IMPRS UFAST

MAX-PLANCK-GESELLSCHAFT

IMPRS UFAST core course

Non-linear optics

Tobias Herr

Abstract:

Nonlinear optics describes the fascinating dynamics arising from nonlinear light-matter interactions. It enables the synthesis of light across the electromagnetic spectrum, from microwaves to X-rays, and is essential for advanced light sources in the study of ultrafast phenomena, quantum optics and emerging photonic technologies.

This course will provide an overview of prominent nonlinear optical effects such as sum and difference frequency generation, harmonic and continuum generation and provide insight into key concepts such as conservation laws and phase matching. We will then make the connection to a quantum mechanical description of nonlinear phenomena and extend the discussion to non-perturbative high-harmonic generation.

Topics include:

- Propagation of light through optical media and origin of optical nonlinearity
- Overview of nonlinear optical effects and examples of application
- Second and third order nonlinear processes
- Conservation laws and phase matching

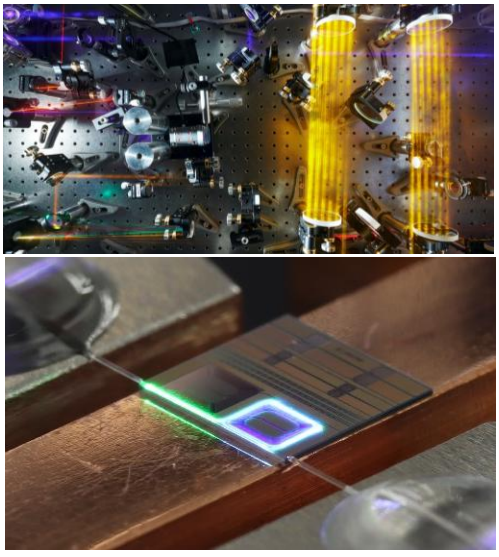


Image credit: (left: DESY/UMP, right: DESY/UFOX).

Bldg. 99 (CFEL); SR O2.068
19th – 21st January 2027
09:00 h – 11:00 h

Register on Geventis: I-UF C6
Registration deadline: 12th January 2027

CFEL SCIENCE

DESY.

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

European XFEL

MAX-PLANCK-GESELLSCHAFT