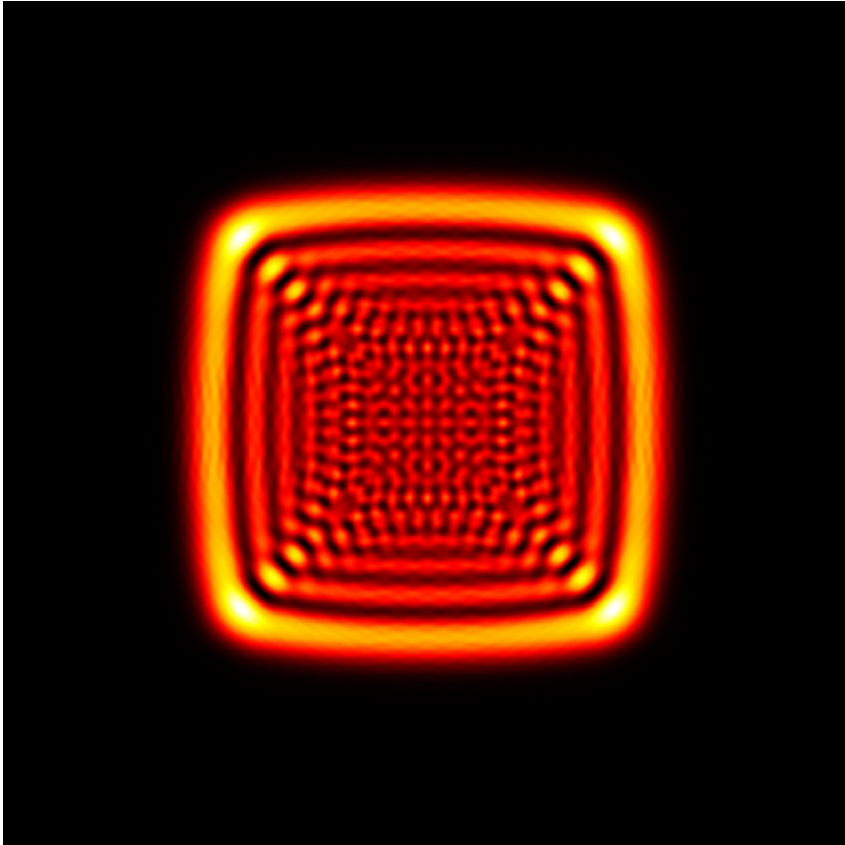# Investigation of Lens Aberrations in a SLM-based Beam Shaping Setup
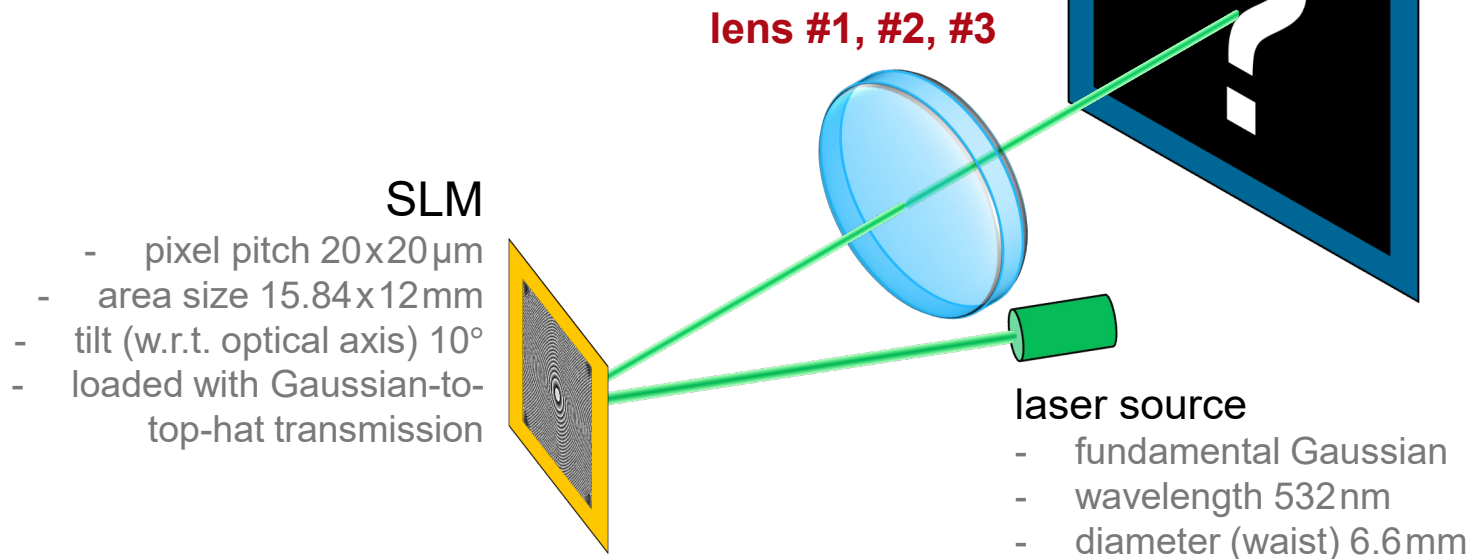
Abstract

Diffractive beam shapers are usually used in combination with other optical components, like focusing lenses. Therefore, the quality of the shaped beam depends not only on the diffractive beam shaper itself, but also on the other components. It is important to understand the role and contribution of each component in the resulting beam quality. In this example, the influence from lens aberrations on the performance of a beam shaping system is investigated in VirtualLab Fusion.
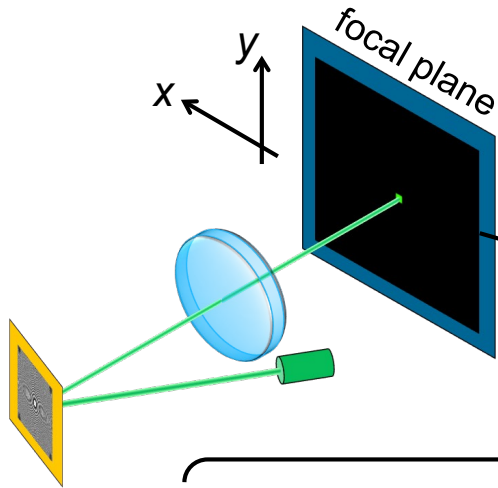
Modeling Task

|	Lens #1	Lens #2	Lens #3
type	spherical biconvex (not optimized)	spherical biconvex (optimized)	aspherical (Asphericon A25-50LPX)
eff. focal length	50 mm	50.95 mm	49.20 mm

How do different lenses, with different aberrations, affect beam shaping performance?

lens #1, #2, #3

SLM
- pixel pitch 20 x 20 µm
- area size 15.84 x 12 mm
- tilt (w.r.t. optical axis) 10°
- loaded with Gaussian-to-top-hat transmission

laser source
- fundamental Gaussian
- wavelength 532 nm
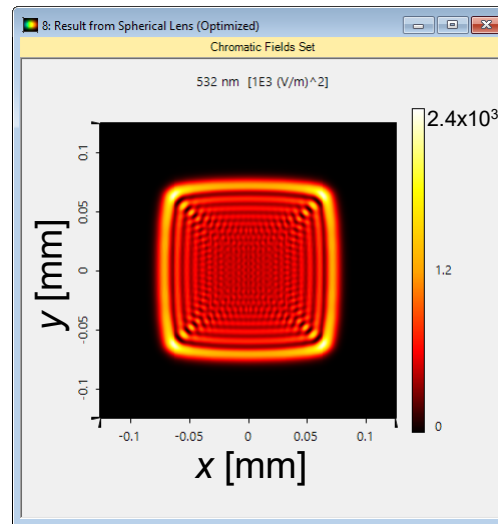- diameter (waist) 6.6 mm
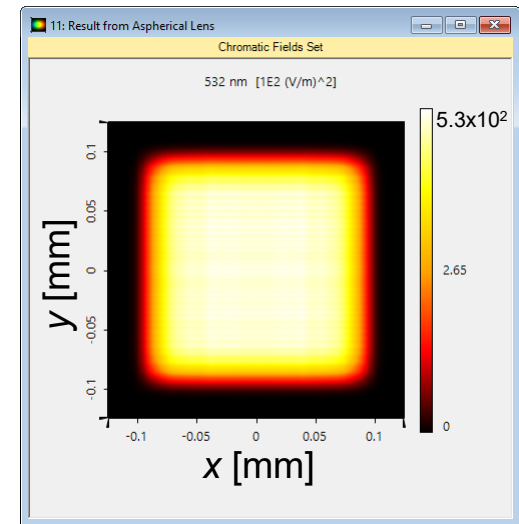
Results

focal plane

y

x

Modeling of both diffractive beam shaper and real lenses including aberrations in one optical system are available in VirtualLab Fusion.
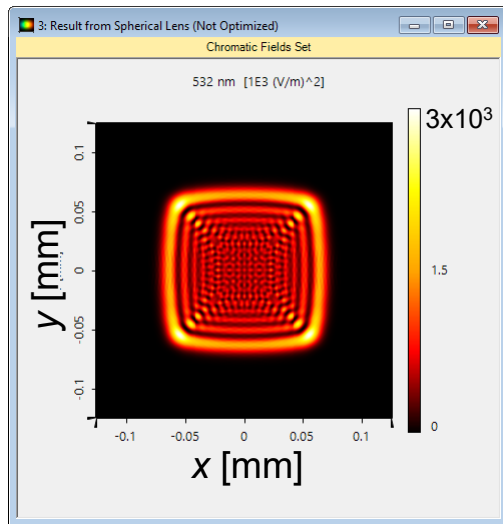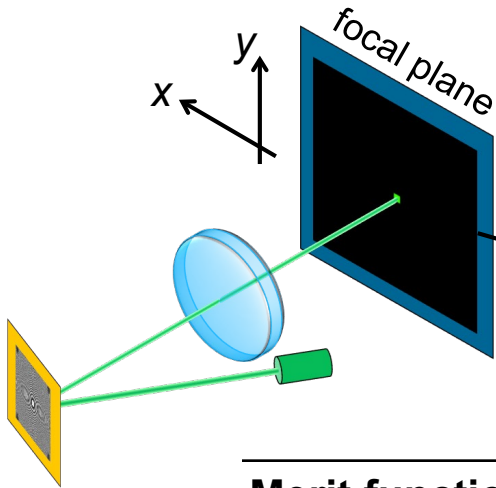

lens #1 (spherical, not optimized)

lens #2 (spherical, optimized)

lens #3 (aspherical)

Results

Merit functions	Lens #1 (spherical, not optimized)	Lens #2 (spherical, optimized)	Lens #3 (aspherical)
conversion efficiency	57.02%	68.87%	88.98%
signal-to-noise ratio	4.27%	6.12%	24.78%
…			

Different merit functions can be accessed for quantitative evaluations of the system performance.

Document Information

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category	Application Use Case