



## PS TO NS LASER SOURCE IMPROVING COLD-SPRAY COATED SURFACES

### Improving Cold-sprayed Surfaces

Functional structuring of substrates prior to cold spray coating promises to improve the adhesion of the coating as well as the deposition efficiency.

To gain a better understanding of the process parameters the effect of different surface structures was tested during the EMLACS – Efficient Manufacturing of Laser-Assisted Cold-Sprayed Components Project by treating metal and composite material samples with a high power laser source. The flexible structuring needs on different substrate materials require a broad parameter range, i.e. picosecond to nano-second pulse length, adjustable output power and variable beam-diameter combined in a single laser source. This broad range in parameters is at present not obtainable in a commercially available laser system.

### Laser Demonstrator

To achieve this flexibility in laser parameters two modules of the EdgeWave laser source portfolio have been chosen as light sources. Their output beams are combined to a single beam at high power. This approach of combining a ps with a ns laser source allows for independent beam diameters and therefore an independent spot size for each pulse duration with just one process optics, and it also allows for a user-defined sequence of ps and ns pulses with pulse energy modulation.

1 Foci of both lasers superimposed at maximum output power, combined beam diameter  $\sim 110 \mu\text{m}$  ( $D4\sigma$ ,  $f = 300 \text{ mm}$ ).

2 EMLACS breadboard laser setup with separate ns and ps laser source.

Different combinations of laser parameters are obtainable by integrating other modules from the EdgeWave lineup. Other beam profiles, such as square top-hat or line top-hat, can also be chosen.

### Technical Data – EMLACS Laser Demonstrator

	Combined laser beam for one processing optics, independent trigger for ps and ns pulses	
Pulse length	1 - 10 ns (10 - 30 ns)*	10 ps
Wavelength	1064 nm	1064 nm
Beam diameter	adjustable	adjustable
Pulse energy	0.01 - 1 mJ (0.3 - 3 mJ)*	2 - 200 $\mu\text{J}$
Rep. rate	10 - 100 kHz	0.4 - 20 MHz
Avg. power typical	100 W	100 W
EdgeWave Laser Module	INNOSLAB IS-Series	INNOSLAB PX-Series

\* Values obtained when using long-pulse ns laser sources, technical data subject to choice of EdgeWave models.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 606567.

### Contact

Dipl.-Phys. Marco Hofer  
Phone +49 241 8906-128  
marco.hoefler@ilt.fraunhofer.de