International Master and PhD Program in Optics & Photonics

Interdisciplinary Qualification in Cutting-edge Research at the International Graduate School of the KIT
Executive Board Message

Since the year 2000, more than 10 Nobel Prizes directly linked to Optics & Photonics have been awarded. This includes not only basic research but also application oriented breakthroughs that facilitated the transformation of our society. Energy-efficient light sources, optical communication and digital camera systems are impressive examples. At the same time, the discipline is mobilizing innovation-driven branches of our economy, such as industrial automation and production, digitalization of the society, autonomous mobility as well as medical technologies and personal health monitoring.

The future progress and growth in this field rely on dedicated researchers and graduates trained in an interdisciplinary environment. In 2006 the Karlsruhe School of Optics & Photonics (KSOP) was founded as one of the first graduate schools within the scope of the German “Excellence Initiative“ at the Karlsruhe Institute of Technology (KIT). KSOP brings together the best talents in engineering and natural sciences. Comprising a Master’s and a Ph.D. Program in Optics & Photonics, the educational concept is designed to qualify its graduates for accelerated careers at world leading academic institutions and in high-technology industries.

KSOP actively promotes the thesis work of its doctoral researchers by dedicated supervision, mentoring, networking as well as scientific and technical training. Concomitantly, KSOP augments the professional skills of its graduates by tailored personal and management training.

Currently, KSOP encompasses professors from 16 institutes and four different KIT Departments, i.e., Physics, Electrical Engineering and Information Technology, Chemistry, and Biosciences, as well as Mechanical Engineering. Over 700 students, Ph.D. candidates and alumni have positioned KSOP as a premium education, research, and innovation hub.

Join us as a student, a doctoral researcher or as an academic or industrial partner.

We are looking forward to a rewarding collaboration.
Qualification for Innovation

The KSOP prepares students and doctoral researchers for the labor market of the German and worldwide Optics & Photonics industry. The close cooperation to industry partners is of high value for industry on the one hand and KSOP students and doctoral researchers on the other hand.

Advantages for Industry

KSOP industry partners have an exclusive access to high potential and international junior staff. The research and teaching environment fosters innovations and empowers the industry partners to ensure their technological competitiveness.

On top of this, the challenge to solve social and technological problems can only be managed by cooperations between research, industry, and politics. Therefore, the initiative Promotion of Junior Researchers in Optics & Photonics was founded by KSOP. Industry partners can choose from a gold, silver & platinum cooperation partnership with KSOP and profit from its network, e.g. recruit young professionals for practical training, a master’s thesis or jobs.

Advantages for Students and Doctoral Researchers

By gaining experiences in well-known international companies via internships or master’s thesis projects, students get in contact with potential future employers and prepare for their professional careers.

KSOP Fosters the Interface Between Industry and Its Members Via:

- Internships & master’s thesis projects
- Recruiting events, i.e. the KSOP Career Fair or company excursions
- Networking events between science & industry, i.e. the symposium Karlsruhe Days of Optics & Photonics (KDOP)

The KSOP Career Events: A Meeting Point Both for Industry & Future Employees
Master of Science Program (2 years)

MBA Fundamentals Program

PhD Program (3 years)

Euro photonics Master Program

KSOP
Karlsruhe School of Optics & Photonics
Master’s & Ph.D. Programs

The KSOP educational concept is designed to qualify its graduates for accelerated careers at the world’s best academic institutions and in optic & photonic high-technology industries.

The 2-year Master’s Program spans the bridge between undergraduate classes in natural and engineering sciences and the required in-depth knowledge that is essential for cutting-edge research. It qualifies for a further career in the industry as well as in research. For those who would like to continue their careers in research, KSOP established an exclusive Ph.D. Program. KSOP also is a member of the European Erasmus Mundus Master’s Program EUROPHOTONICS.

Advantages for Students, Doctoral Researchers & Industry

By fostering a strong industry partner program, KSOP identified the requirements of O&P companies on its graduates. Those demands and specifications were integrated, e.g., within the M.Sc. program including laboratory courses, research projects, industry internships, and German courses tailored to the qualification of international students.

A strong pillar of the Ph.D. qualification concept is the individual coaching and supervision of its doctoral researchers by the research area mentors. On top of this, KSOP actively promotes the thesis work of its doctoral researchers by scientific and technical training. Concomitantly, the professional skills of the graduates are enhanced by tailored personal and management training, e.g., in the MBA Fundamentals Program.

The KSOP Success Story: Over 700 Master, Ph.D. Students & Alumni From 40 Different Countries
An eight-week internship will take place either between the 2nd & 3rd semester or between the 3rd & 4th semester. This internship is credited with 12 ECTS.

*1 Suitable B.Sc.: Physics, Chemistry, Electrical Engineering, Mechanical Engineering, Mathematics, Optics & Photonics, Computer Science, Biology, Biotechnology, Biomedical Engineering
**Interdisciplinary Approach**

The KSOP M.Sc. Program aims at educating excellent students in Optics & Photonics worldwide. The interdisciplinary research structure of the international graduate school forms the basis for this outstanding Master’s program.

Completely taught in English, the program is developed for 40 students each year who apply with a completed Bachelor’s degree in natural or engineering sciences.

**What’s Unique About the Program?**

- **Industry Network:** The studies include an elaborated industry internship program with partners from the Optics & Photonics industry. Furthermore, company visits and career events are offered regularly to all students.
- **Industry Lecture by ZEISS:** Students have the chance to attend lectures by innovation specialists from the industry and create new business ideas.
- **Smart Factory@Industry:** At KSOP students can take part in industry training projects by key players in the German industry.
- **Scholarships:** For outstanding students who are among the best 10% students of their class, scholarships are offered.
- **International Student Community:** Students from all over the world convey an international studying atmosphere to the Master’s program. KSOP students also have the opportunity to join the worldwide OSA and SPIE network through the OSKar student chapter at KIT.

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**Keyfacts:**

- 2-year Master’s Program in Optics & Photonics
- Prerequisites: B.Sc. Degree in natural or engineering sciences
- Specializations: Photonic Materials & Devices, Quantum Optics & Spectroscopy, Biomedical Photonics, Optical Systems, Solar Energy
- Industry internship program & networking
- Intensive lab training, language courses, business etiquette training

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**Fatemeh Hosseini**

Optical Engineer, Robert Bosch GmbH
KSOP Alumna

“For a person like me who is fascinated by every aspect of Optics and Physics, the broad study plan of KSOP was definitely an eye-catching parameter. In addition, the cooperation of KSOP with the industry and its emphasis in acquiring additional soft skills were what motivated me to apply for this program. Although I am working as an Optical Engineer, I can use my experience and knowledge from other divisions proposed by KSOP and be more innovative. I guess most of KSOP students agree on the fact that studying at KSOP is not just about having great courses with sophisticated professors and being exposed to leading industries. It was also about people who were always there to support you. The different backgrounds of my classmates gave me a great opportunity to get to know other cultures and broaden my view towards the world and life. Overall, KSOP had everything that I could ask from a Master’s program and then some.”
KSOP QUALIFICATION PROGRAMS

Suitable M.Sc.:
- Physics
- Chemistry
- Electrical Engineering
- Mechanical Engineering
- Mathematics
- Optics & Photonics
- Computer Science
- Biology
- Biotechnology
- Biomedical Engineering

Research Project

Scientific Modules

Management Modules

optional

MBA Fundamentals Program

Advancing Competencies

Supervision & Mentoring

Mentor

Co-Advisor

PhD Thesis Supervisor

Faculties

Networking

Internal & External

International

Industry

Master of Science*

Additional Benefits

*Suitable M.Sc.: Physics, Chemistry, Electrical Engineering, Mechanical Engineering, Mathematics, Optics & Photonics, Computer Science, Biology, Biotechnology, Biomedical Engineering
Research+ Concept for Success

The Ph.D. candidates are embedded in the excellent research environment of KIT. Integrated into the international graduate school, the doctoral researchers pursue their projects autonomously within one of the KSOP research areas.

One of the core elements of the KSOP Ph.D. program forms the specific modular training, which includes units from a catalog of technical, scientific as well as management and personal key competence modules. Since successful careers in the industry or academia often require leadership and interdisciplinary knowledge, emphasis is laid on management skills, which are taught as mandatory management modules at the HECTOR School of Engineering & Management, the Technology Business School of KIT.

Supervision & Mentoring

A Ph.D. advisor, a co-advisor, and a mentor accompany the research work of each doctoral researcher by meetings on a regular basis. This supervision concept ensures both rapid progress and the successful completion of a thesis.

Management Plus

The optional MBA Fundamentals Program offers the opportunity to deepen the keenly demanded knowledge within six units of five days. The certificate and the corresponding credit points gained in the program are recognized in any international MBA program.

Keyfacts

- 3-year Ph.D. Program
- Scholarship Program
- Supervision & Mentoring
- Additional Management Skills, Technical, Scientific & Key Competence Modules, Networking

“I was heading an independent (junior) research group between 2007 and 2012 on integrated optofluidic systems for biophotonic applications. All of the Ph.D. students within my group joined KSOP, especially appreciating the scientific networking. It is essential for your future career to address challenging scientific questions in cross-disciplinary teams, no matter if you stay in academia or join the industry - this is exactly my experience of daily business in both worlds. This was the case while I was heading global R&D and IT for ZEISS Vision Care with eventually 200 employees on four different continents. The same applies in my present job - establishing the Deutsches Optisches Museum (D.O.M.) as a research museum and the nationwide showroom for optics & photonics: You need to combine internal expertise with external knowledge by clear communication across disciplines while each partner provides its own technical competence.”

Prof. Dr.-Ing. Timo Mappes
Founding Director
Deutsches Optisches Museum (D.O.M.)
Friedrich-Schiller-Universität Jena
Photonics in Europe

Next to its own Master’s program, KSOP is also a member of the European Erasmus Mundus Master’s Program EUROPHOTONICS.

The EUROPHOTONICS Master’s offers excellent teaching at top-level universities and individual study mobility throughout Europe. An extensive two-year master-level teaching program focused on advanced and applied research topics that will constitute the near and extended future scientific goals in the field of Photonics Engineering, Nanophotonics, Biophotonics, and their interdisciplinary applications.

Partner institutions of EUROPHOTONICS are the Karlsruhe Institute of Technology (KIT in Germany), the Aix-Marseille University (AMU in France), and the Universities of Barcelona (UPC, ICFO, UB, UAB in Spain).

Program & Mobility Structure

Semester 1: Fundamentals (AMU)
Semester 2: Core Subjects & Industry Internship (KIT or AMU)
Semester 3: Specialization (KIT, AMU or Barcelona)
Semester 4: M.Sc. thesis (KIT, AMU or Barcelona)

Depending on the personal mobility structure, graduates will receive a Master of Science degree awarded with 120 credits by at least 2 universities. The language of instruction is English.

Keyfacts

- 2-year M.Sc. in Europhotonics
- 3 M.Sc. Degrees
- 3 Different European Countries
- Scholarships Available
- Support in Accommodation, Relocation & Administration

“I thank Europhotonics/KSOP for accepting me in their organization, allowing me to train under their state-of-the-art facilities and most importantly shaping my personal and professional identity beyond my limitations. Its unique and interdisciplinary scientific and management programs educated me in physics, chemistry, math, biology, and business of optics and provided an exposure to world-class research, to top-notch institutions and industries. Above all, it made me who I am – confident, broad-minded, and passionate, which facilitates the working process in every aspect of my life and career. I wish the whole team all the best to keep encouraging the bright young minds and enlightening us with next-generation innovation and technologies!”

Dr. Radwanul Hasan Siddique
Postdoctoral Scholar at Caltech, USA
KSOP Alumnus
Key Technology Research

Optics & Photonics are key technologies of the 21st century. They form, e.g., the basis for today’s optical communications, environmental sensing, biomedical diagnostics in the life sciences, energy efficient lighting and solar energy harvesting.

Future progress and growth rely on dedicated research and graduates trained in an interdisciplinary environment. Consequently, the KSOP RAs were set up to cover many important aspects of Optics & Photonics.

The research and educational concept of KSOP has been established to optimally reflect the spirit of multidisciplinary research among scientists and engineers. Therefore, all RAs are strongly interlinked and most institutes feature research projects in more than one of the RAs.

The RAs I - IV were already established in 2006. Meanwhile, sustainable energy supply has become an even more urgent global challenge. Thus, RA V Solar Energy was set up in the next funding period in 2011.

In what follows, the most significant advances in these five RAs, recent KSOP research highlights, and future KSOP measures concerning the research strategy are summarized.

“The vision of KSOP is to develop solutions for the major challenges of our society. The excellent interdisciplinary research in our five research areas leads, e.g., to new technology solutions in the area of efficient and sustainable energy generation. Therefore, the structure of KSOP actively promotes exchange and collaboration among international researchers and students across classical disciplines.”
Optics & Photonics are all about generating, controlling, and harvesting light – which is simply not possible without linear/nonlinear optical materials. Thus, RA I explores new materials-, synthesis-, and deposition technologies for, e.g., luminescent nanoparticles, organic films, or photoresists.

In addition, novel concepts like plasmonics, photonic crystals, photonic metamaterials, and transformation optics have emerged throughout the last decade, providing completely new conceptual opportunities regarding the design of photonic materials and devices. Furthermore, two-dimensional and three-dimensional lithography as well as chemical synthesis approaches have improved considerably such that photonic structures previously believed to be inaccessible have come into reach. This research is, for example, driven by the quest for ever faster and smaller devices for telecommunications, by biomedical material requirements, or by the need for more efficient and/or less expensive solar-energy conversion. By developing key technologies like three-dimensional direct laser writing (DLW), RA I also provides the basis for parts of RA III ‘Biomedical Photonics’.

Future Aims & Goals
Future aims in this RA are the design and realization of novel material functionalities and of ever smaller and/or faster devices. To achieve this goal experimentally, serious lithography challenges have to be tackled, especially regarding three-dimensional structures. Furthermore, theory has to progress towards quantitative modeling of complex photonic nanostructures with predictive power.
RESEARCH AREA II:
Quantum optics is a dynamic research field concerned with the properties of individual quanta of light, called photons, and their interactions with atomic-scale systems. It comprises the fundamental understanding of the basic processes encountered in spectroscopy, the working principle of lasers, as well as applications of quantum light for secure communication, or for interconnecting future quantum computers into quantum networks. The increasing level of control over individual atomic-scale systems and photons is currently fueling the so-called second quantum revolution, which brings fundamental quantum research towards technological applications.

RA II covers research on both fundamental quantum optics phenomena and their applications, as well as the development and application of advanced spectroscopic methods.

One focus is the investigation of materials that can serve for the realization of quantum light sources and optically addressable quantum bits. To control light-matter interactions, engineered photonic devices are developed, ranging from optical microcavities to nanoplasmonic antennas and integrated optical circuits. Expanding a detailed theoretical understanding of novel materials and photonic devices is key to these developments.

On the other hand, advanced spectroscopic methods which can probe sample composition and properties play a crucial role in helping to uncover and characterize novel quantum and nonlinear phenomena in many fields, ranging from molecular photophysics to atmospheric chemistry. At KSOP, methods are developed and apply ultrafast, remote sensing and highly spatially resolved spectroscopy. Such advanced spectroscopic techniques are essential for expanding research horizons, e.g., in materials science and nanotechnology. Often a novel spectroscopic technique is the method of choice for new sensor systems which can in turn be part of a bigger optical system (see RA IV).

**Future Aims & Goals**

Grand goals of this RA are to push the development of quantum communication over large distances, and to realize optically addressable quantum bit registers for quantum computing and quantum information storage, which could serve as building blocks of a future quantum internet.

Further, RA II will be devoted to develop spectroscopic and multi-spectroscopic tools for molecular sensing with significantly enhanced spatial- and temporal resolution. Well-defined applications for such high-resolution nanochronoscopic tools also require parallel improvements in sample quality. Here ion- and neutral particle traps offer interesting perspectives, e.g., for controlled gas adsorption, molecular orientation and ultralow temperatures.

**Prof. Dr. Manfred Kappes**

Scientific Speaker of RA II

Institute of Physical Chemistry, KIT
Advances in Optics & Photonics have always driven progress in many areas of biology and medicine. For example, biomedical photonic technologies are crucial for non-invasive clinical monitoring, molecular diagnostics, or imaging of physiological parameters in living cells, humans, and whole organisms. In addition, new optics-based tools have been engineered to manipulate biological systems by, e.g., laser tweezers or light-switchable dyes and proteins for optogenetics. Regarding microscopy, several fluorescence-based microscopic techniques have been further developed and applied to image biological samples with sub-diffraction resolution. These techniques include pointillism approaches, like photoactivation localization microscopy (PALM), stochastic optical reconstruction microscopy (STORM), and structured illumination microscopy (SIM).

Research activities within KSOP span from advanced microscopy to the development of optics-based personal health monitoring. Super-resolution microscopic techniques are further developed into live-cell imaging modes. In addition, intelligent high-content screening microscopes for biological samples, e.g., of zebrafish, are engineered. Furthermore, several optical methods for the detection and quantification of biomolecules are developed. These include ultra-sensitive microdisk resonators and other bio-functionalized nanophotonic structures for parallel detection in lab-on-a-chip applications (see RA IV). Moreover, non-invasive monitoring of essential human blood parameters, such as pressure and glucose levels, are developed. Finally, direct laser writing (see RA I) is applied to fabricate three-dimensional ‘designer petri-dishes’ to study cell behavior and stem-cell differentiation.

**Future Aims & Goals**

With these novel multifunctional substrates, the effects of spatial ligand distributions and mechanical scaffold stiffness on cell behavior and stem-cell differentiation can now be systematically studied in three-dimensional environments. Further work in RA III aims at developing light microscopy super-resolution methods into live-cell imaging modes to study biomolecular interactions in living systems at the highest achievable spatial and temporal resolutions. The basic research activities on biomolecular sensing techniques shall be targeting the ultimate goal of label-free single-molecule detection.
In real-world applications, optical materials, devices, and spectroscopic approaches are integrated into optical systems. Examples are sensing and machine perception systems, laser-based manufacturing, optical metrology for production monitoring, and optical communications.

KSOP research in this area addresses a wide variety of optical systems with a broad spectrum of applications. For example, partly automation has significantly reduced accidents of automobiles and fully automated driving is expected in the not so far future. The development of three-dimensional visual perception systems for automated vehicles is one of our long-term goals. Similar approaches form the basis for cognitive machines and robots. Furthermore, our research addresses the ever increasing demand for more energy efficient, ultra-high bandwidth optical communication systems. This requires novel architectures and data-transmission schemes that take advantage of newly emerged linear and non-linear photonic devices (see RA I). In addition, novel optical sensor systems for visual inspection as well as optical lab-on-a-chip systems for biomedical purposes are investigated within KSOP.

**Future Aims & Goals**

Future research in the field shall investigate Bayesian techniques for robust three-dimensional optical scene perception and scene understanding for mobile machines. We aim at fully autonomous navigation of robots and vehicles. The long-term impact of such technological advances can hardly be overestimated. Accident-free automobiles and fully automated multimodal logistics are two innovations enabled through optical scene perception. Furthermore, we will further increase the energy efficiency and band-width of optical communication systems by the integration of novel photonic signal processing concepts that combine the advantages of energy-efficient passive photonic circuits with FPGA-based digital techniques. The third field offering unprecedented innovations is addressed by lab-on-a-chip optical systems. The integration of optical and fluidic functions on one chip and an increased sensitivity by applying both fluorescent and label-free biomedical detection with efficient read-out schemes will be in the focus of future research in this field.
The direct conversion of solar radiation into electrical energy is expected to cover a growing fraction of the electricity supply in the upcoming decades. While solar-panel installations have impressively increased throughout the last decade, further breakthroughs are necessary. Optics & Photonics research can contribute in various ways to further reduce the costs of solar electricity: Light management by means of tailored nano- and microstructures can reduce the costs since it allows for higher efficiencies and a thickness reduction of the solar cells. We explore bio-inspired anti-reflection films as well as 3D cloaking structures for rendering contact grids invisible. Another central aspect are novel materials with improved photovoltaic properties. Cost reduction can be achieved by improved efficiencies and by reduced deposition costs. KSOP has already established a strong collaborative research program on solution processable and thus printable solar cells and on inorganic thin film photovoltaics. As an important partner, the Center for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) in Stuttgart has participated in KSOP from the very beginning.

Future Aims & Goals
We have extended our facilities for the fabrication and the characterization of novel photovoltaic materials and cells and have implemented several new laboratories over the last years. With regard to novel materials, we are ramping up activities in solution processable materials (perovskite and organic semiconductors) and are covering all aspects from novel materials over device architectures towards module fabrication and building integration. RA V has furthermore started significant activities on tandem solar cells combining perovskite semiconductors with silicon and CIGS solar cells. The development of low-cost, high efficiency all printed foils for light and spectrum management will be an important goal of our research.
Karlsruhe offers something for everybody’s taste with its academic centers of excellence in music, art, design, media, and technology.

**Museums & Galleries**
The world-famous Center for Art & Media Karlsruhe called “ZKM” is located there.

**Music Festivals**
“DAS FEST” in July each year is, for example, one of Germany’s largest open-air festivals.

**Sports**
Karlsruhe has more than 1,500 sport clubs that offer 60 different kinds of sport. A wide variety of sport clubs are also based within KIT for students.

**DID YOU KNOW...?**
City’s population: **300,000**
Students in Karlsruhe: **43,000**

Karsruhe has a unique fan-shaped city architecture which was the role model for Washington DC in the USA.

Karlsruhe is also called “the city of justice” since the German Federal Constitutional Court and Federal Court of Justice are seated there.
Study With the Best

The Karlsruhe Institute of Technology (KIT) is one of the leading technical universities in Germany and Europe. Outstanding rankings and evaluations vouch for the standard of research and education at KIT*. This is without a doubt the most beneficial result of the 2006 merger of the Karlsruhe Research Center and the former University of Karlsruhe, which dates back to 1825. Currently, KIT is one of the largest research and teaching institutions in the world. The student satisfaction in Karlsruhe is among the top in Germany due to a systematic, balanced curriculum and excellent teaching staff.

KIT Infrastructure

KIT offers a very comprehensive university infrastructure. Young scientists get a fascinating framework for their explorations at projects, experiments and plants in major research institutions. Furthermore, there is a 24/7 library and a diverse culture, music, and sport offerings. KIT has numerous student organizations where students can, for example, put the theory from their lectures into practice. There is, for instance, a group working on autonomous model cars (KITcar) or a team for innovative field robots (KaMaRo Engineering e.V.).

Optic Students Karlsruhe (OSKar)

OSKar is part of a worldwide network of student chapters of the Optical Society (OSA) and of SPIE and comprises a group of enthusiastic students coming from different academic and cultural backgrounds, united by the common interest in sharing Optics & Photonics knowledge. The combination of Engineering, Physics, and Optics students in the team gives rise to diverse and complementary ideas that are materialized in different projects and events.

“When I started my Master's degree in KSOP, I found the opportunity in OSKar to achieve one common vision: To meet passionate students who want to spread knowledge about Optics & Photonics. OSKar has focused on participating in outreach activities of KIT and KSOP and provides a great opportunity to integrate in the local community. Additionally, activities like company excursions, invited lectures, “Stammtisch”, and many more provide academic, industrial, and networking spaces to further advance our careers. My key takeaway from OSKar is the network it has built: OSKar alumni give an unparalleled advantage at the beginning of our professional careers. From all this, I highly recommend joining the group and sharing the love of optics with everyone.”

Orlando Torres Perales (left) (Former) President of the Student Chapter Optic Students Karlsruhe

*www.ksop.kit.edu/KITRankings.php
WHAT ARE THE BENEFITS OF BEING A PARTNER?

- **Influence the selection of scholarship holders:** KSOP finances the study and the additional qualifications of numerous scholarship holders through its sponsoring contributions. Through a partnership, you can influence the selection of suitable scholarship holders and thus contribute to the training of potential junior staff for your company.

- **Get a personal impression:** Get to know students at networking events and the career fair and start recruiting early during their studies.

- **Present Your Company To Future Employees:** Sharpen your employer branding through excursions to your company.

- **Educate young talent at an early stage according to your needs & link it to your company:** Gain future employees through internships and master’s theses.

- **Employer Branding through the professional marketing of the KSOP:** Benefit from the communication channels of the KSOP and place your company with future talents.

- **Become a partner and enable the training of international junior staff for the Optics & Photonics industry!**

### The Supporting Packages*

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*The supporting packages are all tax deductible.

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Job profiles of our Alumni:

Follow us into the fascinating world of Optics & Photonics!

At KSOP we do not feel as a School in O&P only but as a forum on scientific exchange in O&P topics.

KSOP Summer School on Optical Technologies!
Bi-annual Summer School for young researchers!

Karlsruhe Days of Optics & Photonics
Bi-annual symposium with renowned international guest speakers!
Karlsruhe Days of Optics & Photonics

Bi-annual symposium with renowned international guest speakers!