SCANPLEX – COMPACT SCANNER-ARRAY FOR MULTIBEAM PROCESSING

Task

To increase productivity, research in laser material processing is pursuing multi-beam approaches that increase the production speed in proportion to the number of laser beams used. To ensure a high degree of design freedom in multi-beam processing, the laser beams must be guided independently of one another across the processing field. This requires an array technology consisting of compact 2D scanner elements and having significantly reduced dimensions compared to conventional galvanometer scanners. The smaller the space required by a scanner element for a given aperture and scan angle, the higher the degree of parallelization that can be achieved per area and thus the higher the productivity of the process.

Method

Therefore, Fraunhofer ILT has developed a scanner array that combines four 2D deflection units for parallelized laser material processing in a housing the size of a conventional 2D processing head. The scanner drives are based on a planar galvo scanner technology developed and patented at Fraunhofer ILT, a technology that combines a small construction volume with a large aperture. By using the scanner array and compact F-theta lenses, the institute is able to process an area of 120 x 120 mm² in parallel with four separate laser beams.

Results

The institute set up and characterized the scanner array demonstrator with four 2D deflection units and one F-theta lens per deflection unit. Demonstration tests were carried out with laser powers of up to 150 W per scan head for the application fields of laser marking and engraving and showed the potential of Scanplex technology for a significant increase in productivity.

Specifications of Scanplex scanner array

Dimensions L x W x H	140 x 140 x 90 mm³
Focal length f	160 mm
Scan field size A	120 x 120 mm²
Scanning speed v_s	≤ 8 m/s
Aperture D	7 mm
Irradiance E	≤ 500 W/cm²
Tracking delay t_s	200 µs
Position resolution	16 bit
Interface	XY2-100

Applications

• Laser marking and engraving
• Additive manufacturing
• Microprocessing

Contact

Lazar Bochvarov M. Sc., Ext: -431
lazar.bochvarov@ilt.fraunhofer.de

Dr. Achim Lenenbach, Ext: -124
achim.lenenbach@ilt.fraunhofer.de

3 2x2 Scanplex scanner array.

4 Laser engraving in aluminum created with Scanplex.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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