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3 Doctoral Researcher (FELLOW) 3-year PhD positions available at the IFSW

HiPOVor – "High-Power Optical Vortices – From Generation to Application"

Organization/company:	Institutions across Europe in the HiPOVor Doctoral Network
Research field:	Physics, lasers and optics, non-linear optics, nanophotonics, laser applications, optical engineering, metrology
Researcher profile:	First Stage Researcher (R1)
Application deadline:	**February 28, 2026, 00:00 (CEST)**
Type of contract:	Temporary
Job status:	Full-time
Hours per week:	35-40
Offer starting date:	July 1 – September 1, 2026
EU research framework program:	Horizon Marie Skłodowska-Curie Actions 2024 MARIE CURIE (MSCA-DN)
Grant agreement number:	101226528

We are pleased to advertise 3 Doctoral Researcher (PhD) positions to begin in September 2026, as part of the Doctoral Network of the European Commission HiPOVor "High-Power Optical Vortices – From Generation to Application." The positions will all last three years, and will allow all students to participate in an exciting program comprising international schools, workshops, and secondments at academic as well as industrial partners (see the overview of the project below).

Important: Please review the webpages of the individual vacancies via the IFSW website for details:
https://www.ifsw.uni-stuttgart.de/en/institute/vacancies/

Overview of the project and of the training offered to all Doctoral Researchers of HiPOVor

The use of high-power optical vortex beams has been predicted to provide substantial benefits to many applications ranging from more precise material processing to advanced particles accelerators. However, progress has been hampered by the absence of approaches for their generation while maintaining their unique properties during propagation and/or interaction with matters.

The overall aim of HiPOVor is to train 15 ESRs to be the first generation of a workforce skilled in all aspects concerning the generation of optical vortices with high power and high modal purity and its application as a key enabling technology widely in light-matter interaction aspects.

Through the completion of interconnected individual projects in topics all together covering the full development chain, ranging from components suitable for their generation and fundamental aspects of their physical properties, to amplification, propagation in different environments and applications, the doctoral candidates will develop expert skills and knowledge to drive forward the field of high-power optical vortices.

The HiPOVor network will address gaps both in terms of technology and applications, and in terms of personnel through the innovative research approaches. The interdisciplinary and intersectoral consortium consists of 8 leading academic institutions in the field of structured light and high-power laser development, the world's most powerful laser infrastructure ELI-NP, as well as 9 industrial partners, highlighting the high potential of and interest in our project for rapid market uptake.

The results of our project promise significant impacts in strengthening Europe's scientific excellence. It will enable new products and improved processes, e.g. optical components and nanofabrication, and environmental benefits through building of a circular economy, reduction of harmful chemicals, and reduction of size and power cost of hardware via advanced technologies predicting by high power vortices.

Summary of titles and host institutions for the 3 PhD positions:

FELLOW 3 (IFSW, Stuttgart, Germany):
Thin-disk laser (oscillators & amplifiers) emitting high-power optical vortices in the IR (1030nm, 1420 nm), green (515 nm) and DUV (257.5 nm) wavelength range.

FELLOW 4 (IFSW, Stuttgart, Germany):
Development of hollow-core fibers for efficient guiding of high-power optical vortices.

FELLOW 5 (IFSW, Stuttgart, Germany):
Light-matter interactions using high-power optical vortices in laser drilling of metals.

Additional information

The successful candidates will receive a 36-month, full-time employment contract as per Marie Skłodowska-Curie Actions (MSCA) regulations for doctoral researchers. The monthly salary will be confirmed upon offer, paid in the currency of the host country, and with a correction factor applied to the host country. The approximate monthly salary before employer and statutory deductions is €4,058 (Germany); plus an additional mobility allowance of €710/month. Researchers may also qualify for a family allowance of €495/month depending on family situation at the time of recruitment. Please visit the EU MSCA website for further information.

The fellows will be enrolled in an exciting PhD program of leading academic and industrial researchers. In addition to their individual scientific projects, all fellows will benefit from a dedicated training program comprising an integrated curriculum of local and intensive network courses, schools, workshops and engagement with cutting-edge research.

Eligibility criteria

There are strict eligibility requirements within Marie Skłodowska-Curie Doctoral Networks. At the time of appointment, applicants must not have resided or carried out their main activity (work, studies) in the country for more than 12 months in the 3 years immediately before their appointment; AND shall also be in the first four years of their research careers at the time of appointment and have not been awarded a doctoral degree.

Offer Requirements, Skills and Qualifications

- Must have Masters (or equivalent) degree in Mechanical Engineering, Mathematics, Physics, or Photonics, with solid knowledge of optics and its applications.
- Must be in the first 4 years of his/her career, measured from the date of graduation (MSc degree or equivalent).
- Should not hold a PhD degree.
- Should not have resided or carried out their main activity (work, studies) in the country of their appointment for more than 12 months in the 3 years immediately before their appointment. For refugees under the Geneva Convention, the refugee procedure (i.e. before refugee status is conferred) will not be counted as ‘period of residence/activity in the country of the beneficiary’.

- Must be able to communicate fluently in English, in oral and written form.
- Willingness to travel for secondments and collaborative activities within the HiPOVor network.

Important: Please review the webpages of the individual vacancies via the IFSW website for details:
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Selection process

Applicants will need to submit to marwan.abdou-ahmed@ifsw.uni-stuttgart.de for PhD position 3 & 4 (Fellow 3 & 4) and to christian.hagenlocher@ifsw.uni-stuttgart.de for PhD position 5 (Fellow 5):

- Brief description of why the applicant wishes to become a PhD student within HiPOVor (letter of motivation).
- Copy of transcripts and of their degree, and a copy of master's thesis and any other publications (if available).
- Curriculum vitae of three pages maximum.
- Two written recommendation letters (e.g. one by the former master thesis supervisor and their referee's contact details).

Job description

FELLOW 3 (IFSW, Stuttgart, Germany):
Thin-disk laser (oscillators & amplifiers) emitting high-power optical vortices in the IR (1030nm, 1420 nm), green (515 nm) and DUV (257.5 nm) wavelength range.

In this project, the selected doctoral candidate (DC) will focus on:

1. Design and implementation of thin-disk multipass amplifier (TD-MPA) for optical vortex beams;
2. Design and implementation of SH and TH conversion modules for the generation of optical vortices in the green and UV spectral region;
3. Design and implementation of a single-crystal diamond Raman converter for the generation of optical vortices at 1420 nm wavelengths;
4. Design and implementation of dedicated characterization setups (e.g. interferometers) for the analysis of the optical vortices.

Specific requirements: Solid background in optics and laser physics, strong knowledge in programing or simulation tools (e.g. MATLAB, python or C), practical experimentation with optics and lasers. Ability to work in team.

FELLOW 4 (IFSW, Stuttgart, Germany):
Development of hollow-core fibers for efficient guiding of high-power optical vortices.

In this project, the selected doctoral candidate (DC) will focus on:

1. Development of a reliable simulation model for twisted hollow-core fibers taking all the optical properties into account including optical losses, dispersion, power-weighted spatial overlap with cladding material in dependency of twist rate;
2. Investigation of the feasibility of efficient guiding of high-power optical vortices over distance of up to several tens of meters;
3. Design of the twisted hollow-core fibers for guiding high-power optical vortices;
4. Construction and implementation of suitable mechanical components, including a rotor and pressure system, in the fiber drawing facility to produce twisted hollow-core fibers with high production yield;
5. Characterization of the produced twisted hollow-core fibers in terms of optical losses, beam quality, modal content, and the modal purity of optical vortices exiting the fiber;
6. Implementation of an experimental setup for the efficient guiding of high-power optical vortices over long distances.

Specific requirements: Solid background in fiber optics and laser physics, strong knowledge in programming or simulation tools (e.g. MATLAB, python or C), practical experimentation with optics and lasers. Ability to work in team.

FELLOW 5 (IFSW, Stuttgart, Germany):
Light-matter interactions using high-power optical vortices in laser drilling of metals.

In this project, the selected doctoral candidate (DC) will focus on:

1. Capturing the borehole geometry evolution during drilling with vortex beams by means of x-ray imaging;
2. Modelling of the redistribution of irradiation by means of raytracing including the polarization of the beam;
3. Description of the influence of vortex beams on the borehole geometry and its evolution during drilling;
4. Quantifying the benefits of vortex beams in laser drilling regarding drilling rate and borehole quality.

Specific requirements: Solid background in optics and physics, strong knowledge in programming or simulation tools (e.g. MATLAB, python or C), experience with experimental work and analysis of measurement data, experience in image processing, Ability to work in team.

At the University of Stuttgart, we actively promote diversity among our employees. We strongly encourage applications from qualified candidates of all backgrounds, including those from underrepresented groups. Learn more about The University of Stuttgart as an employer on our website: www.uni-stuttgart.de/en/university/employer/.
We welcome any good application and are looking forward to yours!