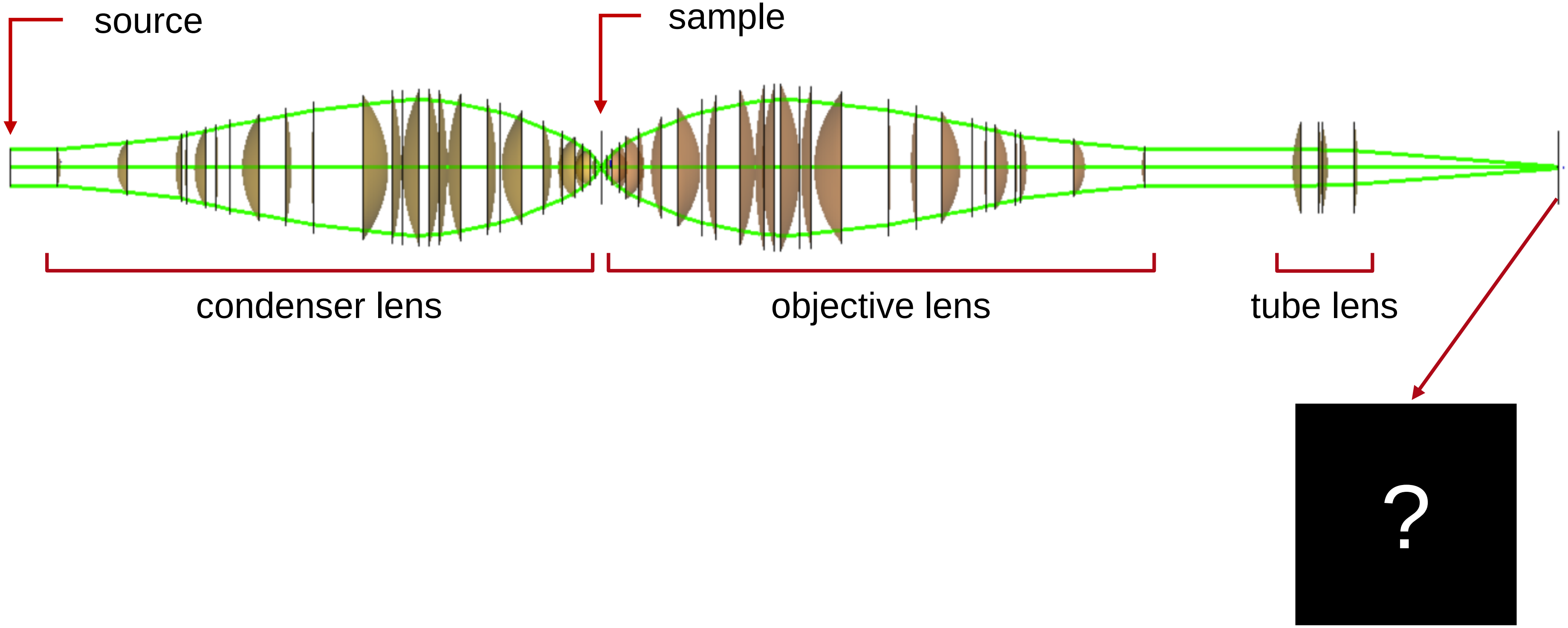
Optical Metrology > Microscopy

# High NA Microscope Investigation of Different Samples

# Task/System Illustration



source

sample

condenser lens

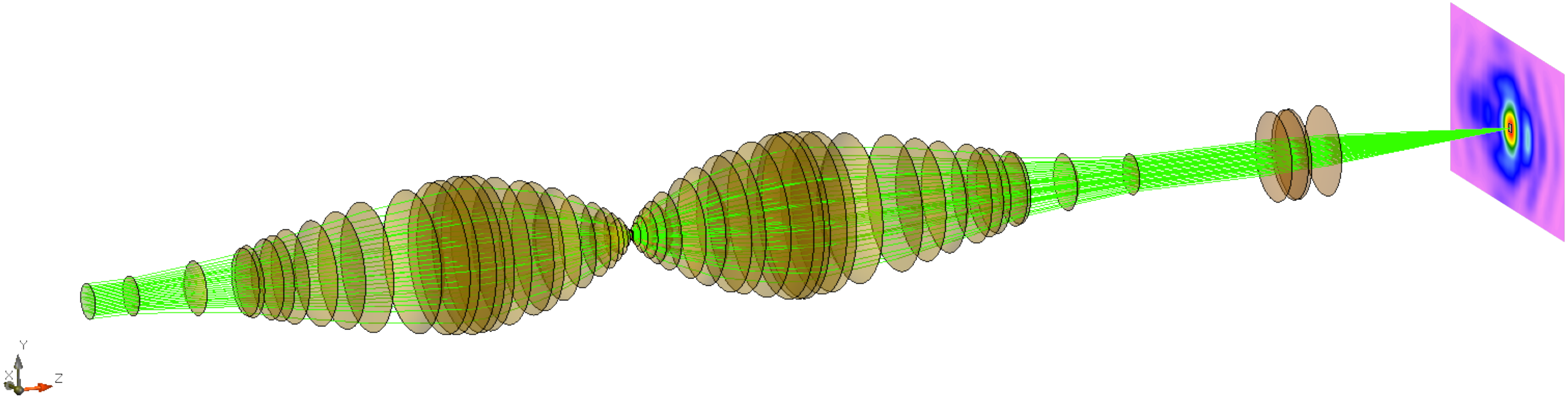
objective lens

tube lens

?

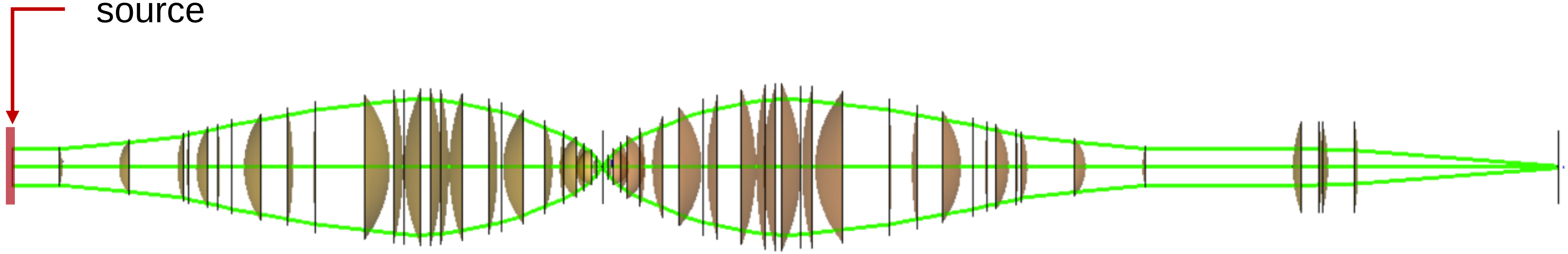
intensity at
imaging plane

# Highlights



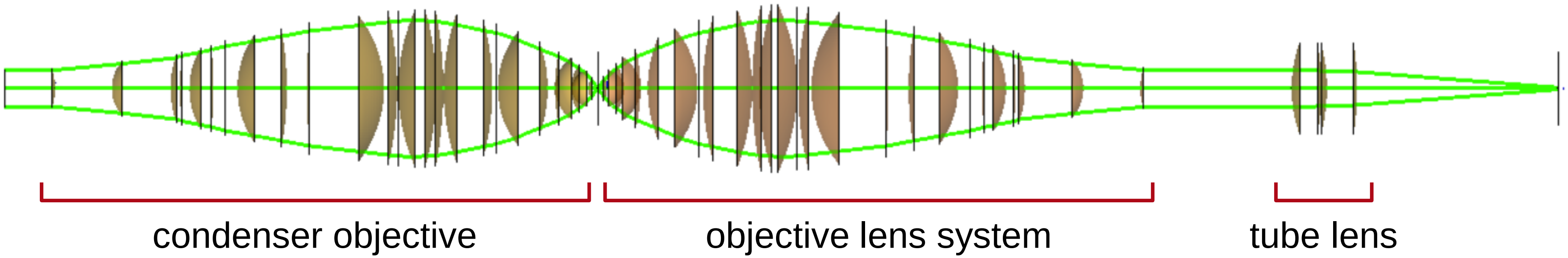
- full vectorial analysis of gratings within microscope systems
- fast high-performance analysis for complex systems within seconds
- simple switching between ray tracing and physical optics modeling

# Specification: Light Source



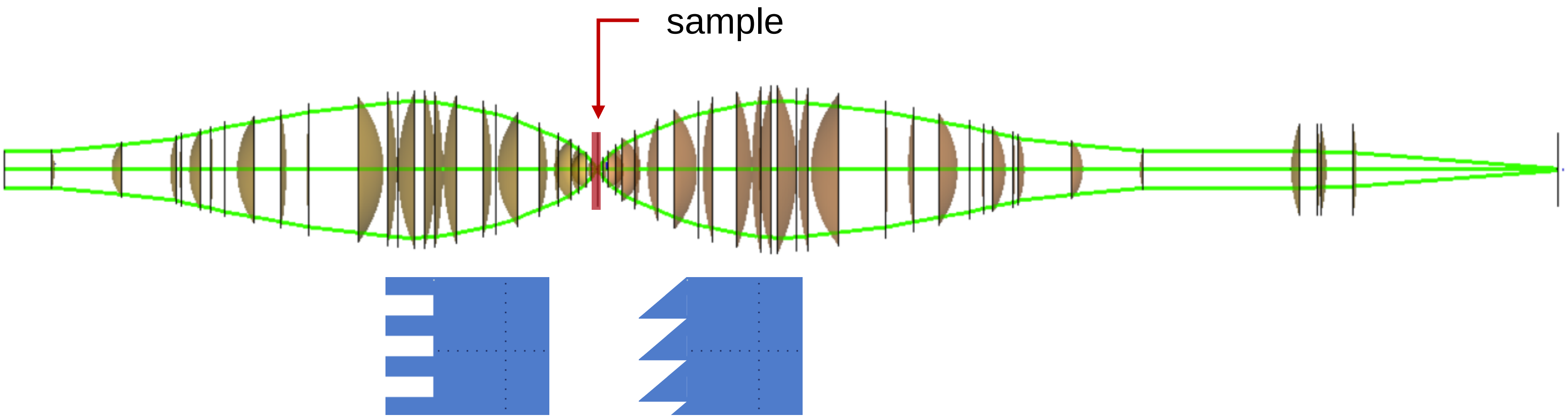
| Parameter | Description / Value & Unit |
|---|---|
| type | plane wave |
| wavelength | 532 nm |
| polarization | linear in y-direction |
| diameter | 3 mm × 3 mm (round) |

# Specification: Lens Systems



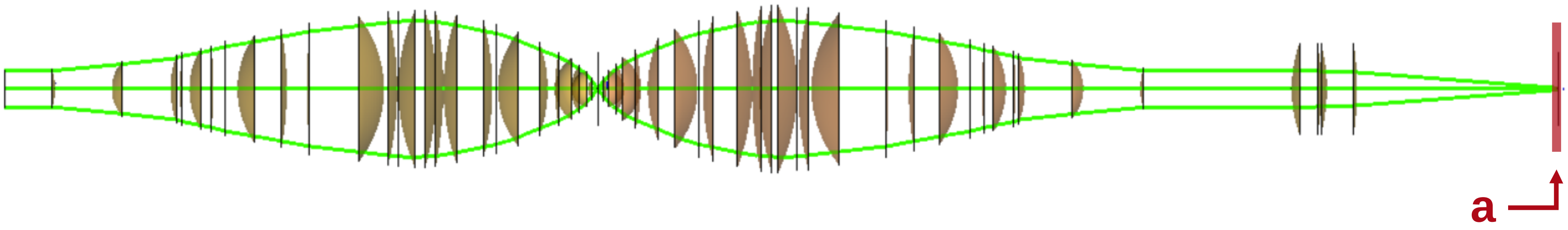
| Components | Parameter | Description / Value & Unit |
|---|---|---|
| condenser objective | numerical aperture (NA) | 0.76 |
| | number of lenses | 16 |
| objective lens system | numerical aperture (NA) | 0.76 |
| | number of lenses | 16 |
| tube lens | numerical aperture (NA) | 0.15 |
| | number of lenses | 2.2 |

# Specification: Sample Structures



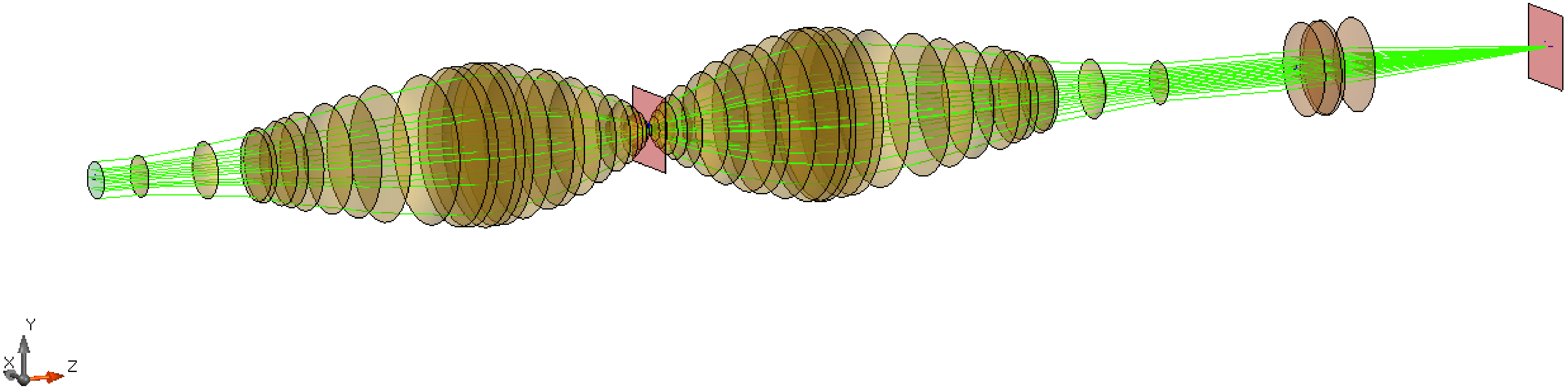
| **Parameter** | **Description / Value & Unit** |
|---|---|
| type of grating profile | rectangular / sawtooth |
| grating period | 450 nm |
| duty cycle | 0.5 |
| grating height | 610 nm |
| grating material | fused silica |

# Specification: Detectors

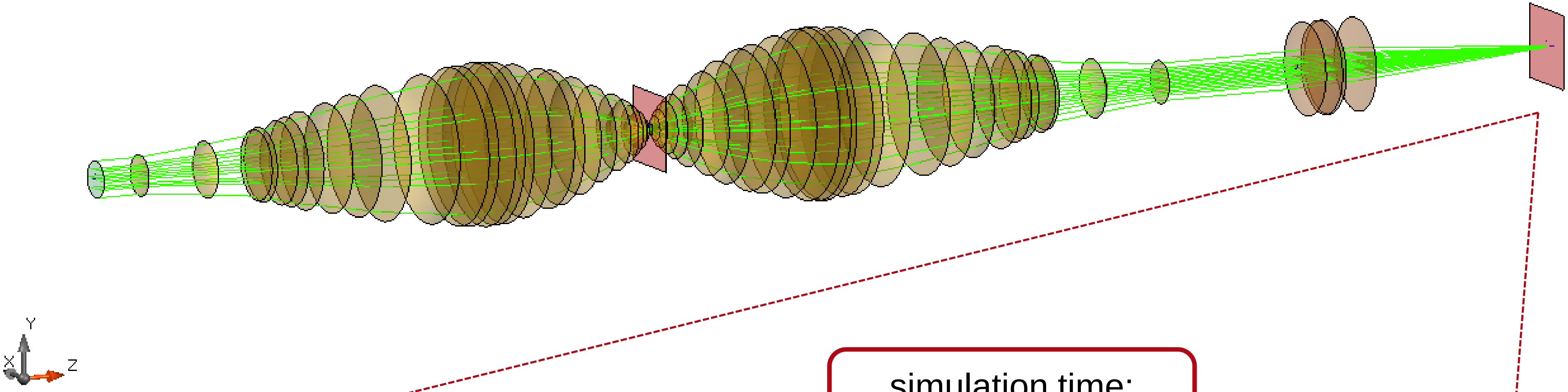


| Position | Modeling Technique | Detector/Analyzer |
|---|---|---|
| full system | 3D ray tracing | 3D ray tracing system visualization |
| a | ray tracing | 2D ray tracing dot diagram |
|  | field tracing | 2D field amplitude and intensity |

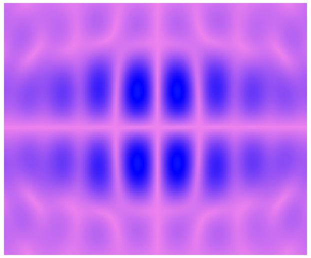
# Result: 3D Ray Tracing

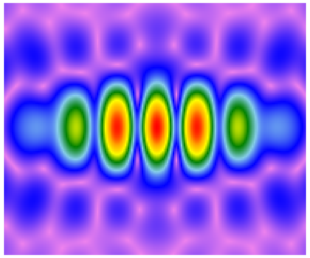


# Result: Field Tracing Rectangular Grating

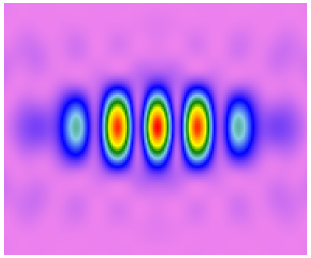


simulation time:
~6 s

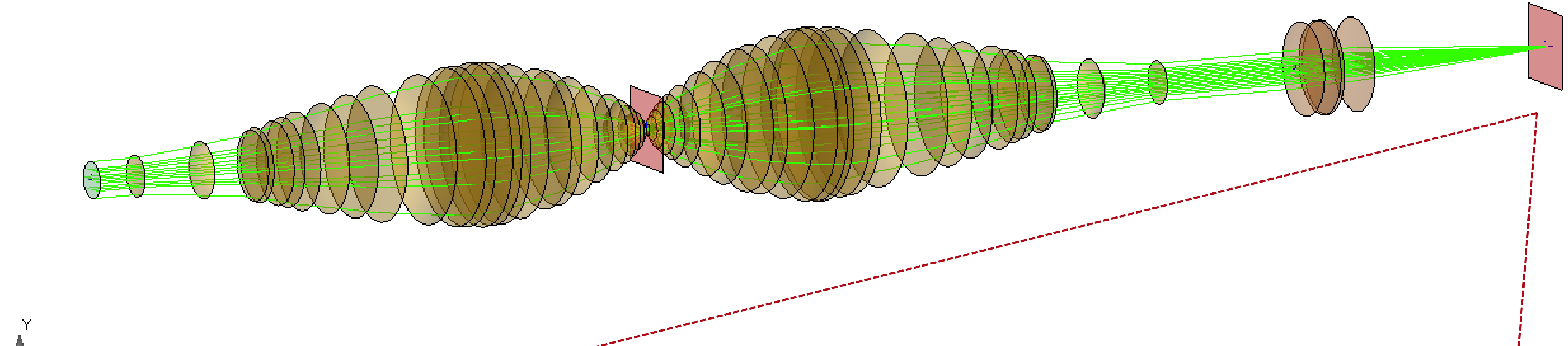

$|E_x|$


$|E_y|$


$|E_z|$


intensity

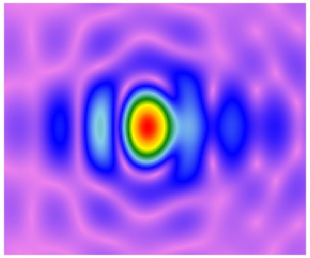
# Result: Field Tracing Sawtooth Grating



simulation time:
~7 s

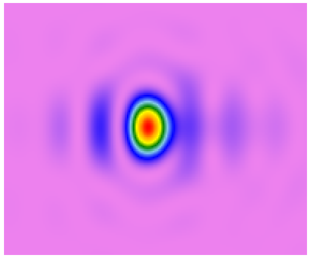
|$E_x$|

|$E_y$|



|$E_z$|

intensity



# Document & Technical Info

| | |
|---|---|
| code | MIC.0002 |
| version of document | 1.0 |
| title | High-NA Microscope Investigation of Different Samples |
| category | Optical Metrology > Microscopy |
| author | Rui Shi (LightTrans) |
| used VL version | 7.0.0.29 |

| **Specifications of PC Used for Simulation** | |
|---|---|
| Processor | i7-4700MQ (4 CPU cores) |
| RAM | 16 GB |
| Operating System | Windows 8 |