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Nota di contenuto	Abstract -- Kurzfassung -- Acknowledgements -- Notation -- Acronyms -- 1 Introduction -- 1.1 Motivation -- 1.2 Related work -- 1.3 Main contributions -- 1.4 Thesis outline -- 2 Theoretical Background -- 2.1 Diffraction simulation -- 2.1.1 Maxwell's equations -- 2.1.2 Scalar approximation and solutions -- 2.1.3 Numerical implementation -- 2.2 Theory of confocal microscopy -- 2.2.1 Focusing by a thin lens -- 2.2.2 PSF of a thin lens -- 2.2.3 PSF of a confocal scanning microscope -- 3 Design and Simulation -- 3.1 See-through DLA design -- 3.1.1 System overview -- 3.1.2 Design process -- 3.1.3 Simulation and optimization -- 3.2 Direct-imaging DLA design -- 3.2.1 System overview -- 3.2.2 Design process -- 3.2.3 Simulation and optimization -- 4 Experiment Results -- 4.1 Spot characterization -- 4.1.1 Spot measurement of See-through DLAs -- 4.1.2 Spot measurement of Direct-imaging DLAs -- 4.2 Lateral measurement -- 4.2.1 Lateral measurement by See-through DLAs -- 4.2.2 Lateral measurement by Direct-imaging DLAs -- 4.3 Axial measurement -- 4.3.1 Axial response of See-through DLAs -- 4.3.2 Axial response of Direct-imaging DLAs -- 4.3.3 Interference measurement by See-through DLAs -- 4.3.4 Measurement of a step height target -- 4.4 Fluorescence measurement -- 5 Conclusions -- 5.1 Summary of the work -- 5.2 Outlook -- Bibliography -- Publications -- Appendix -- A Kirchhoff's Diffraction Formulation.

## Sommario/riassunto

Diffractive lens arrays are proposed in this work for application in reflected-light confocal microscopes. They have overcome the limitations between fields of view and resolution of traditional objectives. Experiments of multi-spot confocal imaging in surface metrology and fluorescence microscopy have been demonstrated based on the proposed concepts, which have shown capabilities of high-resolution measurement over a large area.

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