

MetaOptic Designer

Automatically Generate Metalenses/Metasurfaces

Introduction

Metalenses have the potential to revolutionize optical products by replacing bulky curved lenses with thin, flat surfaces. Metasurfaces are a key enabling technology for the next generation of compact imaging, sensing and display applications.

Keysight is supporting this new world of innovation with MetaOptic Designer, an unprecedented inverse design tool that takes user-specified criteria and generates metalenses / metasurfaces for optimal design performance.

Metalens design traditionally requires extensive physics knowledge and many hours of development. MetaOptic Designer removes these barriers with exclusive Artificial Intelligence (AI) that automatically yields the best metalens designs as fast as possible.

Features at a Glance

- Built-in engineering intelligence allows designers at all levels of expertise to create novel metalens designs quickly and easily.
- Efficient optimization and simulation algorithms generate accurate results, validated by a rigorous Finite-Difference Time-Domain (FDTD) method.
- Powerful and user-friendly features significantly reduce design-to-validation cycles.

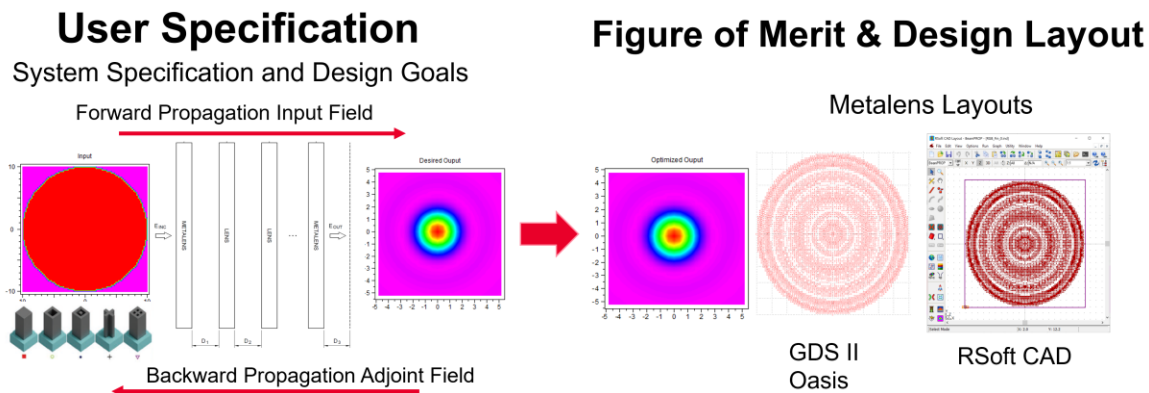


Figure 1. MetaOptic Designer based on inverse design requires a minimal user inputs and generates optimized results and metalens layouts, RSoft CAD files for simulation and GDS files for fabrication

MetaOptic Designer assists in designing an optical system composed of “metalenses”, with the goal being to perform a specific optical imaging function. Each metalens is composed of a regular array of sub-wavelength structures called “meta-atoms”. The detailed structure or “unit cell” of an atom is defined by one or more design parameters. An individual metalens is uniquely defined by the values of these design parameters at each atom site on the lens. The primary function of the tool is to find the optimal choice of this set of parameters for each lens in the system in order to achieve the desired optical imaging function.

Key Features

- Advanced and robust simulation algorithm supports full-vector field solutions in structures and materials.
- Provides unique optimization algorithms to meet user-specified targets.
- Efficient process to define optimal choice for each metalens in the system in order to achieve the desired optical imaging function.
- Capability to use complex meta-atom libraries containing multiple design parameters, and wavelength, polarization & AOI dependences.
- Automatically generates metalens / metasurface layouts, RSoft CAD files for further simulation, and GDS/Oasis files for fabrication.
- Requires minimal user inputs, such as basic lens system configurations, incident conditions, target patterns, and meta-library settings.
- Enable complex optical systems combining multiple metasurfaces and/or refractive lenses
- Is a standalone tool with its own graphical user interface.
- Provides efficient figures of merit including: XZ plot, Near and Far Field, PSF and MTF, AFE...

Applications

Inverse design techniques can explore larger portions of the design space and may be especially useful for:

- Achromatic metalenses

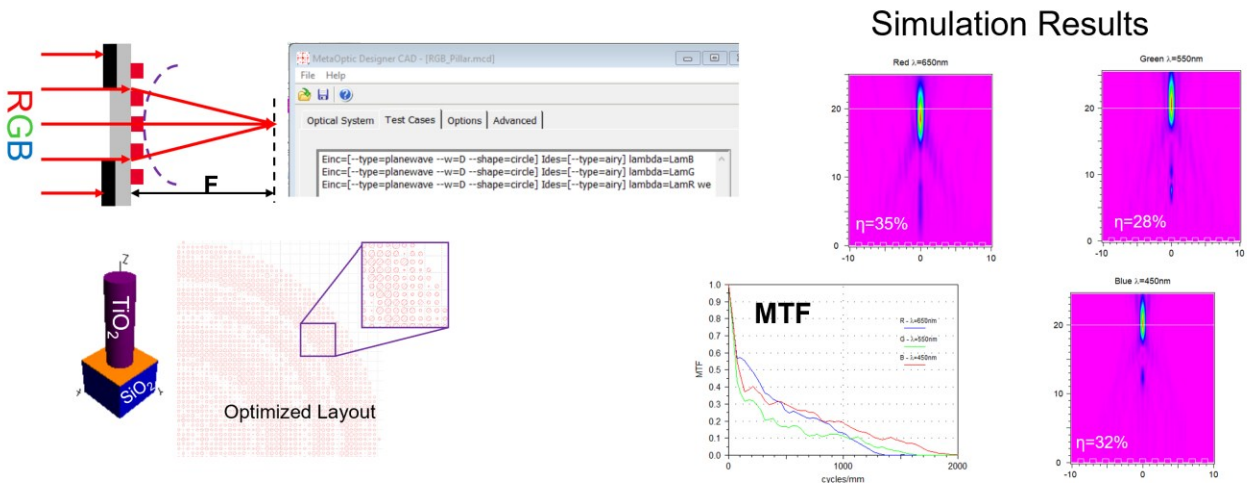


Figure 2. Optimization of an achromatic metalens for RGB. MetaAtom used are based on $\text{TiO}_2/\text{SiO}_2$ material. The XZ plan field (on right) visualization demonstrates that Red, Green and Blue light focused at the image plane. Those results have been validated by full FDTD simulations.

- Holographic optical elements

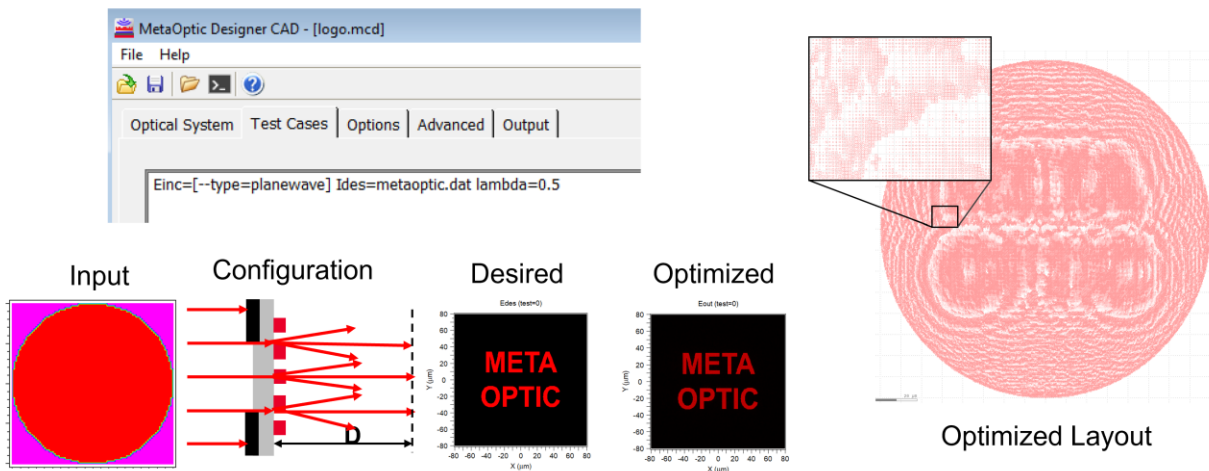


Figure 3. Optimized metalens layout from MetaOptic Designer applied to logo display application. The optimized result (field at the image plane) closely matches the targeted field distribution

- Polarization-dependent devices

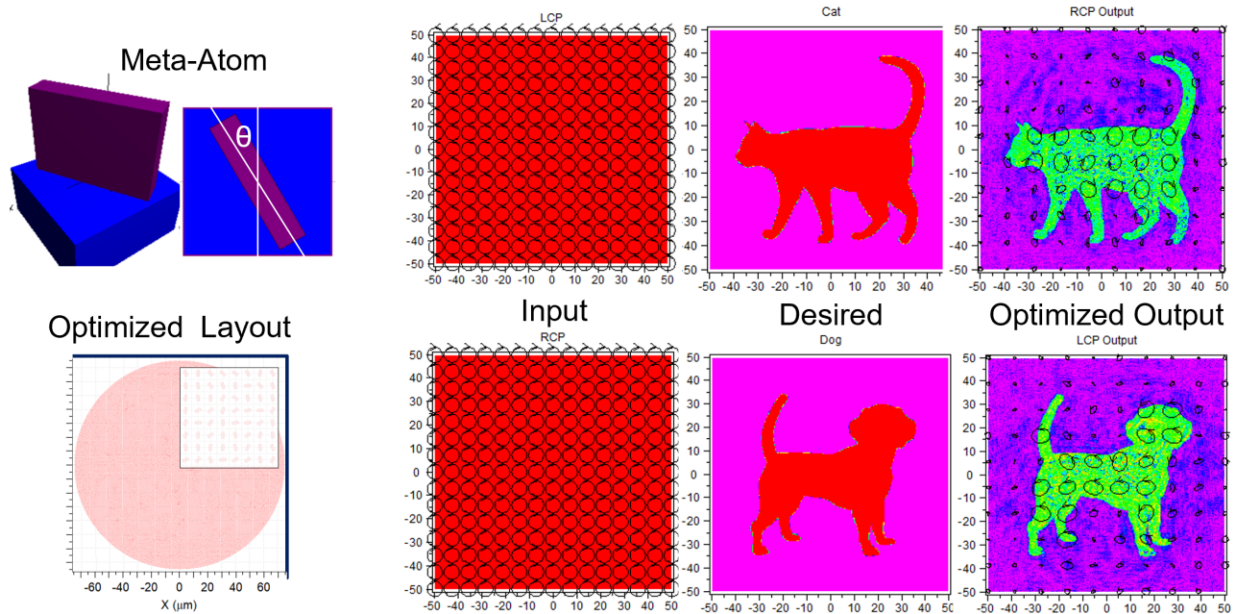


Figure 4. Example of chiral hologram: Meta-atoms are based on nano-fin that are polarization dependent. X- and Y-polarized lights will have different phase delays. Manipulating the rotation angle of each meta-atom can direct the circularly polarized light to different directions, focusing on different positions or forming different images.

And more applications such as: Wide-angle designs, Beam-shaping applications

For More Information

Contact us at [keysight.com/find/email-support](https://www.keysight.com/find/email-support) to request software pricing and to start a trial, or visit the [Optical Design Solutions](#) page.



As a mission-critical design enablement partner, Keysight connects design, emulation, and test so customers can solve the world's most complex engineering challenges. Accelerate innovation at www.keysight.com.

This information is subject to change without notice. © Keysight Technologies, 2025 - 2026, Published in USA, October 7, 2026, 3125-1207.EN