

Shaping light using ultrafast and programmable nano-optics

Otto L. Muskens

Matthew Delaney, Nicholas Dinsdale, Kai Sun, Wei Xiao, Peter Wiecha, Ioannis Zeimpekis, C. H. de Groot, Daniel W. Hewak, Graham T. Reed

University of Southampton, University Road, Highfield, Southampton, United Kingdom

O.Muskens@soton.ac.uk

Abstract

A variety of applications requires light and infrared radiation to be shaped and controlled actively. In our laboratory we are working on shaping light using silicon photonics on a chip [1] and in free space using metasurfaces [2]. Key to these applications are materials that can be tuned or switched optically, electrically or thermally. In this presentation I will give an overview of cutting edge developments in shaping of light using phase change materials [2,3] and ultrafast all-optical perturbations [1]. I will also address efforts at modelling these effects using emerging new techniques from the toolbox of machine learning [4].

References

- [1] K. Vynck et al., Nat. Comm. 9, 2246 (2018)
- [2] K. Sun et al., ACS Photon. 5, 2280 (2018)
- [3] O. L Muskens et al., Light: Sc. & Appl. 5, e16173 (2016)
- [4] P. R. Wiecha, O. L. Muskens, Nano Letters 20, 329 (2020)

Figures

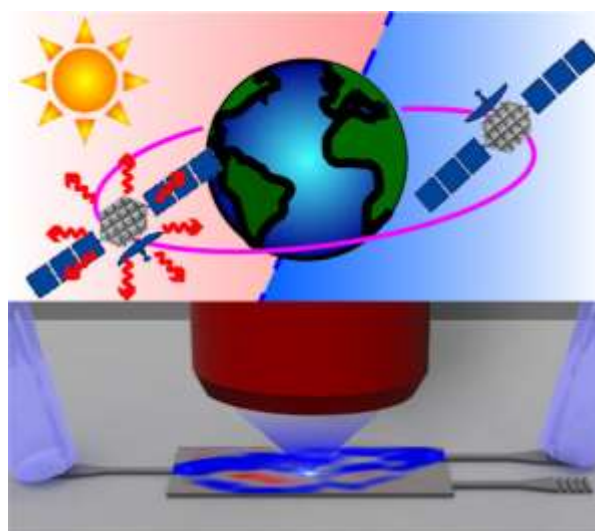


Figure 1: Examples of applications of control of infrared radiation (top, smart solar reflector using VO₂ metasurface) [2] and on-chip programmable photonics (bottom) [1].
