



## RIGOROUS OPTICAL SIMULATIONS IN EUV FOR SEMICONDUCTOR TECHNOLOGY

### Task

The metrology of nanoscale gratings of semiconductor technology requires the application of new, more powerful metrology methods because they are becoming not only increasing complex, but structural dimensions are becoming smaller, below 100 nm. EUV radiation offers promising contrasts in the investigation of nanoscale gratings, whose structural dimensions are in the same order of magnitude or below the wavelength of the probing radiation. Advantageous are shorter wavelengths and a stronger light-matter interaction compared to methods that work in the UV or VIS range.

### Method

To adequately interpret the results of EUV metrology, Fraunhofer ILT is using rigorous optical models to completely simulate the interaction of EUV radiation with investigated nanoscale gratings. It is applying two different simulation methods – Rigorous Coupled Wave Analysis (RCWA) and Finite Element Method (FEM) – both of which provide shorter computation time and/or more accurate results, depending on the design of the gratings studied.

### Results

Through rigorous optical simulations, both near-field and far-field scattering of a nanoscale grating can be calculated when illuminated with EUV radiation. If these results are compared with real measured values, both the structure and the material parameters of the examined gratings can be reconstructed precisely.

### Applications

Applications of EUV metrology can be found in the field of supporting metrology for semiconductor production, since it needs high-performance metrology methods for ever more complex structures and smaller structural dimensions.

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- 3 SEM image of nanoscale test grating.  
4 Simulated near-field optical distribution in the EUV.