

Characterising laser beams with liquid crystal displays

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ABSTRACT:

We show how one can determine the various properties of light, from the modal content of laser beams to decoding the information stored in optical fields carrying orbital angular momentum, by performing a modal decomposition. Although the modal decomposition of light has been known for a long time, applied mostly to pattern recognition, we illustrate how this technique can be implemented with the use of liquid-crystal displays. We show experimentally how liquid crystal displays can be used to infer the intensity, phase, wavefront, Poynting vector, and orbital angular momentum density of unknown optical fields. This measurement technique makes use of a single spatial light modulator (liquid crystal display), a Fourier transforming lens and detector (CCD or photo-diode). Such a diagnostic tool is extremely relevant to the real-time analysis of solid-state and fibre laser systems as well as mode division multiplexing as an emerging technology in optical communication.