Inverse Design of Polariton Devices

O Kuster[1], C Rockstuhl[1], and T J Sturges[1]

[1]*Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology, Wolfgang-Gaede-Str. 1, Karlsruhe, Germany. Contact Phone: +4915209906166*
Contact Email: sturges.tom@gmail.com

We harness topology optimisation to inverse design polariton devices with desired functionalities. By using an adjoint formulation, we only require two full simulations to determine the gradients with respect to all degrees of freedom that characterise the system. This allows us to rapidly converge to an optimised design. In this talk, we will present preliminary results in which we design the effective potential of the Gross-Pitaevskii equation to design the wavefunction. For example, we design the potential that gives rise to a flat-top distribution and phase vortices with specified winding number, as well as a lens and an intensity dependent isolator. In the future we will release an open-source version of our code, but in the mean-time we invite you to get in touch with us if you are interested in using our code or collaborating with us.