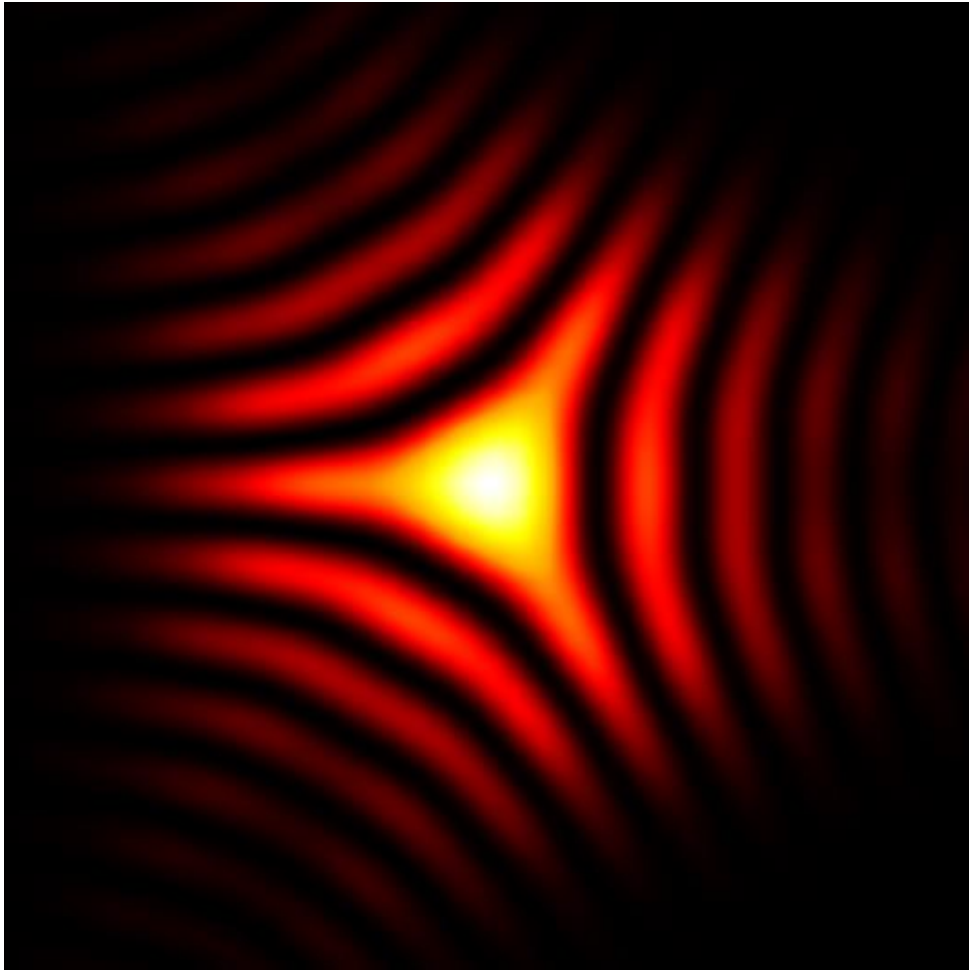


# **Influence of Aberration Effects of a Spherical Wave on the Focal Spot**

# Abstract

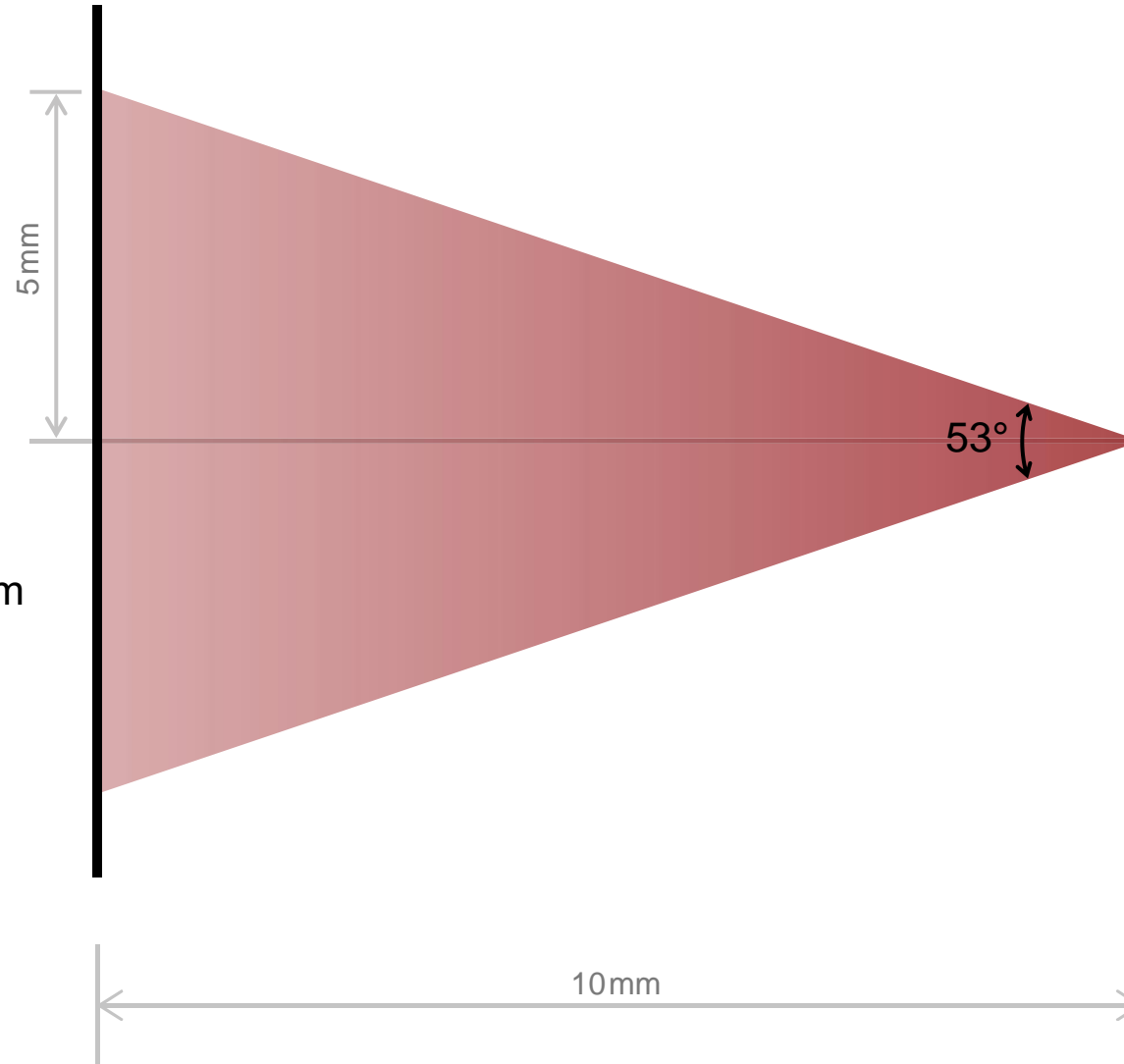


Different types of wavefront aberrations have individual influences on the pattern in focus. It is therefore crucial to be able to investigate these effects in detail, e.g. to evaluate the performance of imaging systems. In VirtualLab Fusion, different wavefront aberrations can be generated, and their effects on the focal spot distribution studied, conveniently. As examples, we select several typical aberrations (spherical, coma, astigmatism, ...), vary their values, and calculate the corresponding focal spot distributions.

# Modeling Task

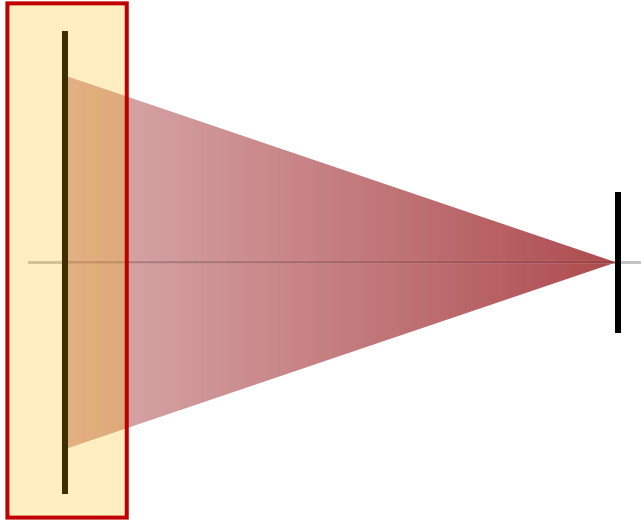
## spherical wave with different aberrations

- wavelength @ 532nm
- type of aberration:
  1. defocus
  2. spherical
  3. astigmatism
  4. coma
  5. secondary coma
  6. trefoil



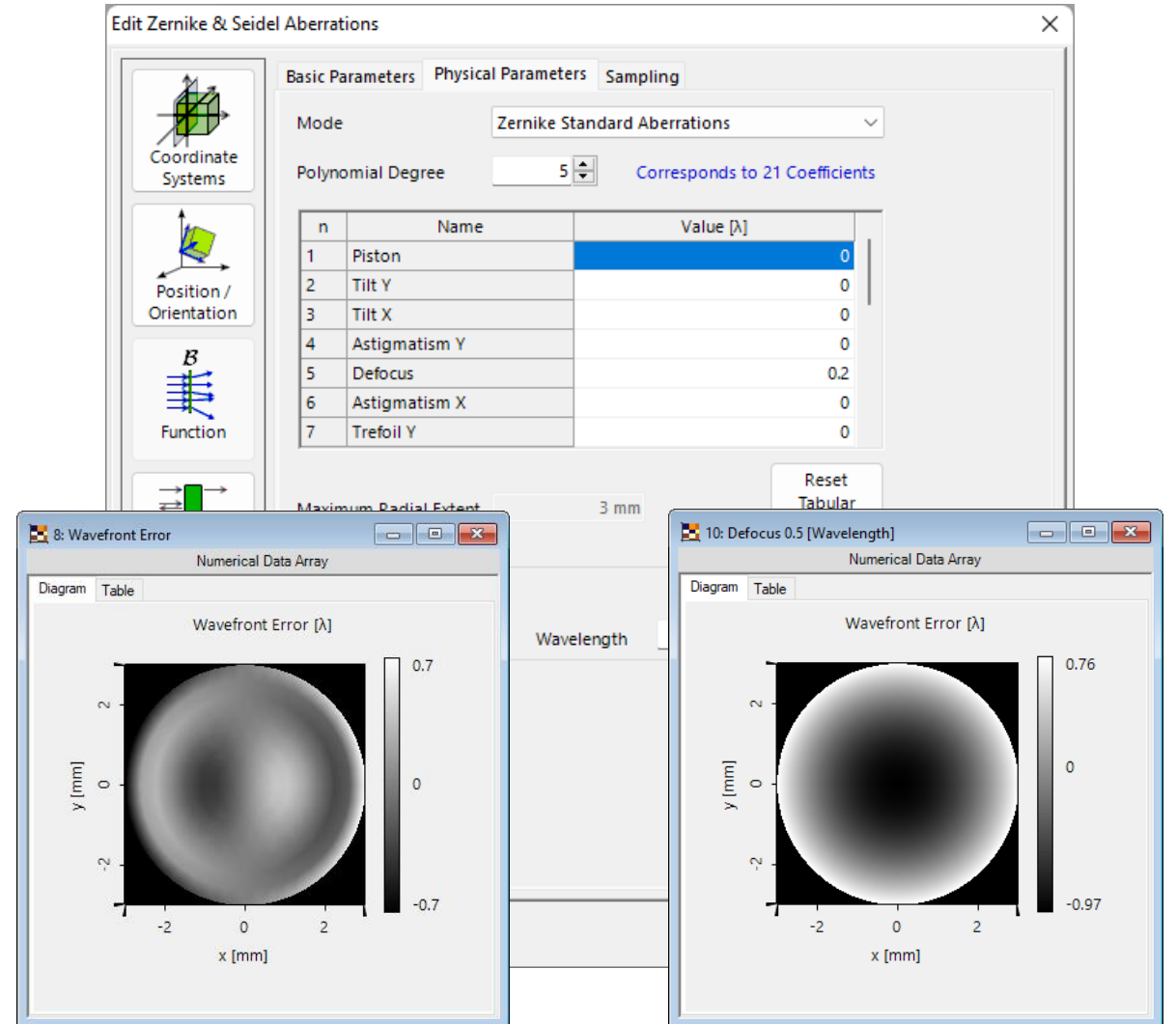
What is focal spot distribution for different aberration?

# Zernike & Seidel Aberrations

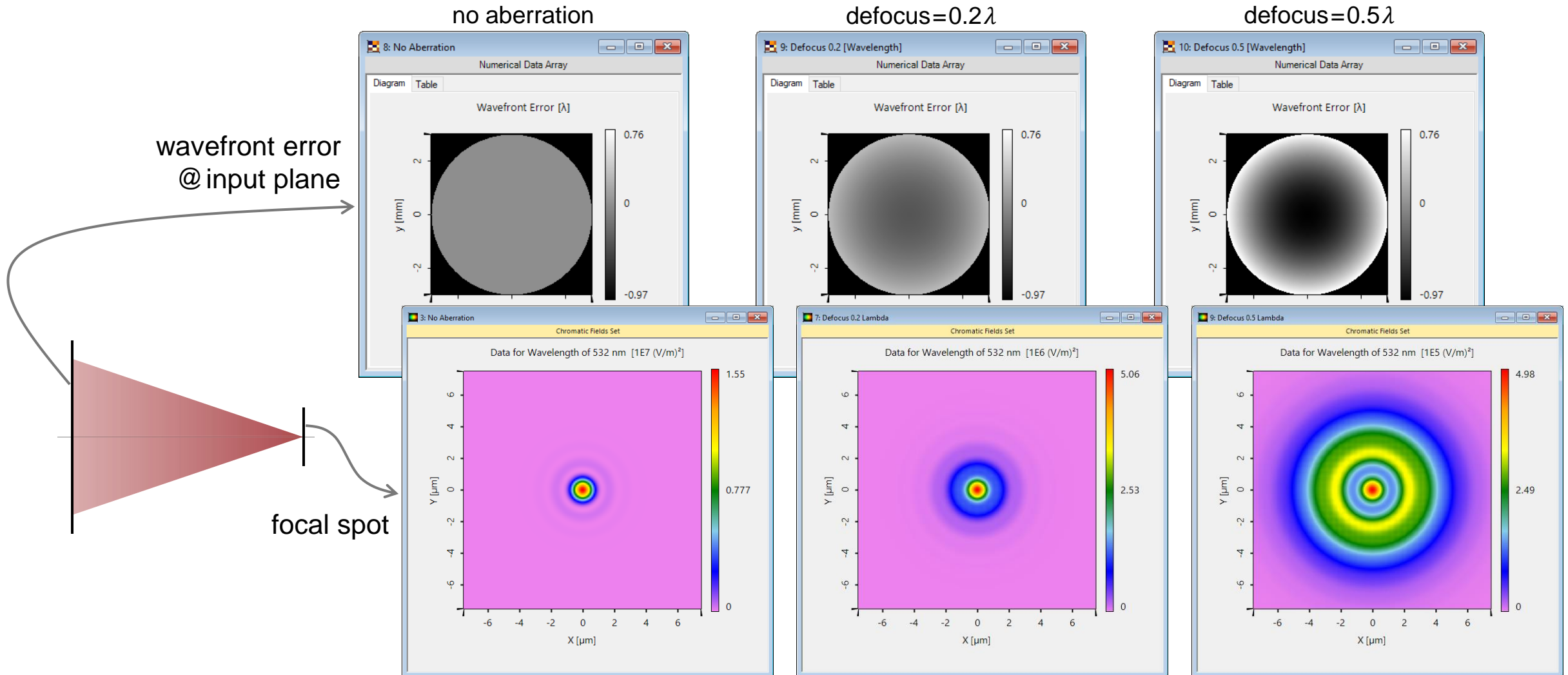


The *Zernike & Seidel Aberrations* component is a special type of transmission function that allows the user to define the desired aberrations and multiplies them onto the field, including:

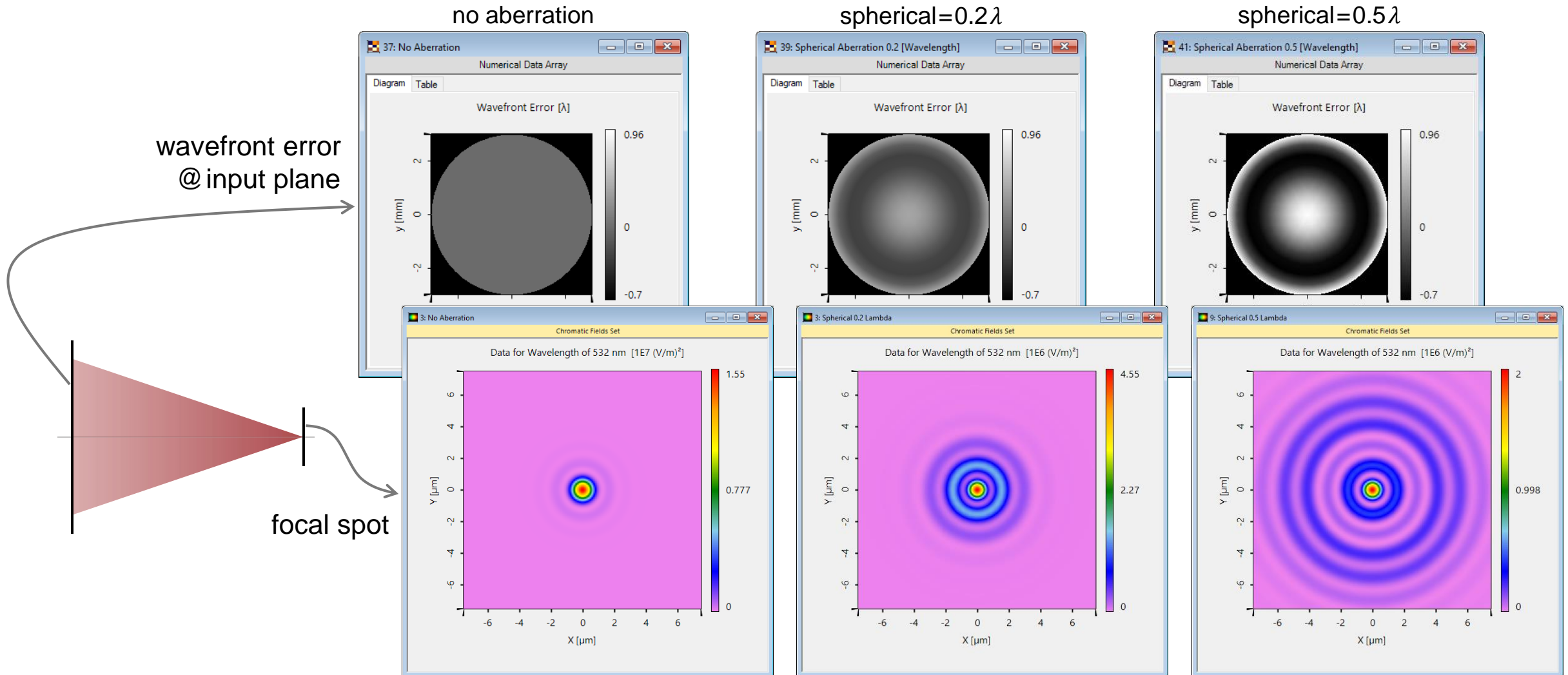
- defocus
- coma
- spherical aberration
- astigmatism



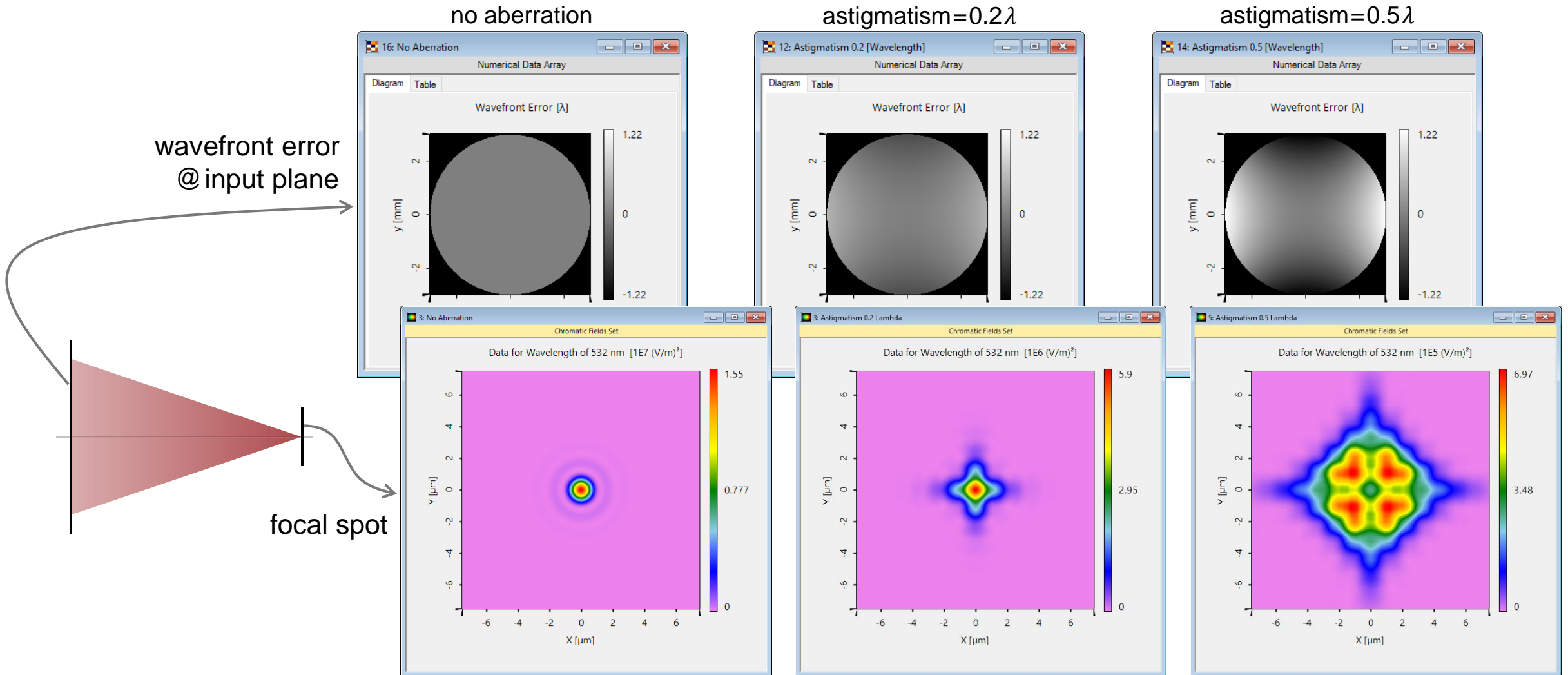
# Defocus



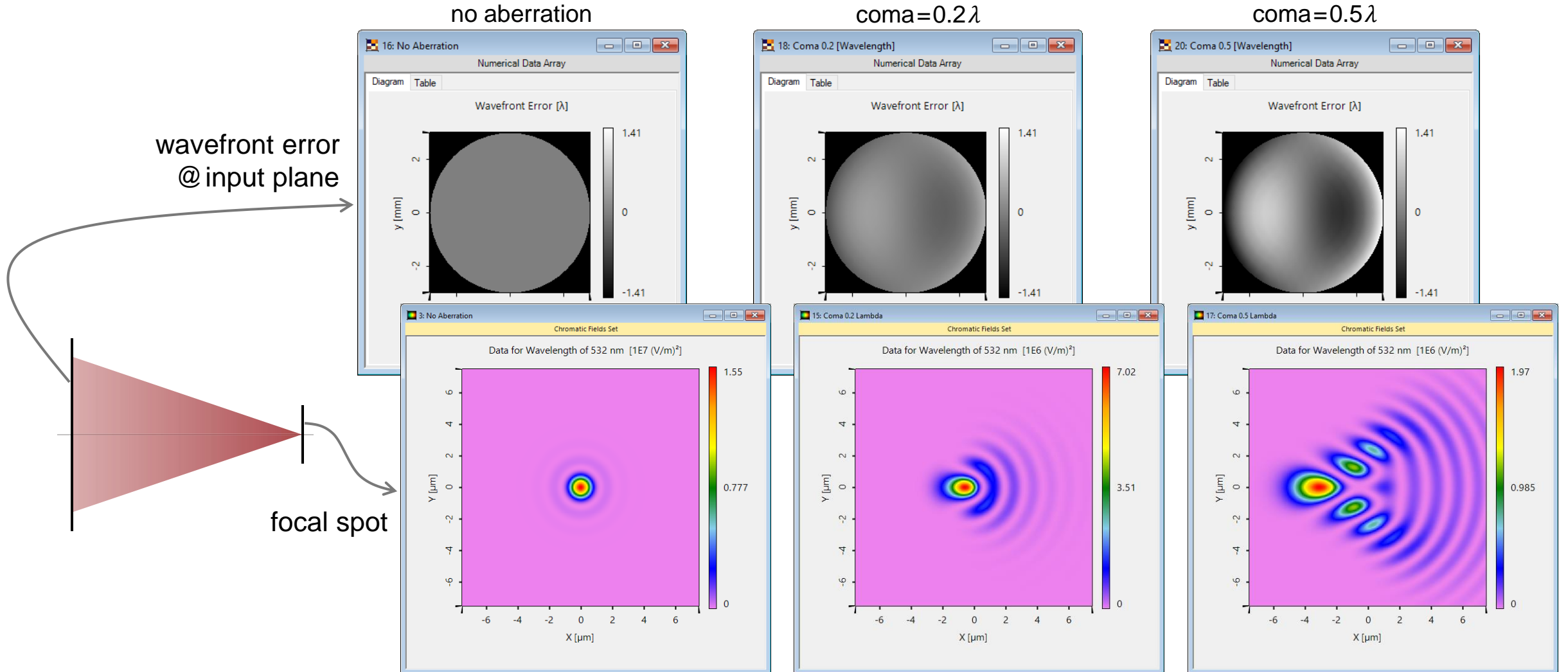
# Spherical Aberration



# Astigmatism



# Coma



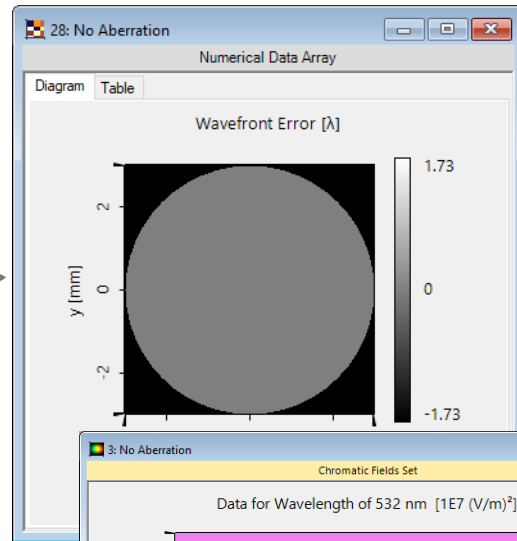


# Secondary Coma

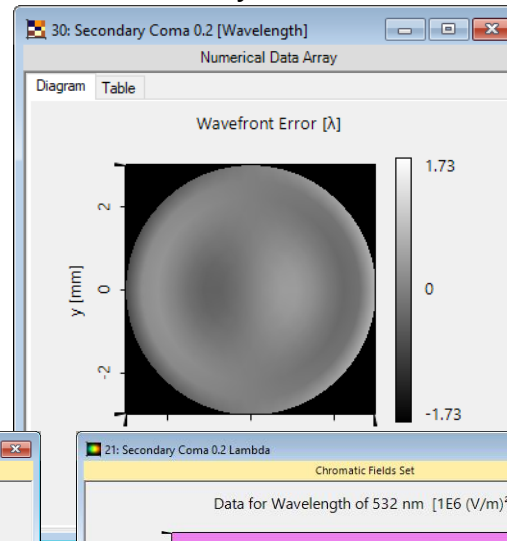
wavefront error  
@ input plane

focal spot

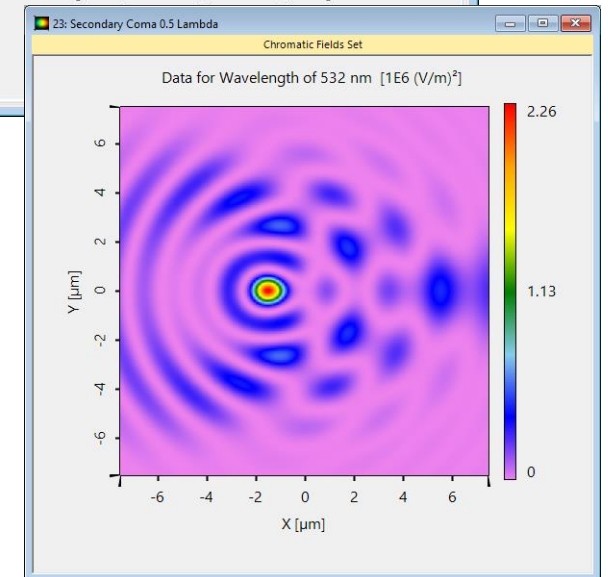
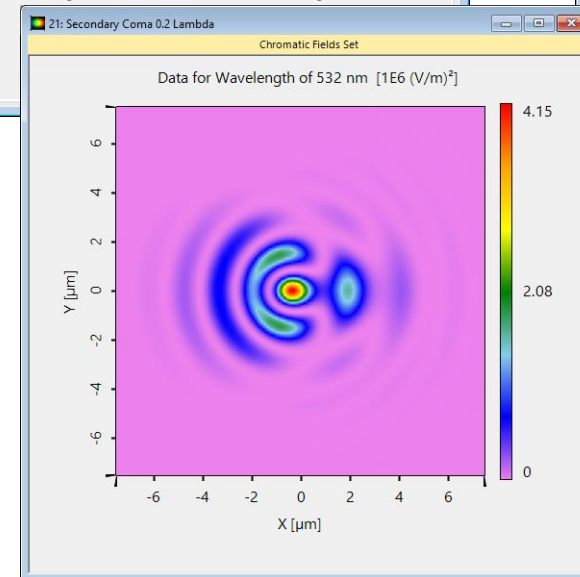
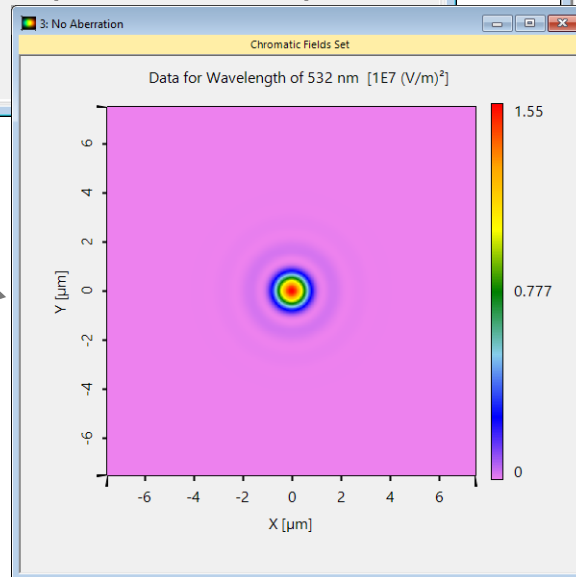
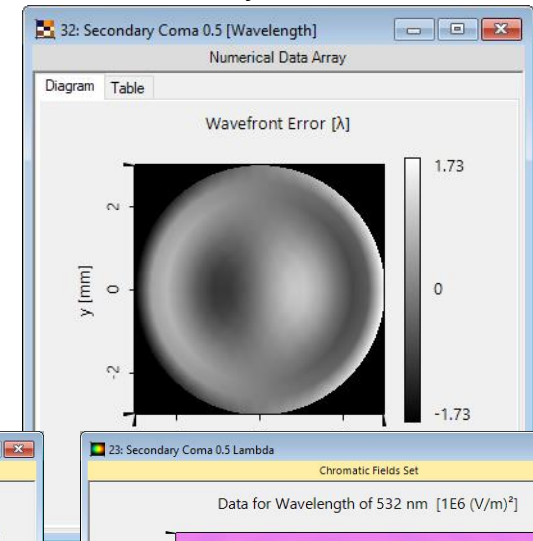
no aberration



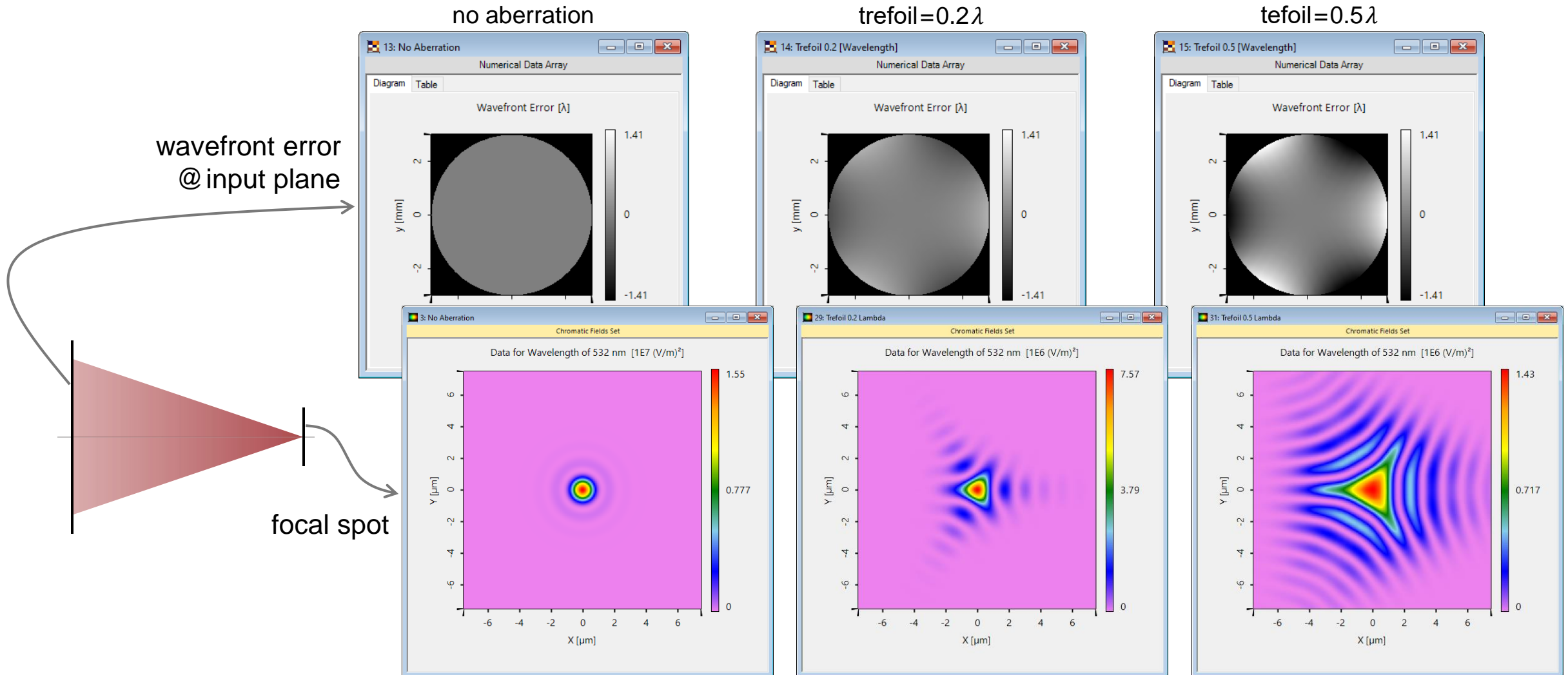
secondary coma= $0.2\lambda$



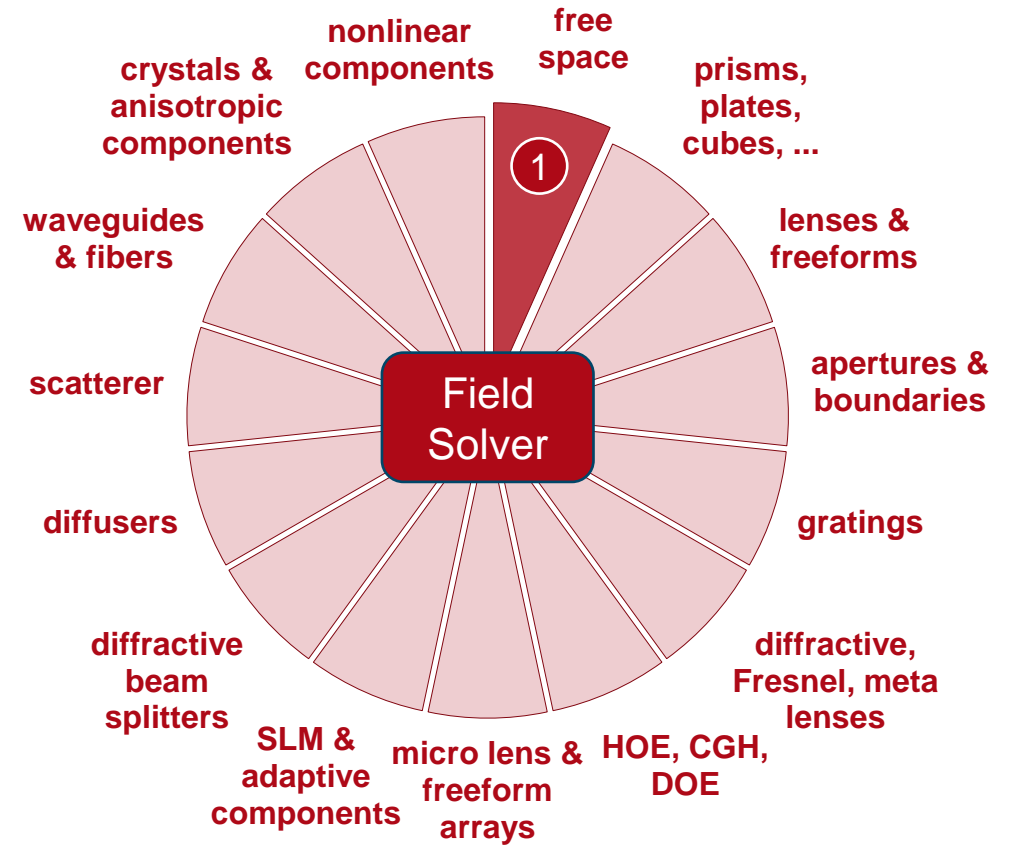
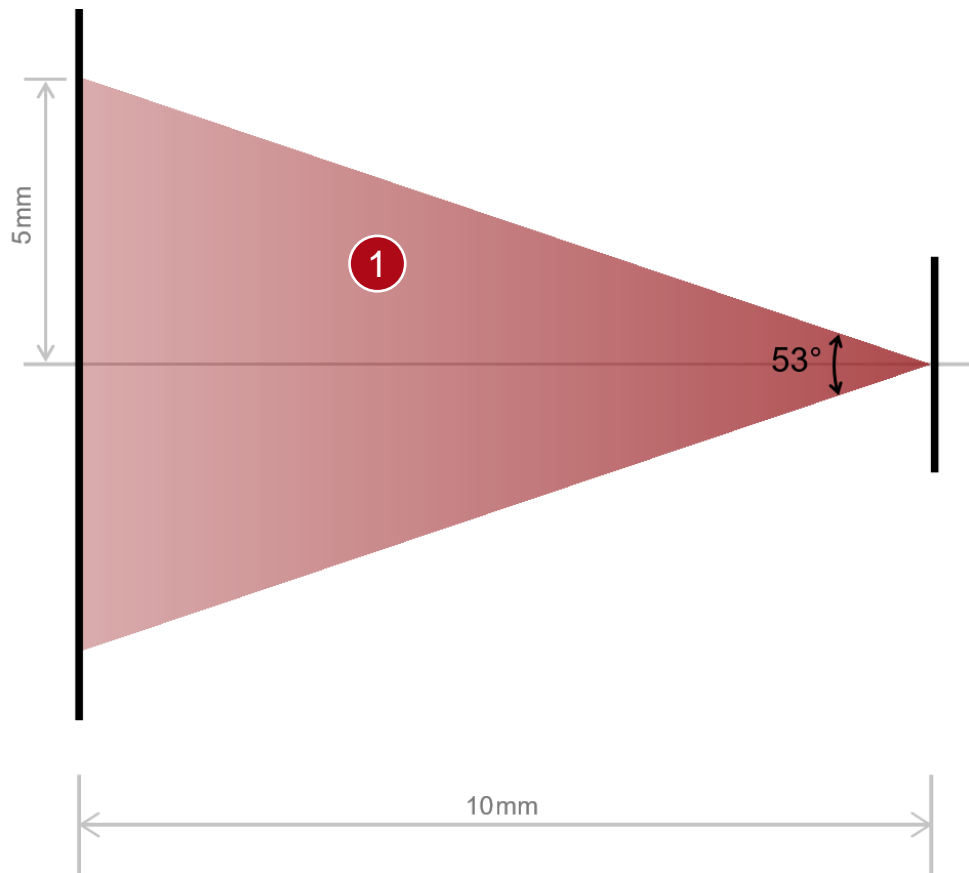
secondary coma= $0.5\lambda$



# Trefoil



# VirtualLab Fusion Technologies



# Document Information

title	Influence of Aberration Effects of a Spherical Wave on the Focal Spot
document code	MISC.0002
document version	1.1
software version	2021.1 (Build 1.180)
software edition	VirtualLab Fusion Basic
category	Application Use Case
further reading	<ul style="list-style-type: none"><li>• <a href="#"><u>Advanced PSF &amp; MTF Calculation for System with Rectangular Aperture</u></a></li><li>• <a href="#"><u>Simulation of Laser Beam in Focal Region of High-NA Asphere</u></a></li></ul>