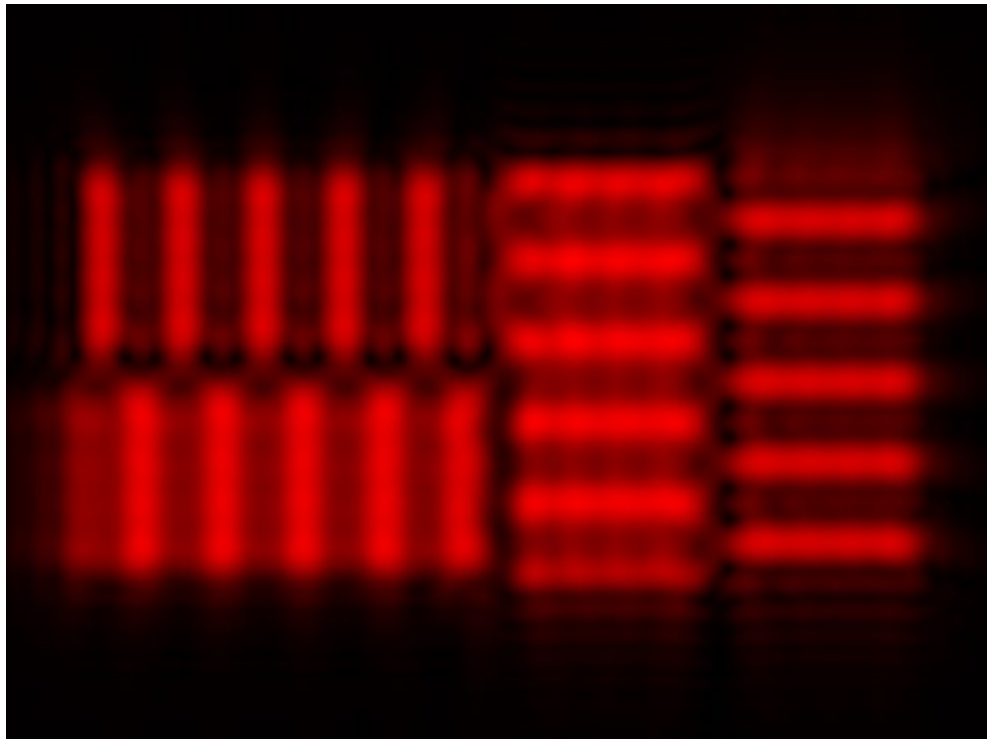
Imaging of Grating Patterns Positioned on Each Side of a Wafer

Abstract



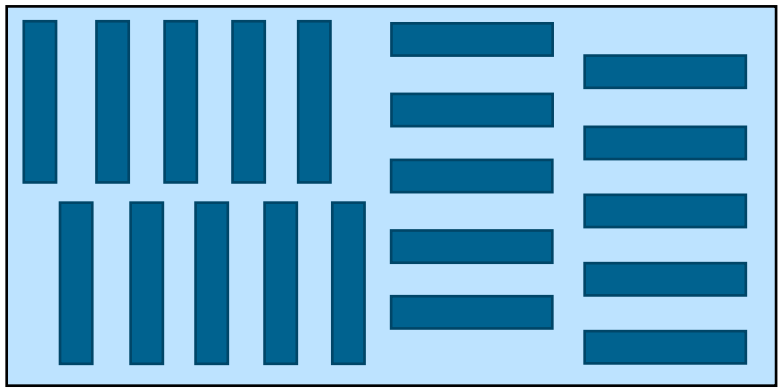
Simulating aperiodic structures commonly found in semiconductor testing systems is notoriously challenging: feature sizes of the structures fall between the capabilities of rigorous Maxwell solvers and ray-based solvers. VirtualLab Fusion's field decomposition technique addresses this by dividing the structure into regular subsections, allowing for individual calculation. Its flexible detection concept then enables light recombination at the detector, allowing for automatic calculation of radiometric quantities like irradiance.

Modeling Scenario – Imaging System

aperiodic test structure

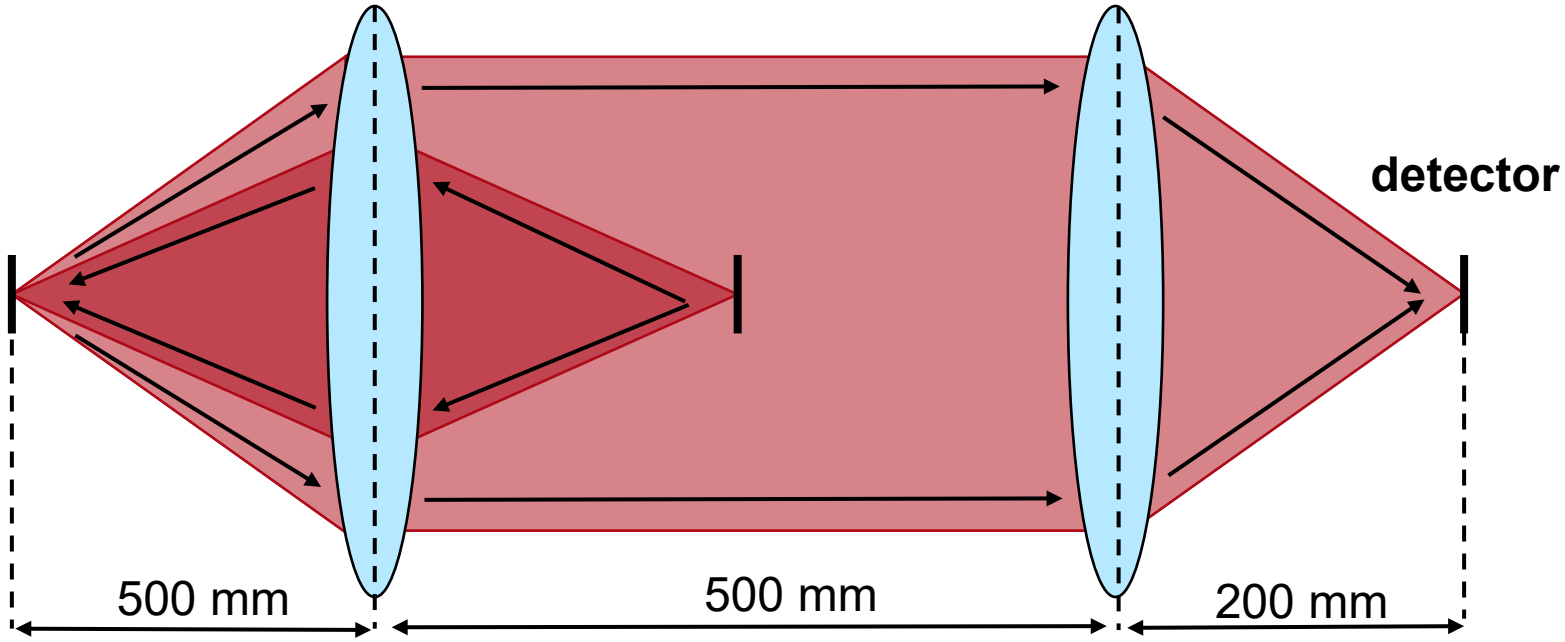
- assemble of multiple rectangular gratings
- period: 8 µm
- grating material: silicon dioxide
- substrate: silicon

(details see next page)



Gaussian source

- wavelength: 800 nm
- linearly polarized in x



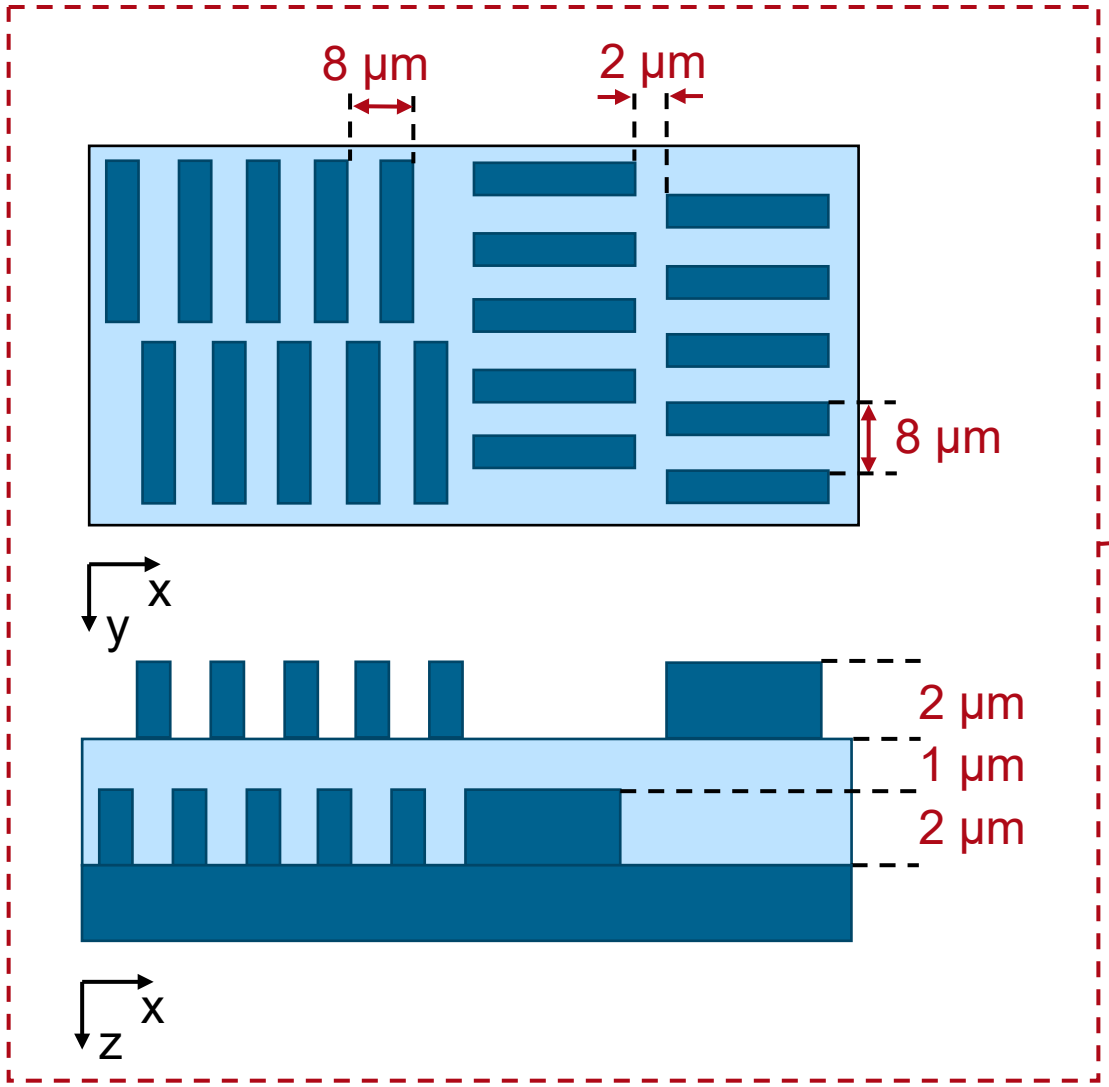
objective lens

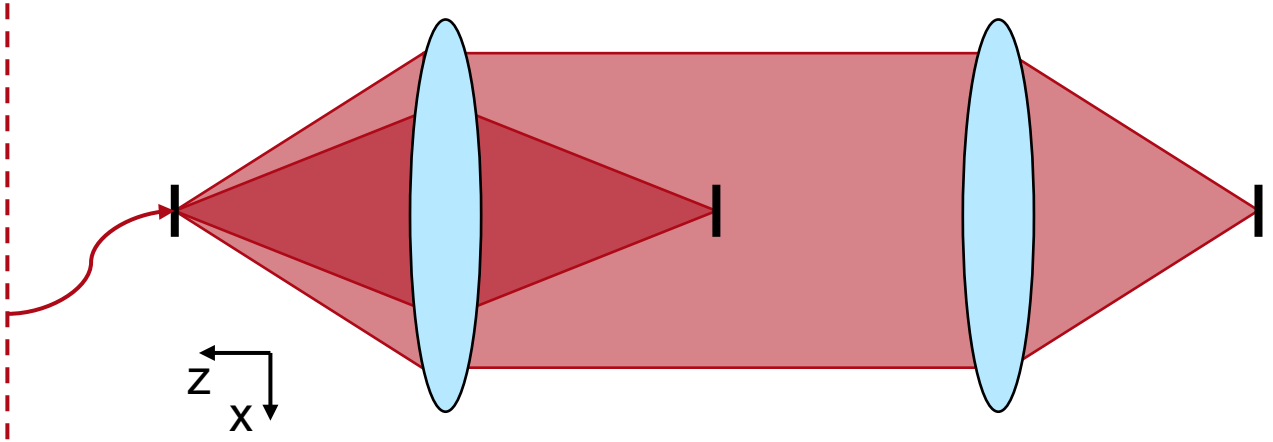
- focal length: 500 mm
- functional lens

imaging lens

- focal length: 200 mm
- functional lens

Modeling Scenario – Multi-Layer Grating





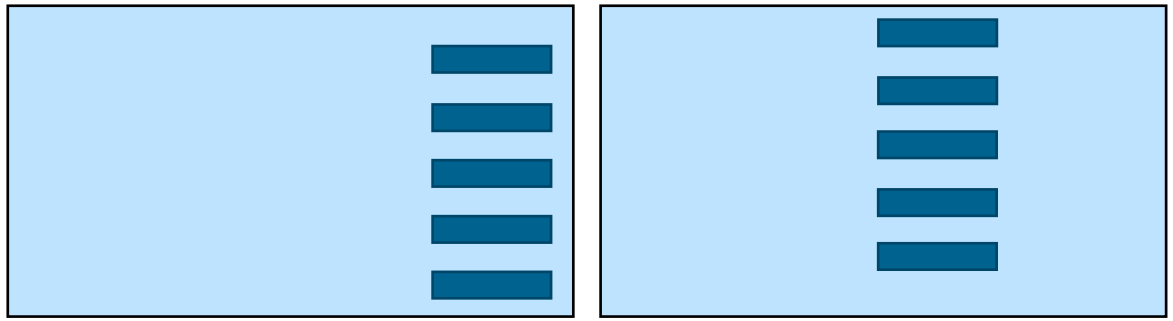
silicon

silicon dioxide

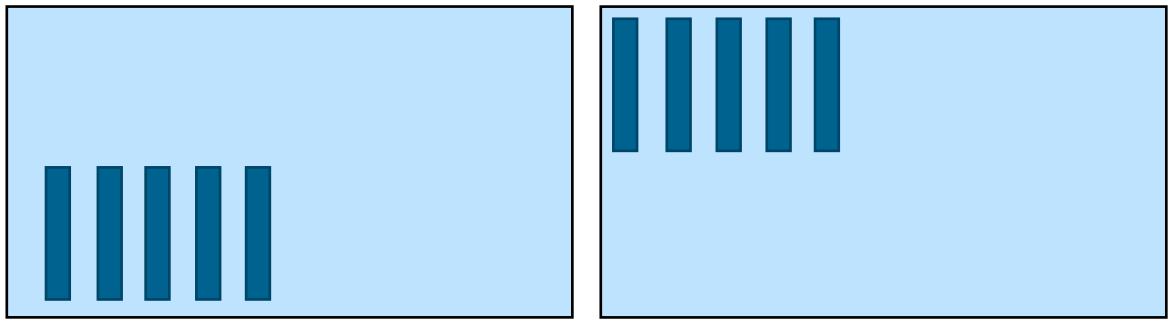
Modeling Task

configuration 1

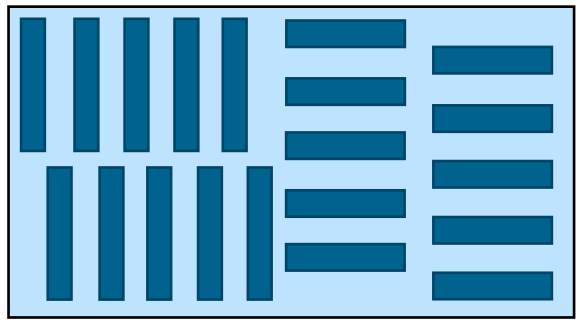
configuration 2



configuration 3



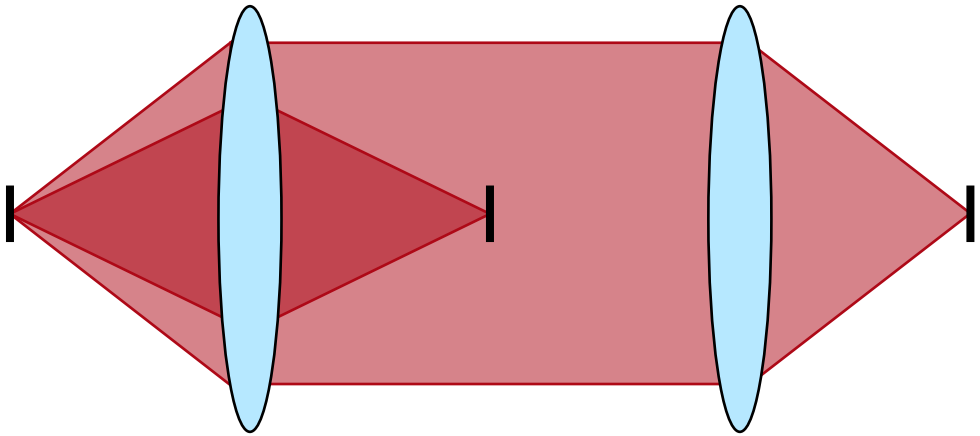
configuration 4



configuration 5

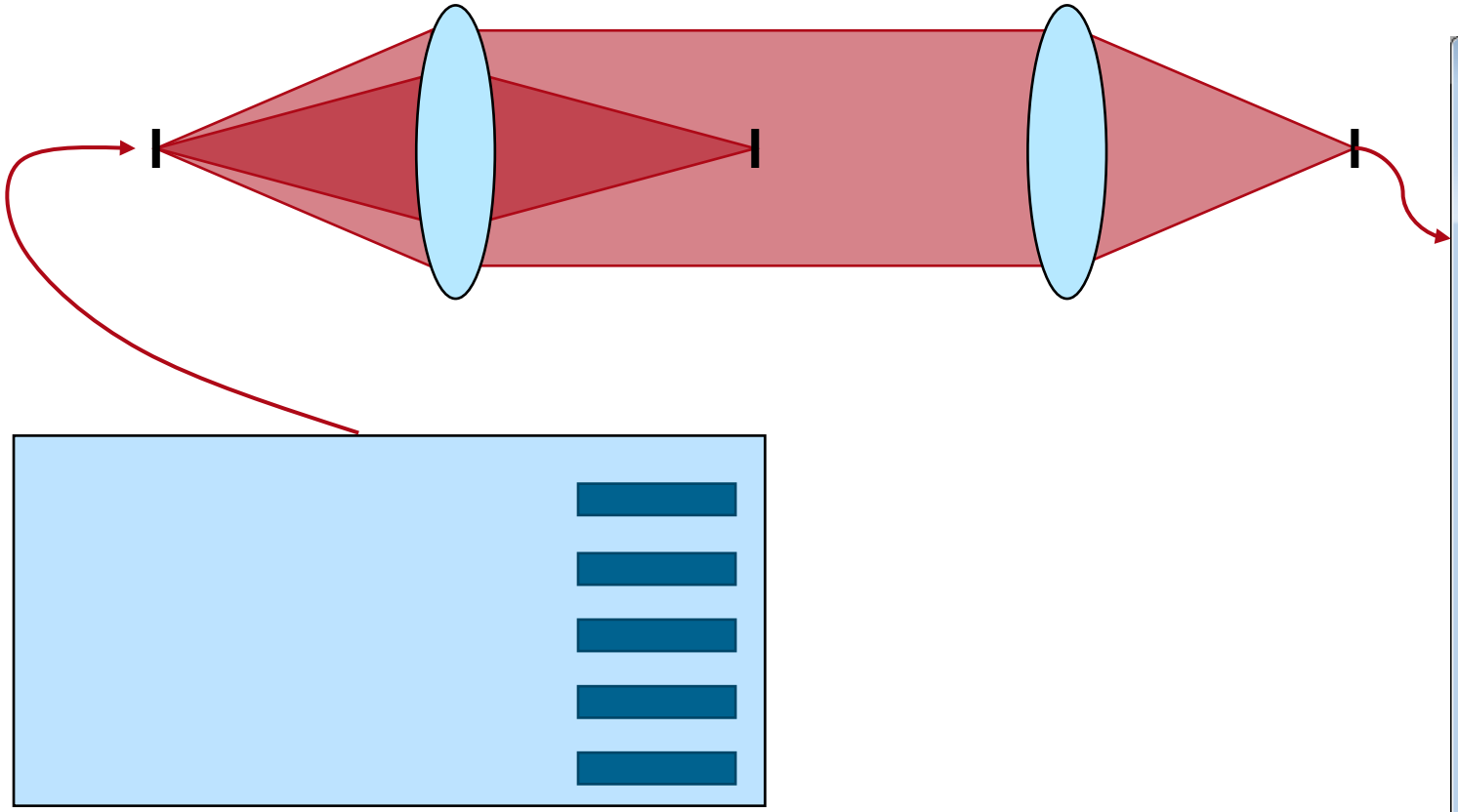
detector

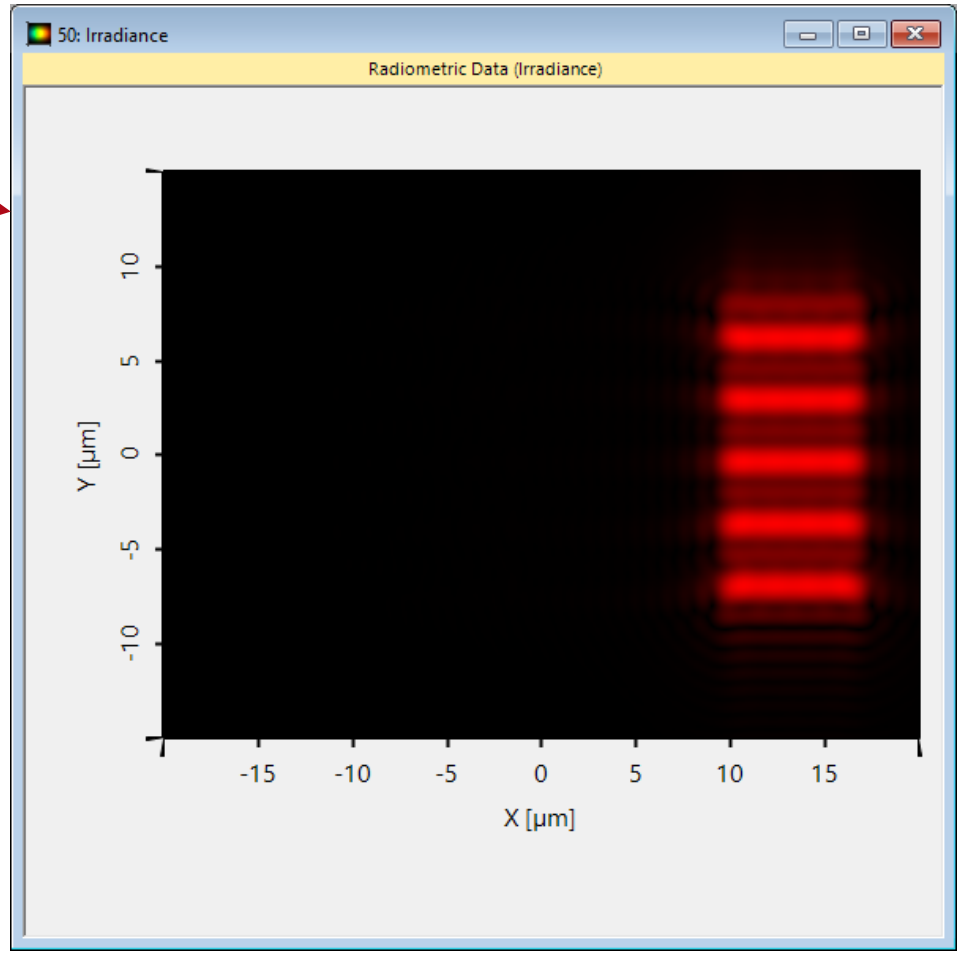
- irradiance



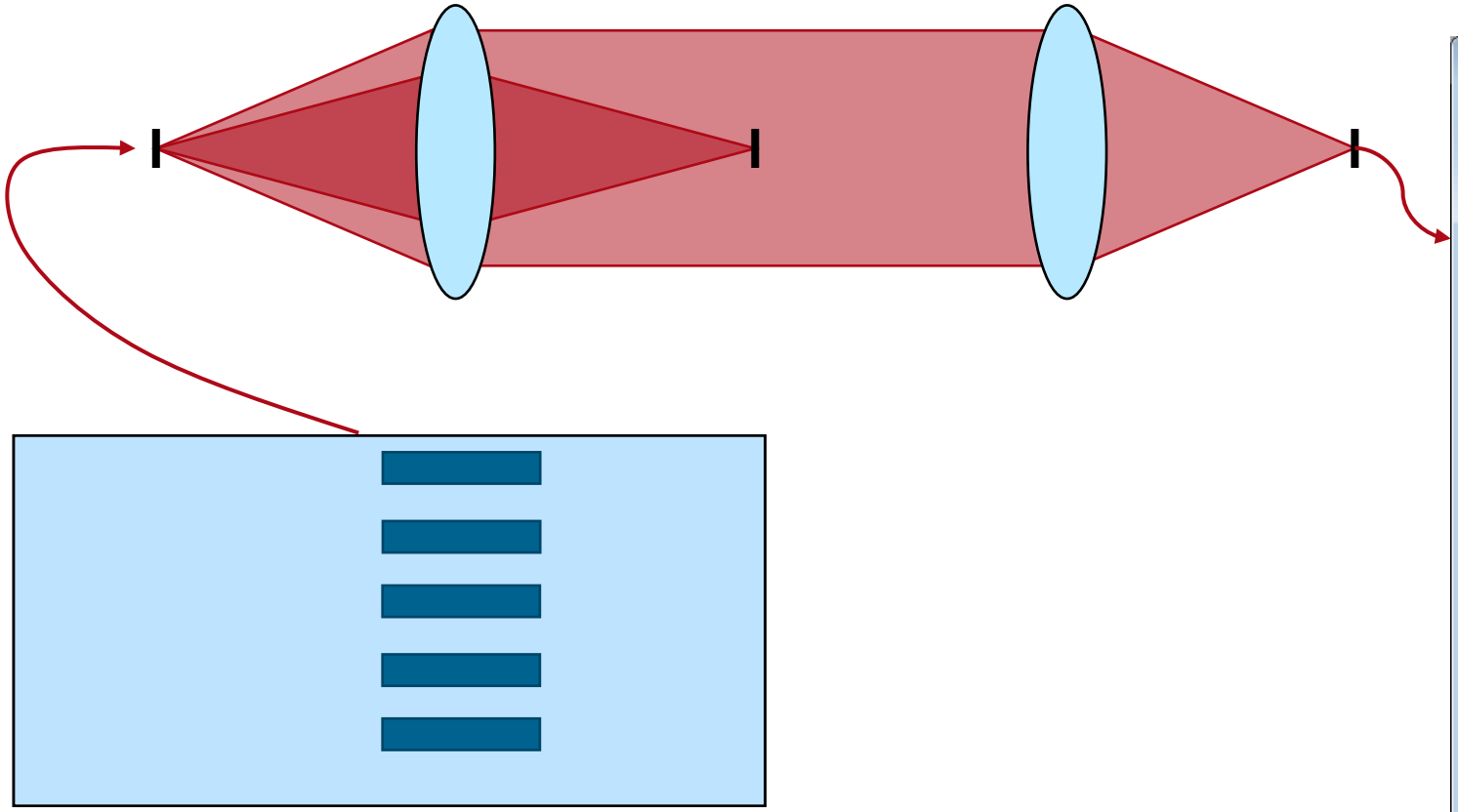
Task: Calculate imagine of various grating configurations.

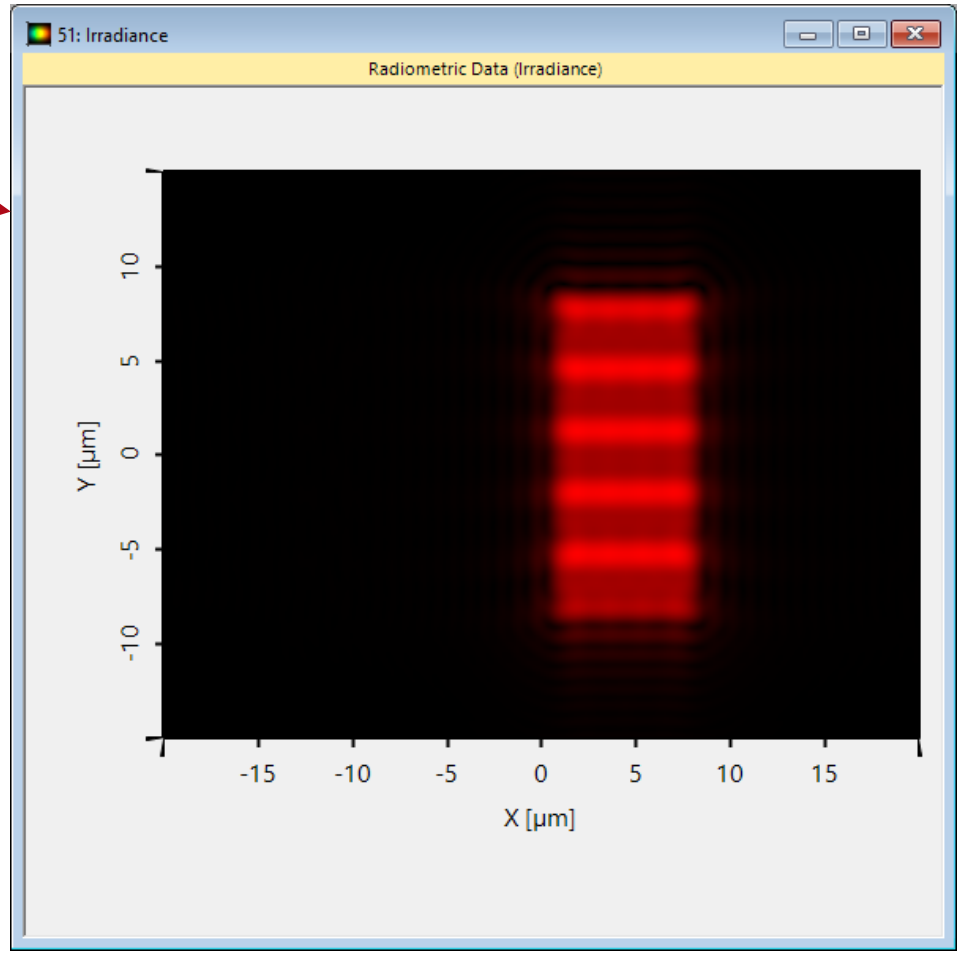
Configuration 1



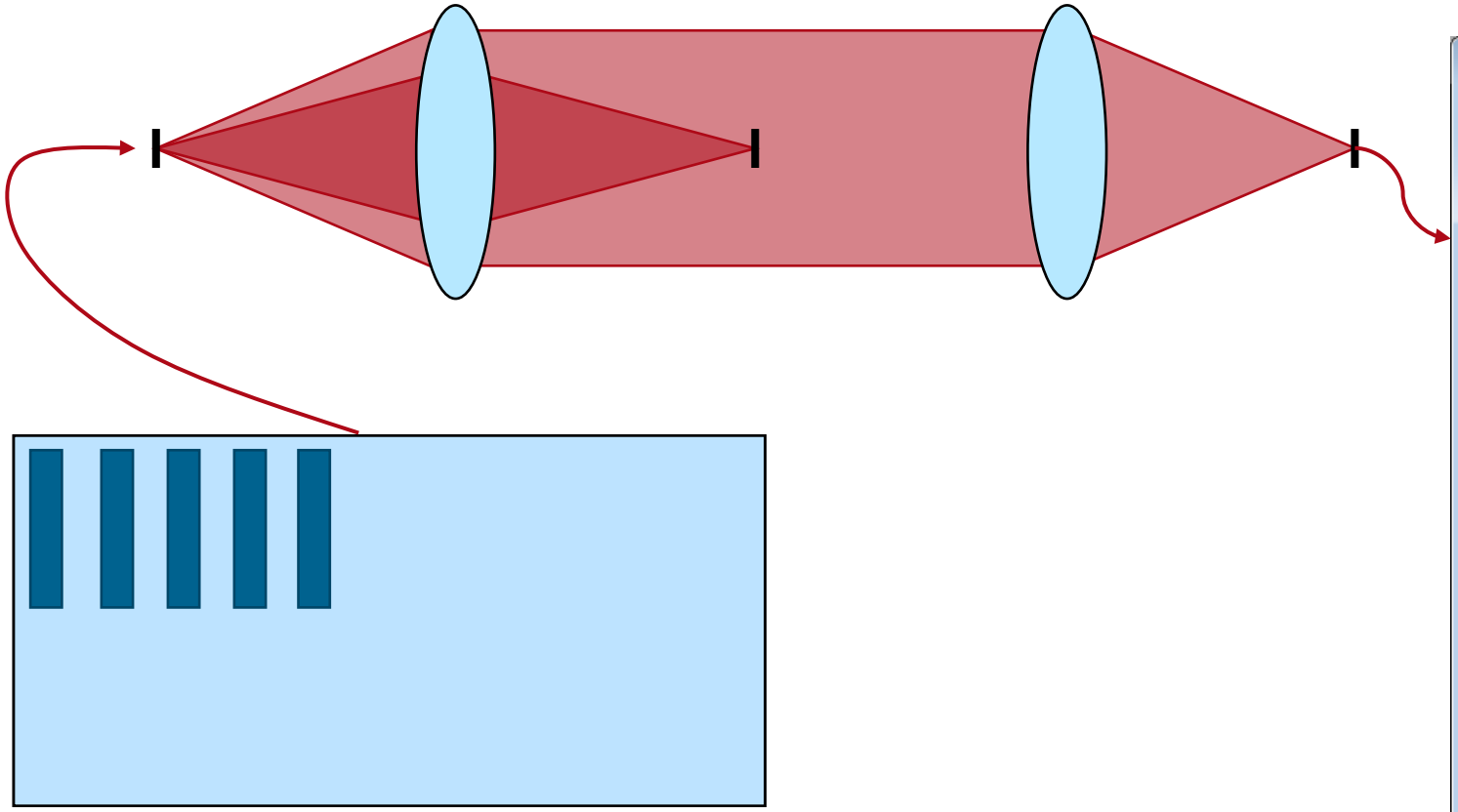


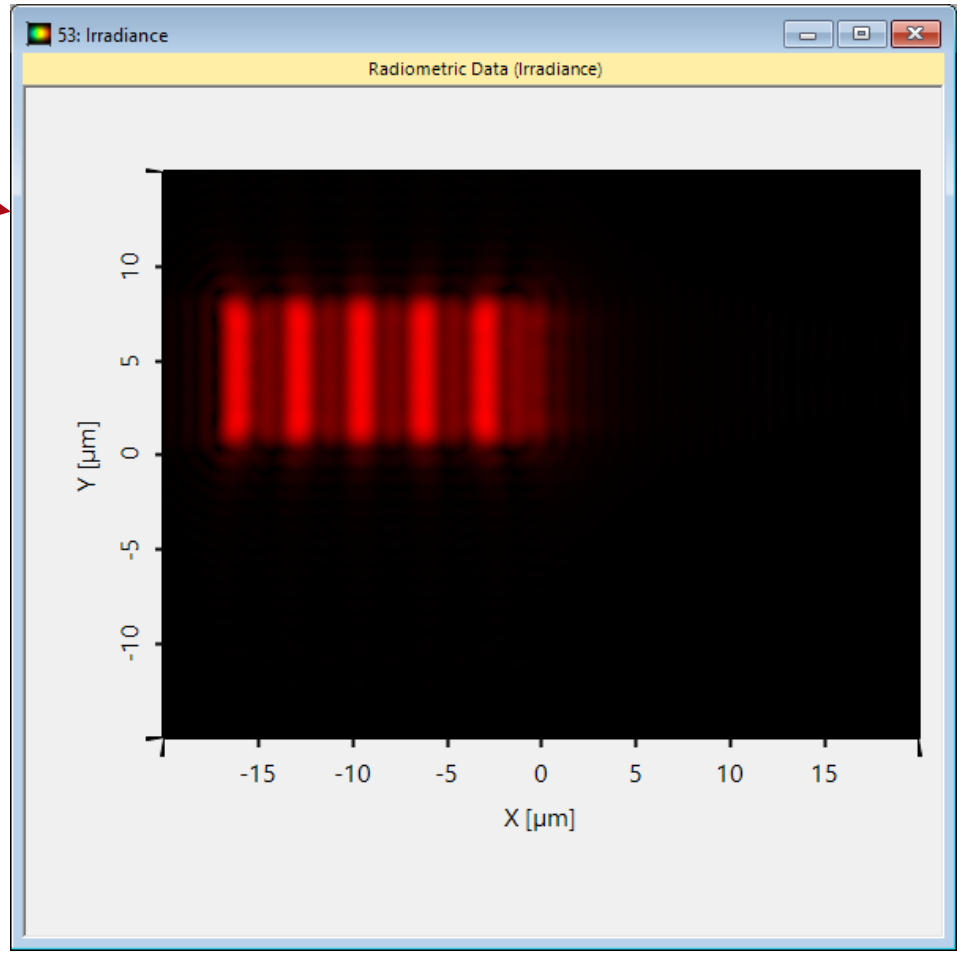
Configuration 2



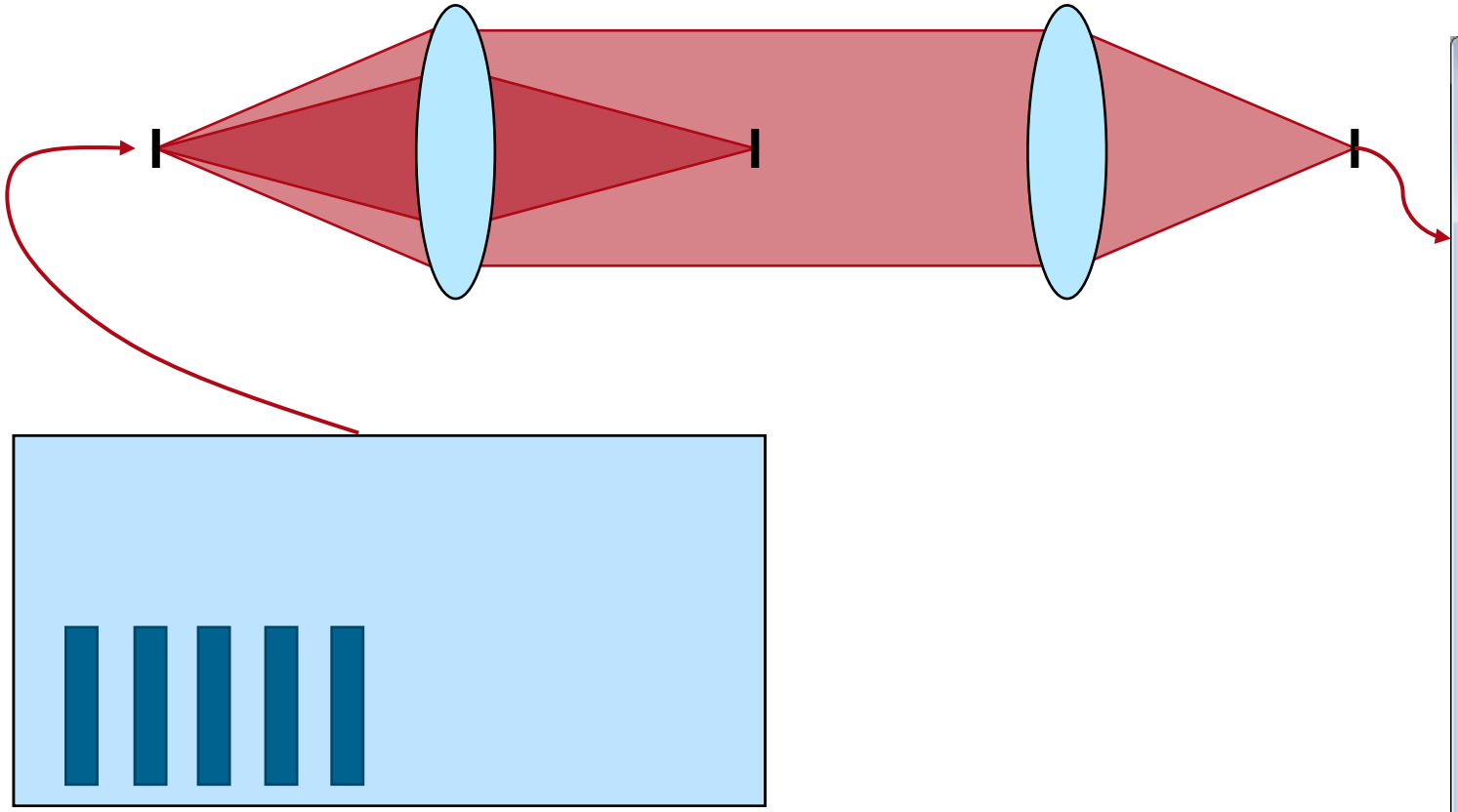


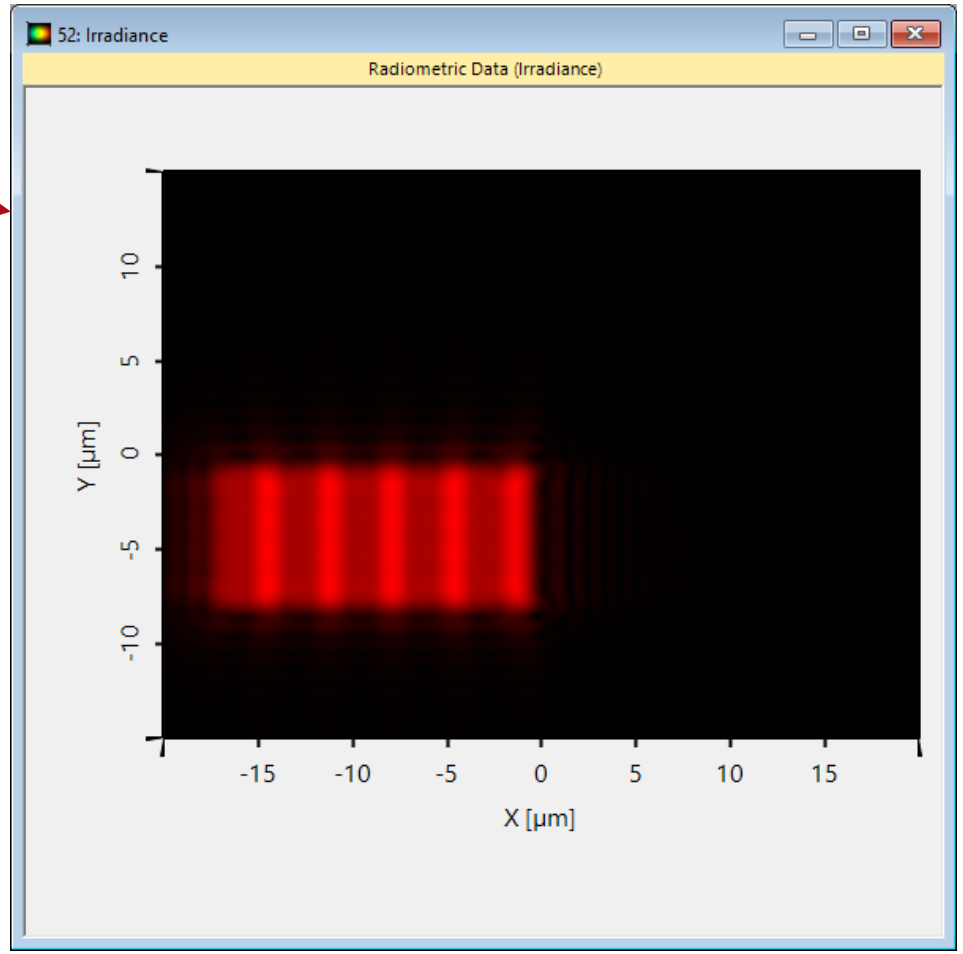
Configuration 3



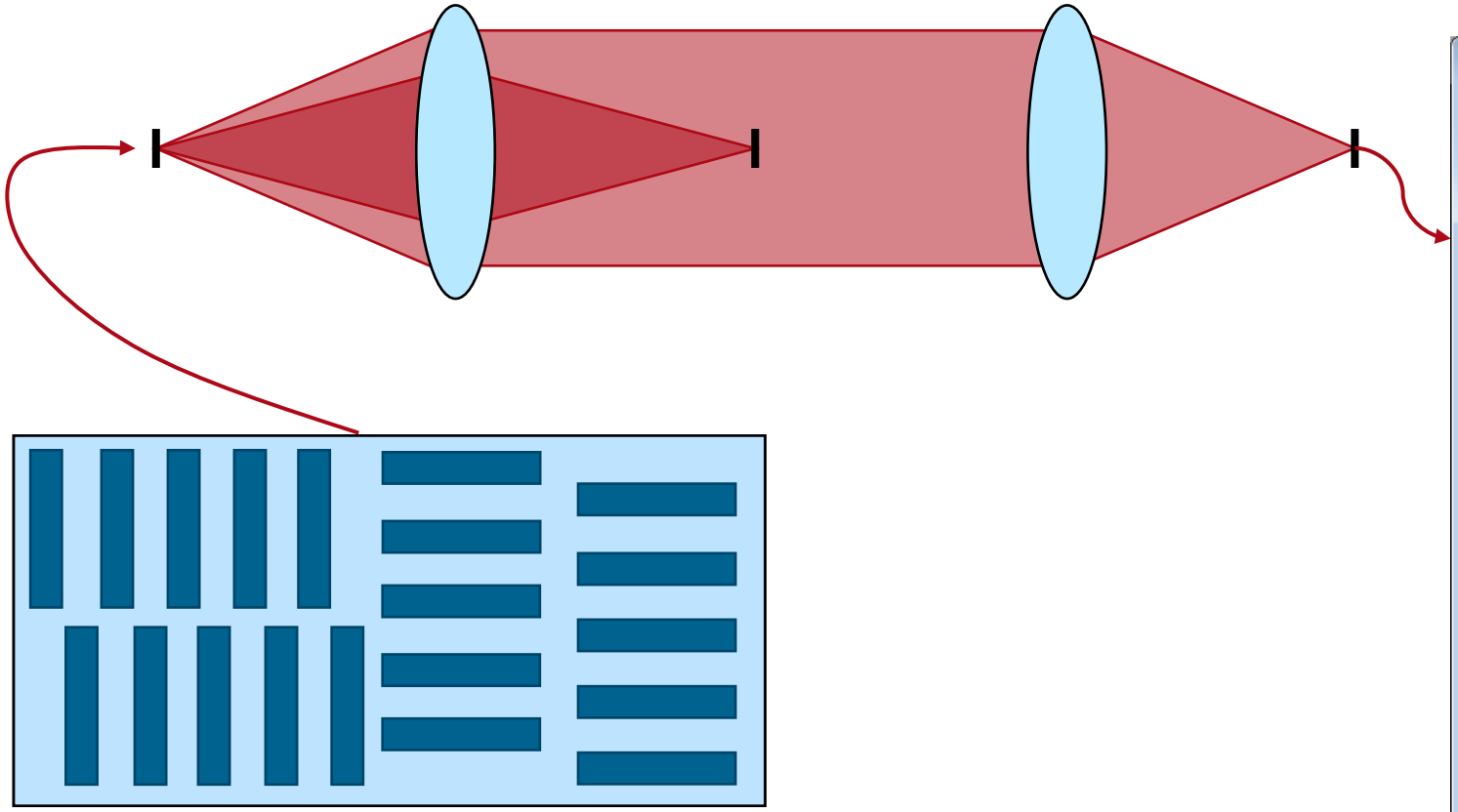


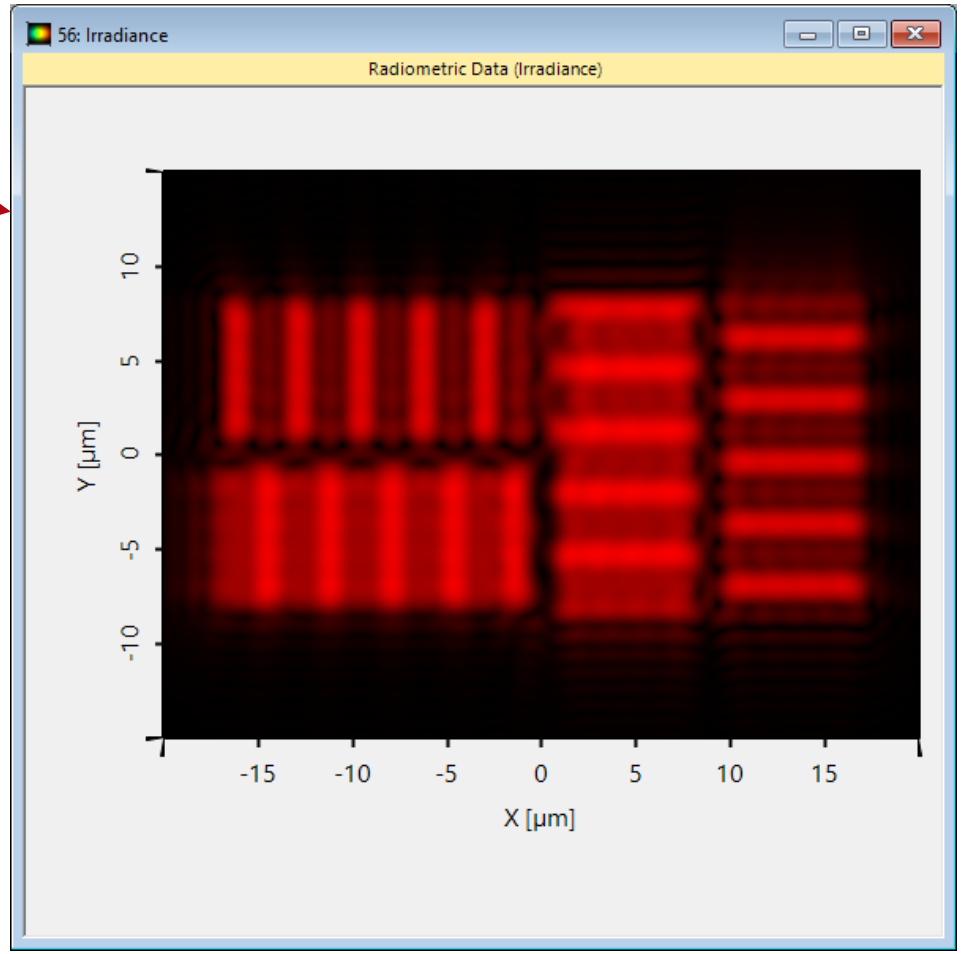
Configuration 4





Configuration 5



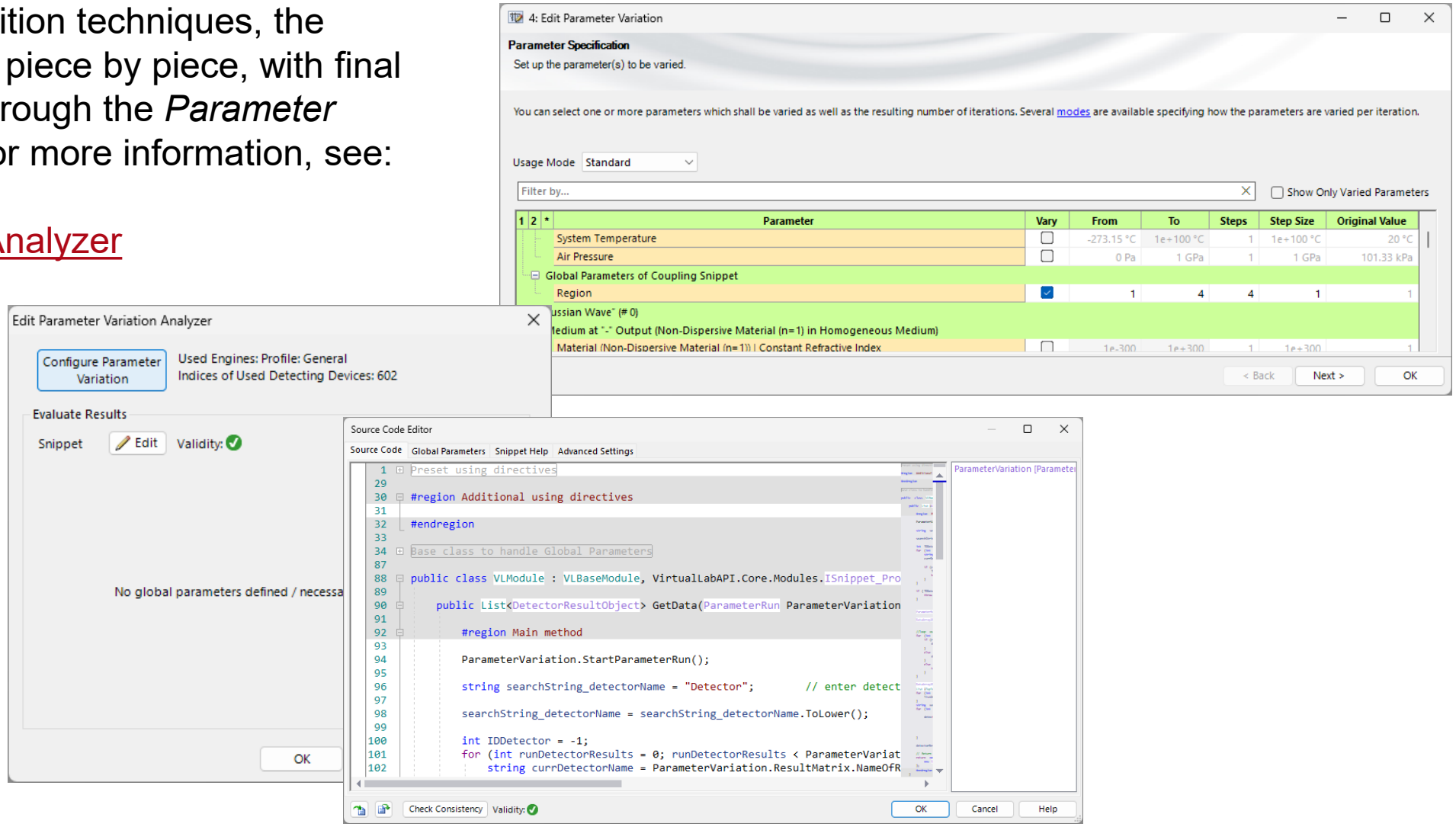


Workflows

Parameter Variation Analyzer

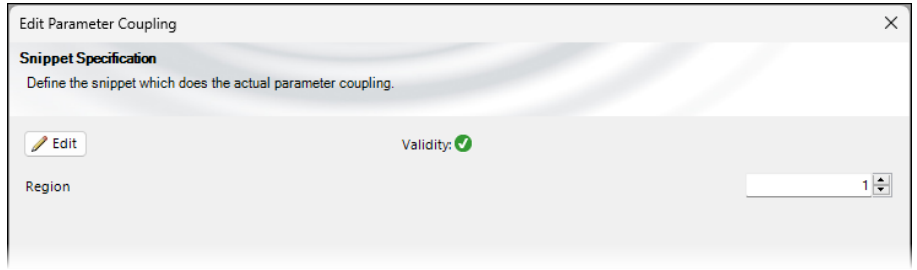
Using field decomposition techniques, the structure is simulated piece by piece, with final results recombined through the *Parameter Variation Analyzer*. For more information, see:

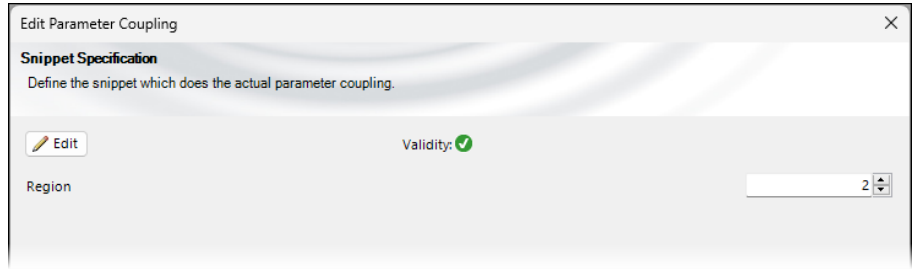
Parameter Variation Analyzer

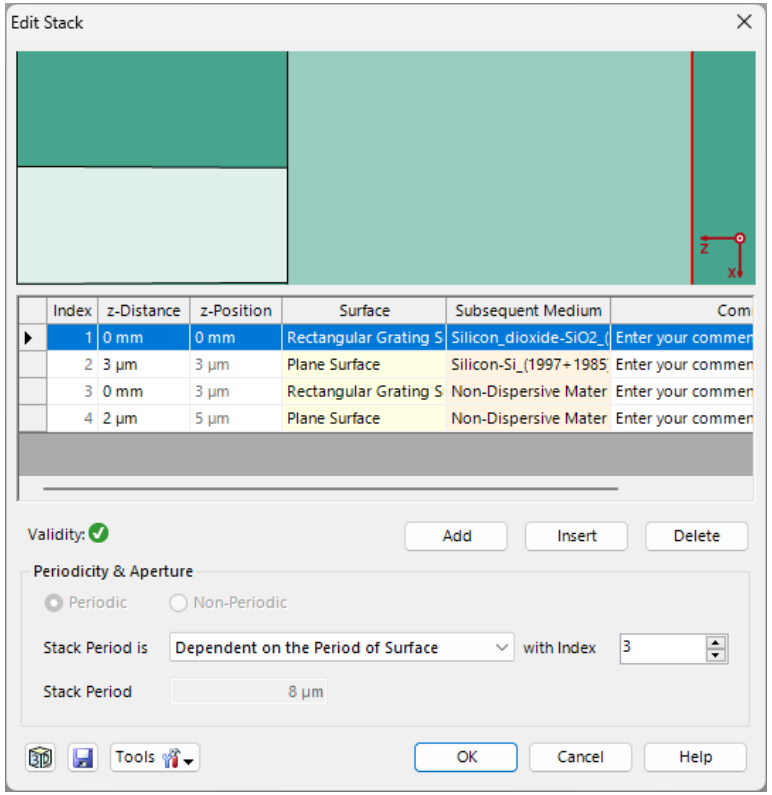


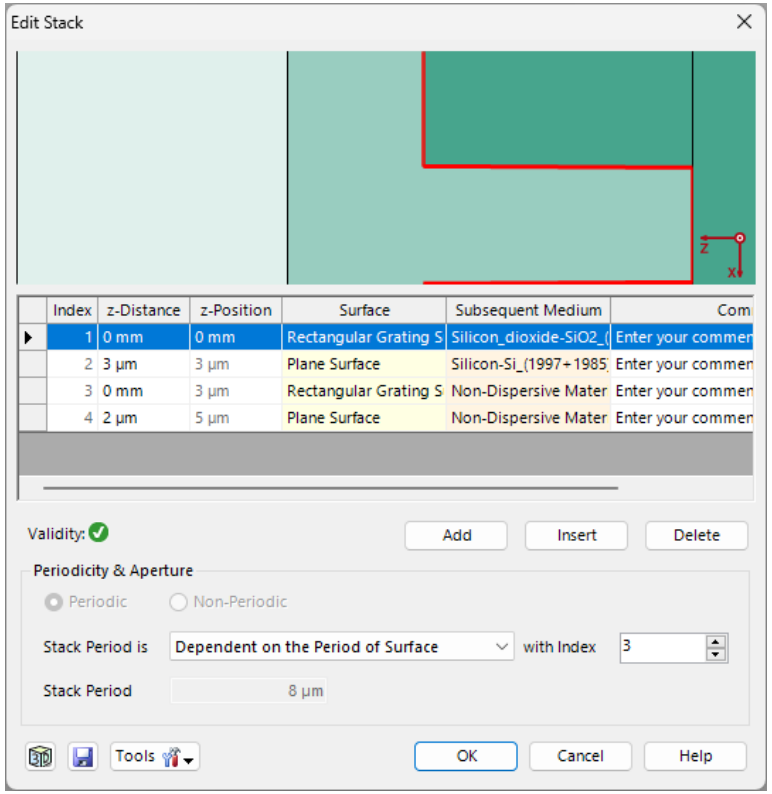
Parameter Coupling

We use *Parameter Coupling* to generate the different configurations. The parameter Region is used to control this. A value of 1 or 3 represents the “upper grating”, while 2 and 4 correspond to the “lower gratings”.









Document Information

title	Imaging of Grating Patterns Positioned on Each Side of a Wafer
document code	USC.0413
document version	1.0
required packages	Grating Package
software version	2024.1 (Build 1.132)
category	Use Case
further reading	• Parameter Variation Analyzer • Optical System for Inspection of Micro-Structured Wafer