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Polychromatic liquid crystal laser arrays

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Abstract

A two-dimensional array of chiral nematic liquid crystal (LC) band-edge lasers is demonstrated by photo-exciting multiple regions in the LC cell using a lenslet array. The multiple laser outputs can be recombined into a single monomode output, which permits an almost 50-fold increase in energy density in comparison to a single-focus LC laser device. Higher throughput LC laser devices are therefore facilitated, which circumvent restrictions in performance limited by dye bleaching and optical reorientation when pumped with high intensity pump beams.

By carefully controlling the chiral pitch of LC cells, liquid crystal laser arrays of almost arbitrary wavelength can be produced. Furthermore, by preparing a gradient pitch cell, using two laser dyes, a polychromatic laser array can be demonstrated, with multiple simultaneous laser emissions of wavelengths ranging across the majority of the visible spectrum.