

### 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**



# **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 at the End









# **Ray Tracing Results: Inclined Incidence**



# 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





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





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

#### **Document Information**

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further reading	<ul> <li><u>Debye-Wolf Integral Calculator</u></li> <li><u>Analyzing High-NA Objective Lens</u></li> <li><u>Resolution Investigation for Microscope Objective Lenses by Rayleigh Criterion</u></li> </ul>