



POLITECNICO
MILANO 1863

DIPARTIMENTO DI MECCANICA

LAMBDA Lab

Measurements for biomedical applications Fiber optic and image-based solutions for measurements

Description:

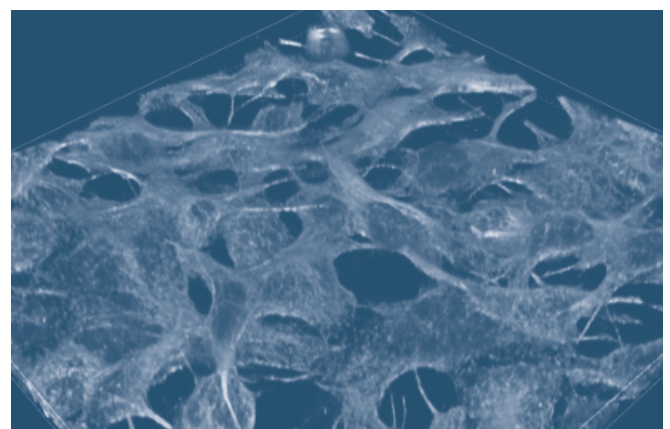
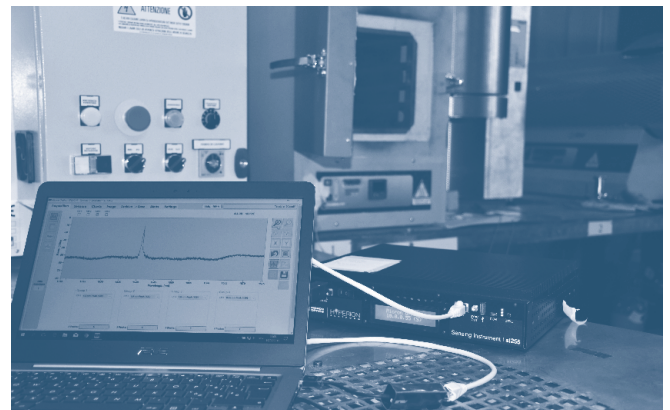
The Lambda Lab (Laboratory of Measurements for Biomedical Applications) is part of the Measurement and Experimental Techniques area. The main research fields of the group are based on fiber optic and image-based measurements for biomedical applications, along with light-based approaches for minimally invasive therapy and monitoring. The Lambda Lab develops innovative and experimental solutions for thermometry in biological tissues undergoing laser and nanoparticles-enhanced photothermal treatments. The team works on novel algorithms for temperature-based therapy control, and in the field of hyperspectral imaging for biomedical applications. A new research line is developed in the field of biomechanical monitoring for health and sport activities.

References:

European Research Council (ERC), Fondazione Cariplo and Regione Lombardia, Ministry of University and Research (MUR).

Instruments & Facilities:

- Interrogators for multipoint fiber optic sensing, static and dynamic full-spectrum analysis, in the ranges 800-900 nm and 1460-1620 nm
- Core Alignment Fusion Splicer for optical fibers splicing
- Fiber Bragg Grating sensors with custom-made features
- Laser sources operating within the therapeutic window (808-1064 nm) in both continuous and non-continuous modes
- Enclosure and systems for laser safety
- Infrared imaging for contactless thermal field measurements
- Hyperspectral camera working in the range 400-1000 nm (VIS-NIR)
- Thermal property analyzer
- 3D printer
- Workstation
- Magneto-inertial measurement units
- Power meter, thermopile and thermocouples



- Different laser applicators (200-300-400-600 μm) and collimators for contact and contactless target irradiation

Activities:

Thermometry for biomedical applications

- Temperature measurement in tissues undergoing thermal ablation procedures
- Sensors-based temperature measurements
- Infrared thermometry
- Diagnostic imaging for thermometry (Magnetic Resonance Thermometry)

Measurements for photothermal therapy

- Thermal characterization of nanoparticles-embedded phantoms
- Measurement of thermal properties of biological tissues
- Hyperspectral-based estimation of biological thermal damage
- FEM analysis

Fiber optic-based measurements

- Thermometry for biomedical applications
- Shape sensing, strain for prosthetic devices

Other expertise

- Experience with cell cultures and in vivo models (accredited)
- FEM analysis and Monte Carlo-based simulations of laser-tissue interaction
- Biomechanical monitoring for health and sport activities

