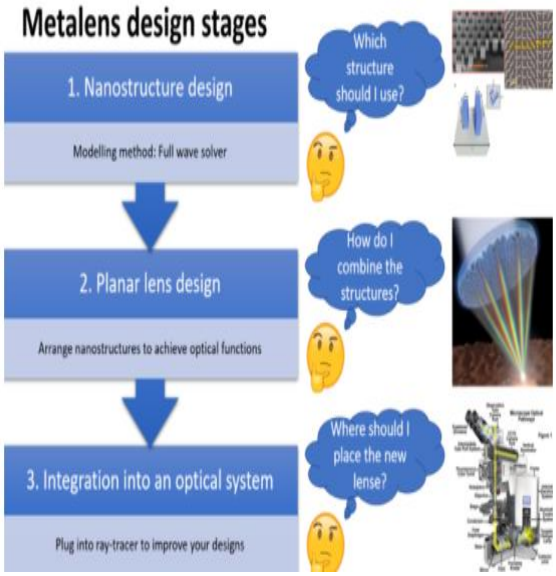
PlanOpSim Enlightened Planar Optics WWW.PLANOPSIM.COM

HTTR 北京华通特瑞 www.htterui.com 台北廣集企業 www.globalsi.com.tw

PlanOpSim 结合各个阶段平面光学 planar optics 设计的须要,從纳米亚波長的尺度对相位、偏振、振幅、频率等光场波前有效调控 metasurface/metamaterial 超构表面材料到各种光学透镜、波片、全息等零件 metalenses, holograms, 再到制作零件系统性 GDSII 整合。



PlanOpSim 软件具备强大优化功能並且三阶段功能在同一软件、一般电腦高速有效运算模拟分析!

*Stage 1,纳米结构模型
Nanostructure modelling
A full wave solution of Maxwell's equations

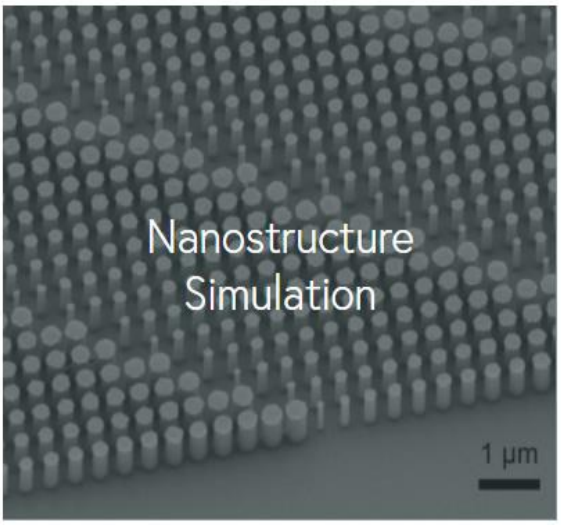
*Stage 2,平面光学零件设计
Component design using powerful optimization methods

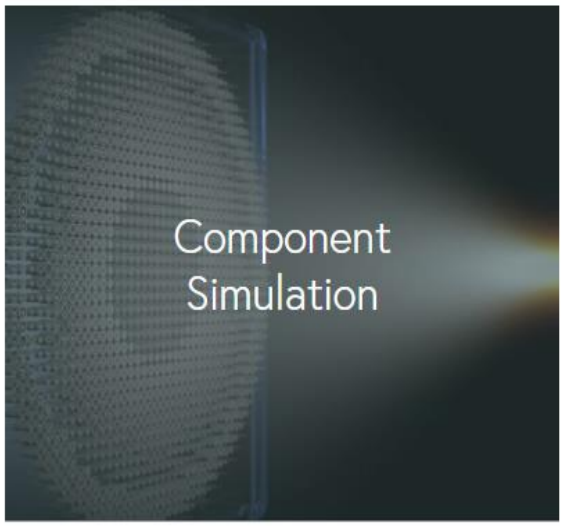
*Stage 3,系统性整合直接导入广泛应用 ray-tracer 软件和 GDSII 半导体制作文件格式。
System integration for ray-tracer and GDSII.

PlanOpSim 模拟分析软件採用 RCWA 全波分析法可以更高速、有效运算较大鏡片,並且**在一般电脑完成纳米超构表面、平面光学零件、GDSII 格式制作整合三阶段.

***Inverse design from targeting component to optimizing metasurface/meta-atoms is possible.

****Quantifying fabrication errors in metalenses with Monte Carlo simulations

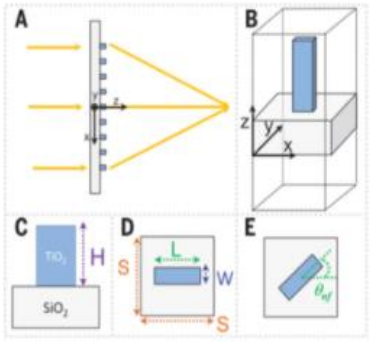


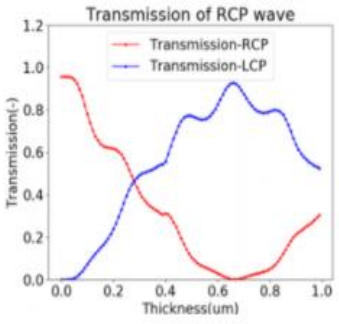


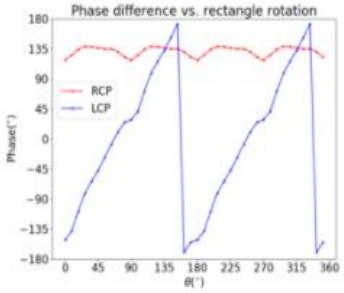
成功案例 a,

TiO nano-fin elements on a soda-lime glass substrate

-美國哈佛大學 Capasso 教授团隊

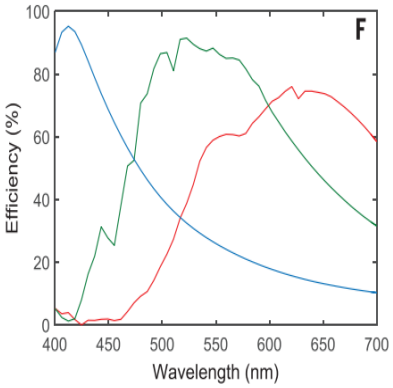


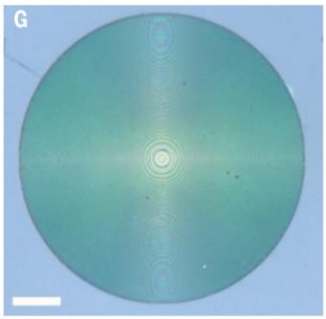


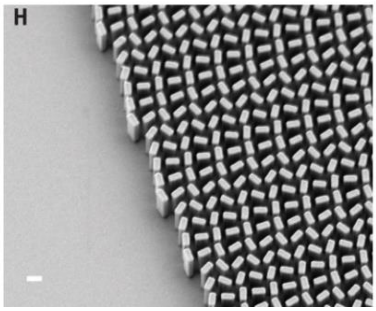


請參考文献(DOI 10.1126/science.aaf6644)

Metalenses at visible wavelengths: Diffraction-limited focusing and subwavelength resolution imaging





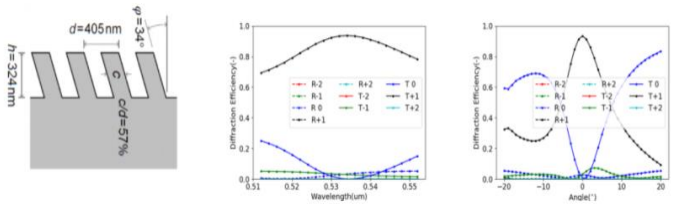


- **PlanOpSim 採用 RCWA 全波分析法严密且快速模拟矩形纳米元素 meta-atoms 结构高度、间距、旋转和可见光极化相关，並建立 Pancharatnam Berry 模型关连性.**

-哈佛大学 Prof. Capasso 团隊指出 TiO_2(NA=0.8)在可见光范围任意波長衍射极限下的聚焦效率 focusing efficiency 可达 86%，170X 倍率放大/亚波長高解析间距，这些指出如此緊密平面光學鏡片对於光刻 Optical Lithography、激光显微镜 Laser-based Microscopy、光谱仪应用呈现巨大潜力。

成功案例 b,

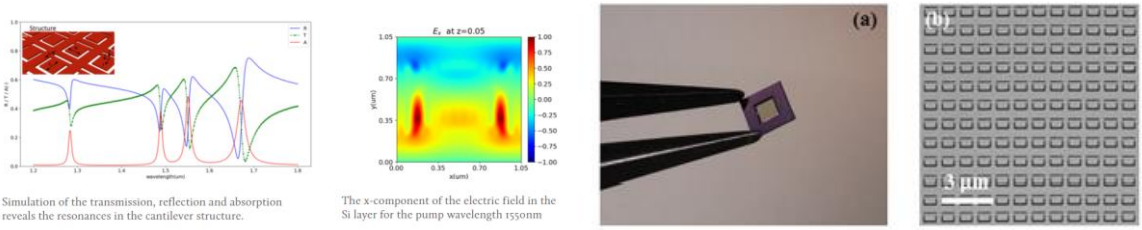
Slanted and blazed gratings for coupling light into waveguide for VR/AR headsets



-100%一阶衍射耦合效率可由超构表面斜光栅 slanted gratings/闪耀光栅 blazed gratings 完成。
-PlanOpSim 超构表面软件可以正确、快速建立模型，五分钟内完成衍射效率相对於入射光谱和角度相关性分析。这结论对於 VR/AR 头带显示的光耦合至关重要。

成功案例 c,

Analyse electric field profile inside an optomechanical cantilever
英國南安普敦大學 Zheludev 教授团隊



Simulation of the transmission, reflection and absorption reveals the resonances in the cantilever structure.

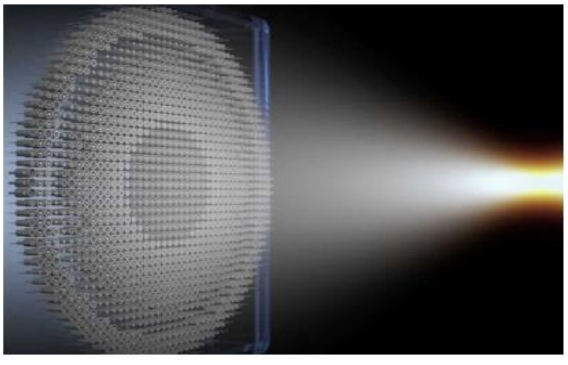
The x-component of the electric field in the Si layer for the pump wavelength 1550nm

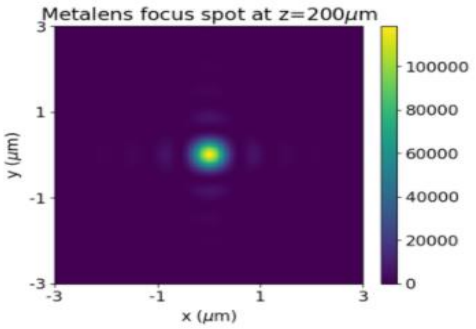
請參考文献 1. Karvounis, A., Ou, J. Y., Wu, W., Macdonald, K. F. & Zheludev, N. I. Nano-optomechanical nonlinear dielectric metamaterials. *Appl. Phys. Lett.* **107**, (2015).

- PlanOpSim 模拟复雜纳米超构表面电磁场和 1310nm/1550nm 激发光互相作用分析硅基患臂 cantilever 光机作用力。

成功案例 d,

平面光學零件 Component Simulation for metasurface and metalens





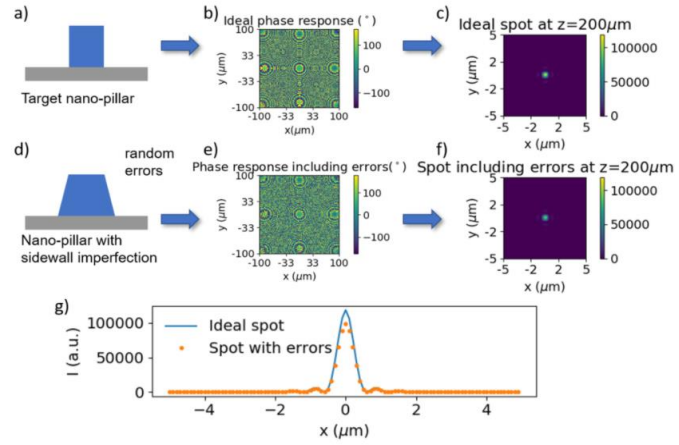
-PlanOpSim 平面光学 planar optics 零组件软件定义计算每一 meta-atom 光学行为、周期集合,精确便捷建立 metasurface 超构表面新模型，這種 forward design 可以取代所有经典传統光学零組件。
Inverse design 方式直接输入目标零組件光学行为，PlanOpSim 软件可以决定相应最佳的超构表面。

成功案例 e,

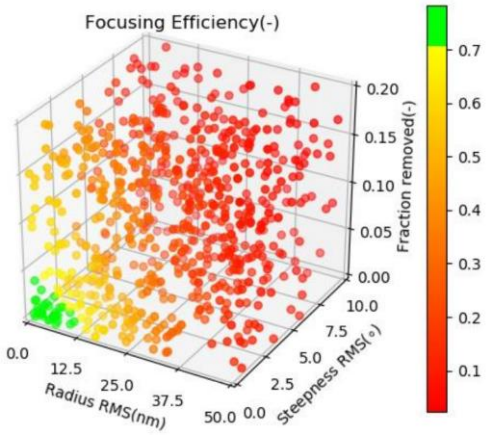
Integrated nano-structure calculation from meta-atom to metasurface/metalens design

And quantifying fabrication errors (Steepness angle, Radius modified, Missing structure)

with Monte Carlo simulation of 25,230 metalenses in a plot

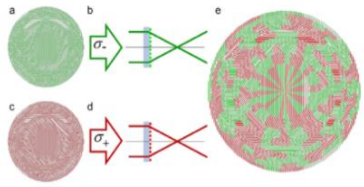


Monte carlo simulation of a metalens. Individual meta-atoms are randomized and their response calulated by the full wave solver. PlanOpSim component level simulation then computes the focal spot.

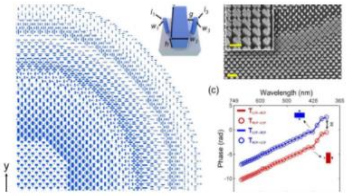


More latest news on metasurfaces/meta-atoms

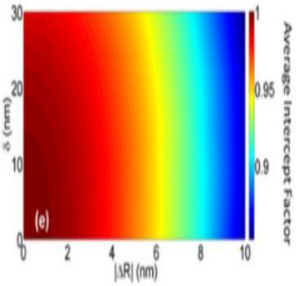
更多最近超表面科研信息



A polarization insenstive metalens by interleaving nano-fins for left and right circular polarized light.



By using only 2 orientations (0 and 90 degrees) of nano-fins a polarization insenstive metalens is made.



左圖

Lin, D. *et al.* Polarization-independent metasurface lens employing the Pancharatnam-Berry phase. *Opt. Express* **26,** 24835 (2018).

中圖

Chen, W. T., Zhu, A. Y., Sisler, J., Bharwani, Z. & Capasso, F. A broadband achromatic polarization-insensitive metalens consisting of anisotropic nanostructures. (2018).

右圖

https://doi.org/10.1364/OE.26.023178 published 24 Aug 2018

Planar dielectric cylindrical lens at 800 nm and the role of fabrication imperfections

Jeongho Ha, Abdoulaye Ndao, Liyi Hsu, Jun-Hee Park, and Boubacar Kante