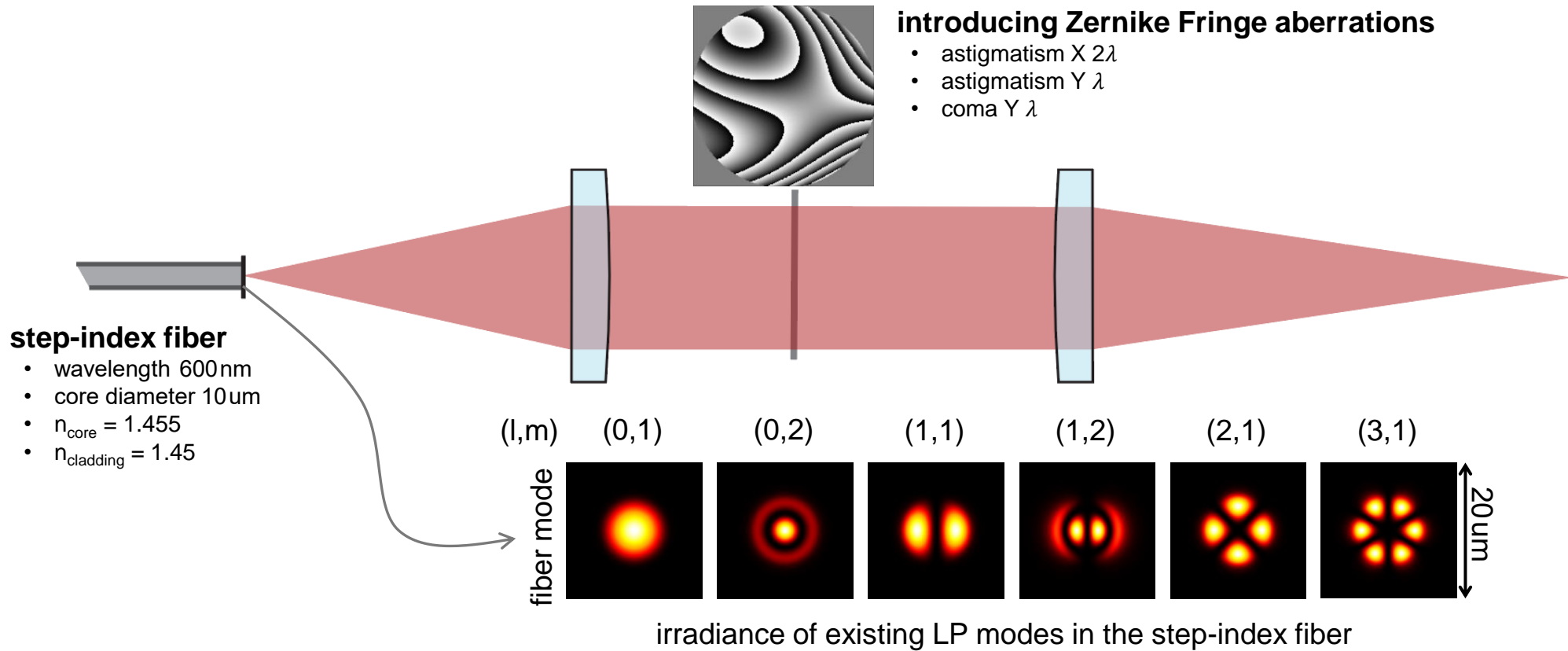
Index	Azimuthal Order L	Radial Order M	Propagation Constant β	Effective R...
1	0	1	$1.5231e+07 \text{ m}^{-1}$	1.4545
2	0	2	$1.5208e+07 \text{ m}^{-1}$	1.4522
3	1	1	$1.5223e+07 \text{ m}^{-1}$	1.4536
4	1	2	$1.5192e+07 \text{ m}^{-1}$	1.4507
5	2	1	$1.5212e+07 \text{ m}^{-1}$	1.4526
6	3	1	$1.5198e+07 \text{ m}^{-1}$	1.4513



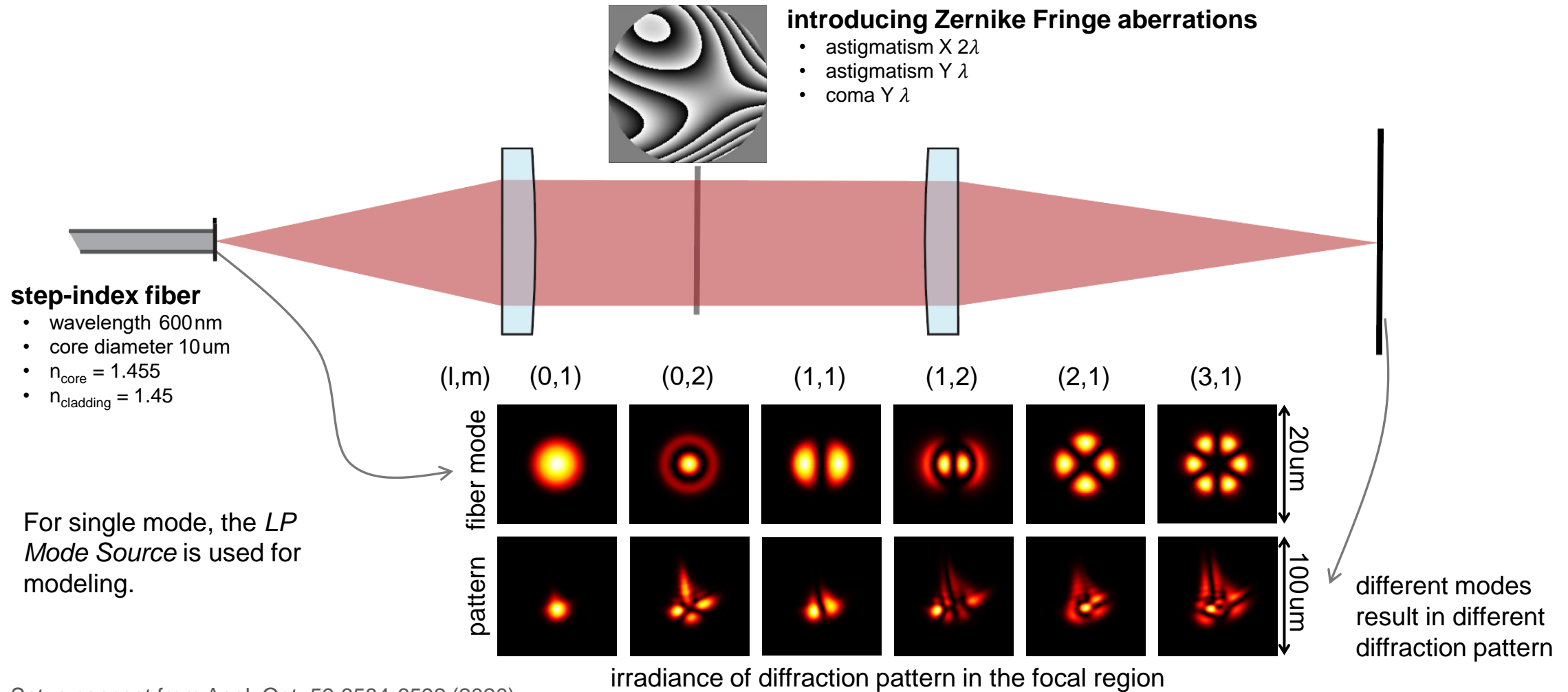
For further information:
[LP Fiber Mode Calculator](#)

fields of all LP modes

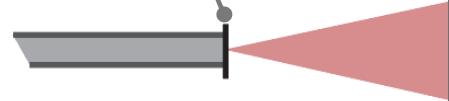
Source of Fiber Modes



Diffraction Patterns



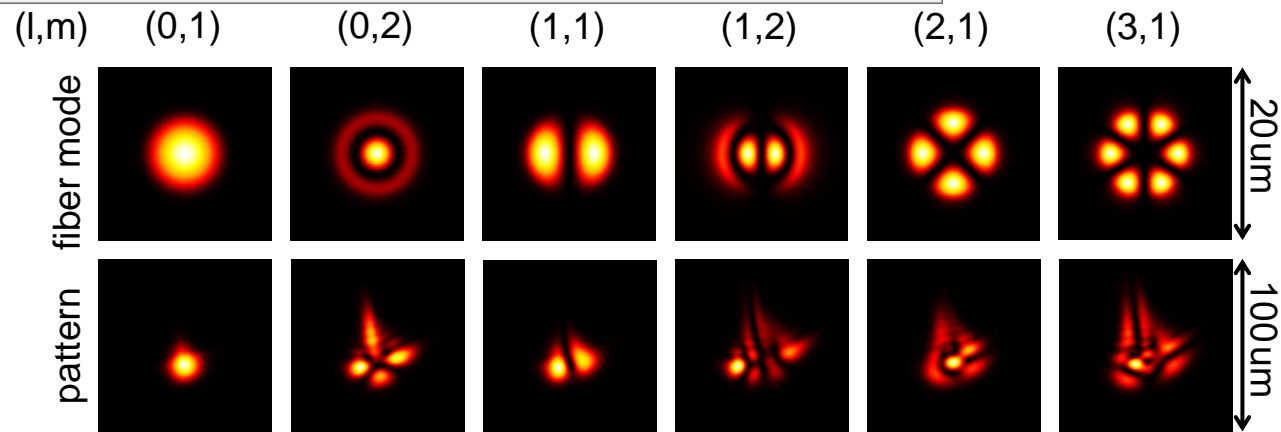
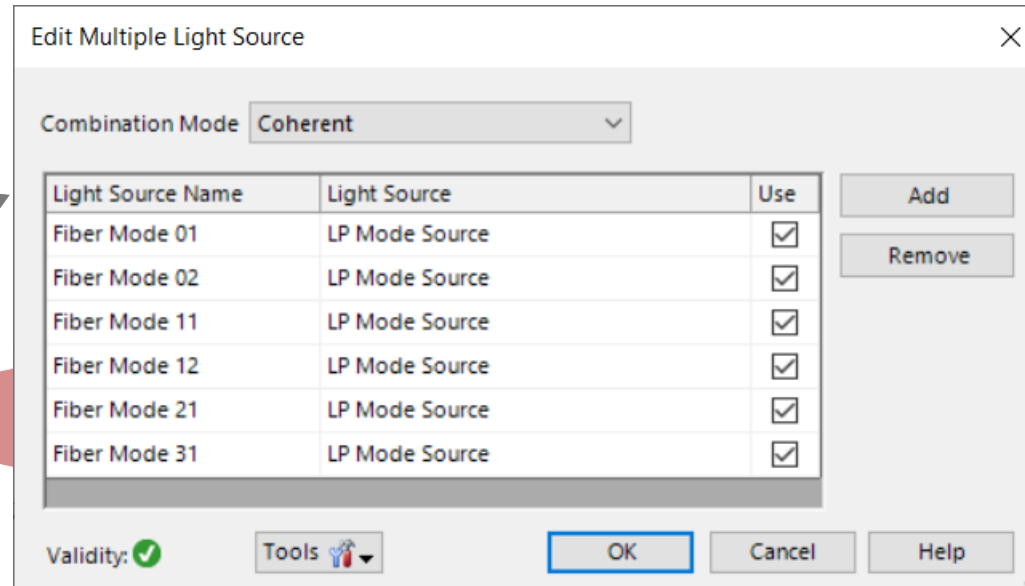
Switch from Single Mode Source to Multiple Light Source



step-index fiber

- wavelength 600nm
- core diameter 10 μm
- $n_{\text{core}} = 1.455$
- $n_{\text{cladding}} = 1.45$

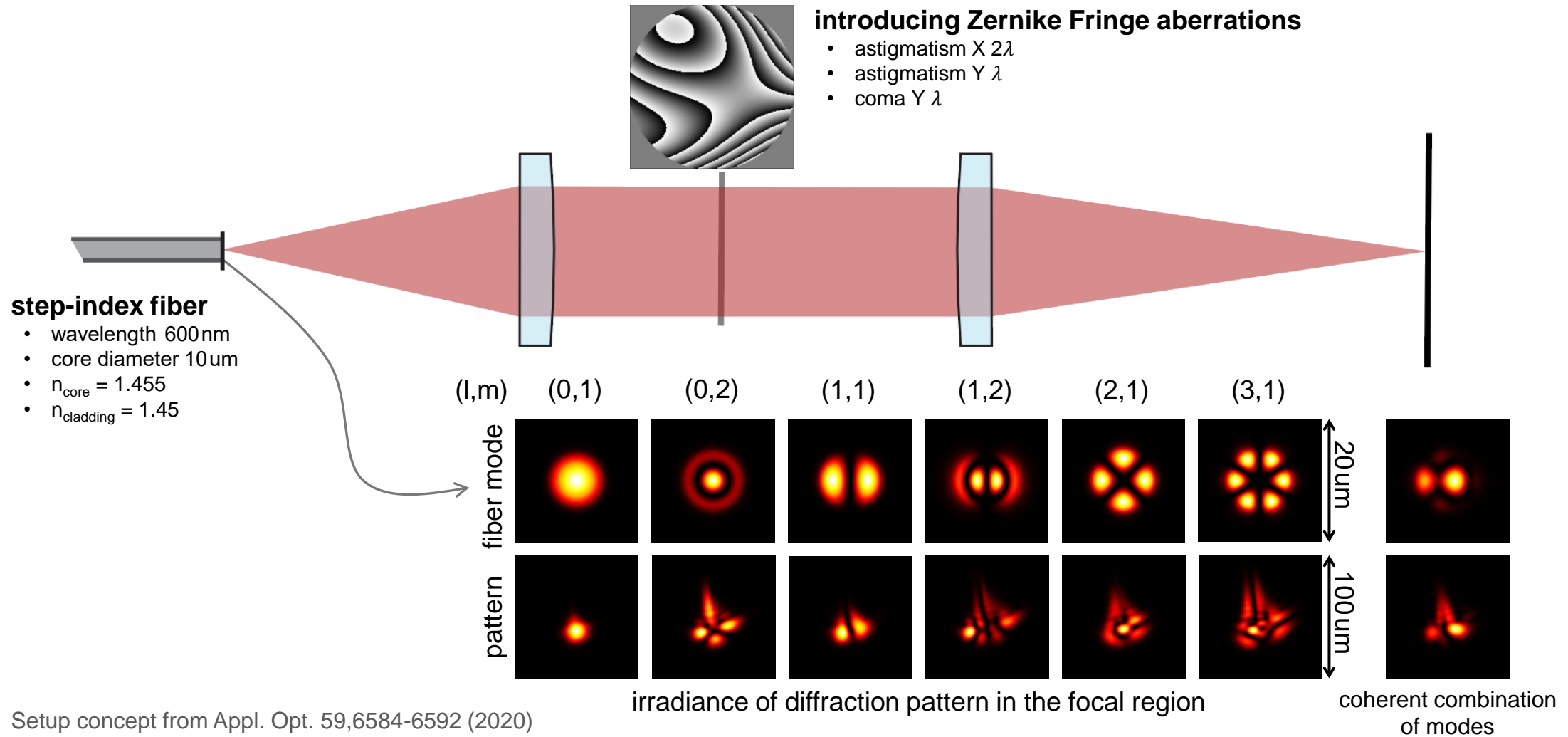
For combined simulation, either a *Multiple Light Source* or the *Parameter Run* can be used.



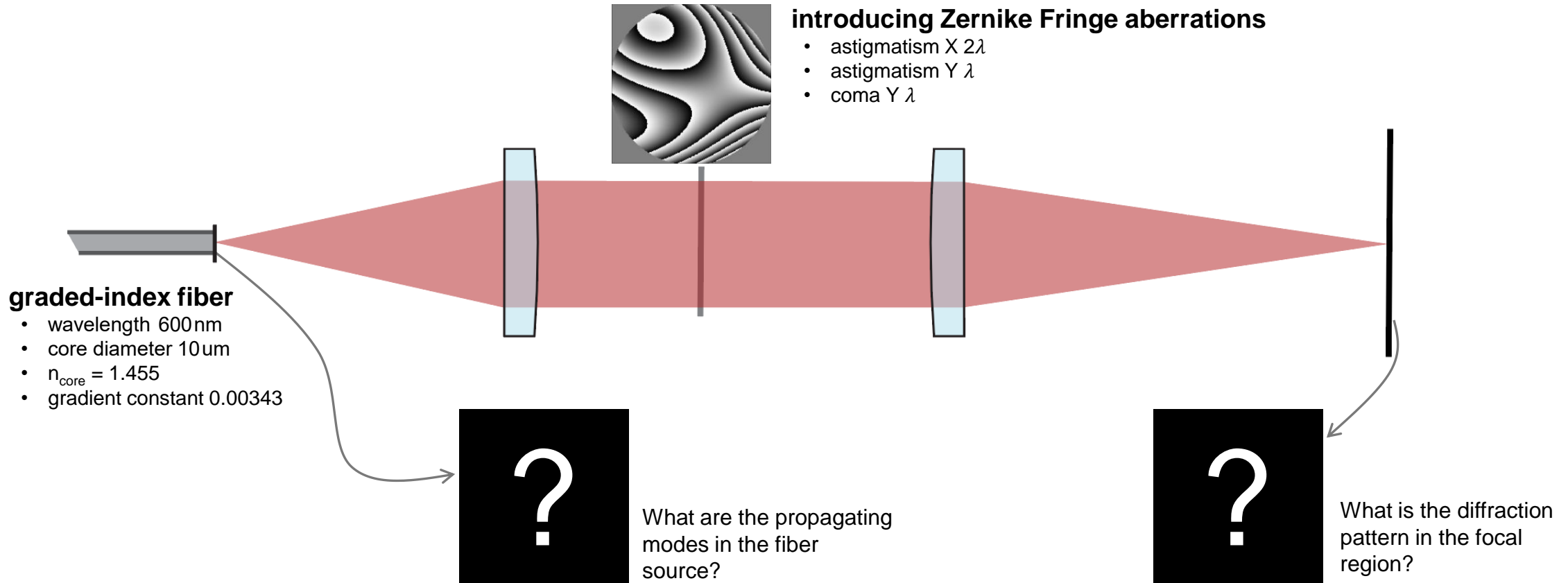
irradiance of diffraction pattern in the focal region

different modes result in different diffraction pattern

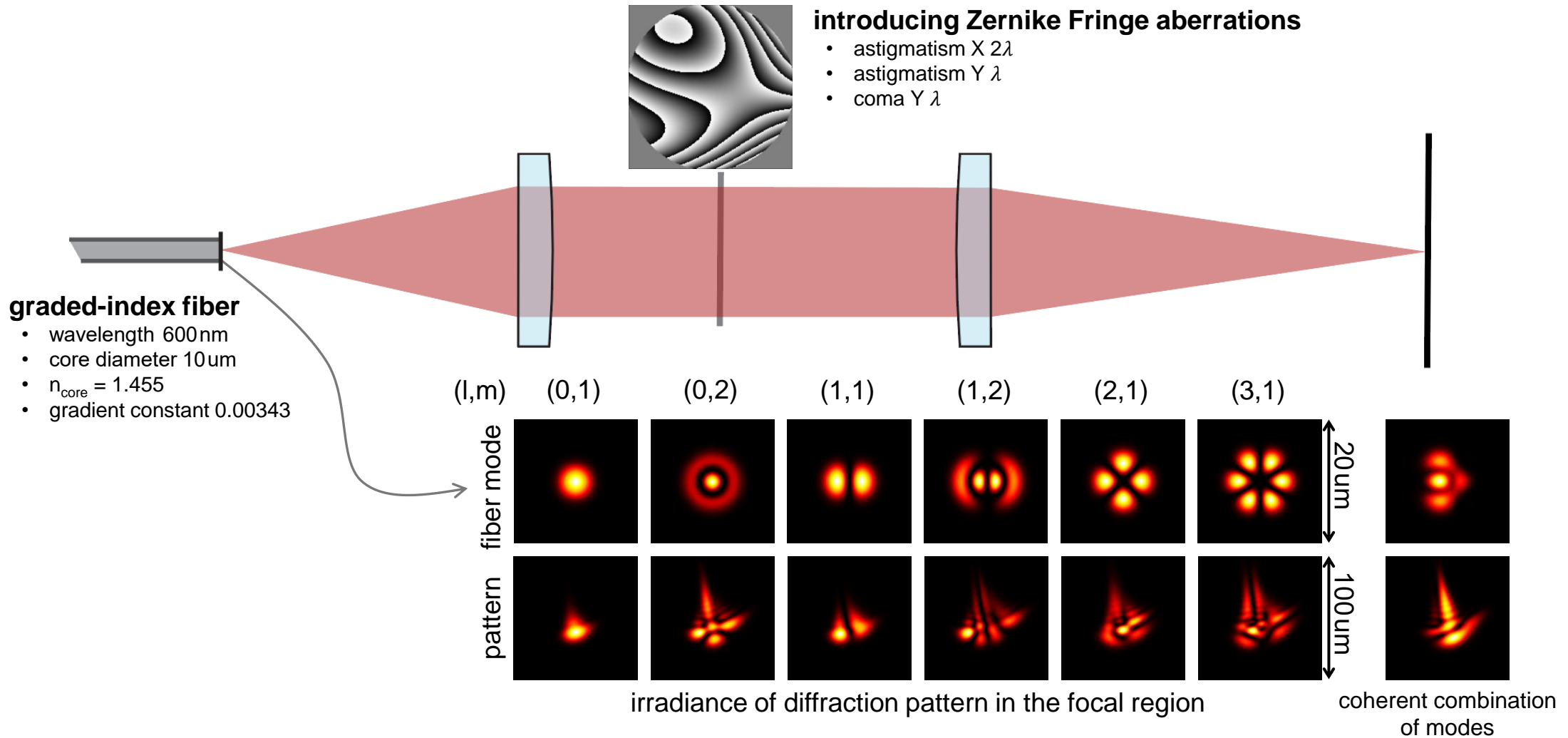
Switch from Single Mode Source to Multiple Light Source



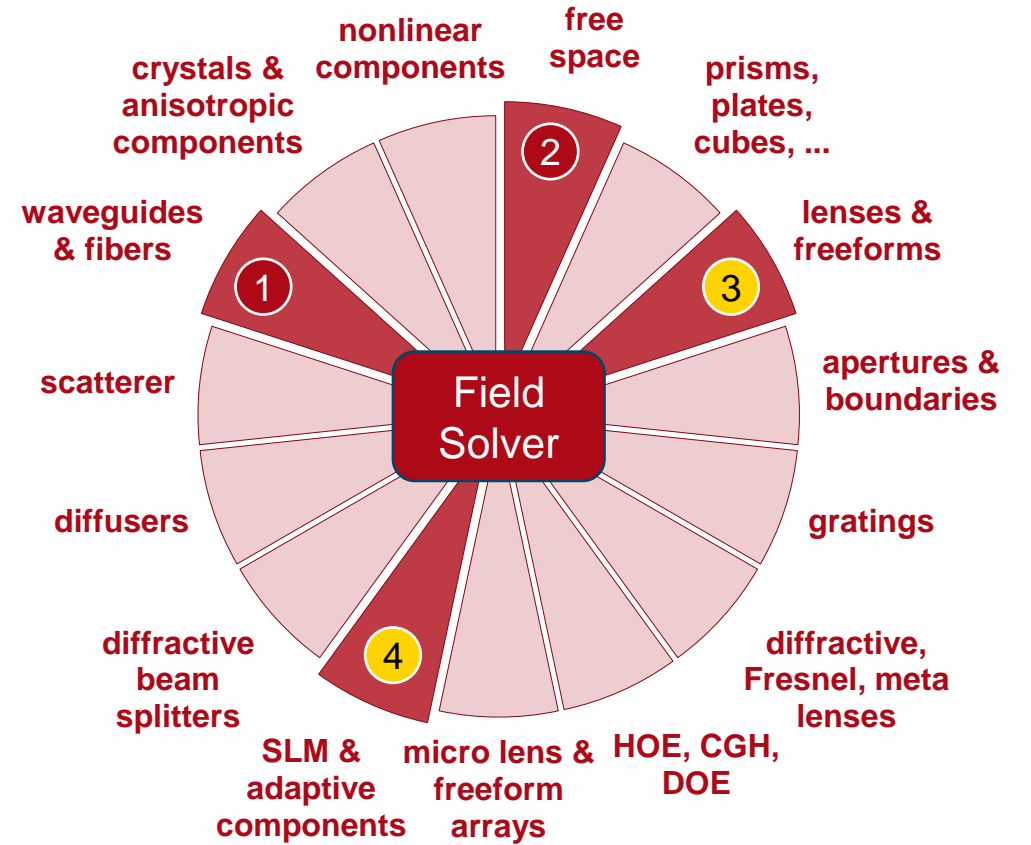
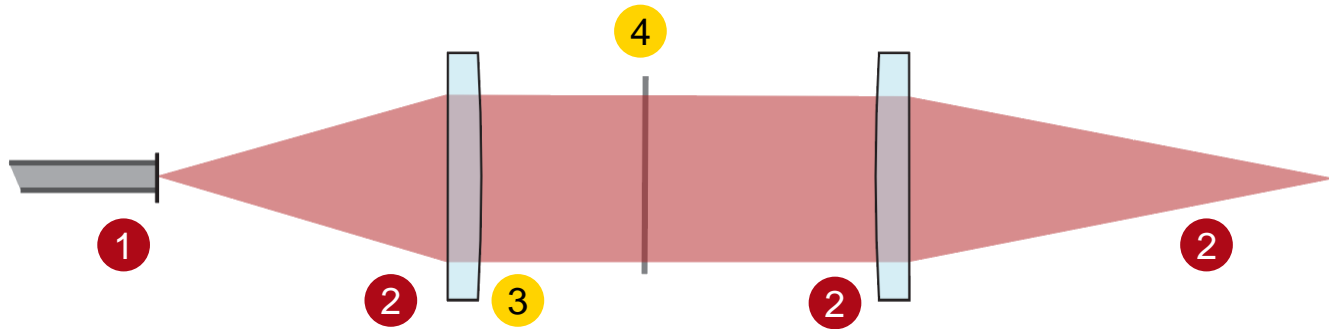
Modeling Task with a Graded-Index Fiber



Source Modes and Diffraction Patterns



VirtualLab Fusion Technologies



idealized component

Document Information

title	Aberration Effects on Focused Modes from a Fiber Source
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software edition	VirtualLab Fusion Basic
software version	2023.2 (Build 1.242)
category	Application Use Case
further reading	<ul style="list-style-type: none">- Fiber Mode Calculator- Few-Mode Fiber Coupling under Atmospheric Turbulence