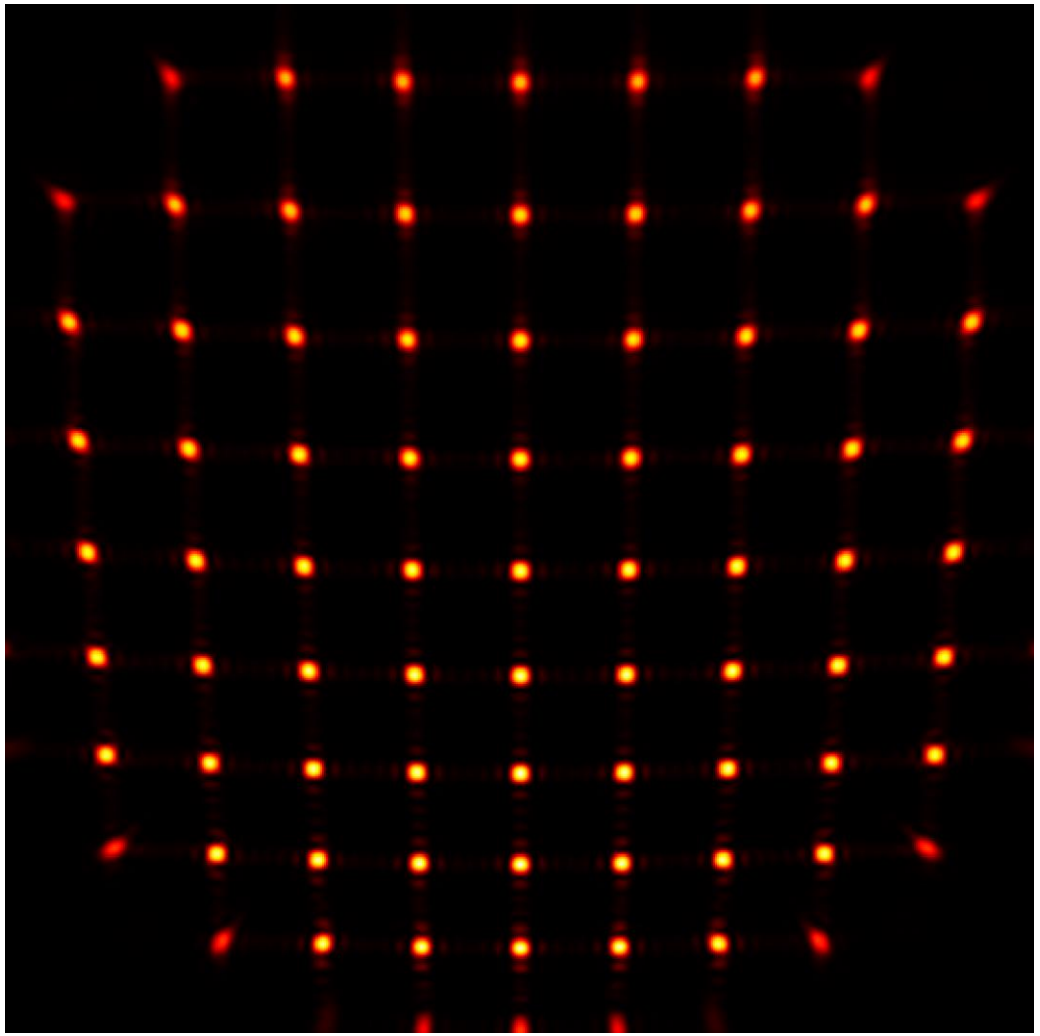
Modeling of Microlens Arrays with Different Lens Shapes

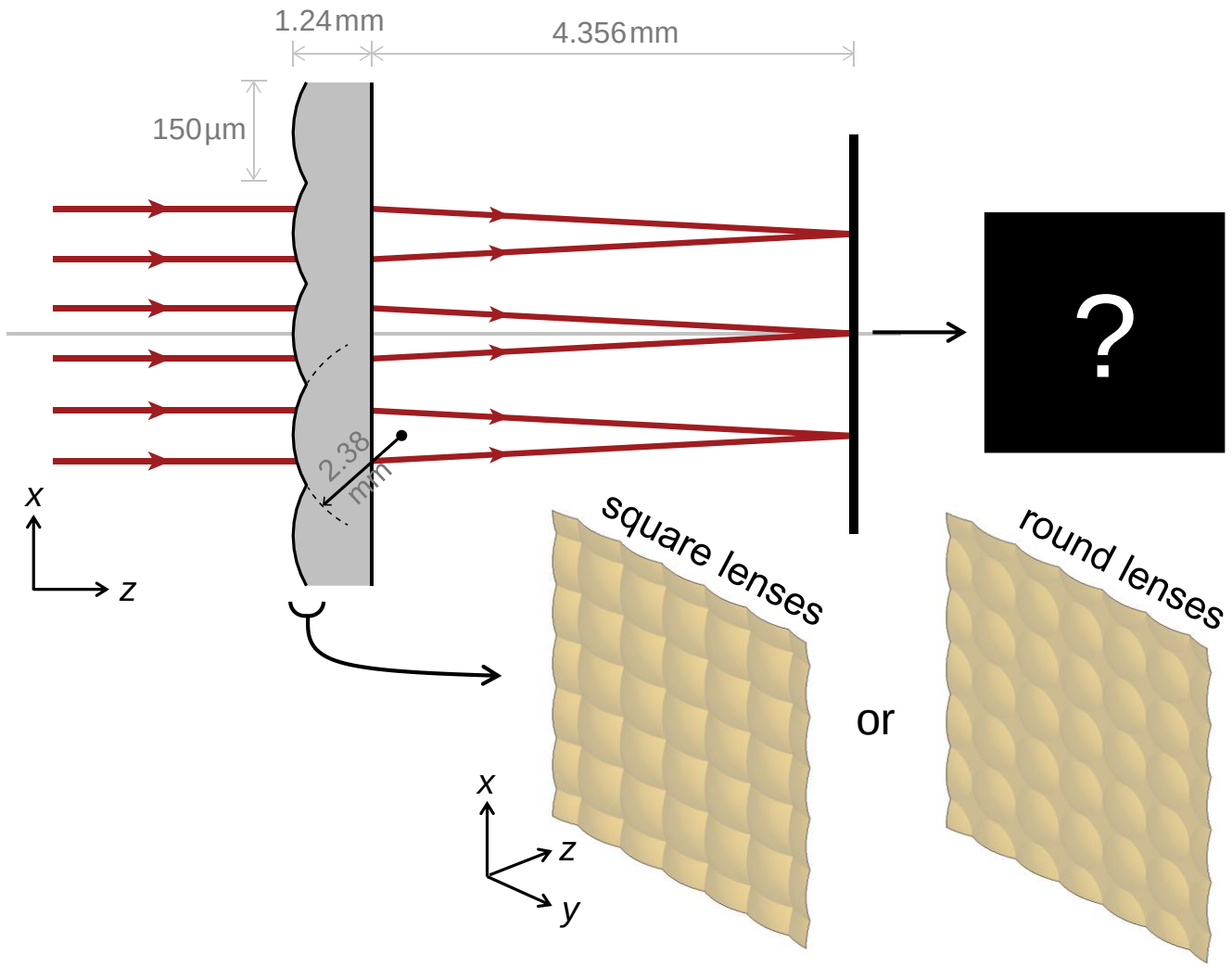
Abstract



Microlens arrays are found useful in many applications, such as imaging, wavefront sensing, light homogenizing, and so on. Due to different fabrication techniques / processes, the microlenses may appear in different shapes. In this example, microlens array with two typical lens shapes – square and round – are modeled. Because of the different apertures shapes, the focal spots are also different due to diffraction. The change of the focal spots distribution with respect to the imposed aberration in the input field is demonstrated.

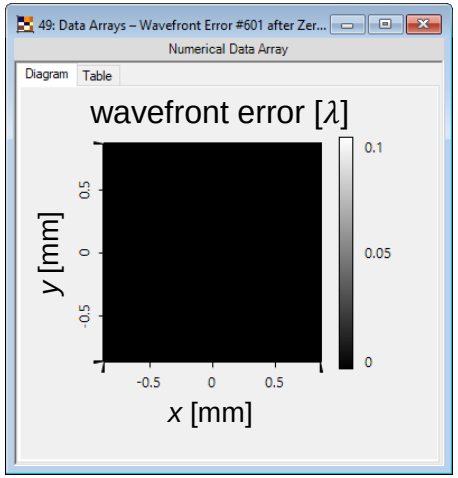
Modeling Task

input field
- wavelength 633 nm
- diameter 1.5 mm
- uniform amplitude
- phase distributions
  1) no aberration
  2) spherical aberration
  3) coma aberration
  4) trefoil aberration

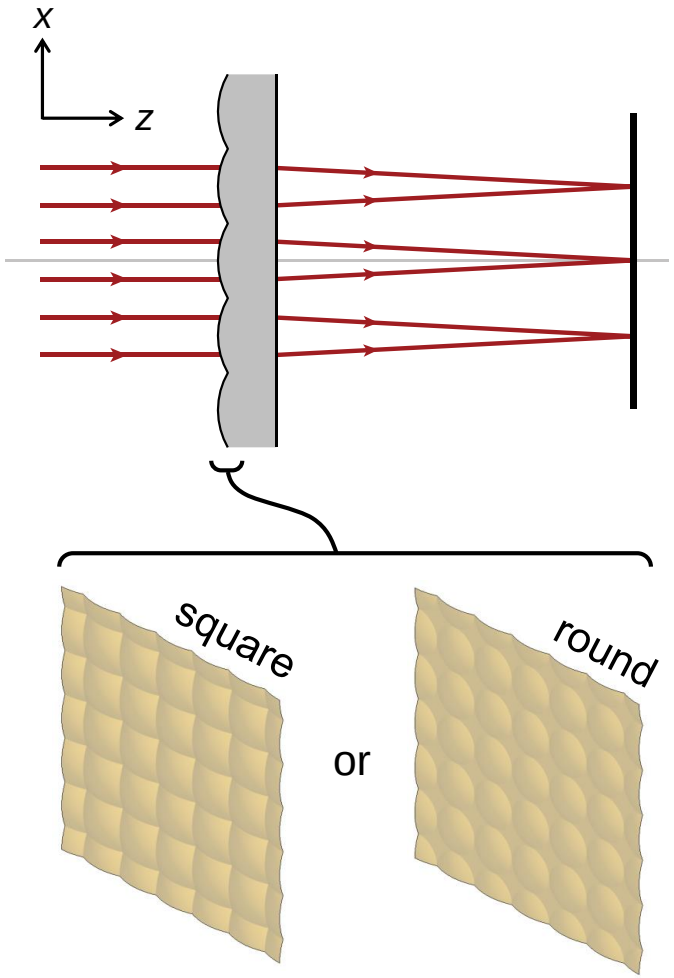


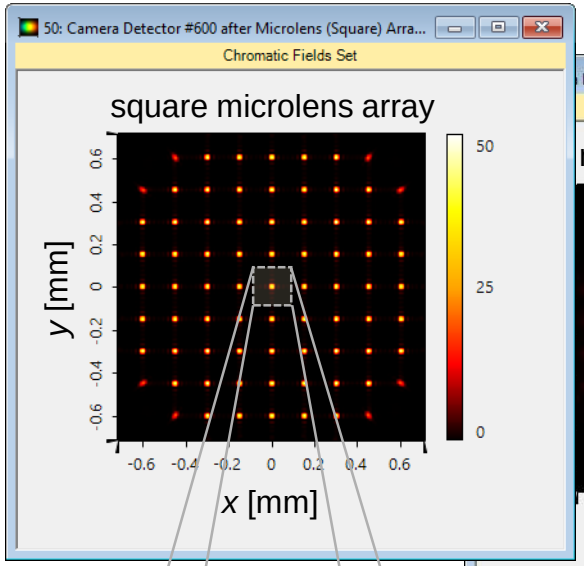
How to calculate field on focal plane behind different types of microlens arrays, and how does the spot distribution change with the input field aberration?

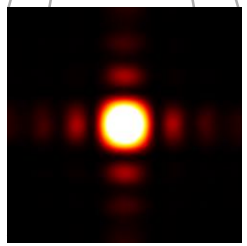
Results



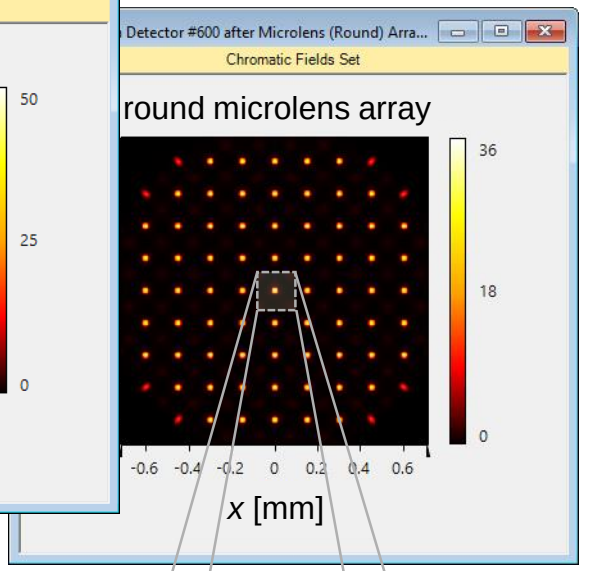
no aberration

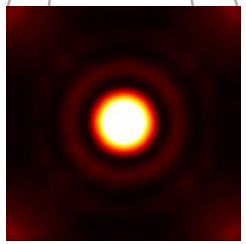






diffraction due to square aperture

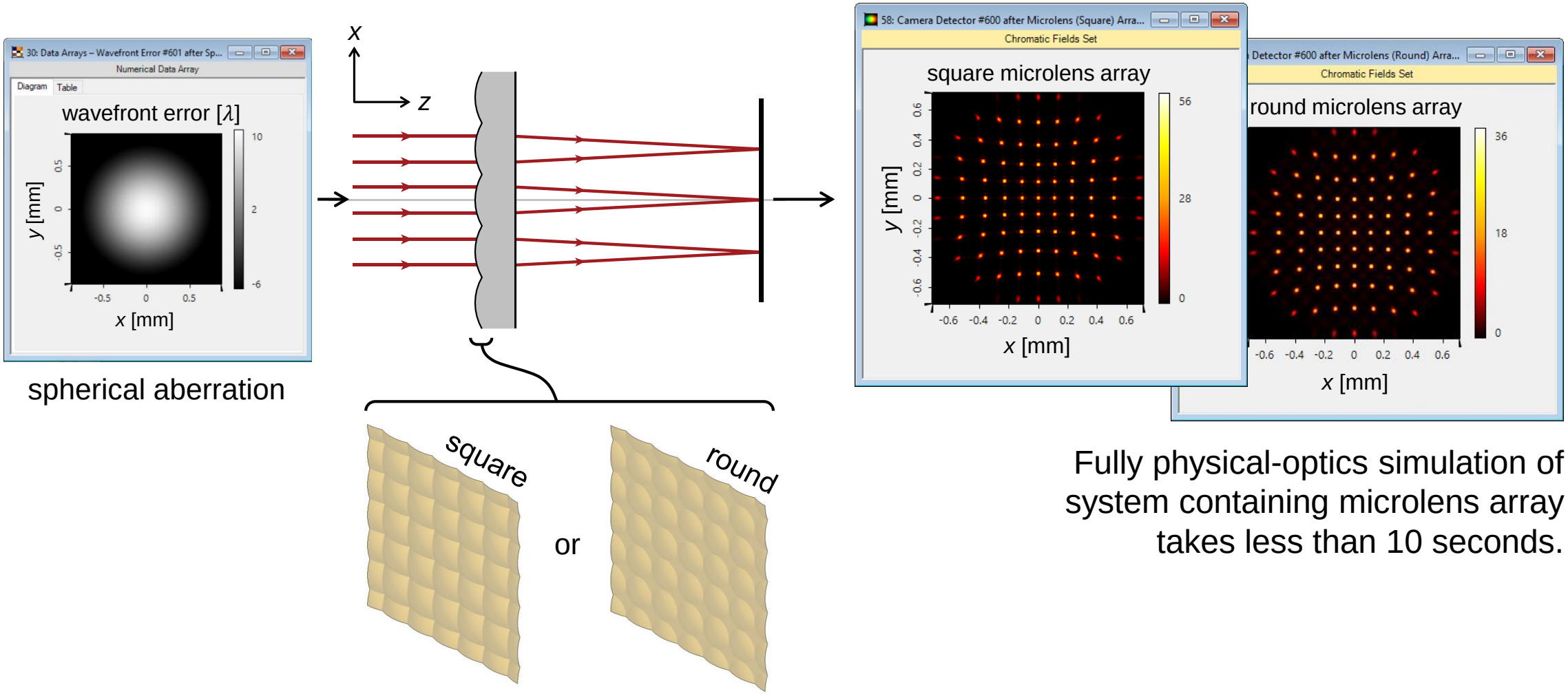




(color saturation at 1/3 maximum)

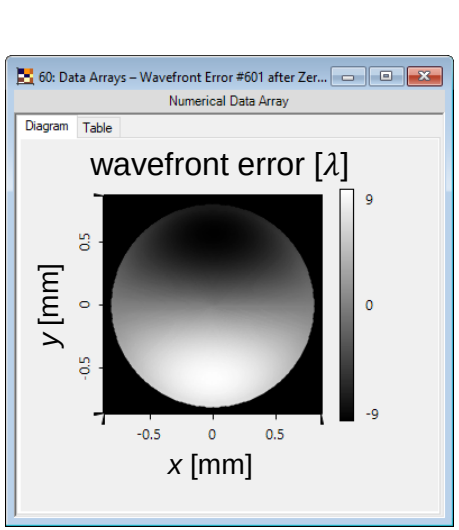
diffraction due to round aperture

Results

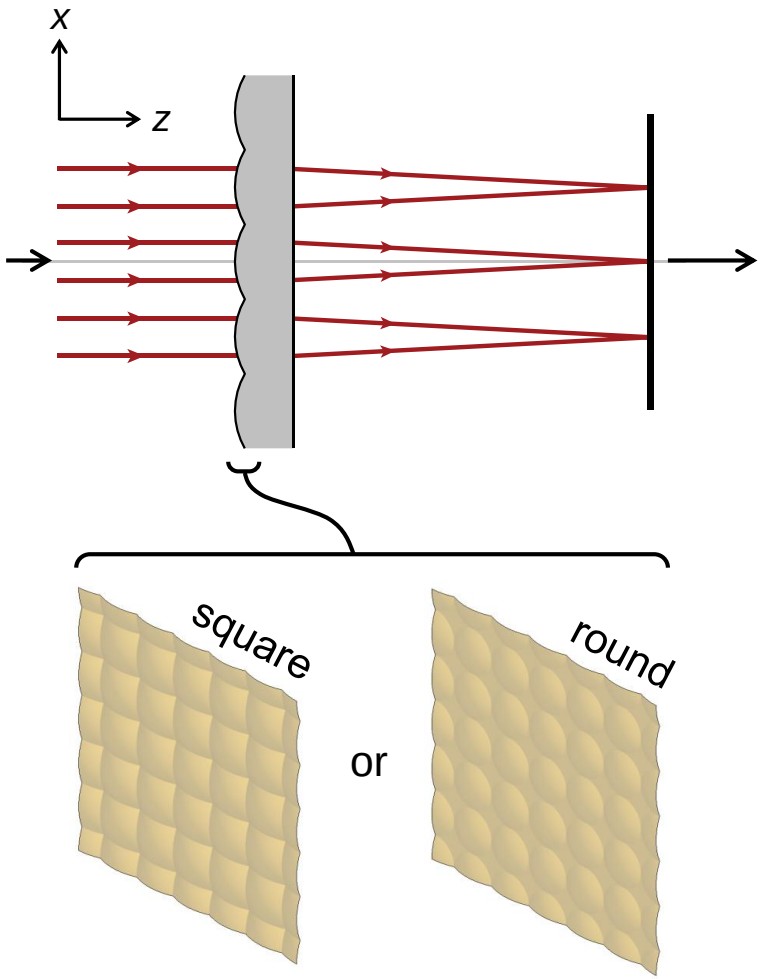


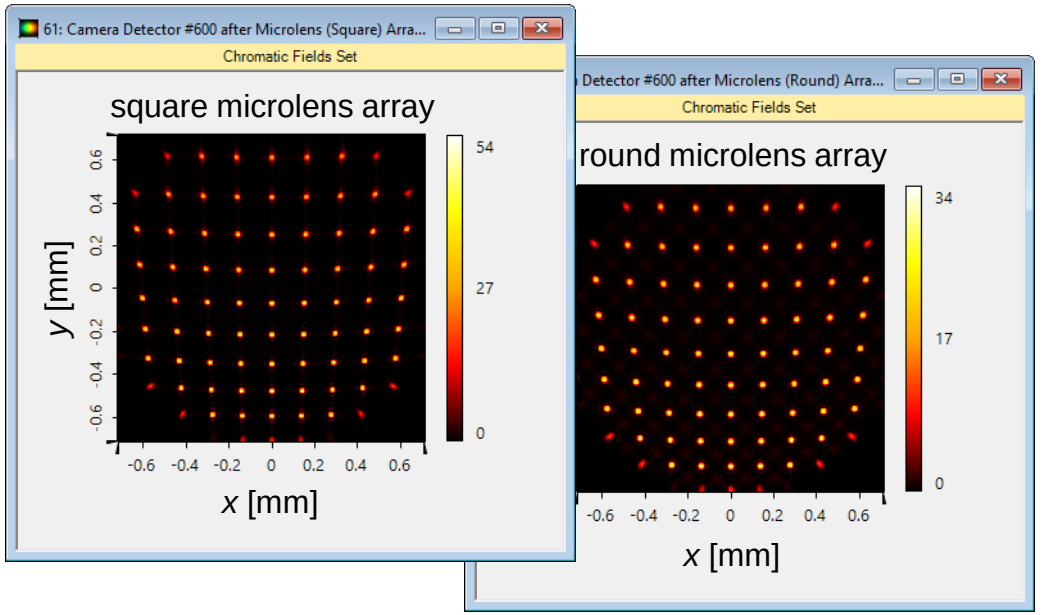
Fully physical-optics simulation of system containing microlens array takes less than 10 seconds.

Results



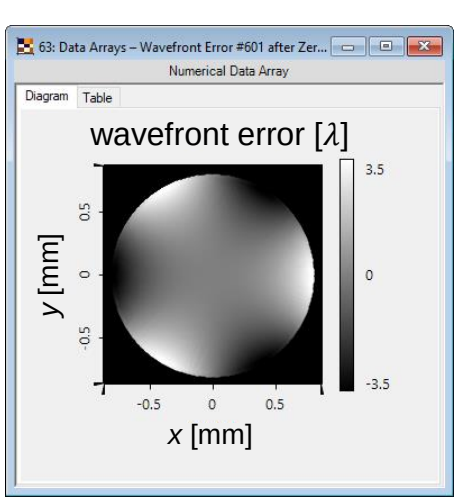
coma aberration



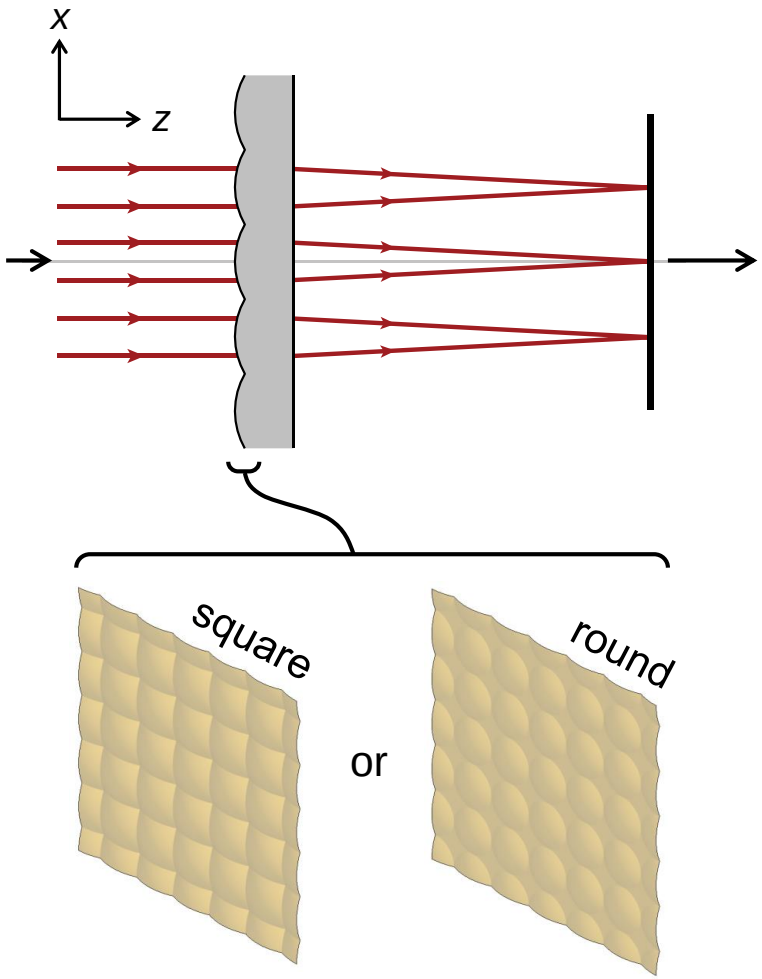


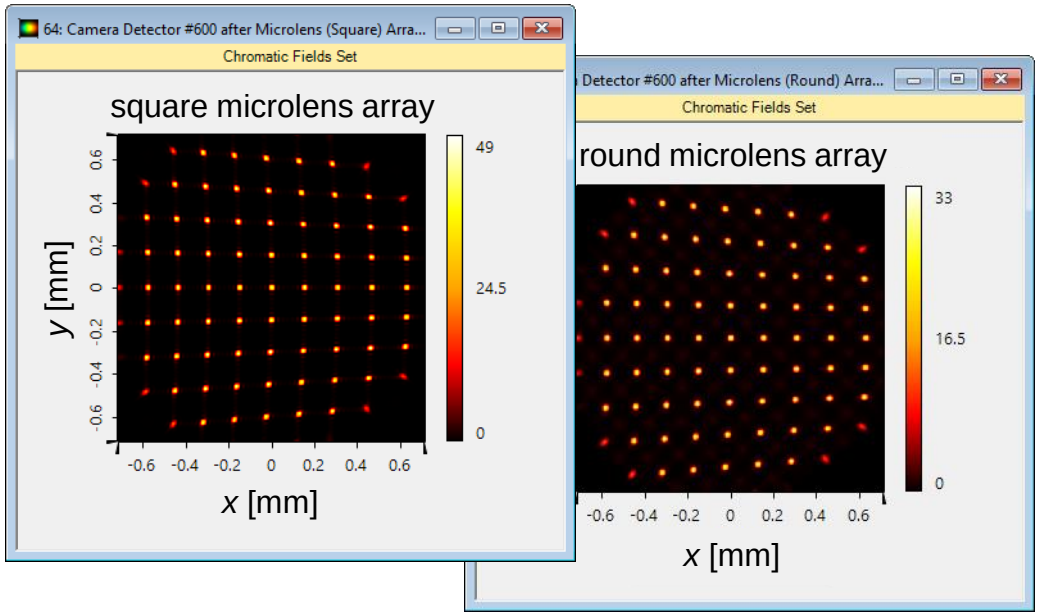
Focal spots distribution changes with respect to the aberration of the input field.

Results



trefoil aberration





Focal spots distribution changes with respect to the aberration of the input field.

Document Information

title	Modeling of Microlens Array with Different Lens Shapes
version	1.0
VL version used for simulations	7.3.1.5
category	Application Use Case