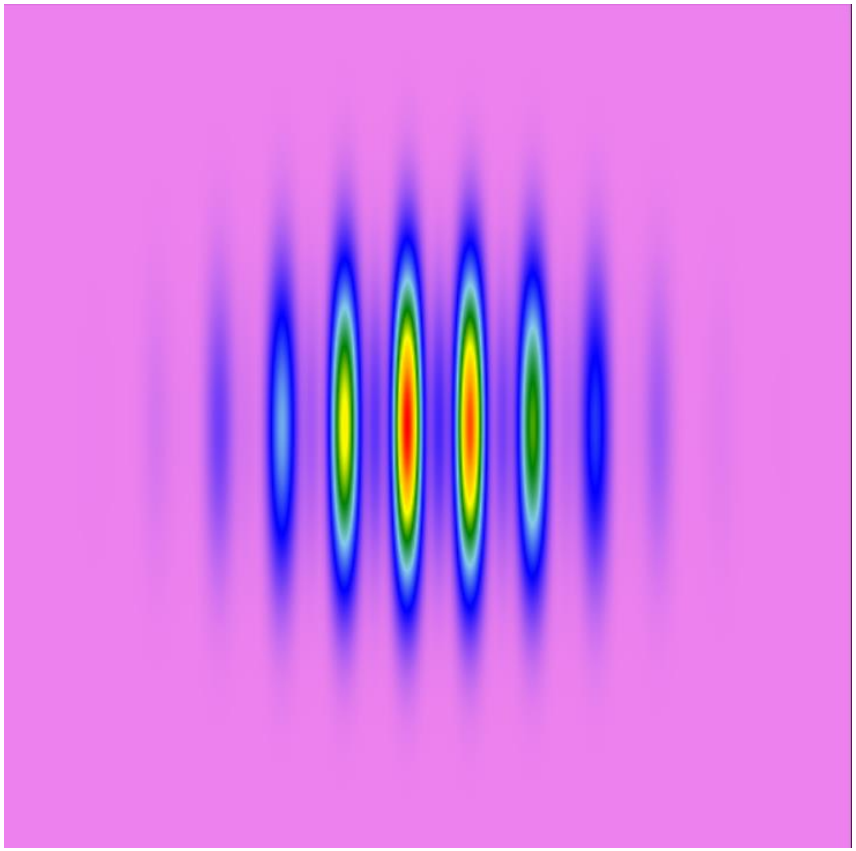
# Optical System for Inspection of Micro-Structured Wafer

# Abstract

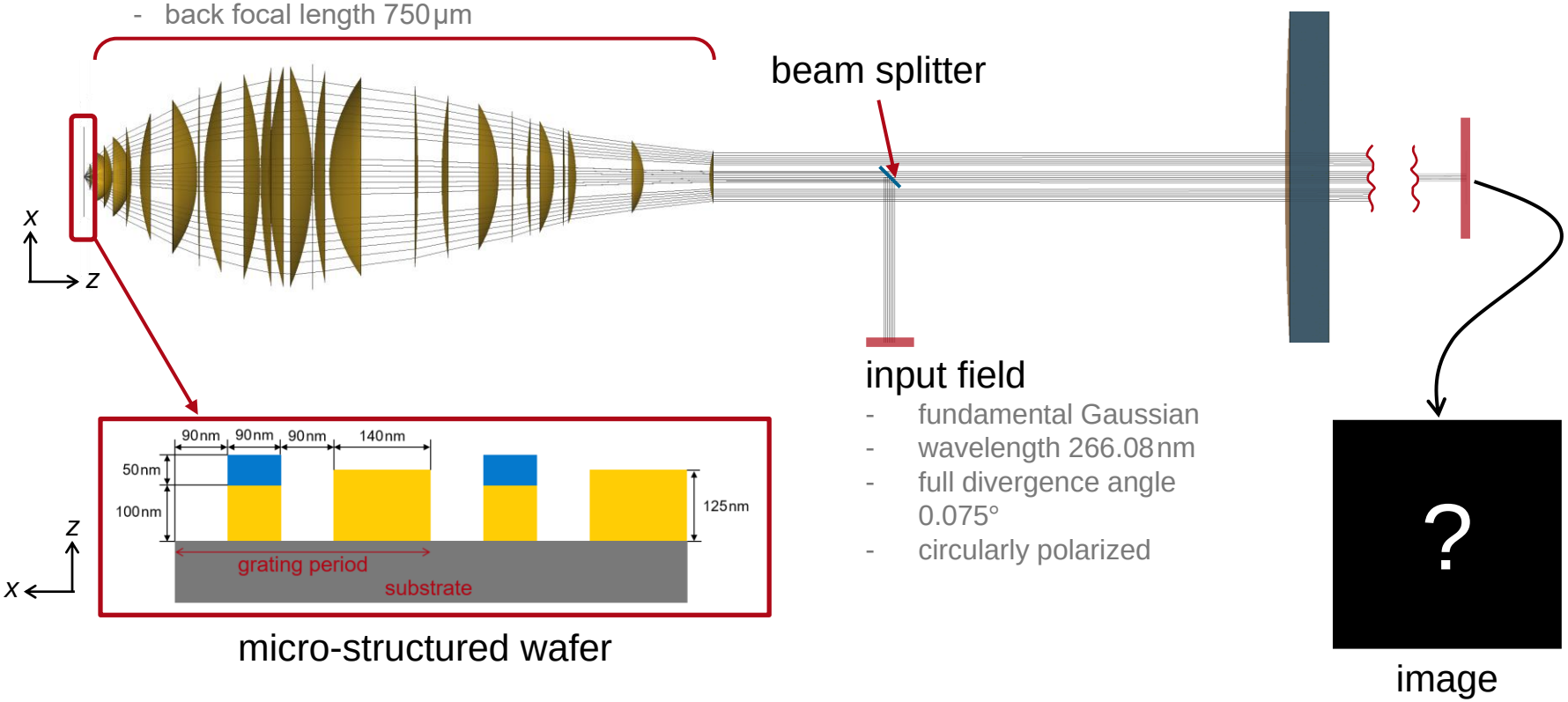


In semiconductor industry, wafer inspection systems are used to detect defects on a wafer and find their positions. To ensure the image resolution for the microstructures, the inspection system often employs a high-NA objective and works in the UV wavelength range. As an example, a complete wafer inspection system including high-NA focusing effect and light interaction with microstructures is modeled, and the formation of image is demonstrated.

# Modeling Task

inspection objective
- NA = 0.9
- effective focal length 2 mm
- back focal length 750 µm

imaging lens
- Newport SPX031AR.10
- effective focal length 500 mm

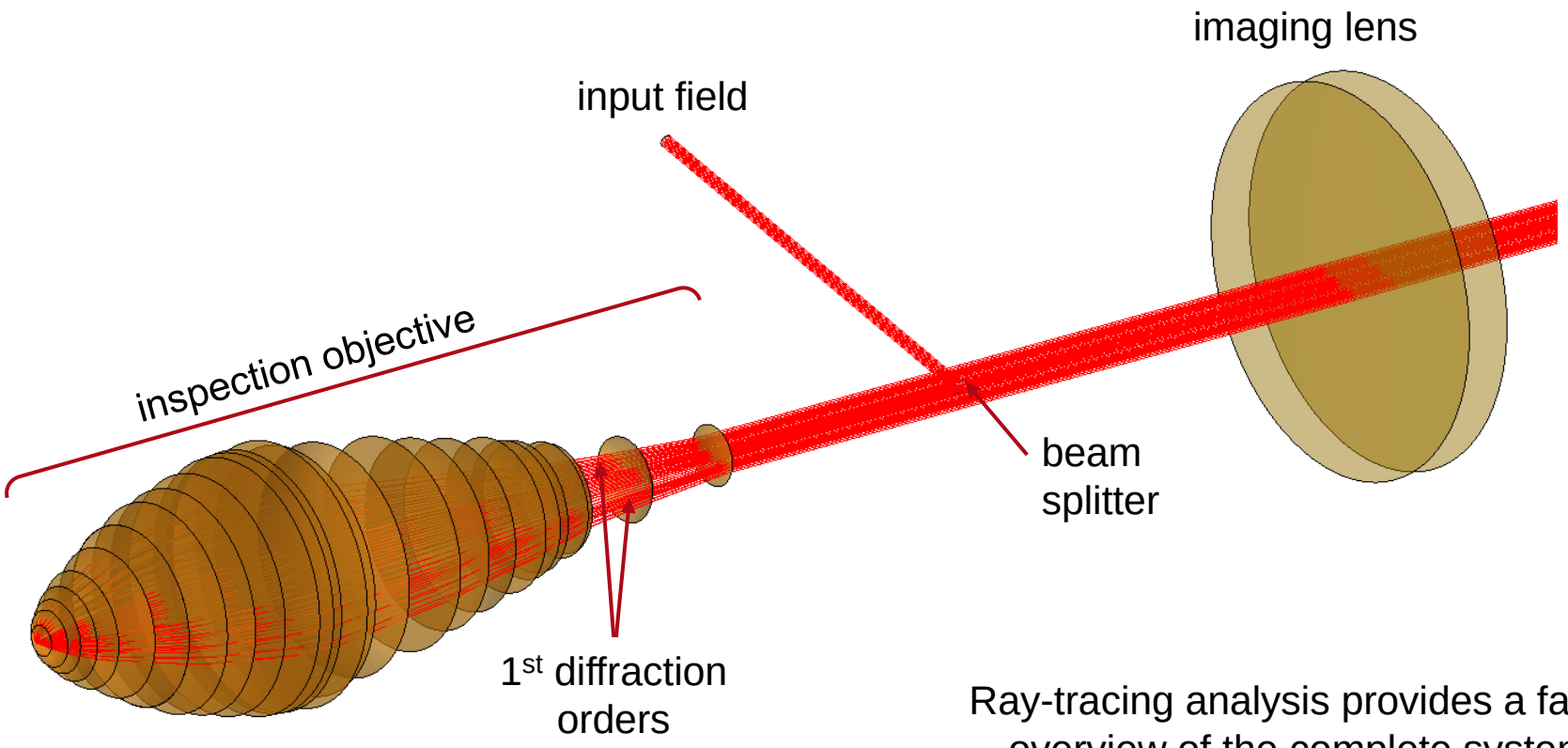



input field
- fundamental Gaussian
- wavelength 266.08 nm
- full divergence angle 0.075°
- circularly polarized

micro-structured wafer

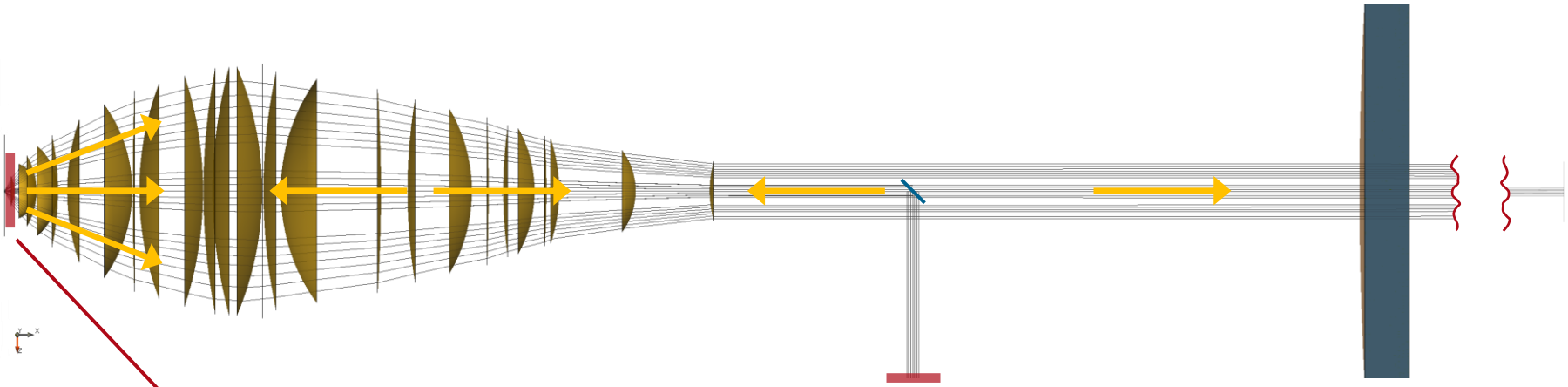
image

# Results

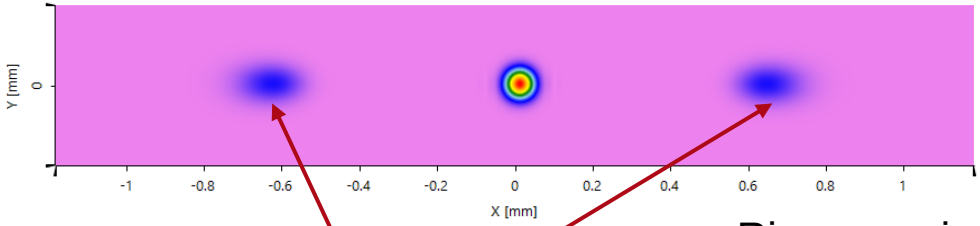



Ray-tracing analysis provides a fast overview of the complete system, including high-NA lens and grating.

# Results



behind micro-structured wafer




1st diffraction orders

Rigorous simulation of grating with Fourier modal method (FMM) is imbedded within the system simulation.

# Results

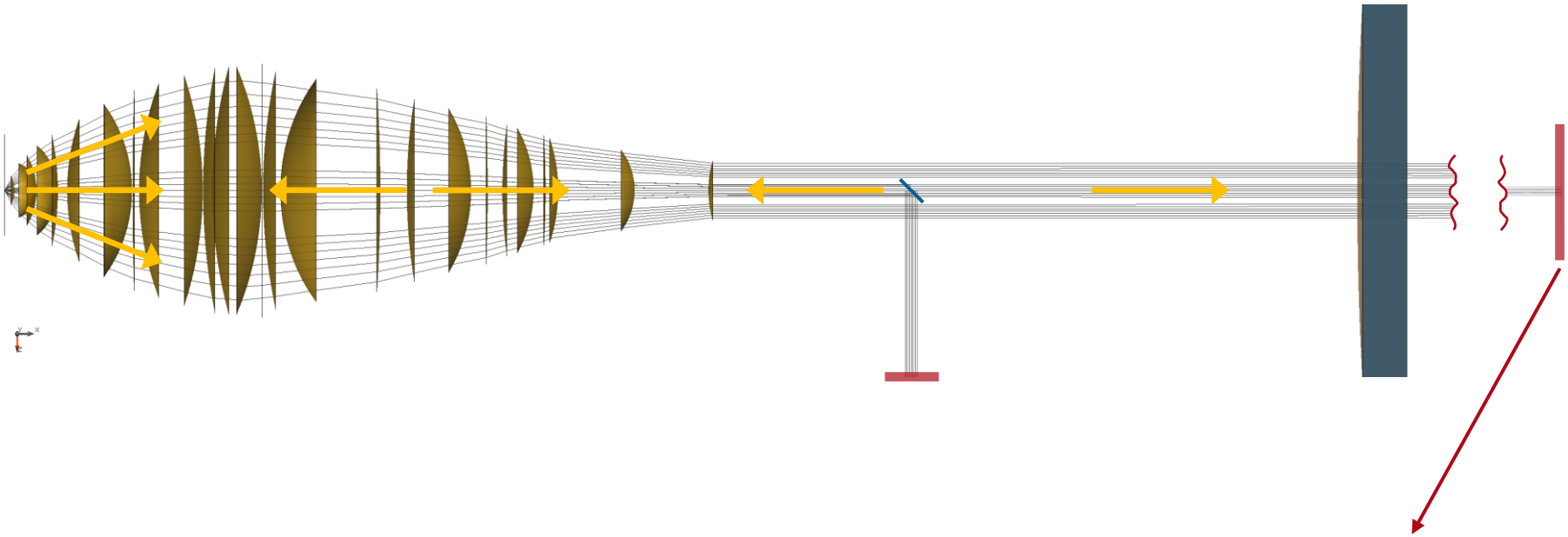


image plane

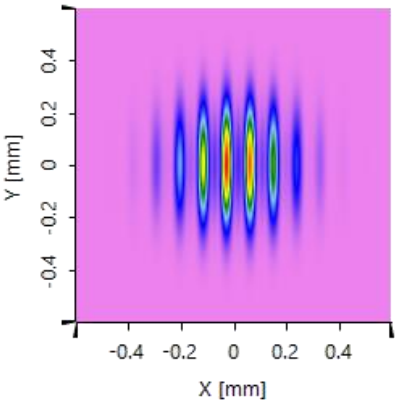



Image is formed by interference of different diffraction orders. Simulation of complete system from input field to image plane takes less than 10 seconds!

# Document Information

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|---|---|
| title | Optical System for Inspection of Micro-Structured Wafer |
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