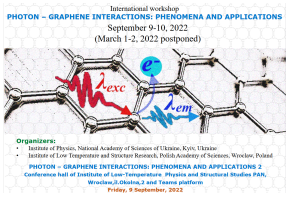
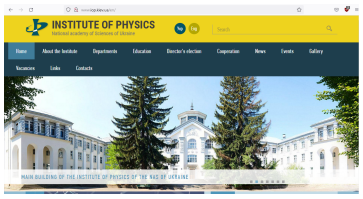


Laser Femtosecond Complex

within **the Institute of Physics of NAS of Ukraine**

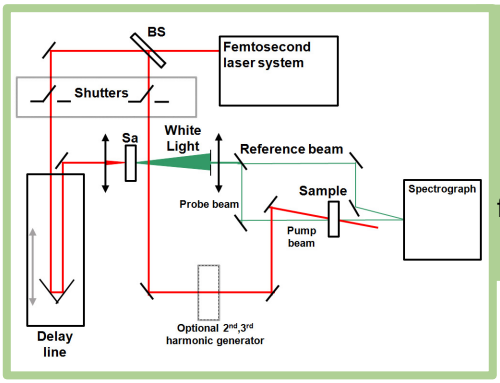
Facilities and applications



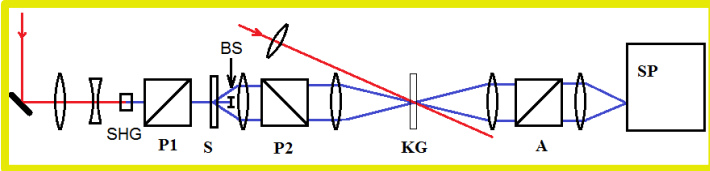
I. Blonskyi, *I. Dmitruk, A. Dmytruk, V. Kadan, I. Pavlov, P. Korenyuk, A. Rybak*

The LFC was put into operation in 2005, aiming initiation and development in Ukraine of the investigations of ultra-fast electronic processes at femto- picosecond time scale, laser-induced structural transformations in materials under intense optical excitation of up to 1 EW/cm^2, precise laser technologies of micro-processing of materials, education and training of graduate and PhD students in the field of laser physics.

Experimental techniques:

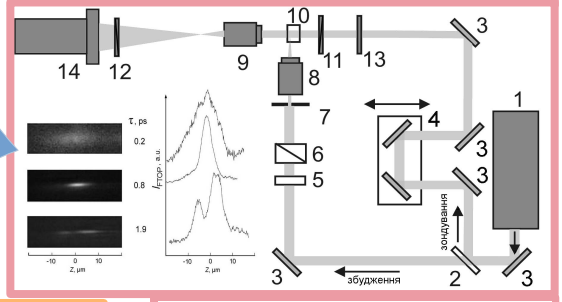


"Pump-probe" for transient absorption measurements (temporal resolution is 150 fs, spectral range is 450÷650 nm)

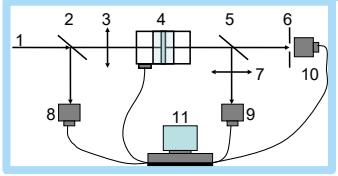


"Kerr gate" for secondary emission spectroscopy (temporal resolution is 300 fs within 2 ns time domain, spectral range is 350÷1050 nm)

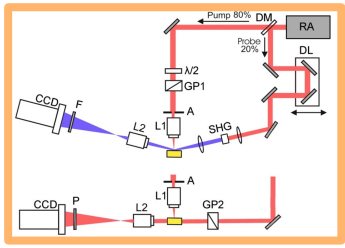
Laser pulse compression up to 65 fs

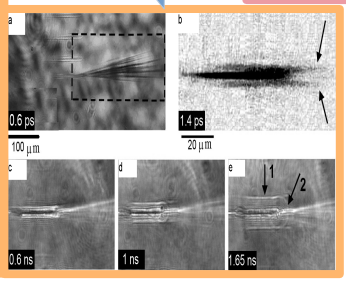


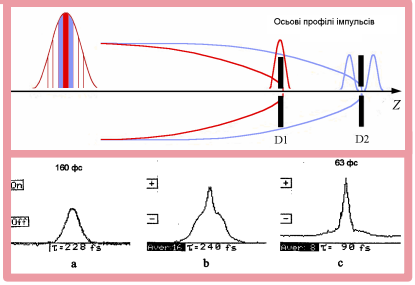
"Z-scan" for nonlinear index n_2 (Kerr nonlinearity) and the nonlinear absorption coefficient characterizations



Femtosecond time-resolved polarization **microscopy and shadowgraphy** techniques for direct observation of space-time transformations of a femtosecond laser pulse in transparent media (temporal resolution is 65 fs, spatial resolution is 2 μm)







The areas of **fundamental research**:

- filamentation of laser radiation;
- induced anisotropy of surface plasmons;
- conical light emission;
- sub- and superluminal light pulse propagation;
- supercontinuum white-light emission within 300 nm ÷ 4 μm spectral range;
- laser-induced periodic surface structure (LIPSS) formation features.

Implemented **applications**:

- arrays of microlenses and micromirrors have been produced;
- biocompatibility of implants has been improved by laser-induced surface structuring;
- kinetics of laser damage of materials has been studied in femto- nanosecond time domain;
- optical recording and erasing has been demonstrated in copper-silica nanocomposite.

Selected recent **publications**:

- І. В. Блонський, В. М. Кадан. Ультракороткі надпотужні світлові імпульси в конденсованих середовищах (монографія) // Наукова думка, Київ, 2017, 189 ст.
- V. Kadan, I. Blonskyi, I. Pavlov. Time-resolved microscopy of femtosecond laser filaments in fused quartz // Optics Communications 2022, 505, 127497.
- A. Dmytruk, I. Dmitruk, N. Berezovska, A. Karlash, V. Kadan, I. Blonskyi. Emission from silicon as real time figure of merit of LIPSS formation // Journal of Physics D: Applied Physics 2021, 54, 265102.
- I. Blonskyi, V. Kadan, O. Shpotyuk, L. Calvez, I. Pavlov, S. Pavlova, A. Dmytruk, A. Rybak, P. Korenyuk. Upconversion fluorescence assisted visualization of femtosecond laser filaments in Er-doped chalcohalide 65GeS2-25Ga2S3-10CsCl glass // Opt. Laser Technol. 2019, 119, 105621.

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