

ULTRASHORT PULSED LASER PROCESSING AT 1 KILOWATT USING A FLEXIBLE MULTI BEAM APPROACH

Project Summary













PHOTONICS PUBLIC PRIVATE PARTNERSHIP

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825201.

The MultiFlex Project

OBJECTIVE:

High Speed Ultrashort Pulsed Laser Processing Using Kilowatt Laser Power and Individually Modulated Multi-Beams -Making Ultrafast Lasers Faster-

Why **ultrashort** pulses? Why **kilowatt** average power? Why individually modulated **Multi-Beams**?



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Why ultrashort pulses?

- Pulse duration < 10 ps</p>
- Negligible thermal load
- Highly precise
- Nearly all kind of materials
- Non-contact processing
- Wear-free tool
- Truly digital process
- No use of environmentally harmful chemicals



Source: ILT



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Why kilowatt average power?



- Typically ablation rates some mm³/min for ultrafast laser processing
- Quality excellent but productivity much too small for many industrial applications
- Productivity determined by average power
- → Power-scaling to the kW-range
- $P = E_P \cdot f_{rep}$
 - Scaling by pulse energy
 - Scaling by repetition rate



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Why individually modulated Multi-Beams?

Multi-Beam approach unlimited scalability in principle

Source: ILT

- Restricted by field distortions
- Only periodic structures
- Overcoming the restrictions by flexible multi beam approach



Source: ILT



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Concept and Idea: The "Laser Matrix Printer"

- FPGA-based control scheme
- Large spot distance (~5mm) to avoid thermal interactions
- Femtoseconds for high throughput, high quality and high reproducibility
- Pulse Bursts for increased surface quality
- Scan field correction for each beamlet
- Encoder-based control scheme/arbitrary scanning
- Use of pulse on demand/free-trigger





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MultiFlex: The Project





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MultiFlex: Changing Ultrafast Laser Processing

- Productivity increase up to factor 100
- 10 times higher laser power
- 20 times faster control system
- New dimension of flexibility for Multi-beam processing
- New, large area applications possible
- Highest degree of freedom pixel by pixel ablation
- Efficient use of available laser power
- Replacing environmental problematic technologies







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The Consortium

Flex



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Where to find us?

- Webpage: <u>www.multiflex-project.eu</u>
- Twitter: @MultiFlex_EU
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Source: ILT



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