



PHOTONICS PUBLIC-PRIVATE PARTNERSHIP

PHOTONICS<sup>21</sup>



Factories of the Future  
Public-Private Partnership

Grant Agreement number: 723805 –  
PoLaRoll – H2020-IND-CE-2016-  
17/H2020-FOF-2016



**PoLaRoll - Polygon  
scanner based ultra-short  
pulse laser processing in  
roll-to-roll manufacturing**

**PoLaRoll**

Project Duration:

**01.10.2016– 31.09.2019**

Grant Agreement number: **723805**

Research & Innovation Action

**WP 2**

**D2.1 | Fraunhofer  
IPT**

Ablation machine  
adapted for roll-to-  
roll products

Dissemination Level:

**PU**

**PP**

**RE**

**CO**

## EXECUTIVE SUMMARY

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Deliverable 2.1 shows public results about the ongoing technical progress of the project. An existing multi-axes 3D laser ablation machine is modified with a specific optical set-up in order to perform highest accuracy structuring of coated metal foils. The content of this deliverable will be published on the website.

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement number 723805.

## 1 RESULTS

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The EU project PoLaRoll aims at substituting the lithography step in the current etching processes for microstructuring of stainless steel reels. With a laser micro machining unit, which is integrated in a roll-to-roll machine, a fast and flexible structuring process will be developed to remove the etch resist lacquer. Implementing a modular approach, the efficient laser process can easily be used for other applications that depend on inflexible masking processes.

For a fast laser ablation of the lacquer, it is indispensable to perform extensive parameter studies in order to achieve highest accuracy combined with high ablation rates. The ablation rate depends on the laser process itself but also on the lacquer formulation. The laser parameter studies are performed by Fraunhofer IPT and Lasea. Lasea supports this activity thanks to two different laser systems integrating fs laser sources. At the Fraunhofer IPT, an existing multi-axes 3D laser ablation machine has recently been modified with a specific optical set-up in order to perform highest accuracy while structuring coated metal foils. In Figure 1, the machine set-up is shown. A 5-axes machine tool is equipped with a picosecond ultra-short pulse laser. Via a mirror system, the laser radiation is successively guided into a dynamic beam expander, a laser scanner and a telecentric F-Theta optics.

In order to achieve a higher precision for the parameter studies, the old, analog laser scanner and the mirror system for guiding the laser beam have been replaced. With the new digital scanner, a better position accuracy, reproducibility and resolution is achieved. In this way, it is possible to process the lacquer samples in a reproducible and fast way. The updated machine tool is shown in Figure 1.



Figure 1 Existing 5-axes laser machine tool updated for laser-based lacquer ablation.