QUANTIFYING UNCERTAINTIES OF RECONSTRUCTED PARAMETERS IN OPTICAL SCATTEROMETRY OF NANOSTRUCTURED SURFACES

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Methods for solving Maxwell's equations in three spatial dimensions are an integral part of many optical metrology and ellipsometry setups in technology and science. In critical dimension metrology characterising deviations and uncertainties from (idealised) targets accurately play an important role.

We discuss a method which allows to efficiently compute highly accurate solutions and parameter sensitivities to Maxwell's equations for general scattering targets. The method is based on hp-adaptive finite-elements. Therefore, complex shapes including corner roundings and sidewall angles can be handled without additional computation cost compared to the idealized case of geometries composed from rectangular shapes. We present a combination of machine learning tools and Newton-like methods to solve the inverse problem and quantify parameter uncertainties.

This project has received funding from the European Unions Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 675745 (MSCA-ITN-EID NOLOSS).

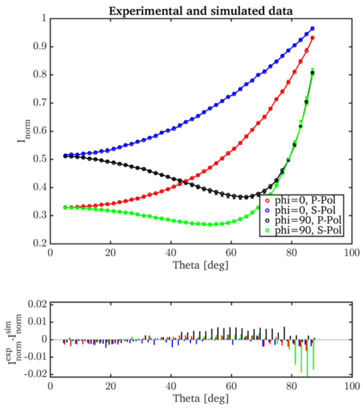

Fig. 1. Experimental and simulated data for a reconstructed line grating with corner roundings and non-rectangular sidewalls

Keywords: Electromagnetic field solver; finite elements, uncertainty quantification; Bayesian optimization, optical metrology

References

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