

Abstract Submitted
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Micro-manufacturing with Three-dimensional Intensity Patterns: Practical Limits and Considerations¹ DANIEL MCADAMS, DANIEL COLE, University of Pittsburgh — It is possible to generate 3D intensity patterns for micro-manufacturing using a phase hologram displayed on a liquid-crystal spatial light modulator (SLM). Knowledge of the phase and amplitude of a field in a single plane (the SLM plane) allows for calculation of the phase and amplitude in any set of subsequent planes. Iterative phase retrieval algorithms can take a 3D target intensity pattern and generate a hologram for display on the SLM; however, arbitrary 3D intensity patterns are not necessarily achievable because the light field must obey the wave equation. Furthermore, these algorithms have not been discussed from the point of view of lithographic micro-manufacturing. This paper presents one method for making a 3D intensity pattern that can be used to cure resist in a single-shot, and discusses the limits to patterning due to power, resolution, and SLM-related issues. The relationship between the resolution in the patterning volume and physical specifications of the SLM is more restrictive than if the patterning were being done in a single plane, but with sufficient laser power, this algorithm could be used in high-throughput 3D micro-manufacturing.

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