The PULSE Project

High-Power Ultrafast Lasers Using Tapered Double-Clad Fiber

This project is an initiative of the Photonics Public Private Partnership and has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 824996

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The EU funded PULSE project brings 12 partners throughout Europe together for one mission – enabling the shift to an advanced manufacturing industry by developing a high-power pulsed laser system.

Europe is the world leader in laser technology, and maintaining this lead is important. To do this, new materials processing technologies must be developed at a competitive cost – and PULSE intends to provide this.

Using state-of-the-art techniques, we aim to build an ultra-high power 2.5kW laser system providing ultrashort pulses down to femtosecond range with repetition rates up to 1GHz.

**Our main focuses:**

- **Ultra-Hard Materials Cutting**
- **Automotive Boron Steel Cutting**
- **Welding of Dissimilar Materials**
- **Laser Surface Texturing**

"This is a truly innovative project with genuine prospects to revolutionise laser-based digital manufacturing and reap huge economic benefits for Europe."

- **Tapered Fiber Amplifiers**
  - High immunity to nonlinear effects
  - Large mode diameter
  - Pure single-mode operation
  - Low cost production

- **High-Power Polygon Scanner Technology**
  - Extreme high-power operation
  - Ultra-high speed of up to 1.5 km/s
  - Precise control of the processing

- **3D Nano-Imprint Lithography**
  - Complex geometry directly on the top of the fiber
  - High-power resistant materials
  - Beam tailoring optics

- **High Purity Glass Material**
  - Single mode delivery fiber
  - Extreme high peak power damage threshold
  - High beam quality, immunity to bending

- **Fully Integrated Laser-Machining System**
  - Full integration of the above components
  - Fully developed software and algorithms for machine control
  - Precise positioning of the scanner head relative to the workpiece

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The laser is only part of the story, with additional technological advances being established by the consortium enabling the laser to travel at over 5,000km per hour over a material surface, allowing for faster manufacturing processes.

This technology will revolutionise the manufacturing industry whilst maintaining Europe’s rightful place at the apex of laser technology.