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Micro-machining of transparent materials

With femtosecond laser pulses it is possible to machine materials even if they are transparent at the laser wavelength being used. The highly non-linear nature of the interaction between sample and pulse is the key to precise and clean machining of a wide array of materials with one and the same tool.

The BlueCut - a micro-Joule, femtosecond fiber laser

KEY FEATURES

- Wavelength 1030 nm
- Pulse Energy: >4 µJ
- Pulse Duration: typ. 400 fs
- Single pulse to 10 MHz repetition rate
- Integrated AOM for external gating and energy tuning

Manufacturing optical elements - utilizing new spectral ranges of light more efficiently

Laser inscribed volume gratings in Gallium Lanthanum Sulphide (GLS) Glass designed for high efficiency diffraction from the near- to mid-infrared wavelength range.

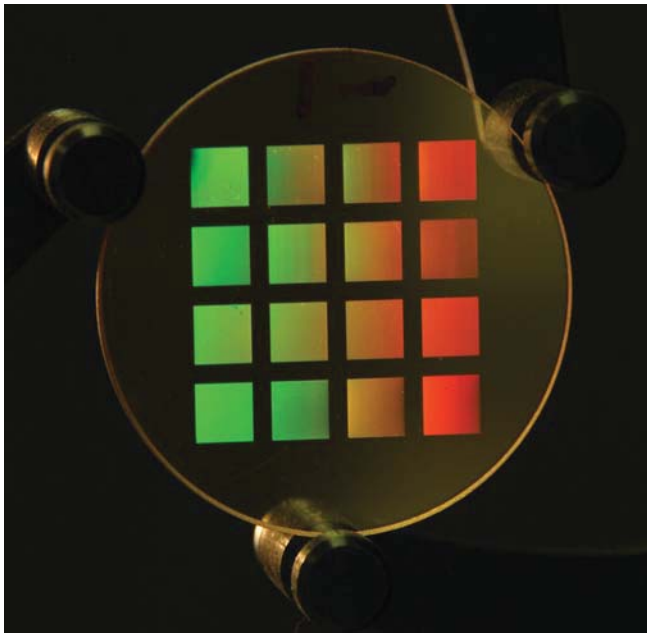

Image courtesy: Prof. Robert Thomson, Heriot Watt University

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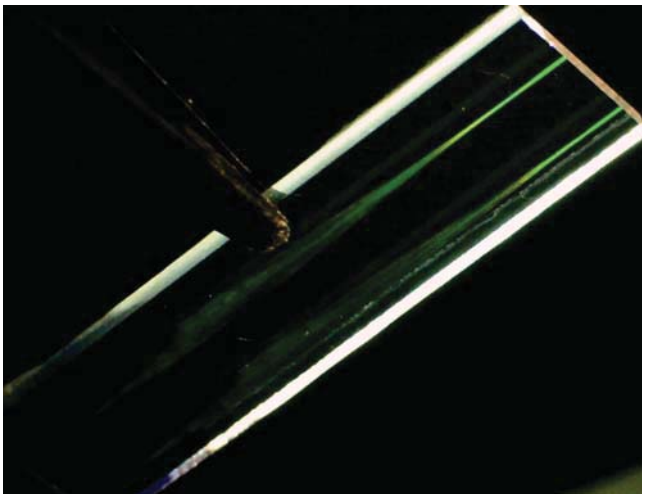
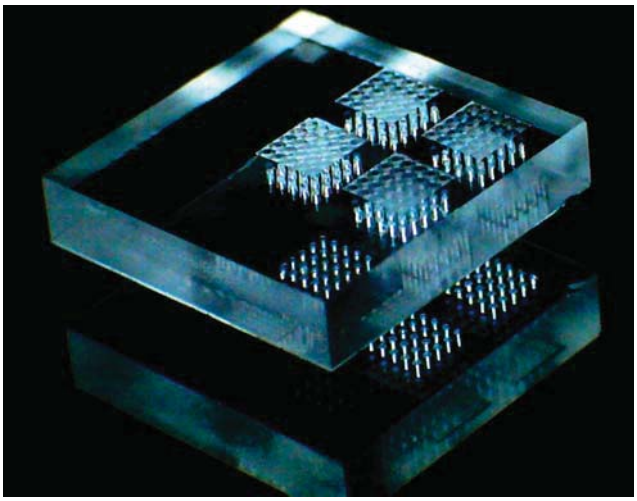
The photonic dicer
- improving the performance of astronomical instruments



This optical element consists of a pair of ultrafast laser inscribed waveguides. Designed for near-infrared astronomical applications, it offers a fully integrated alternative to contemporary fiber-based approaches and enables the multimode stellar light collected by a telescope to be reformatted efficiently. This can help minimize the length of the pseudo-slit as well as reduce detector noise in future astronomical instruments.

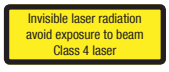
Image courtesy: Prof. Robert Thomson, Heriot Watt University

Integrated optical elements
- novel processing techniques open up new applications



Using the focus spot from a femtosecond laser source as an essentially unrestricted “tool-path”, it is possible to directly write the surface of a lenslet in three dimensions within the volume of a transparent material. The lenses can then be etched and a high surface quality can be achieved by using an oxy-natural gas flame to polish the roughness caused by etching. The shape and position of each lenslet can be tailored to match the spatial positioning of a two-dimensional array of multimode fibers, which can be monolithically integrated with the micro-lens array.

Image courtesy: Prof. Robert Thomson, Heriot Watt University



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