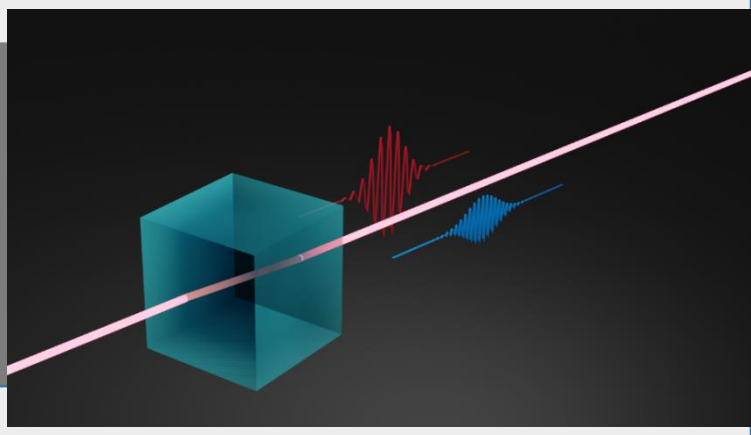
Laser Research Center

Group of Terahertz Spectroscopy and Nonlinear Optical Phenomena in isotropic media (TSNOP)

Group Leader: Dr. (HP) Virgilijus Vaičaitis

Researchers: Dr. Viktorija Tamulienė, Dr. Ona Balachninaitė

PhD students: Danas Buožius, Julius Skruibis



Research group activities

- Development of novel methods for terahertz radiation generation, characterization and its applications
- Numerical simulation of nonlinear optical phenomena in air including third harmonic and terahertz radiation generation
- Microfabrication of transparent and metallic materials with femtosecond laser systems in order to produce various compact optical elements (filters, lenses, polarizers) suitable for terahertz spectral range
- Numerical modelling of propagation of THz radiation through periodically modulated surface-relief gratings
- Application of Laser induced breakdown spectroscopy (LIBS) for monitoring plasma induced by femtosecond laser pulses in air and for analysis of various materials

Proposal

- Long term or project based collaboration with academia and industry towards development of various optical elements by ultrafast laser machining, LIBS material characterization, terahertz radiation generation, characterization and its applications and advanced nonlinear applications.
- Feasibility studies or small scale batch production are available via open access facility “NAGLIS”.

International scientific collaboration:

Linköping University (Dr. C. Ponseca); Leibniz University of Hannover (Prof. U. Morgner); Max Born Institute (Dr. I. Babushkin); Cairo University (Dr. A. Galmed), University of Patras (Prof. S. Couris); Université de Bordeaux (dr. L. Bergé), Université de Lyon (dr. S. Skupin), Patras University (Prof. S. Couris), Aristotle University of Thessaloniki (Dr. N. Semaltianos), Cairo University (Dr. A. Galmed)

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Research outcomes

According to WoS databases the group released over 140 research papers, that were cited more than 950 times. The most important/recent publications are:

- V. Vaičaitis *et al.*, Influence of laser-preformed plasma on THz wave generation in air by bichromatic laser pulses, Laser physics, 28, art. no 095402 (2018).
- J. Skruibis, O. Balachninaitė, S. Butkus, V. Vaičaitis, V. Sirutkaitis., Multiple-pulse laser-induced breakdown spectroscopy for monitoring the femtosecond laser micromachining process of glass", Optics and Laser Technology 111, 295-302 (2019).
- O. Balachninaitė, V. Tamulienė, L. Eičas, V. Vačaitis, Laser micromachining of steel and copper using femtosecond laser pulses in GHz burst mode, Results in Physics, Vol. 22, p. 103847 (2021), doi: 10.1016/j.rinp.2021.103847
- D. Buožius, B. Motiejūnas, V. Vaičaitis, and V. Tamulienė, Emission of conical THz radiation induced by bichromatic pump X waves in an air plasma, Phys. Rev. A 105, 023521 (2022).
- O. Balachninaitė, J. Skruibis, A. Matijošius and V. Vaičaitis, Temporal and spatial properties of plasma induced by infrared femtosecond laser pulses in air, Plasma Sources Sci. Technol. 31(4), 045001 (2022).
- V. Vaičaitis, V. Tamulienė, Beam-distortion enhanced terahertz radiation generation in air, Results in Physics, 42, 105985 (2022).
- Babushkin, I., Galán, Á.J., de Andrade, J.R.C. et al. All-optical attoclock for imaging tunnelling wavepackets. Nature physics 18, 417–422 (2022).
- V. Vaičaitis, O. Balachninaitė, A. Matijošius, I. Babushkin, and U. Morgner, Direct time-resolved plasma characterization with broadband terahertz light pulses, Phys. Rev. E 107, 015201 (2023).

Resources

- Automated setups of ultrafast lasers synchronized with linear stages and galvo-scanners for spatio-temporal selective light-matter interaction (DLW setup with widely tunable exposure conditions);
- Femtosecond Yb:KGW and Ti:sapphire laser systems;
- Chemistry laboratory for sample preparation, development, spin-coating and vacuuming;
- Access to and expertise in scanning electron microscopy and optical profilometry inspections;
- Custom optical setup for femtosecond LIBS measurements.
- 8-core processor computer for spatio-temporal numerical simulations

Contacts

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