

Collaboration Statement for Lithuania-Taiwan Proposal (Laser Technologies (Green Energy Technologies)) from Terahertz Spectroscopy and Nonlinear Optical Phenomena group of Vilnius university Laser research center

Our laboratory offers advanced expertise in ultrafast laser technologies with potential/direct applicability to next-generation green energy systems and drone-based solutions. We operate femtosecond Yb:KGW laser systems (fundamental and second harmonic) integrated with high precision galvanoscanner micromachining capabilities, enabling controlled micro- and nanoscale material modification. This includes the fabrication of LIPSS (Laser-Induced Periodic Surface Structures) for enhanced optical, mechanical, and functional surface properties.

We have also been working for a long time on developing Ti:Sapphire and Yb:KGW laser-based broadband terahertz radiation sources and their application to time-resolved spectroscopy and the characterization of various materials, including laser-created air plasma.

In addition, our dedicated LIBS (Laser-Induced Breakdown Spectroscopy) interaction chamber supports rapid elemental analysis for material development, quality control, and in-situ diagnostics. Together, these tools allow us to prototype, optimize, and characterize materials and components across a wide range of emerging applications.

Within the scope of this collaborative proposal, our laboratory can contribute to:

Green energy technologies:

- Laser texturing of surfaces to improve light absorption, catalytic activity, or energy harvesting efficiency.
- Ultrafast laser micromachining for high-precision patterning of battery, photovoltaic, and hydrogen-generation components.
- LIBS for compositional analysis of energy materials, coatings, and recycling streams.
- Terahertz spectroscopy and characterization of various materials.