The Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy in Berlin coordinates an European consortium working on novel lasers for neurosurgery

19 representatives of the 9 partners and 4 guests took part in the kick-off meeting of the EU project MIRSURG on June 24-th in Berlin. After greetings by the Managing Director of the Forschungsverbund Berlin e.V. and one of the Directors of the Max-Born-Institute (MBI), the official programme included individual presentations of all partners and their plans, discussions of organisational issues, and 3 scientific talks given by members of the consortium. Within the unofficial part of the meeting the day before, the partners had the chance to visit some of the MBI laboratories.

A total of 9 institutions (5 academic and 4 industrial partners) are collaborating in a 3-year Specific Targeted Research Project (STREP) called MIRSURG (**M**id-**I**nfra**r**ed Solid-State Laser Systems for Minimally Invasive **Surg**ery) with an overall cost of € 3.9 M.

The main goal of the project which started on June 1st, is to develop advanced table-top solid-state photonic sources for a specific wavelength in the mid-IR spectral range, as a practical, reliable and cost-effective alternative to large-scale free-electron lasers (FELs), for an important application in biomedicine (health): minimally invasive surgery. The project is funded by the ICT (Information and Communication Technologies) part of the European Union's 7th Framework Programme (DG Information Society & Media – Photonics) with a grant of € 2.8 M.

Previous experiments have verified that the use of mid-IR FEL at wavelengths near 6.45 µm, with a focused beam penetration depth comparable to the cell size and coupled both into the spectral wing of the water bending mode and the amide-II vibrational mode, results in tissue ablation with minimal collateral damage and very effective ablation rate. This finding is extremely important as a useful tool for minimally invasive human surgery. However, the clinical use of FEL is ultimately not viable due to large size, high cost, operational complexity and restricted access at a few multi-million-dollar accelerator-based facilities worldwide.

Several attempts to develop non-FEL alternatives have largely failed to meet the necessary requirements in terms of pulse energy and repetition rate. The main strategy in this project will be to exploit nonlinear optical techniques (OPO) in combination with novel near-IR laser pump sources (near 1 and 2 µm) and new materials (e.g. orientation patterned GaAs) to obtain an unprecedented energy level (10 mJ) near 6.45 µm at a repetition rate of 100 Hz (an average power of 1 W). Two basic approaches, differing in the time structure, will provide less than few µs (macro) pulse duration.

The project encompasses four distinct elements:
(1) Material research;
(2) Pump laser development;
(3) OPO development; and
(4) Validation in tissue ablation experiments.

The 9 beneficiaries from 7 member states, with proven track record, extensive expertise, and complementary skills provide the critical mass and strong cohesion to achieve the goals of the project in the most successful, effective and timely manner.

More details on the European Project MIRSURG and the partners involved can be found at **www.mirsurg.eu**

Contact Details:

Dr. Valentin Petrov / Coordinator
MIRSURG
Max-Born-Institute,
2A Max-Born-Str.,
D-12489 Berlin, Germany
Phone: +49-30-63921272
E-mail: petrov@mbi-berlin.de