

Lappeenranta University of Technology

Ever since its foundation in 1969, Lappeenranta University of Technology, LUT, has brought together technology and economics in a pioneering spirit. LUT's strategic focus areas are green energy and technology, the creation of sustainable competitiveness and operation as a hub of international Russian relations. Our international scientific community consists of 7 000 students and experts.

LUT Laser – Laboratory of Laser Materials Processing – is a part of Lappeenranta Laser Processing Centre (LPC) which is a joint institute between LUT and VTT (Technical Research Centre of Finland). The research facilities are located in the city of Lappeenranta in south-eastern Finland. LUT Laser has a significant influence to laser processing in Finland, and most of the laser related businesses in Finland today have history with LUT Laser.

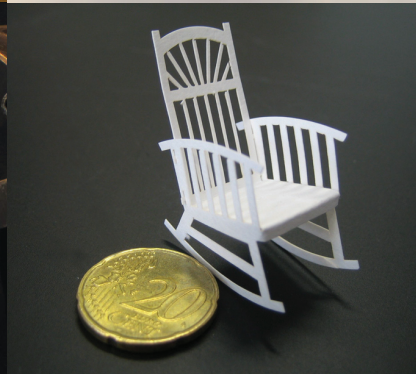
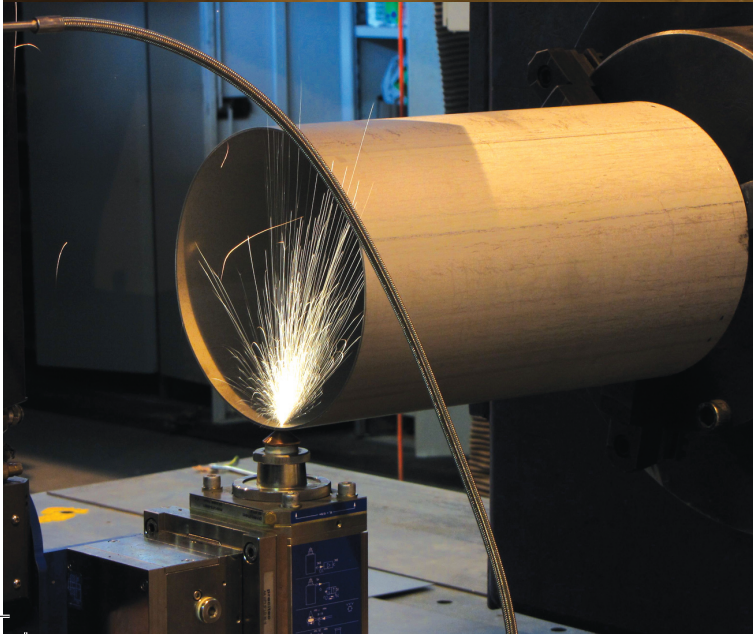
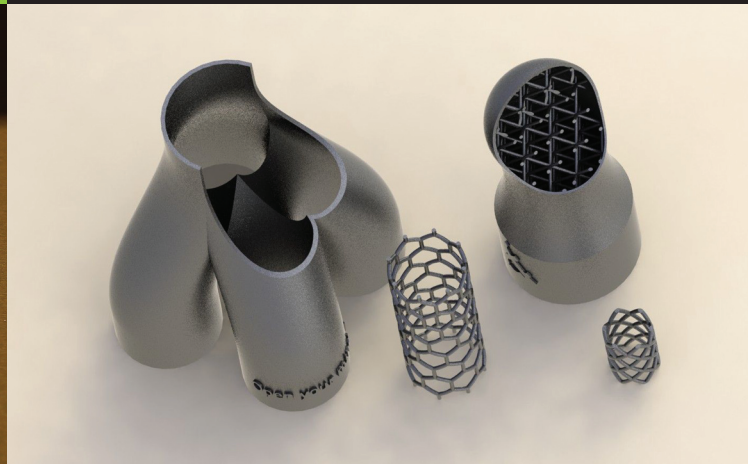
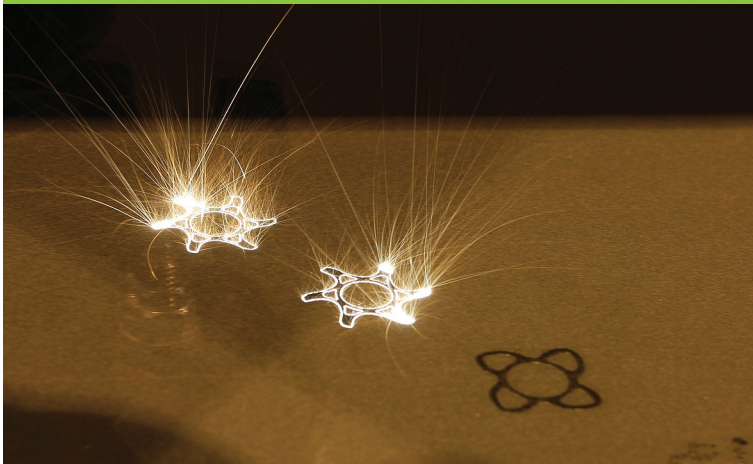
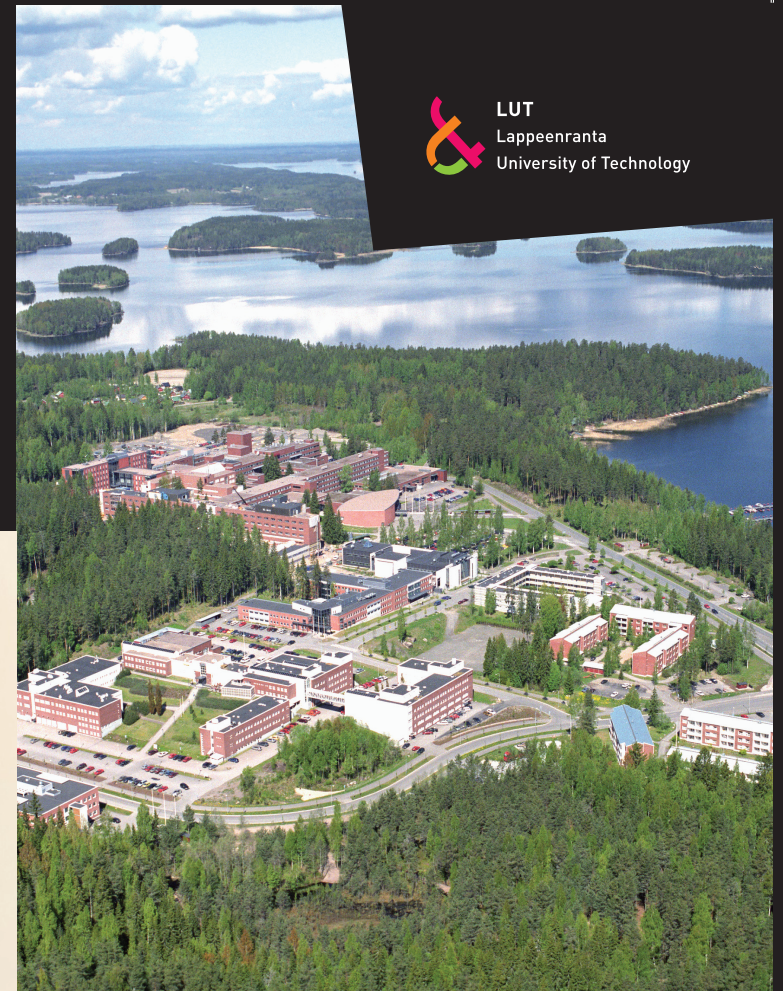
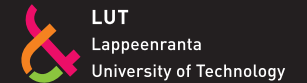
Venue

LUT Laser, Future Factory,
Tuotantokatu 2, Lappeenranta, Finland

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APPOLO Workshop

5Th of June, 2015
Lappeenranta, Finland

Online Monitoring in Laser Processing



www.lut.fi/laser
www.appolo-fp7.eu

APPOLO in Brief

During more than 50 years of the existence, lasers have been proved as the unique tool for diverse material processing application. New application ideas, coming from universities and research institutions, are implemented usually by spin-off companies with limited resources for market penetration. Research laboratories are using universal tools (laser machines), while the effective and low-cost production requires adaptation of the processes and equipment during the technology assessment phase by the end-user. The process and equipment go jointly.

APPOLO concept

The APPOLO project seeks to establish and coordinate connections between the end-users, which have demand on laser technologies for (micro)fabrication, knowledge accumulated in the application laboratories of research institutes and universities and the laser equipment manufacturers (preferable SMEs: for integration, lasers, beam control and guiding, software, etc.) in order to facilitate faster validation of the process feasibility and adaptation or customization of the technology (equipment) for manufacturing conditions, including reliability of components and their interaction as well as assessment of the dedicated production processes in terms of the process speed, quality and repeatability.

APPOLO Activities

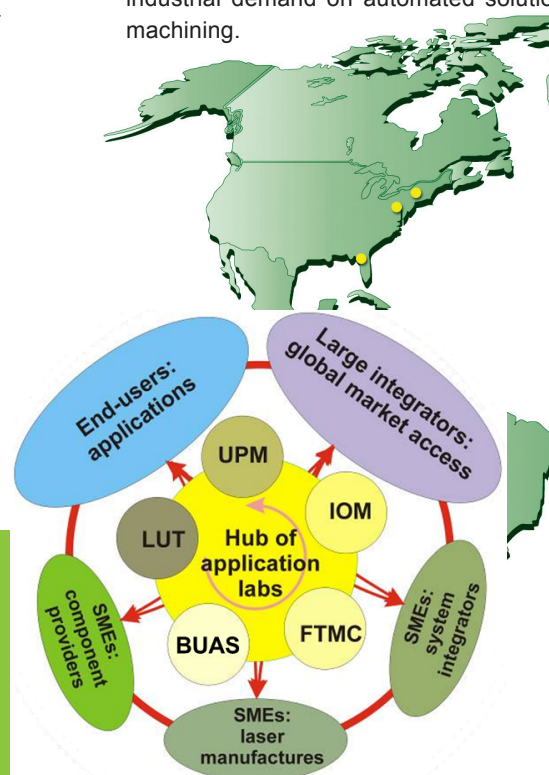
- CIGS scribing cluster: Assessment of new equipment & reliable laser scribing processes
- Texture cluster 1: Fast structuring for printing & decoration
- Texture cluster 2: Surface functionalisation
- Laser Direct Writing cluster 1: 3D interconnections on plastics
- Laser Direct Writing cluster 2: LIFT for Photovoltaic Applications
- On-line monitoring tools

APPOLO Workshop

- Online Monitoring in Laser Processing
- 5Th of June, 2015
- LUT Laser, Future Factory, Tuotantokatu 2, Lappeenranta, Finland

Online Monitoring in Laser Processing

Laser micro machining and laser surface structuring are innovative manufacturing technologies, and useful with a wide range of machinable materials. They both offer high levels of flexibility. During the last few years, these technologies experienced a strong increase in their industrial application. New process requirements involving precise monitoring and quality assurance play crucial roles. Process monitoring in laser micro machining control, not only an indirect acquisition of the focus position or processed material removal depth, but also a direct recording of the melting pool are possible. However, these techniques struggle with inherent disadvantages such as a relatively high uncertainty, the high material dependency, low lateral accuracy (capacitive sensors), or an indirect acquisition of process parameters (systems based on process related phenomena). In particular, for the processing of non-metals, only a few of these monitoring techniques are applicable. In addition, the large number of influencing parameters in laser processes leads to a time-consuming process set-up and configuration, especially in setting the laser process parameters for new materials and new laser devices. In this context, there is a strong industrial demand on automated solutions suited for micro machining.



Topics of the workshop

- Development and validation of on-line laser processing monitoring and beam control systems
- On-line process control during the assessment experiments
- Tool assessment and tool integration into laser processing monitoring.
- Real-Time control and control algorithms development in laser Processing

