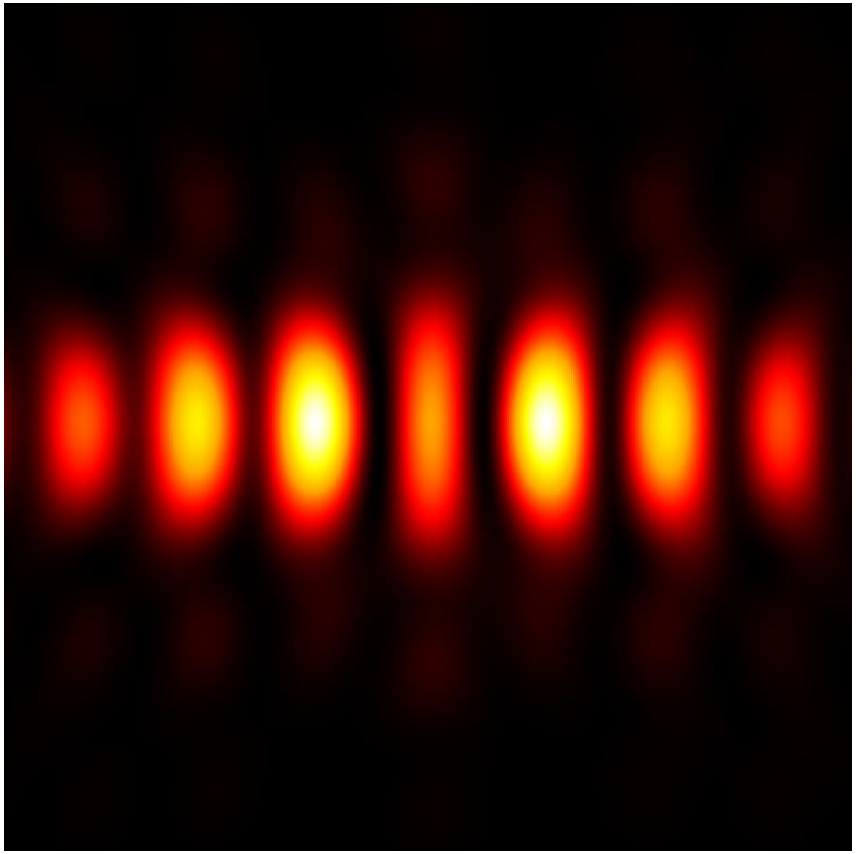
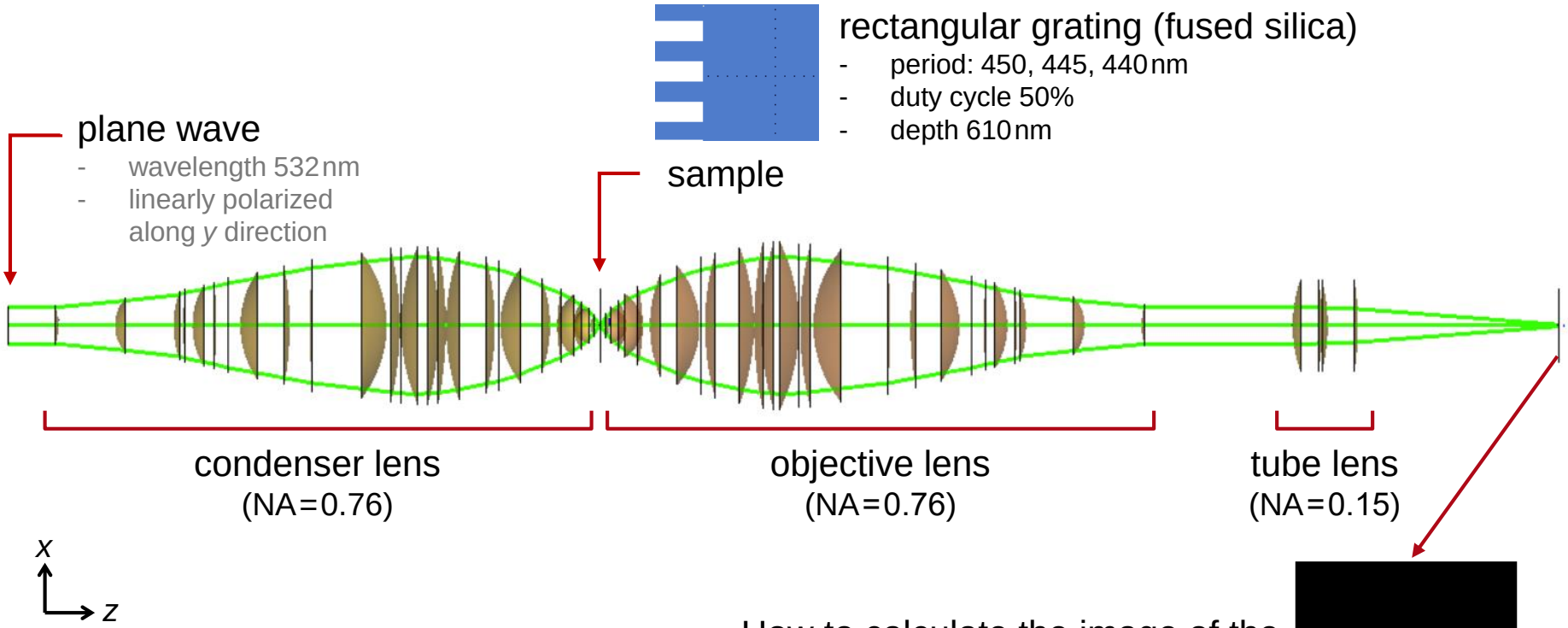
Imaging of Sub-Wavelength Gratings with Varying Period

Abstract



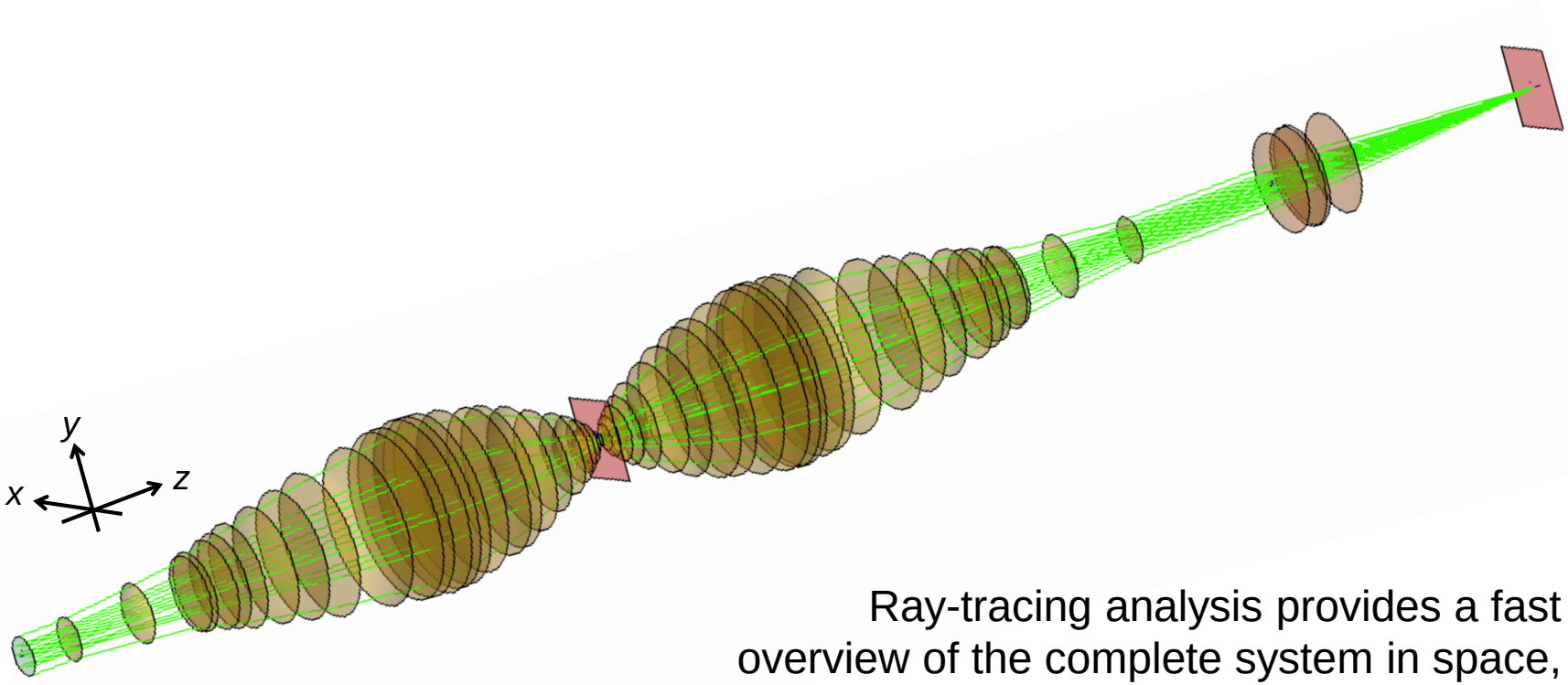
Sub-wavelength gratings, when illuminated with paraxial light, generate only one diffraction order, and therefore no image is formed in this situation. To overcome it, non-paraxial illumination can be used. As in this example, a high-NA condenser lens is employed to provide a highly focused illumination for gratings with varying period, and the diffracted field is to be collected by another high-NA objective. VirtualLab enables simulation of such an imaging process, including rigorous simulation of sub-wavelength gratings with Fourier modal method.

Modeling Task



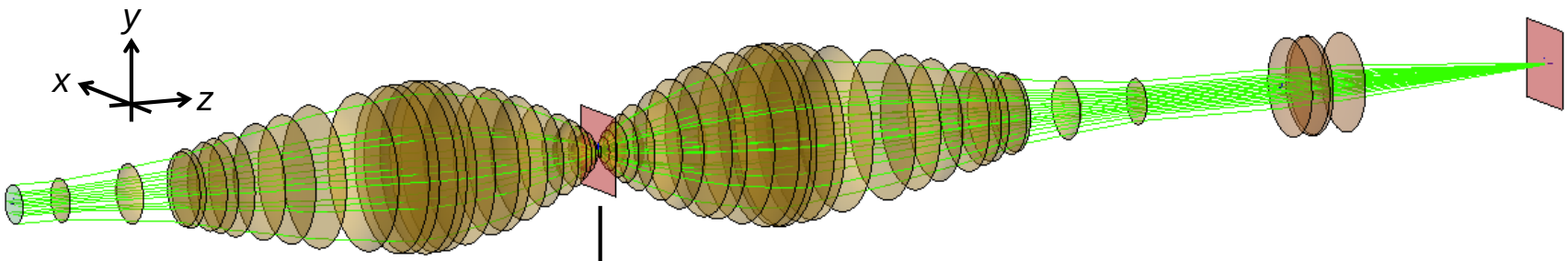
How to calculate the image of the sub-wavelength grating, taking the grating diffraction and vectorial effect in high-NA system into account?

Results



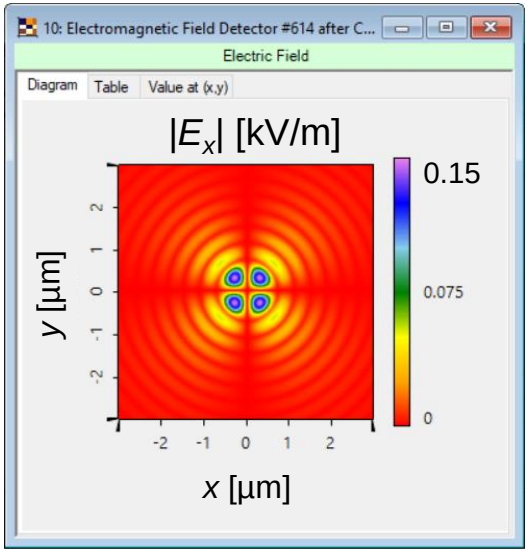
Ray-tracing analysis provides a fast overview of the complete system in space, including multiple diffraction orders.

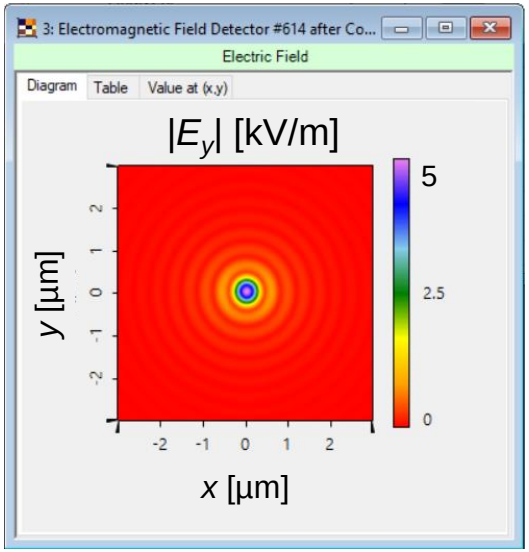
Results

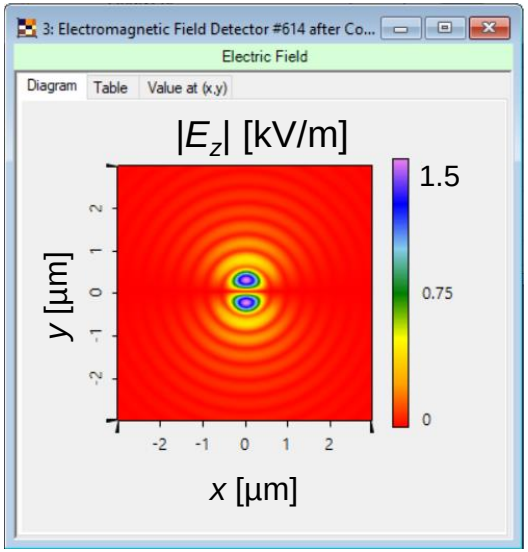


input field linearly polarized along *y* direction

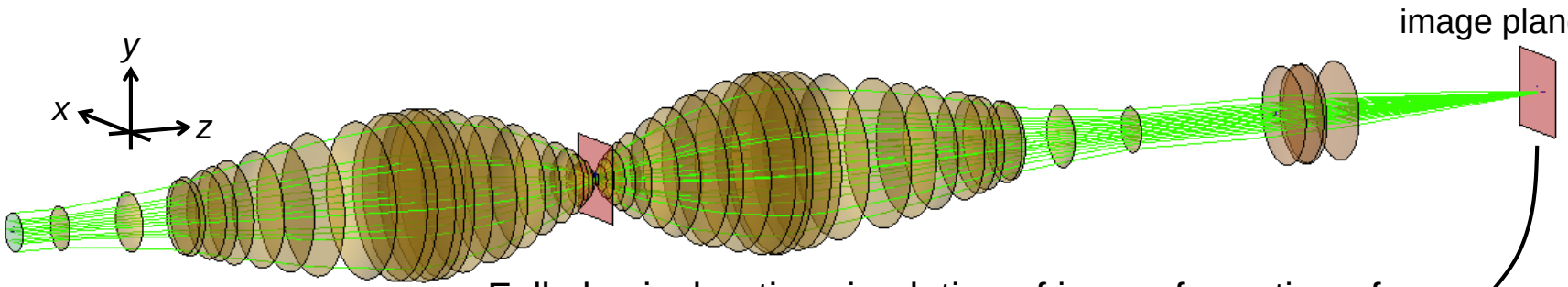
Vectorial effect of electromagnetic field is shown in the highly focused illumination field on the sample.





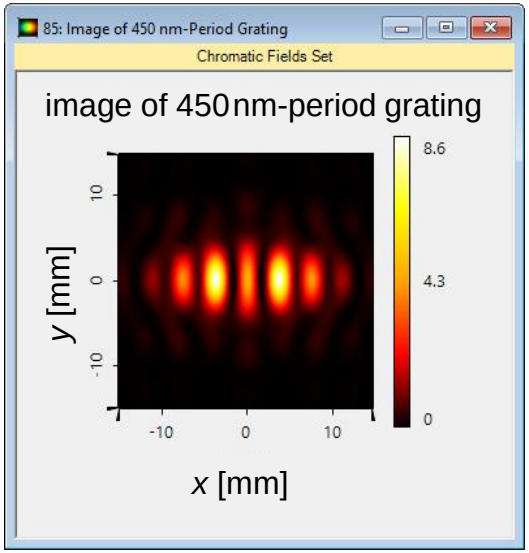


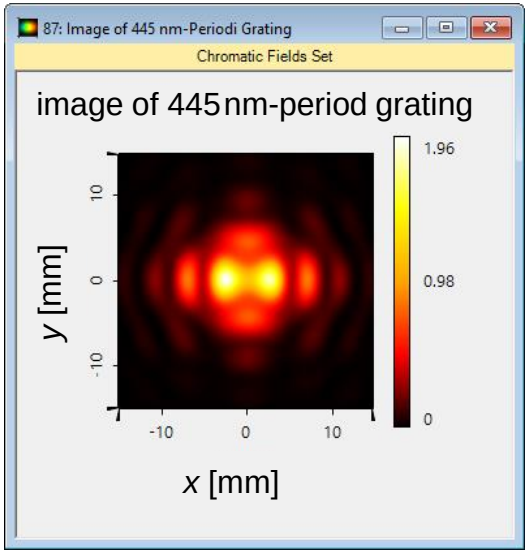
Results

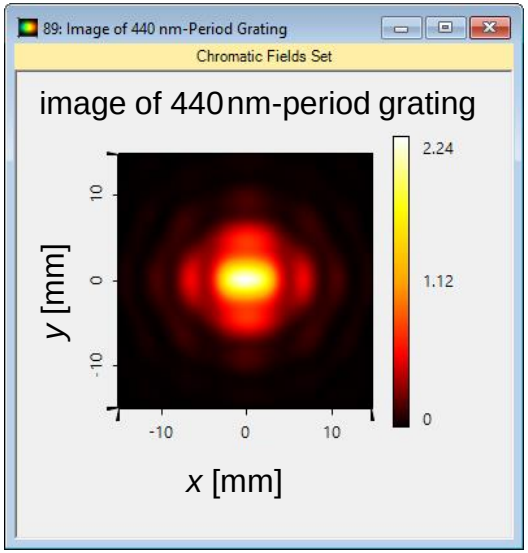


input field linearly polarized along *y* direction

Full physical-optics simulation of image formation of sub-wavelength grating (modeled with FMM) in high-NA imaging system takes less than 10 seconds.







Document Information

title	Imaging of Sub-Wavelength Grating with Varying Period
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category	Application Use Case