French-German Research Institute of Saint-Louis

The **French-German Research Institute of Saint-Louis (ISL)** situated in the border triangle of Germany, France and Switzerland is an internationally renowned research institute belonging to a global industrial and economic network.
The spectrum of our core activities comprises a variety of topics: aerodynamics, energetic and advanced materials, lasers and electromagnetic technologies, protection, security and situational awareness. Our activities are related to both basic and applied research.

ISL is offering a **PhD Position**

Research Field: Laser and electromagnetic technologies

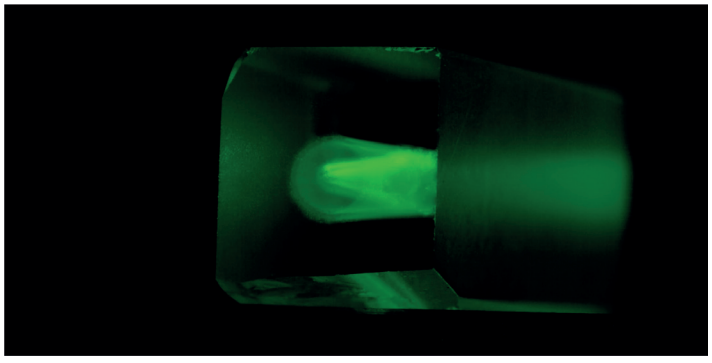
Investigation on pulsed 2 µm-laser operation based on photo-elastic effects in double-tungstate crystals

Topic description

Double-tungstate crystals like KYW or KGW are monoclinic, materials with very interesting anisotropic optical, acoustic and thermal properties. They exhibit three main indices of refraction building up its own index eigenframe, which is not attached to the crystallographic eigenframe and can, e.g., cause specific effects like conical refraction. Many other material related parameters (spectroscopic cross sections, thermal conductivity, thermal expansion, sound velocity etc.) do also depend on the crystal orientation or on the polarization of the propagating light, with often their own eigenframes not directly linked to the other ones. Thus, a proper choice of crystal cut and propagation can allow for interesting phenomena which enhance laser power or brightness, e.g. by counteracting thermo-optic effects in index (dn/dT) and expansion (dl/dT) or thermally-induced stress.

References

- R. CATTOOR et al., Wavelength dependence of the orientation of optic axes in KGW, Applied Physics B, 116 (4), 831-8362014, 2014
- R. CATTOOR et al., Laser action along and near the optic axis of a holmium-doped KY$(WO_4)_2$ crystal, Optics Letters 39 (22), 6407-6410, 2014.
- R. CATTOOR et al., Orientation and polarization dependence of both the absorption and the laser efficiency around the optic axis in monoclinic Ho^{3+}:KYW, Appl. Phys. B 120, 451–459, 2015.



Job Description/Objectives

The aim of this work is to investigate such laser crystals for 2 µm operation and the feasibility of novel laser devices based on these materials. Thermo-optic and acoustic properties of doped KYW or KGW materials for 2 µm laser emission will be analyzed. In addition, laser performance for optimized geometries of monoclinic lasers (pulse energy, efficiency, (average) power) under various pumping and lasing conditions and optimization of laser operation for maximum output power will be investigated.

You will work in a group of 15 researchers, PhD candidates and engineers in the field of development of new laser sources, including new lasing materials (holmium, thulium, erbium), nonlinear crystals such as zinc germanium phosphide (ZGP), doped fibers, non-planar optical parametric oscillators (OPOs) and innovative diode pumping schemes for lasers from 1.6 µm to beyond 5 µm.

Candidate Profile
Qualified diploma or master's degree in photonics, laser physics, or crystal solid-state physics.

University supervisor: Inka Manek-Hönninger, CELIA Université Bordeaux 1 - 351 Cours de la Libération - 33405 Talence Cedex - France

French-German Research Institute of Saint-Louis (ISL)
Anne DHOLLANDE / Christelle KIELECK – Directed photonics and applications
5 rue du Général Cassagnou – 68301 Saint-Louis – France
anne.dhollande@isl.eu – tel : +33 (0)3 89 69 53 69 / christelle.kieleck@isl.eu – tel : +33 (0)3 89 69 58 70

www.isl.eu