

Propagation-based Phase Measurement

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In this paper I consider an approach to phase determination based on a measurement of the propagation of intensity. This technique is largely based on the so-called transport of intensity equation that, in the absence of phase dislocations, permits the phase to be uniquely determined. The ideas enable the concept of phase to be generalised to partially coherent fields. I show that this generalised version of phase behaves in an identical manner to the conventionally defined phase and then describe how phase measurement may be performed.

The technique is very robust to noise and has shown itself to be a very powerful and practical method. I will present experimental results from optical microscopy, electron microscopy, x-ray imaging and neutron radiography. I also discuss the application to atom optics and present some recent experimental atom phase measurements.