

MICROLENSSES FOR COUPLING OPTICAL FIBERS
TO ELLIPTICAL LIGHT BEAMS

Abstract

5 An asymmetric hyperbolic microlens on the end of a single-mode
optical fiber enhances the fiber's coupling to elliptical laser beams. The lenses, with
controlled eccentricity ratios, are made by micromachining the end of the fiber with
a pulsed CO₂ laser as the fiber is directed, preferably by computer control, about the
focused laser beam. Coupling efficiencies of 90 percent (-0.75 dB) have been
realized with single transverse mode lasers at a wavelength of 0.98 μm having an
10 approximately 3 to 1 beam ellipticity. With multimode lasers at 1.48 μm having
similar elliptical beams, the asymmetric lenses demonstrate an almost 2 dB increase
in coupling efficiency over symmetric hyperbolic microlenses. Such lasers are
useful to pump erbium-doped fiber amplifiers. About 120 mw was coupled from
such a laser into single-mode fiber.

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