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Phase retrieval is a powerful numerical method that can be used to determine the wavefront of laser beams based only on intensity measurements, without the use of expensive, low-resolution specialized wavefront sensors such as Shack–Hartmann sensors. However, phase retrieval techniques generally suffer from poor convergence and fidelity when the input measurements contain electronic or optical noise and/or an incoherent intensity contribution overlapped with the otherwise spatially coherent laser beam. Here, we present an implementation of a modified version of the standard multiple-plane Gerchberg–Saxton algorithm and demonstrate that it is highly successful at extracting the intensity profile and wavefront of the spatially coherent part of the light from various lasers, including tapered laser diodes, at a very high fidelity despite the presence of incoherent light and noise.

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