

Ph.D. scholarship in “High-power visible-near-IR Supercontinuum sources for spectroscopic photoacoustic microscopy”

A 3 year Ph.D. position is available at DTU Fotonik, Department of Photonics, Technical University of Denmark (DTU). The Ph.D. project is a part of the Marie Skłodowska Curie Initial Training Network SUPUVIR (SUPercontinuum broadband light sources covering UV to IR applications), which is a European PhD school that commences on October 1, 2016. It combines the efforts of 6 academic and 4 non-academic partners across Europe, and 15 new Ph.D. positions (5 in Denmark) are now open. Additionally the network launches a comprehensive international training program within the technology of supercontinuum laser sources at leading photonics research labs across Europe.

Project description

This particular Ph.D. project is entitled High-power visible-near-IR supercontinuum sources for spectroscopic photoacoustic microscopy (PAM). Its objectives are to improve kHz repetition rate supercontinuum sources in the visible and near-IR with respect to pulse energy, noise and repetition rate for spectroscopic multi-wavelength PAM and other spectroscopy applications. The improvements will be obtained by developing a flexible diode-modulated pump laser, as well as by fibre design, fibre tapering, and fibre concatenation. A spectroscopic PAM demonstrator will be developed that uses the improved supercontinuum source and an acousto-optic tunable filter for wavelength selection. Complete system tests will be performed and the applicability range for the supercontinuum sources will be determined. Expected Results: Demonstrate low noise and pulse energies of kHz supercontinuum sources of >200 nJ in a 10nm window, which is 5 times the pulse energy of the current state-of-the-art SuperK Compact supercontinuum source from market leader NKT Photonics. Demonstrate the improvements in spectroscopic PAM with the developed improved SC source. Secondments are planned at NKT Photonics in Denmark and RECENDT in Austria. The candidate will work closely with the other SUPUVIR candidates, especially the other 3 at DTU and the candidate at NKT Photonics.

Background to SUPUVIR

The initial training network SUPUVIR involves 15 Ph.D. positions within the broad field of supercontinuum sources, which essentially are laser sources emitting coherent laser light that is broadband enough to be considered white. Scientifically, SUPUVIR aims at solving current challenges preventing supercontinuum light sources from taking over key market shares or from being used for cutting-edge research. Specifically the objectives are to reduce noise and increase pulse energy of supercontinuum modules, as well as investigate supercontinuum generation in emerging wavelength regimes (ultraviolet and mid-infrared) including fabrication of novel fibres and waveguides, and finally using supercontinuum sources for applications as to gain valuable knowledge of application requirements. This research and development will give improved supercontinuum sources and supercontinuum spectra enabling new science and applications for optical imaging, spectroscopy, sensing and control, e.g. optical coherence tomography, IR multimodal spectroscopy, confocal and fluorescence microscopy, photoacoustic imaging and food quality control. Supercontinuum sources is an area in which Europe has developed internationally competitive research and commercial activity. SUPUVIR will exploit new emerging opportunities brought forward by the supercontinuum source through its unique properties of delivering a stable, bright, broadband and coherent light beam. SUPUVIR will provide the co-evolution of technology and applications, and hence contribute to the strategic transition of Europe to a knowledge-based society, driving the transformation of industry towards higher added value and sustainable development. SUPUVIR involves interdisciplinary research, blending nonlinear physics, applied mathematics, numerical modelling, fibre optics, material science, laser physics, as well as intersectoral applications in diverse scientific areas like physics, material science, chemistry, and bio-medicine and in the industrial sector for applications like production line

monitoring, gas sensing, imaging etc. The knowledge and experience in these complementary disciplines are present in the consortium, and will contribute to significant advancements in the field.

Qualifications

Candidates are required to have a Master's degree or a very good first degree in Physics, Engineering or Material Science, ideally with a track record within the areas of nonlinear optics, fibre optics and waveguides, and laser physics. At the time of recruitment by the host organization, candidates must be in the first four years (full-time equivalent research experience) of their research careers, and have not been awarded a doctoral degree.

Researchers can be of any nationality. They are required to undertake transnational mobility (i.e. move from one country to another) when taking up their appointment. Nationality is therefore not a criterion. Rather the location of the researcher's residence or main activity during the 3 years prior to their recruitment is determining. At the time of recruitment by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than 12 months in the 3 years immediately before the reference date. Compulsory national service and/or short stays such as holidays are not taken into account.

Approval and Enrolment

The scholarship for the PhD degree are subject to academic approval, and the candidates will be enrolled in one of the general degree programs of DTU. For information about the general requirements for enrolment and the general planning of the scholarship studies, please see the [DTU PhD Guide](#). You can read more about Department of Photonics Engineering on www.fotonik.dtu.dk

Salary and appointment terms

Salary and appointment terms are consistent with the current rules for PhD degree students. The PhD candidate will be employed on a 3 year contract at a salary equivalent to €50,494 per year supplemented by a monthly mobility allowance of €1,100 (candidates with family responsibilities) or €600 (candidates without family responsibilities).

Further information

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