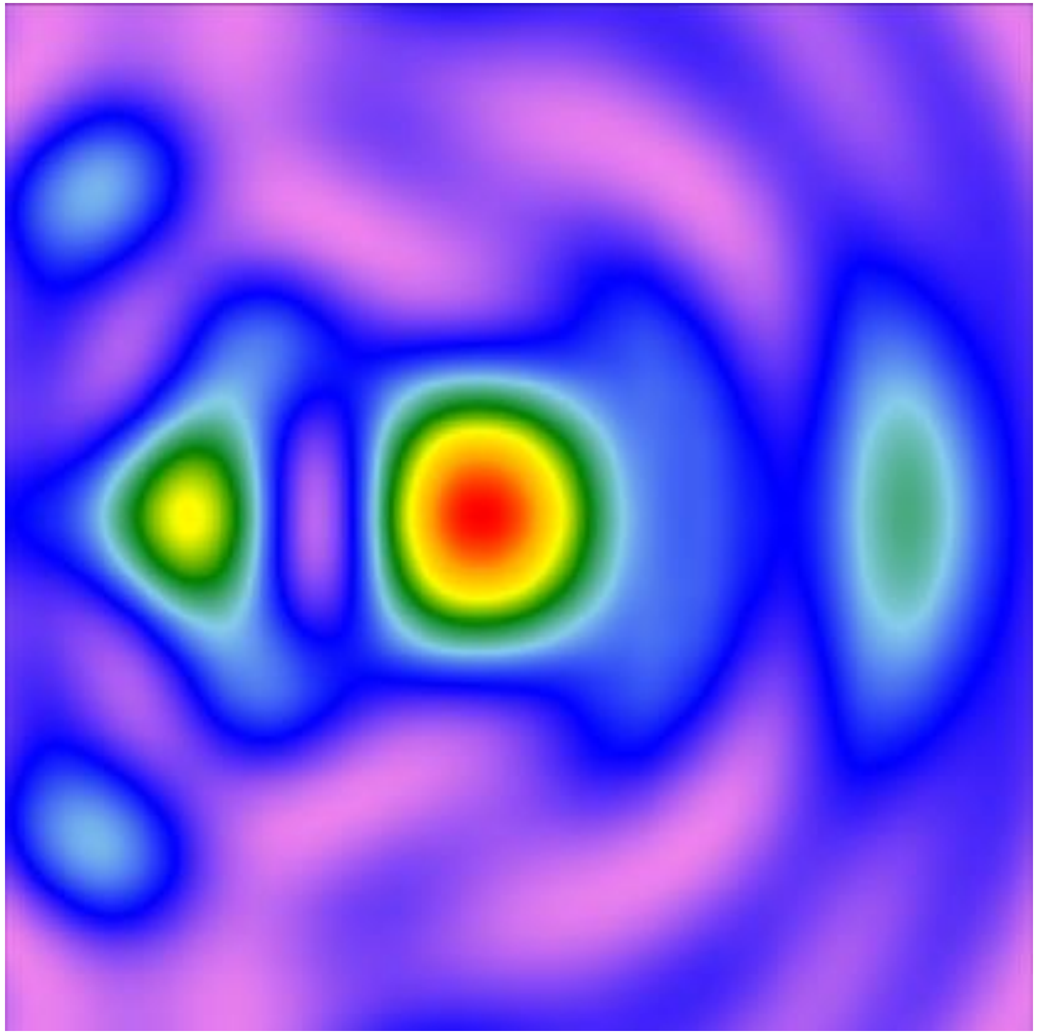
Influence of the Position of the Stop in a Lens System on Point Spread Function (PSF)

Abstract



Stop in a lens system is important because it directly determines the light interaction with the edge of the aperture of the lens surface, which exsited physically in the manufactured lens system. Therefore, different positions of the stop might have an influence on the Point Spread Function (PSF). VirtualLab Fusion provides an ease way to investigate this influence by considering the diffraction, if necessary, from the edge of each surface, especially with inclined illumination.

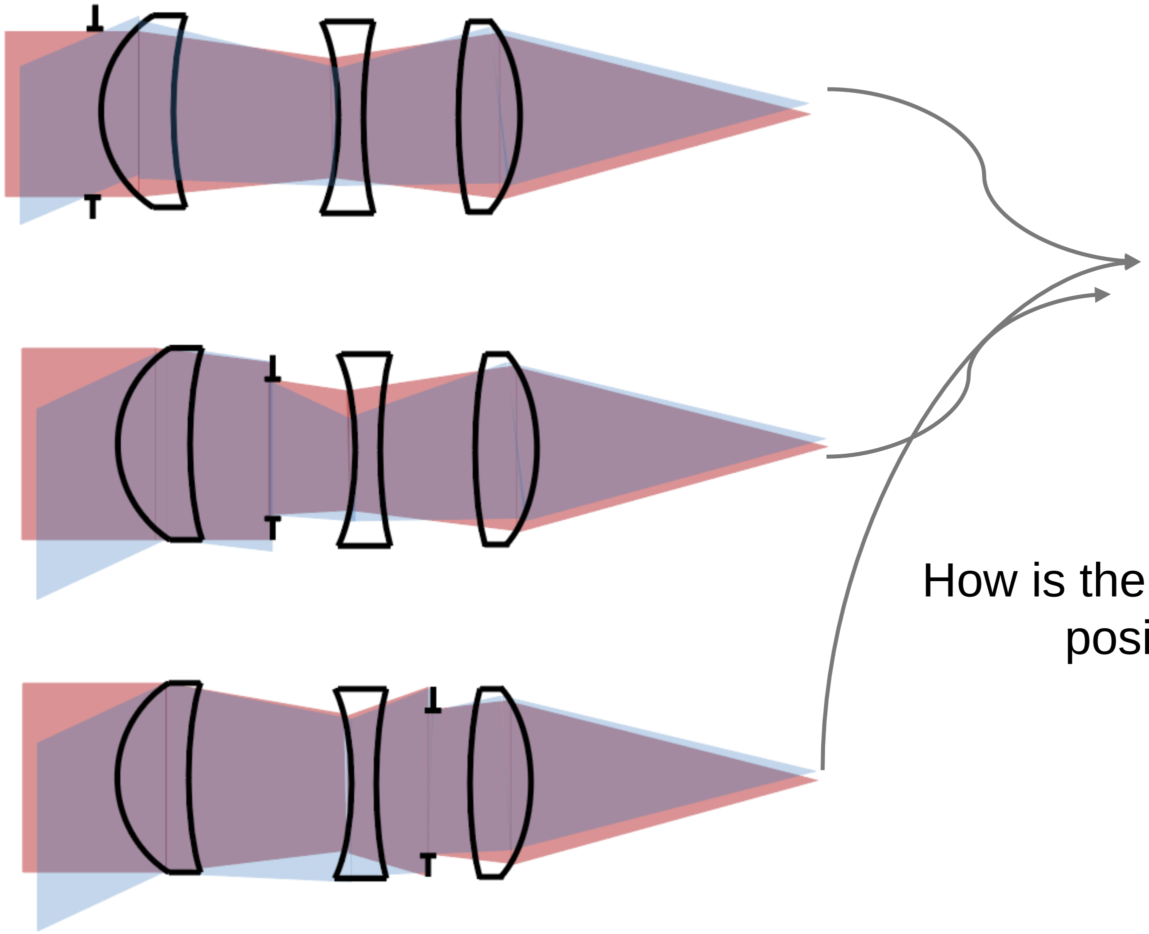
Scenario

retrofocus lens

- US4950055

plane wave

- normal or inclined incidence with 8°
- circularly polarized
- wavelength 587.7 nm

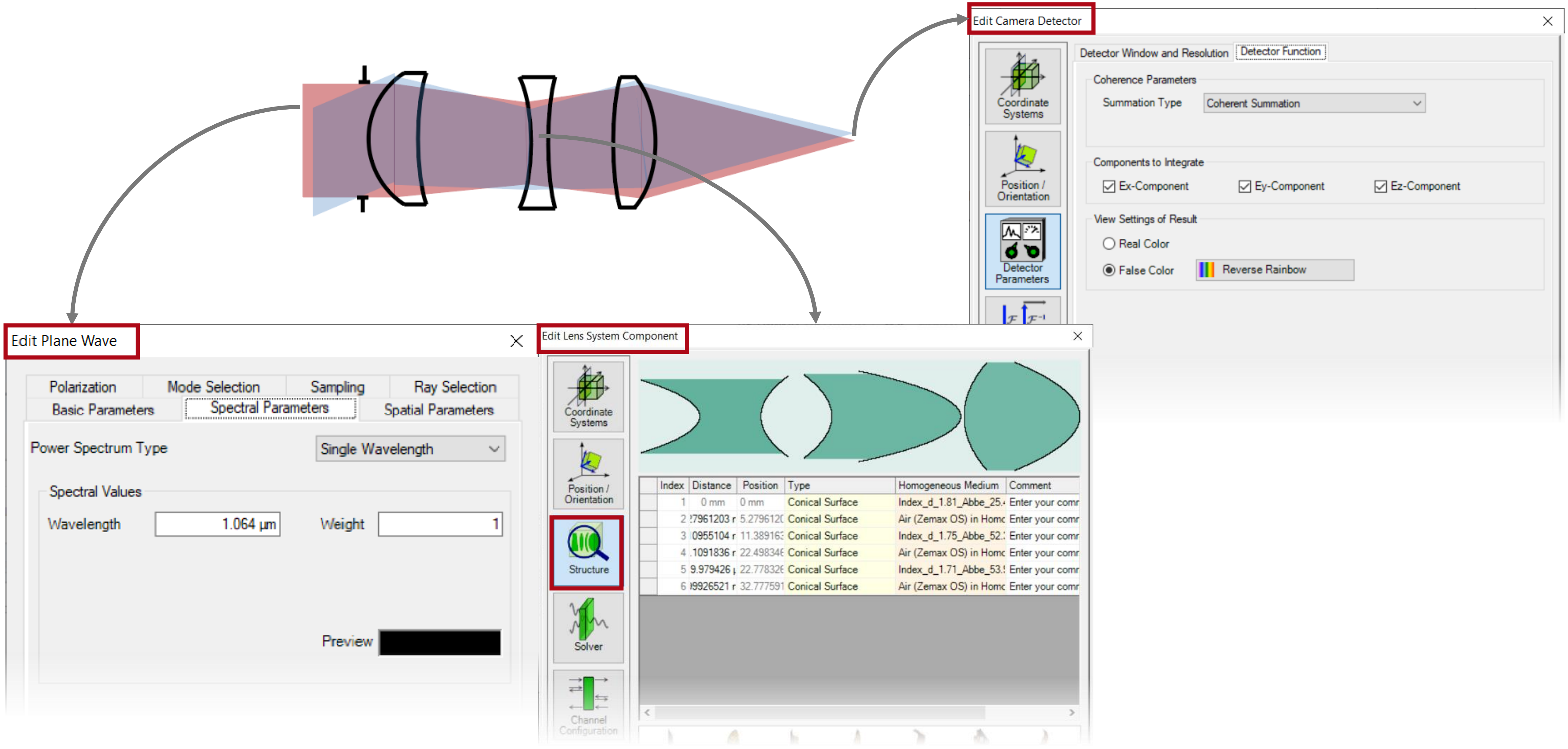


PSF $|E_x|^2 + |E_y|^2 + |E_z|^2$

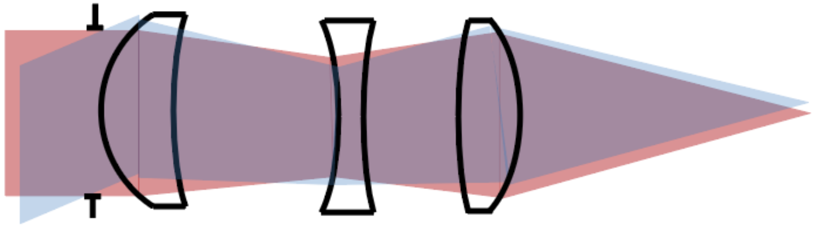
How is the PSF influenced by the different positions of the stop in the cases of normal and inclined incidence?

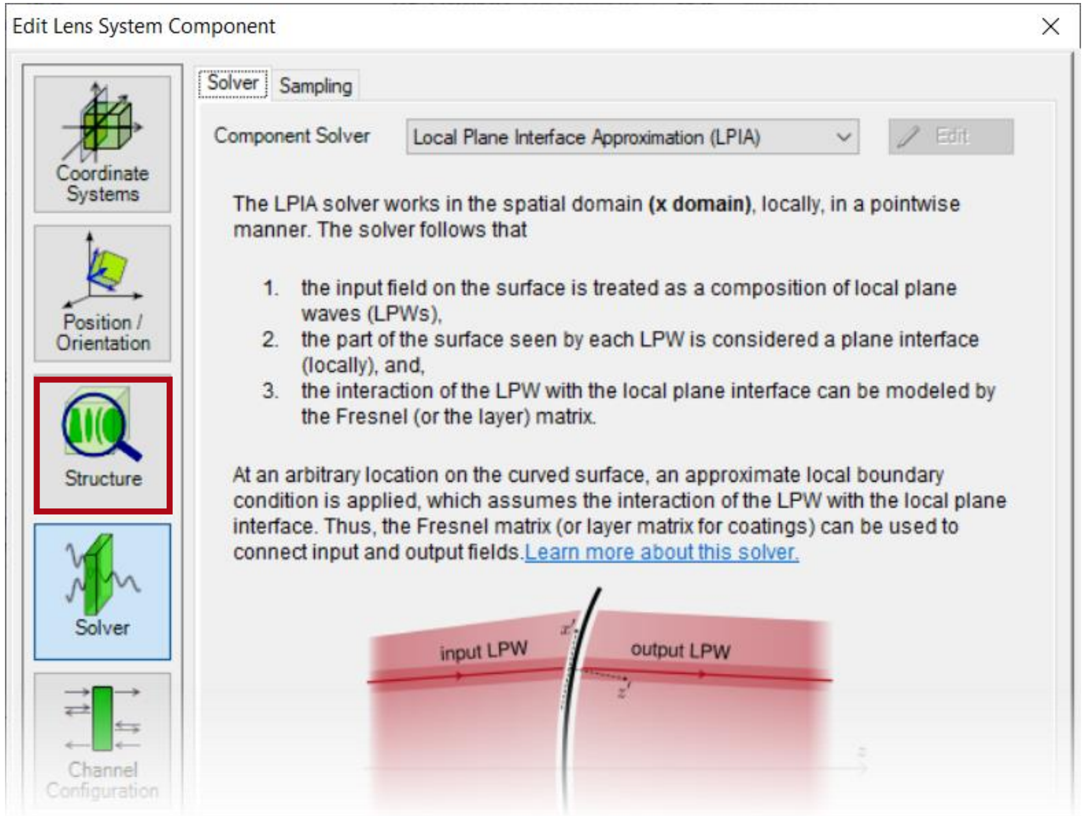
Building the System in VirtualLab Fusion

System Building Blocks



Solvers for Components

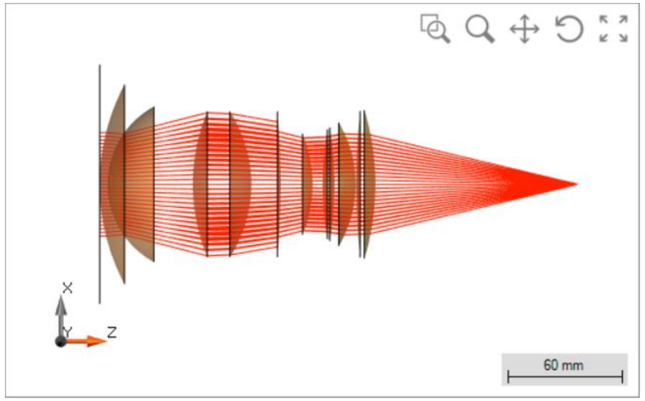
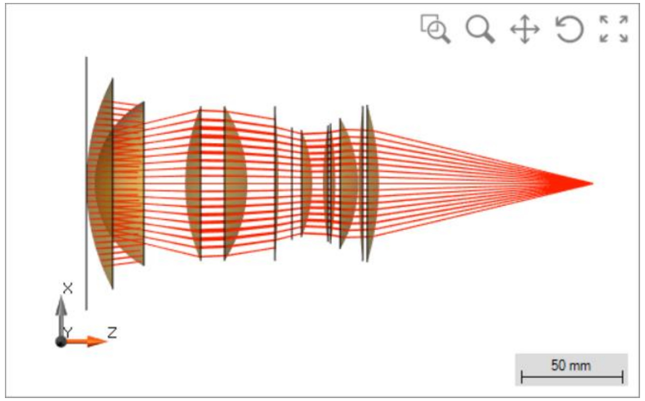
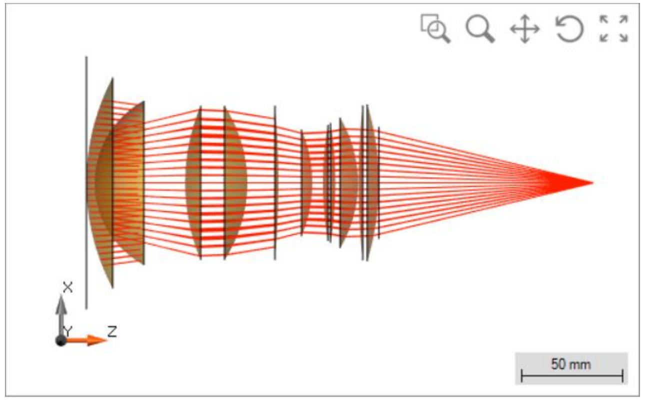
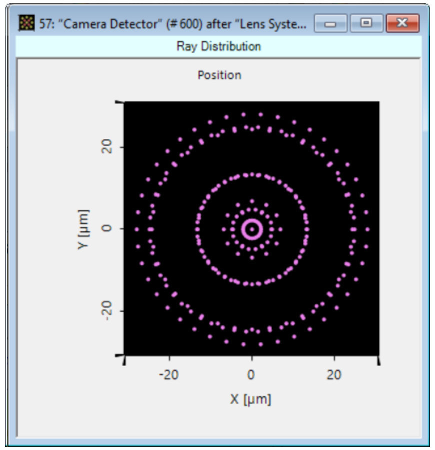
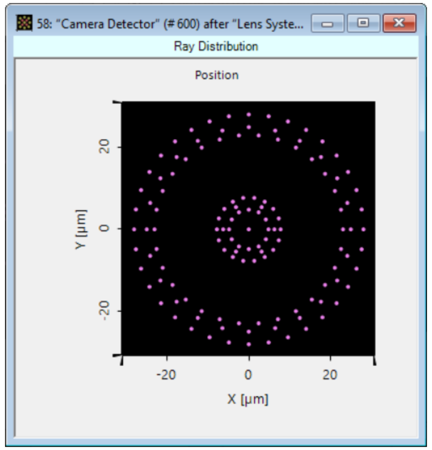
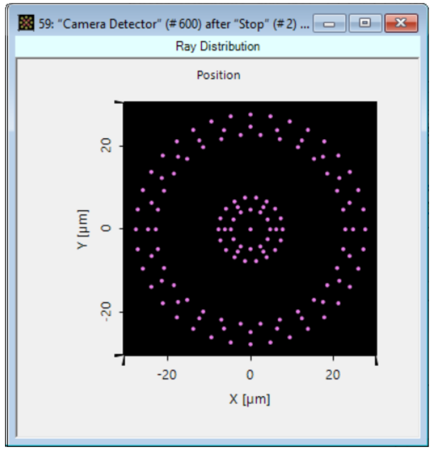




Components	Solvers
Lens system	Local Plane Interface Approximation (LPIA)

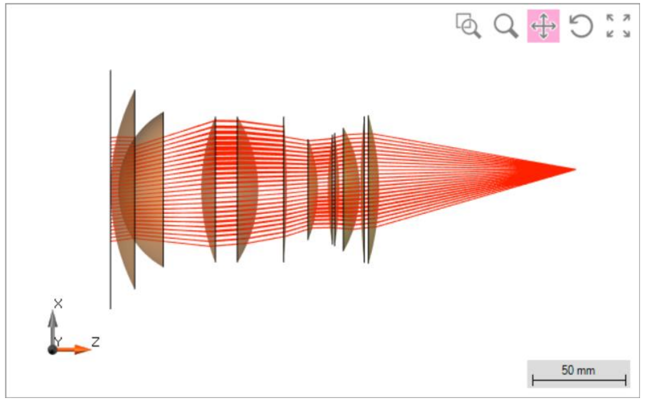
Ray Tracing Simulations

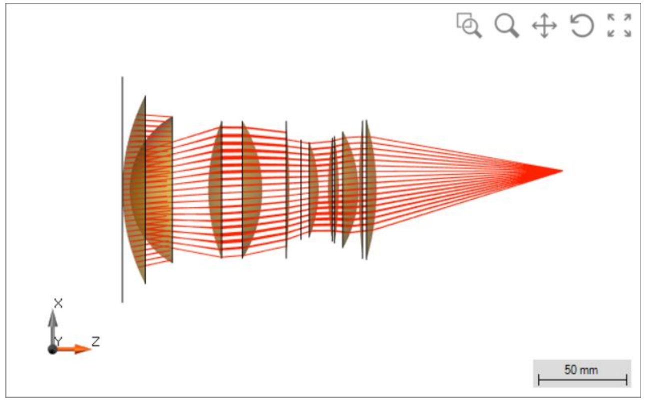
Ray Tracing Results: Normal Incidence

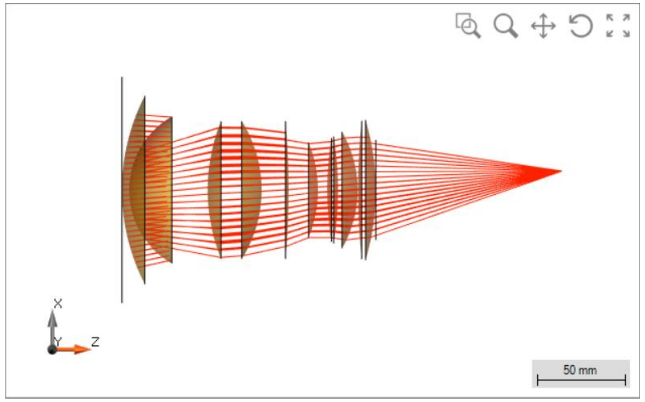
Stop at the Front	Stop in the Middle	Stop at the End
		
		

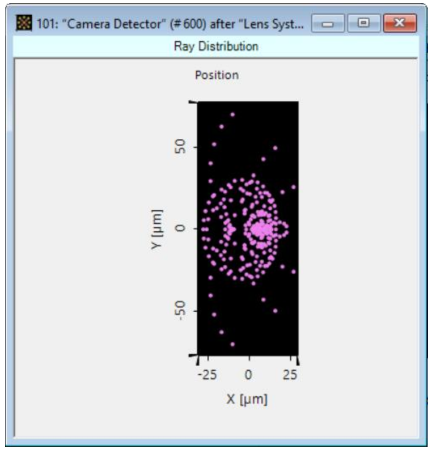
Ray Tracing Results: Inclined Incidence

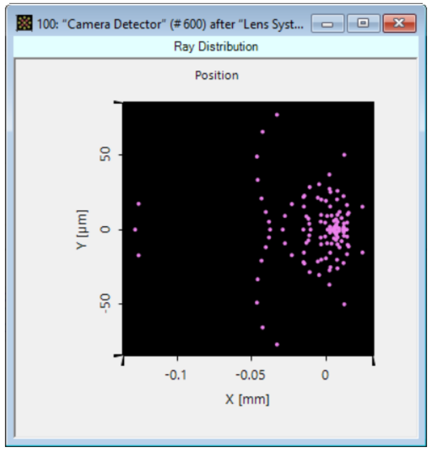
Stop at the Front	Stop in the Middle	Stop at the End

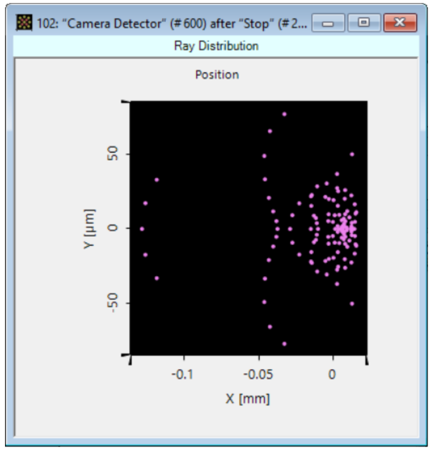










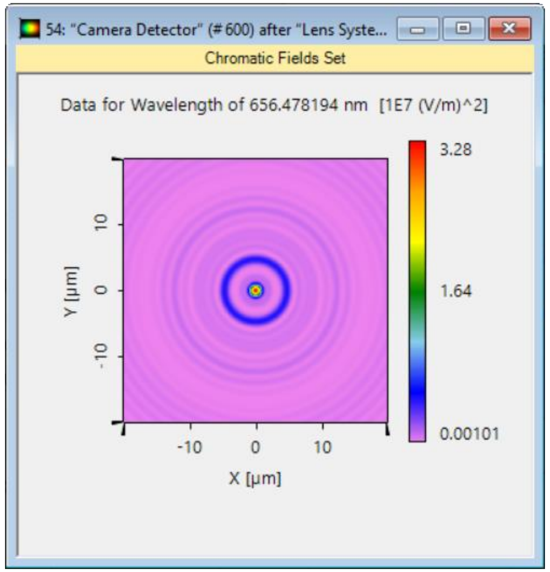


Fast Physical-Optics Simulations

Field Tracing Result: Normal Incidence

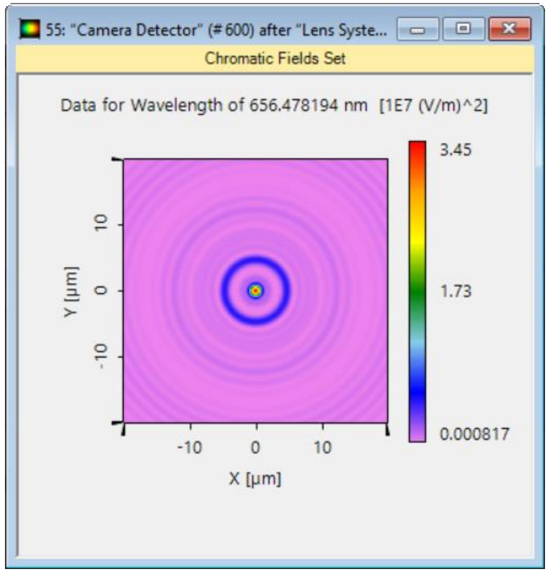
Stop at the Front

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$



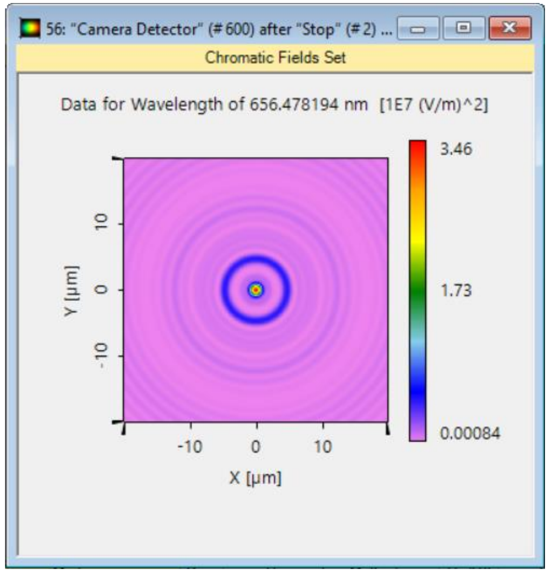
Stop in the Middle

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$



Stop at the End

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$

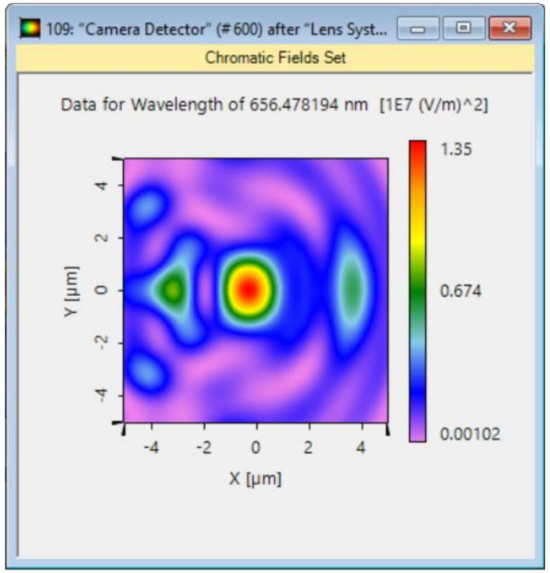


The results have slight difference, which means the position of stop is not important in the case of normal incidence.

Field Tracing Result: Inclined Incidence with Angle 8°

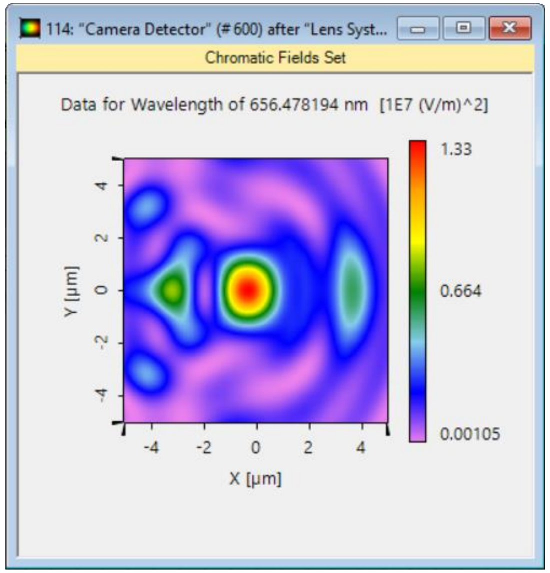
Stop at the Front

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$



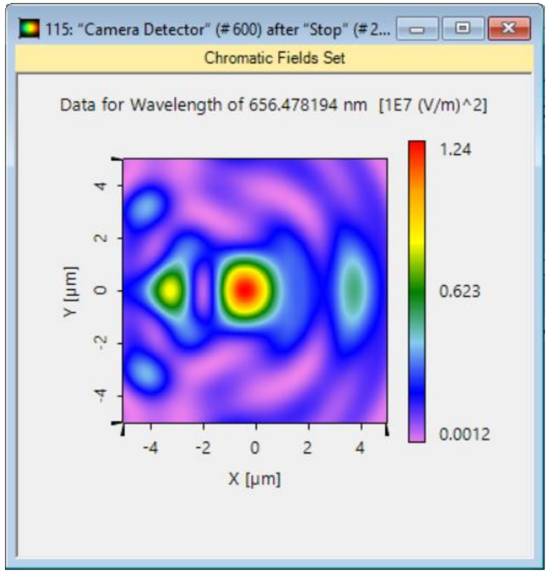
Stop in the Middle

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$



Stop at the End

$$|E_x|^2 + |E_y|^2 + |E_z|^2$$



The results have difference, which means the position of stop needs to be considered well in the case of inclined incidence.

Document Information

title	Influence of the Position of the Stop in a Lens System on Point Spread Function (PSF)
document code	MIC.0021
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