

Fully reflective one by nine beam splitter for high throughput surface decoating

Ivan Gusachenko¹, Jérôme Patars², **Gwenn Pallier**¹, Anne Henrottin², David Bruneel², Pu Jian ¹, Olivier Pinel¹, Jose Antonio Ramos-de-Campos², Guillaume Labroille¹

1- *Cailabs, Rennes, FRANCE*

2- *Lasea, Angleur, BELGIUM*

Gwenn@cailabs.com

Lasers have been widely used for decades for material processing from Laser Beam Welding to Laser Cutting applications. The recent development of Ultra Short Pulse (USP) lasers has broadened the range of possibilities thanks to their inherent capabilities of processing without thermal effects.

Direct surface treatment is one of these highly promising applications. Laser thin film removal is especially interesting for solar cells industry, OLED and microelectronics, as well as watchmaking and jewellery. Laser decoating consists in ablating small thickness of material in a highly selective way, achieving selective engraving without delamination, bumps or microcracks.

Despite the constantly increasing power available in turn-key USP systems, the throughput speed is governed by the optimal beam parameters for a given process, and does not scale with power. On the other hand, splitting the main beam into several beams offers a scalable parallelization while conserving the optimal fluence/pulse energy. Therefore, associating versatile beam splitting to USP lasers enables processing larger area and improving the process yield, the main challenge being handling the high power.

We report here a one by nine beam splitter with a fully reflective design used with an average power of up to 100W with a pulse duration below 500 fs. The patterns on the processing area are 15 μm waist gaussian shapes with a 150 μm pitch.

We show here the process results including the repeatability of the pattern over the 100mm F-theta field of view. A pattern in both directions has been tested showing the performance while scanning in each direction. The achievable ablation rate is presented and quality comparison with a process with a single beam of similar dimension and energy. We also demonstrate the compatibility with micro-processing processes and equipment such as industrial femto-second laser and galvo-scanner.