

Laser Center

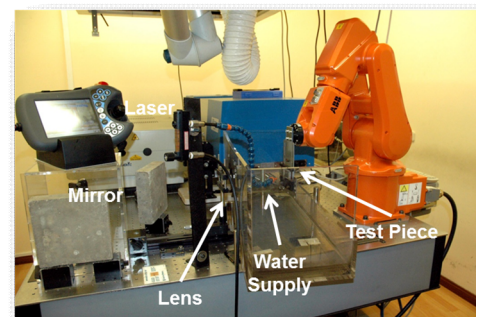
The main activity of the UPM Laser Center is applied to research in industrial processes based on laser technology for transfer to industry. Currently, the UPM Laser Center is a member of the Laboratories Hub of the FP7 APPOLO project, serving as a link between the European optoelectronic industry and different strategic industrial sectors to increase their productive capacity through the use of latest generation laser technology.

His lines of research cover processes ranging from improving the mechanical properties of metallic materials through very high-power laser treatments, to tissue engineering in biomedicine through manufacturing based on transfer of biological material with lasers. The UPM Laser Center has a laser microfabrication service available to its users equipped with the latest generation systems and characterization laboratories with different microscopy techniques and material properties analysis.

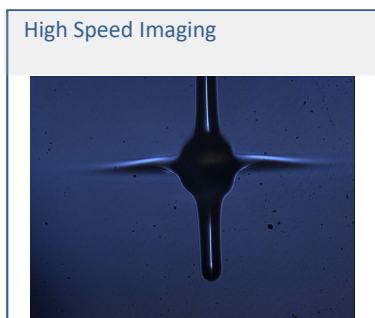
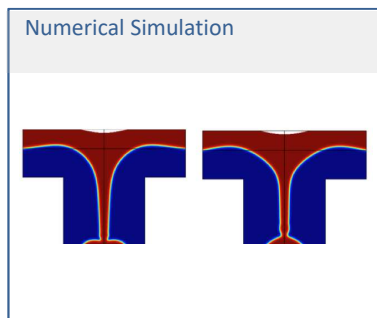
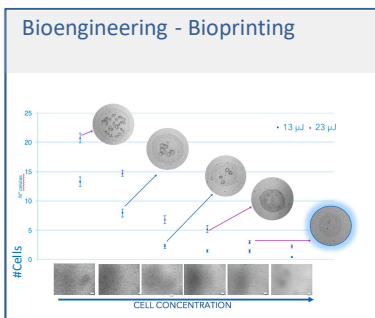
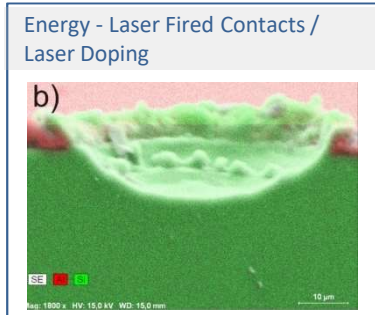
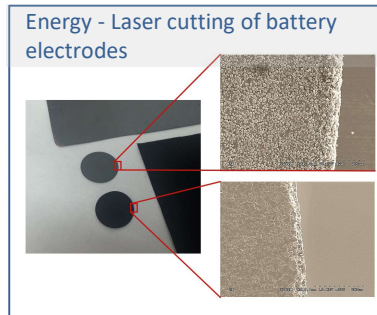
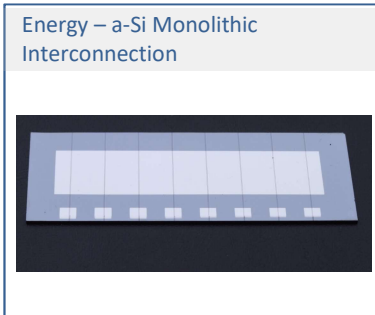
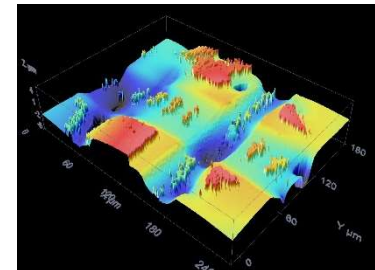
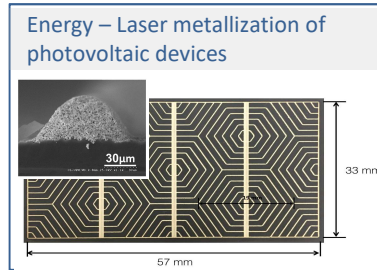
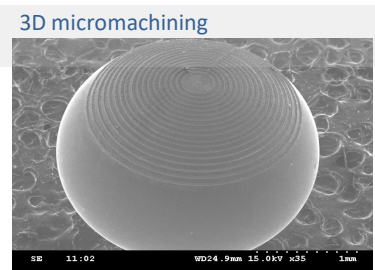
Facilities and infrastructures



- ❑ Robotized Laser Processing Cell (6 DoF) including:
 - 3,3 CW fiber transmitted Nd:YAG Laser.
 - 3,5 CW CO₂ (slab) optically transmitted.
 - Hybrid Laser-Arc welding + heat treatment / cladding equipment.
- ❑ Laser Shock Processing Cell including:
 - Pulsed (2,5 J, 10 ns, 10 Hz) Nd:YAG Laser.
 - 6 DoF Robotized positioning system.
 - Spectroscopic + fast camera Plasma analysis system.
- ❑ Laser microprocessing lab., including:
 - Microprocessing workstation OPTEC ML-100 equipped with KrF + Nd:YVO₄ (mW range) ns lasers.
 - Microprocessing workstation OPTEC AB-200 equipped with PULSEO (100 kHz, 25 ns, 10 W) and VANGUARD (80 MHz, 20 ps, 8 W) Nd:YVO₄ lasers.
- ❑ Mechanical testing laboratory equipped with MTS 100 kN system.
- ❑ Microscopy (SEM + confocal) and Surface Characterization (wear, corrosión, residual stresses) laboratories.
- ❑ For the development of models for the predictive assessment of laser processing applications, the Group operates a moderate range workstation based computational centre.



Research areas associated with Big Science



Main projects in Big Science

- *Monitoring Laser Peening for Stress Corrosion Cracking and Fatigue Resistance Enhancement of Launchers External Structures (LASER EXPRO; ESA).*
- *FP7 **APPOLO** Hub of Application Laboratories for Equipment Assessment in Laser Based Manufacturing. ^{ISEP}European Project FP7-2013-NMP-ICT-FOF. 2013-2017. ^{ISEP}Coordinator: G. Raciukaitis (FTMC – Lithuania).*
- *Mechanisms of residual stress generation in mechanical surface treatment: the role of cyclic plasticity and texture (MEDUSA; US-EOARD).*
- *Intelligent Manufacturing of Advanced Materials for Transport, Energy and Health Applications (MAT4.0-CM; CAM).*
- *LSP Treatment of Biodegradable-Resorbable Mg alloys for improved in-body mechanical performance (LSP-BIOMAG; AEI).*

Collaboration with Large European Scientific Facilities

- ***HiLASE, ZAL and ILL:** laser shock processing as a method for the induction of compressive residual stresses fields in metallic alloys.*
- ***ILL:** use of neutron diffractometry for the characterization of microstructural transformations following high rate deformation of Ti6Al4V by laser shock processing.*
- ***ILL:** analysis of the effect of pre-processing conditioning on the microstructural transformations following laser shock processing of Ti6Al4V.*

Software, tools or licenses to be applied to Big Science

- ***COMSOL** software.*
- *High Speed Imaging System (25 ns resolution).*

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