



Centre for Metamaterial
Research and Innovation

EPSRC Centre for
Doctoral Training
in Metamaterials

XM^2



Engineering and
Physical Sciences
Research Council

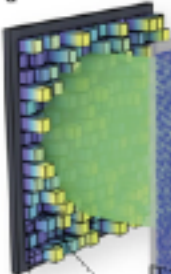
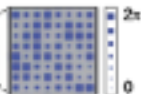
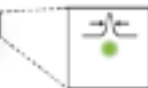
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Inverse Design of Electromagnetic Systems



Image credits, left to right:

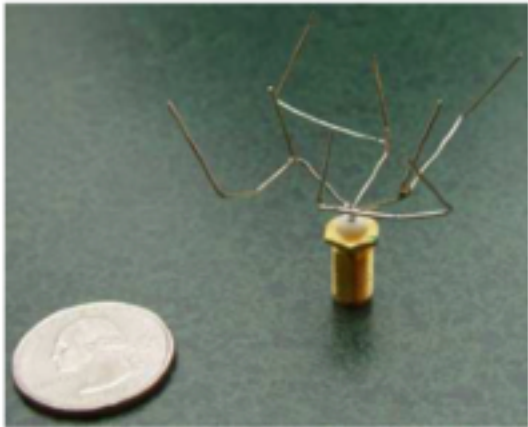
- M. Jang et al., “Wavefront shaping with disorder-engineered metasurfaces”, Nature Photonics 12 84-90 (2018)
- G. S. Hornby et al. “Automated Antenna Design with Evolutionary Algorithms” American Institute of Aeronautics and Astronautics (2006)
- A. Y. Piggott et al., “Inverse Design and Demonstration of a compact and broadband on-chip wavelength demultiplexer” Nature Photonics 9 374-377 (2015)

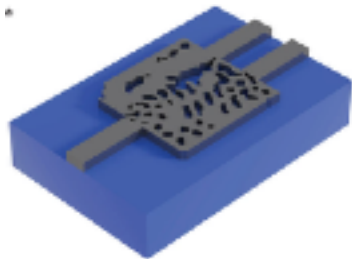
a**e** Reconfigurable control**b** Disorder-engineered metasurface
(calibration-free transmission matrix)**c** High-NA focusing over a wide FOV**d** Wide memory effect range and high stability

Imaging through disordered
structures

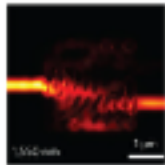
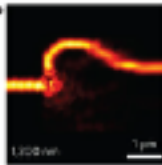
Evodanin

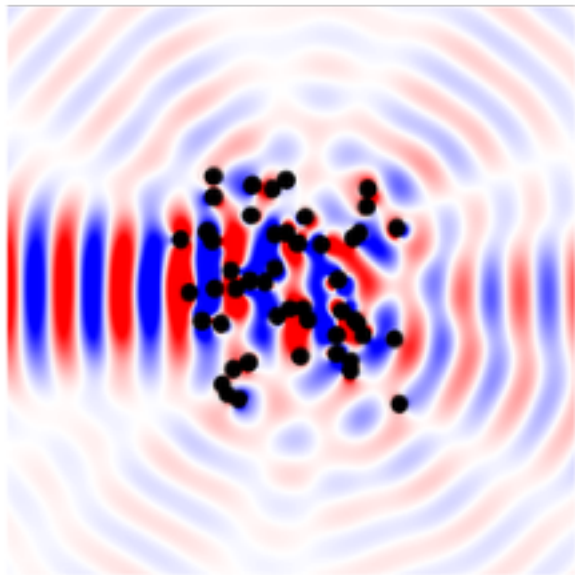
Broadband Wavelength Demultiplexer





b







E·i·c·i·d·e·n·t

*E*scattered

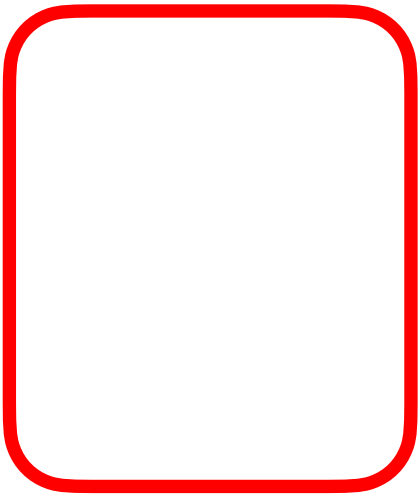


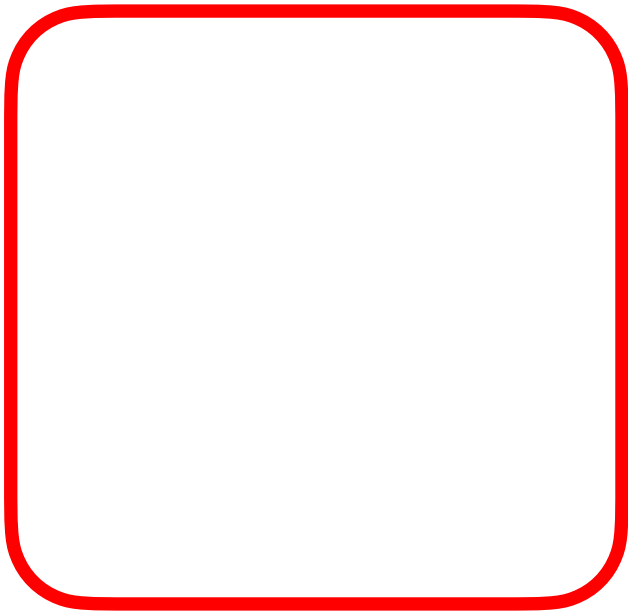


$$\{r_n\}$$

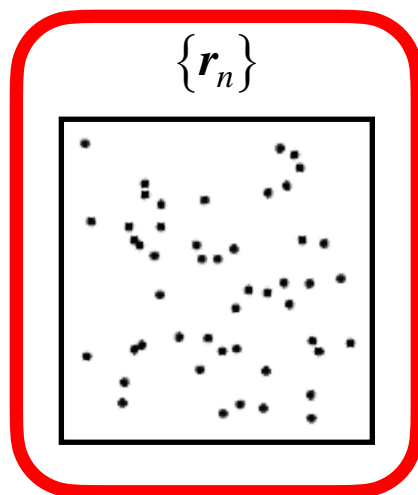
$\epsilon(r)$

neverborn

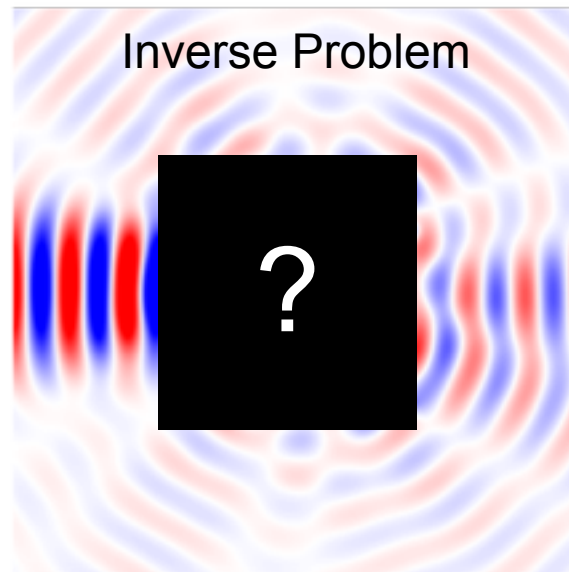




Inverse Design of Electromagnetic Systems



E_{incident}

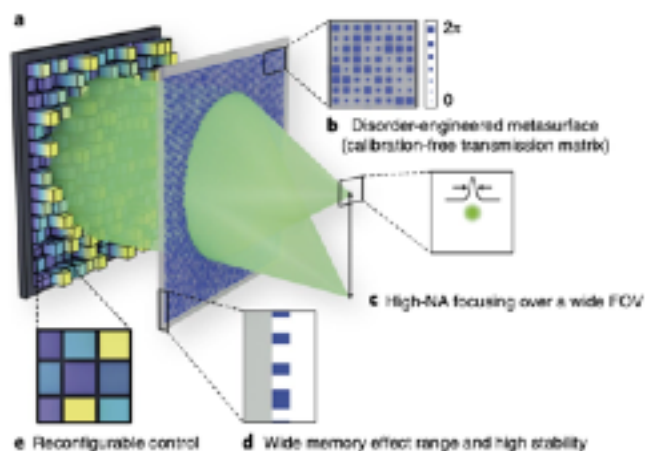


$E_{\text{scattered}}$

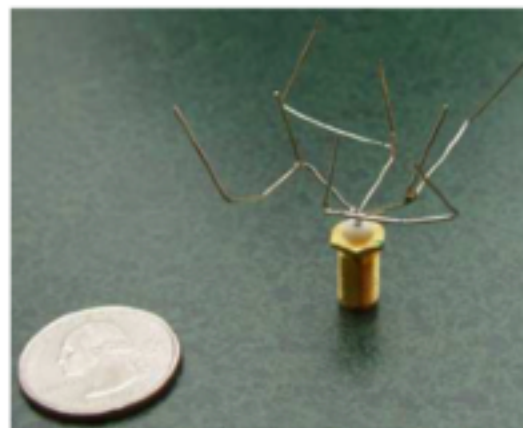
$\epsilon(r)$



Imaging through disordered
structures



Evolved Antenna



Broadband Wavelength
Demultiplexer

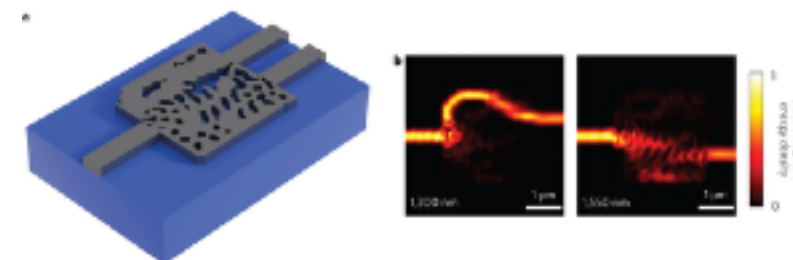


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A Slow Way of Optimising

Emitter polarisation \mathbf{p}

Emitter location \mathbf{r}'

