



COMBINED PICO-/NANOSECOND LASERS

Task

Metal surfaces structured with nanosecond and picosecond pulses are being examined as part of the European project »EMLACS«. This application aims to improve the adhesion of coatings applied by means of the »cold-spray method«, following the laser structuring, at economic area rates. In this process, solid particles of the applied material, about 10 - 50 μm in diameter, are accelerated at high speeds so that when they hit the surface they form a solid, positive connection. When the construction is completed, the flexible laser system should make it easier, above all, to compare structuring results and to find advantageous parameter ranges.

Method

One commercial ns und ps laser, each adapted to the task, is spatially superposed so that both beams rest coaxially and, subsequently, can use the same processing optics. The ps source has an output power of up to 80 W at a pulse repetition rate of 1 MHz and pulse energy of up to 80 μJ at a pulse duration of 12 ps. The ns source also has output power of up to 80 W, but a pulse repetition rate of 100 kHz and pulse energy of up to 0.8 mJ at an optional pulse duration of 1.5 ns or 8 ns. Before superposition, the optical radiation of the two sources is symmetrized by means of beam shaping and adapted to each other concerning propagation parameters.

Result

Fraunhofer ILT has made a flexible beam source available with superposed laser pulses of different pulse durations. In the basic configuration, both beams exhibit the same focus diameter. If necessary, the diameter may be selected differently for the two beams. The two radiation sources can both be operated simultaneously pulsed as well as with an adjustable temporal offset of the laser pulses.

Applications

This system is suitable for the systematic investigation of advantageous temporal and spatial parameter ranges in the structuring of surfaces. Since commercial laser platforms serve as a basis for further development, both the single-beam source as well as the entire system can be provided by the industrial partners directly or in cooperation with Fraunhofer ILT.

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2 Ps-ns beam source.