PHYSICAL AND TECHNO-LOGICAL SCIENCES

Ultrafast Nonlinear Optics Group

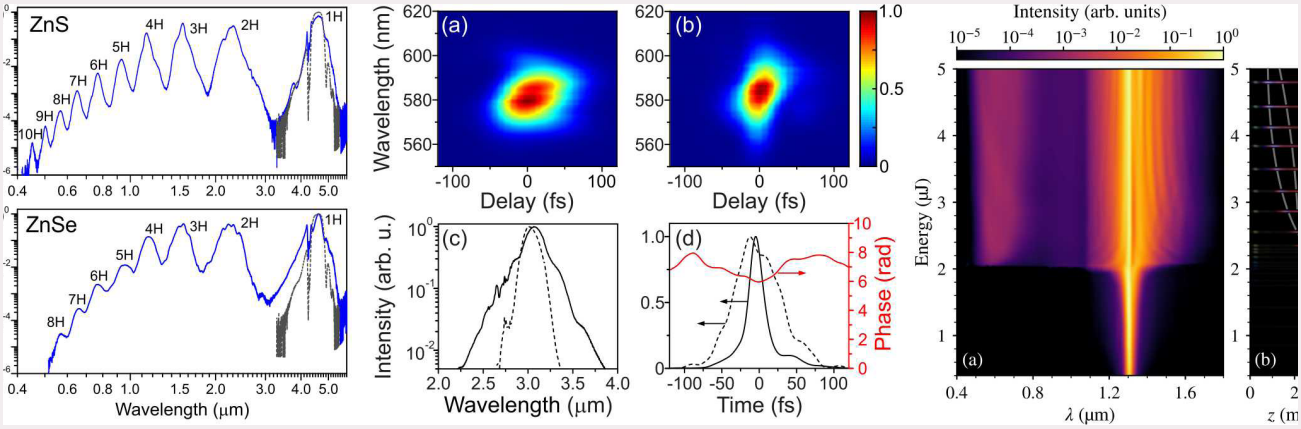
Keywords: femtosecond filamentation, supercontinuum generation, few optical cycle pulses

Vilnius University

Research group activities

Ultrafast Nonlinear Optics Group is engaged in the following actities:

- Ultrafast laser-matter interactions;
- Femtosecond filamentation and supercontinuum generation in bulk solid-state materials;
- Generation, amplification and compression of few optical cycle pulses.



From left to right: harmonics spectra in polycrystalline ZnS and ZnSe excited by 100 fs, 4.6 μm laser pulses; self-compression of 70 fs pulses at 3 μm in a YAG plate making use of anomalous GVD; experimentally measured dynamics of supercontinuum generation and filament-induced luminescence in sapphire.

Proposal

Long term or project based collaboration with academia and industry towards development of new ultrabroaband light sources. The research targets development of novel techniques for pulse compression and generation of coherent ultrabroaband radiation based on self-action effects of intense light pulses in transparent bulk materials, including laser hosts, semiconductors, and short and far range-order nonlinear photonic crystals at high pulse repetition rates.

Meet our team

Leading researcher: Prof. Audrius Dubietis, h-index – 31.

Staff:
Prof. Gintaras Valiulis, Dr. Vytautas Jukna, Dr. Gintaras Tamošauskas

PhD students:
Nail Garejev, Rosvaldas Šuminas, Agnė Marcinkevičiūtė.

Research outcomes

1 monograph, 3 book chapters, 2 review papers, > 170 research papers, > 4500 citations. The most important publications are:

A. Dubietis and A. Couairon, Ultrafast supercontinuum generation in transparent solid state media, Springer Nature, Cham, Switzerland, ISBN 978-3-030-14994-9, 125 p., 2019.

A. Dubietis et al., Light filaments without self-channelling, Phys. Rev. Lett. 92, 253903 (2004).

J. Darginavičius et al., Ultrabroadband supercontinuum and third-harmonic generation in bulk solids with two optical-cycle carrier-envelope phase-stable pulses at 2 μm, Opt. Express 21, 25210-25220 (2013).

D. Majus et al., Nature of spatiotemporal light bullets in bulk Kerr media, Phys. Rev. Lett. 112, 193901 (2014).

R. Šuminas et al., Multi-octave spanning nonlinear interactions induced by femtosecond filamentation in polycrystalline ZnSe, Appl. Phys. Lett. 110, 241106 (2017).

A. Marcinkevičiūtė et al., Femtosecond filamentation and supercontinuum generation in bulk silicon, Opt. Lett. 44, 1343-1346 (2019).

International scientific collaboration:

Centre de Physique Théorique, Ecole polytechnique, CNRS, Institut Polytechnique de Paris (Prof. A. Couairon), University of Insubria (Prof. P. Di Trapani), University of Glasgow (Prof. D. Faccio), University of Eastern Finland (Prof. J. Turunen).

Cooperation with industry:

Light Conversion, Eksma Optics.

Resources

- Amplified Ti:sapphire (100 fs, 800 nm, 1 kHz) and Yb:KGW (200 fs, 1030 nm, 10-200 kHz) laser systems with broadly tunable optical parametric amplifiers and DFG, accessible wavelength range 400 nm – 5 μm;
- High dynamic range fiber and scanning spectrometers, detection range 200 nm – 5.8 μm available through a single scan;
- Pulse characterization: SFG and DFG FROG, 3D mapping;
- Fully automated experiments and data acquisition.

Contacts

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