NETLAS NEWSLETTER 6-2021

This newsletter marks 1st success in term of secondments, we welcome PhD12 Sacha Grelet employed by NKT, to the University of Kent, **Applied Optics Group (AOG)!**

PhD Project: Time Stretched Pulse Supercontinuum (SPSC) swept laser source

NKT: In record 5 months, a time stretch laser was assembled, characterised and shipped to University of Kent, operating at 80 MHz, wavelength 1060 nm.

PhD12: Sacha Grelet

Sacha is joining the NETLAS PhD Students in Kent:
From left to right: Alejandro Martinez, Gopika Venugopal and Rene Riha

European Researchers' Night
24th September 2021

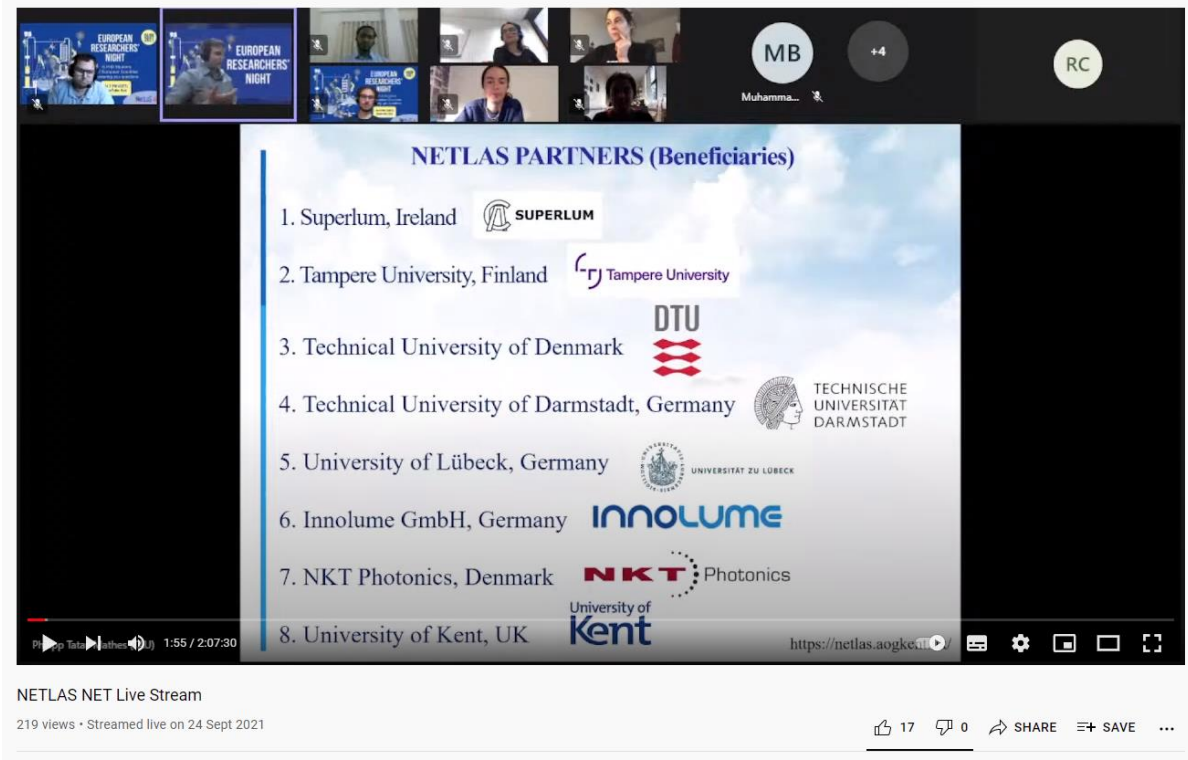
With the occasion of European Researcher's Night, 14 NETLAS PhD students have organized a live broadcast event on Youtube on Friday 24th September at 6 pm UK time.

This was a student lead event, where the students divided themselves in 4 groups with a Moderator in each group ((Philipp Tatar-Mathes/Tampere University, Irene Rodriguez Lamoso/University of Darmstadt, Alejandro Martinez Jimenez/University of Kent and Sacha Grelet/NKT). All the PhD students have been invited to present their route and motivation towards joining a trans-European PhD on Photonics with emphasis on lasers for optical coherence tomography, their research hot topics, experience accumulated so far, and their advice for potential PhD Students. Moderators picked up questions from the public and asked each student different questions.

The students participated from eight different locations in academia and industry in Europe (https://netlas.aogkent.uk).

Moderators in the 1st and 3rd group (Philipp Tatar-Mathes and Alejandro Martinez Jimenez) presented an introduction to NETLAS including Project Objectives, PhD Students, 8 beneficiaries (5 world-leading academic institutions and 3 companies) and 6 associated partners (4 non-academic institutions and 2 teaching hospitals). The event was advertised on Twitter, Univ of Kent Student mailing list, by NETLAS beneficiaries and partners, and other scientists in the OCT field from all over the world. So far, by today 28/09, the broadcast had 229 views.

Print screens from the event are shown below.

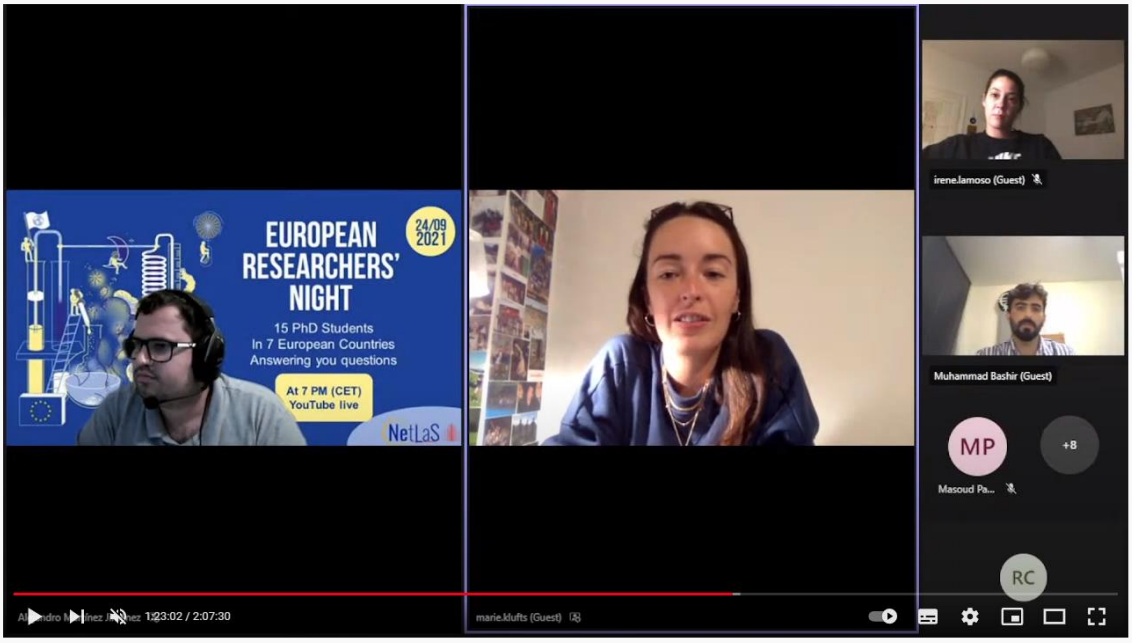


Print screens from the European Researcher's Night, live broadcast event on 24th September 2021

NETLAS NET Live Stream

219 views • Streamed live on 24 Sept 2021

17 0 SHARE SAVE



NETLAS NET Live Stream

219 views • Streamed live on 24 Sept 2021

17 0 SHARE SAVE

Print screens from the European Researcher's Night, live broadcast event on 24th September 2021

Prof. Adrian Podoleanu, NETLAS Coordinator said:

"We are still under the nice memories of the last Friday night unique event. NETLAS community of students contributed to an European Researcher's Night event by talking about their option to dedicate their next 3 years to research.

We have learned a lot from our students, how much they value their research, the teams they are in, the relation with the supervisors. We also heard confessions on sacrifices they made to swop their country with a different one, compensated by the enjoyments and excitation of melding with different cultures.

For sure, those finishing college who connected should have enticing examples to follow when deciding to choose a PhD as their next step in education.

Congratulations to our students for their contributions to the European Researcher's Night, to Ramona Cernat for initiating the idea and to the Applied Optics Group researchers in Kent that masterminded the technicalities, especially Adrian Fernandez Uceda, 3rd Y PhD student".

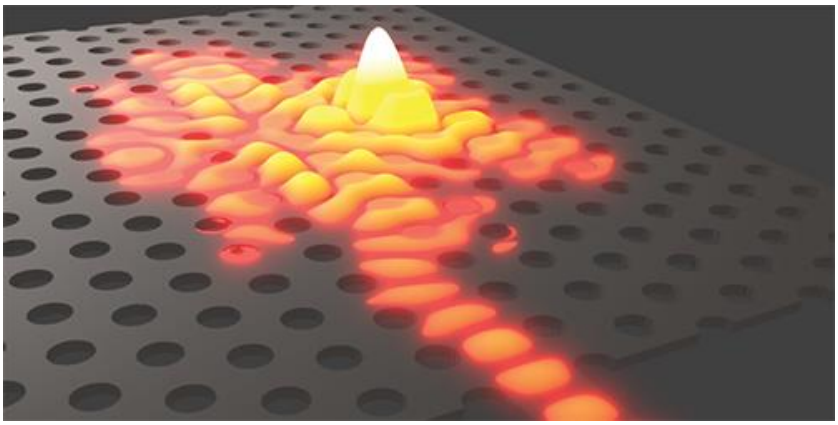
Please enjoy our 1st NETLAS video product recorded on Youtube:

https://www.youtube.com/watch?v=CJyu2Yr4WIA

DTU News

Novel physics gives rise to the highest coherence for microscopic lasers

An increasing fraction of the global energy consumption is used for information technology, and photonics operating at very high data rates with ultra-low energy per bit has been identified as a key technology to enable sustainable growth of capacity demands.
However, existing laser designs cannot just be scaled down to reach the goals for next-generation integrated devices, and fundamental discoveries in the field of nanophotonics are therefore needed.
Supported by a Villum Center of Excellence, NATEC, a newly established DNRF Center of Excellence, NanoPhoton, and an ERC Advanced Grant, scientists from DTU are exploring the physics and applications of a new class of photonic devices using a phenomenon known as Fano interference. This physical effect offers an opportunity for realizing ultrafast and low-noise nanolasers (called Fano lasers), optical transistors, and quantum devices working at the level of a single photon.
Now, the DTU scientists have shown that the coherence of a Fano laser can be significantly improved compared to existing microscopic lasers. The result has been published in *Nature Photonics* ("Ultra-coherent Fano laser based on a bound state in the continuum").



The figure shows a schematic of light generation in a Fano laser. (Image: DTU)

"The coherence of a laser is a measure of the purity of the colour of the light generated by the laser. A higher coherence is essential to numerous applications, such as on-chip communications, programmable photonic integrated circuits, sensing, quantum technology, and neuromorphic computing. For example, coherent optical communication systems transmit and detect information using the phase of light pulses, leading to a tremendous information capacity" says Jesper Mørk, Professor at DTU Fotonik and Center Leader of NATEC and NanoPhoton.

Jesper Mørk further explains: "The Fano laser, with a size of a few microns (one micron is one-thousandth of a millimetre), operates in an unusual optical state, a so-called bound-state-in the-continuum, induced by the Fano resonance. The existence of such a state was first identified by some of the early pioneers of quantum mechanics, but evaded experimental observation for many years. In the paper, we show that the characteristics of such a bound-state-in-the-continuum can be harnessed to improve the coherence of the laser."

"The observation is somewhat surprising," adds lead author and senior researcher at DTU Fotonik, Yi Yu, "since a bound-state-in-the-continuum is much less robust than the states commonly used in lasers. We show in our paper, experimentally as well as theoretically, that the peculiarities of this new state can be used to advantage."

Yi Yu continues: "To achieve the goal we have developed, in collaboration with **Professor Kresten Yvind's group at DTU Fotonik**, an advanced nanotechnology platform, called Buried Heterostructure Technology. This technology allows realizing small, nanometer-sized regions of active material, where the light generation takes place, while the remaining laser structure is passive. It is the physics of Fano resonance combined with this technology that eventually enables the suppression of quantum noise, leading to the highest measured coherence for microscopic lasers."
This new finding may lead to the use of Fano lasers in integrated electronic-photonic circuits, in particular in new generations of high-speed computers. In today's computers, electrical signals are used for logic operations as well as for transmitting data between different parts of the computer.

However, due to ohmic losses, a lot of energy is wasted in the transmission. The primary role of the Fano laser will be to convert the electrical data to light signals, which then are transmitted within the computer almost without loss – just as it is done in optical fibres on the internet today. The long-term perspective is to get much faster computer chips with minimal energy consumption.

CONFERENCES & WORKSHOPS

OSA® Laser Congress

03 October 2021 – 07 October 2021

This OSA Meeting will be presented in a virtual, web-conference format using a program schedule based on Eastern Daylight Time (EDT, UTC-04:00).

Participants have the option of viewing sessions live or streaming recorded sessions on demand. Speakers can present live during a session or submit a pre-recorded video. [Learn more.]

Nobel Laureate Donna Strickland and Steve Rummel with II-VI Incorporated to Headline Laser Congress Plenary

High-Intensity Laser Physics and Role of Lasers in Modern Photonics Focus of Talks

Donna Strickland, 2013 OSA President and Professor, University of Waterloo, Canada, will focus on differences between nonlinear optics and high-intensity laser physics in her plenary presentation. Chirped pulse amplification, also known as CPA, boosted laser intensity levels by orders of magnitude and helped enable a new realm of high-intensity laser-matter interaction. Strickland won the 2018 Nobel Prize in Physics with Gérard Mourou for co-inventing CPA. She will discuss future applications of this technique.

Steve Rummel, Senior Vice President Engineered Materials and Laser Optics, II-IV Incorporated, USA, will examine megatrends that have brought lasers to the forefront of metrology and manufacturing, enabling processing of advanced materials such as diamond and silicon carbide. His talk will explore the role of photonics in defining technology shifts, from 3D sensing to laser additive manufacturing, EUV systems and beyond.

“We are pleased to have such noteworthy speakers present developments in groundbreaking research as well as their industrial applications,” said Johannes Trbola, Laser Applications Conference Chair. “This is an opportunity for attendees to gain insight into these technological developments and breakthroughs.”

The Laser Congress plenary program will take place Monday, 04 October, 08:00 – 10:00 (EDT, UTC-04:00).

The five-day event includes two topical meetings – Advanced Solid State Lasers Conference (ASSL) and **Laser Applications Conference (LAC).** ASSL highlights new sources, advanced technologies, components, and system design to extend the operation and application of solid-state lasers. LAC focuses on materials processing and applications for high power lasers. Technical sessions and Short Courses will be presented live from the Eastern Daylight Time Zone (EDT).

Conference registration is currently open. You must register in advance to receive the web link for the conference. All registrants will receive access to the Technical Digest, the live technical sessions and recorded/archived content. **The deadline to secure exhibit and/or sponsorship participation at the All-Virtual Laser Congress is 20 September.**

Software Online Training:

Grating Modeling and Design

04–07 October 2021

Online

Gratings are the most widely applied diffractive optics elements in various optical systems. VirtualLab Fusion software provides the Fourier modal method (FMM a.k.a. RCWA) and the thin element approximation (TEA) for grating simulations. This interactive online training shows how to use the corresponding technologies from VirtualLab Fusion to solve practical grating modeling and design tasks for modern optics applications. In the training, we will of course work together with our latest released version, 2021!

October 4th – 7th | 2021

PHOTONICS DAYS Berlin Brandenburg

innovationconference

Look forward to 25 online or hybrid sessions with over 100 speakers from about 15 countries with following topics from the fields of photonics, optics, and microsystem technology:

Photonics for forestry and the wood industry | BioSensing with photonic integrated circuits | Quantum Technologies | PhotonHUB Europe | Photonic terahertz technology for beyond 5G wireless communication | Data center interconnects | German-Israeli nano photonics session in cooperation with NanoIL | Hyperspectral imaging | Optics for solar energy | PolyPhotonics Berlin | Laser Technology | Photonics for AgriFood applications | Sensor AI - a key for a new generation of sensor systems | Advanced UV technologies and applications | Microelectronics & Si-Photonics | Photonic integration as quantum enabling technology | Advances in optical metrology | Vision systems & IR detection for industry, security & defence | Photonics in Japan | Photonics in China | "Working in Photonics".

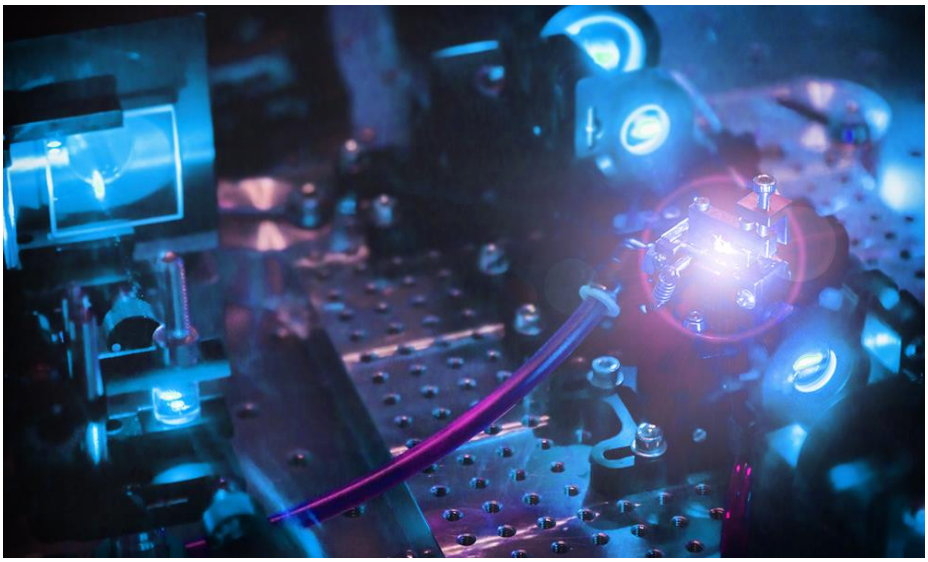
On the face-to-face days there will be an accompanying exhibition and an evening event in addition to the workshops. This networking should give the participants from different industries and regions the opportunity to get in touch with each other and to find new ways of cooperation and knowledge transfer to create innovation together. The conference language is English.

SPIE Photonics Europe 2022

03–07 April 2022, Strasbourg, France

The premier European optics and photonics research and development event

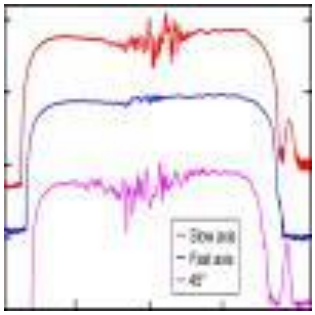
The 2022 abstract submissions are due 20 October 2021.



Explore the technical tracks

*** Nano- and Quantum Sciences**
*** Optical Imaging and Sensing**
*** Lasers and Nonlinear Optics**
*** Biophotonics**
*** Applications of Photonic Technology**

PUBLICATIONS

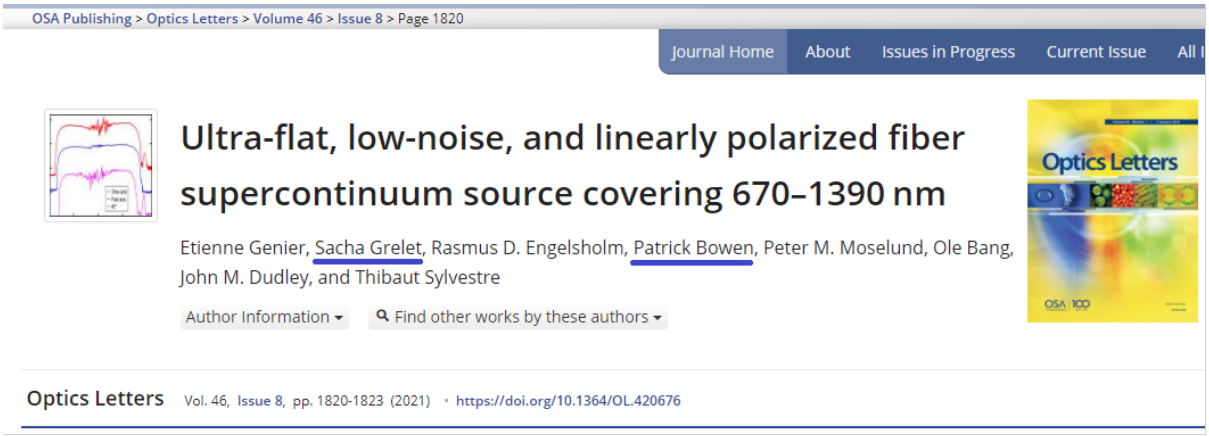


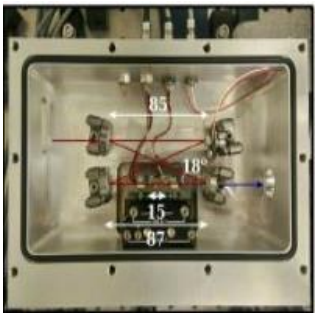
Ultra-flat, low-noise, and linearly polarized fiber supercontinuum source covering 670–1390 nm

Etienne Genier, **Sacha Grelet,** Rasmus D. Engelsholm, **Patrick Bowen,** Peter M. Moselund, Ole Bang, John M. Dudley, and Thibaut Sylvestre

Optics Letters, Vol. 46, Issue 8, pp. 1820-1823 , (2021)

- **https://doi.org/10.1364/OL.420676**



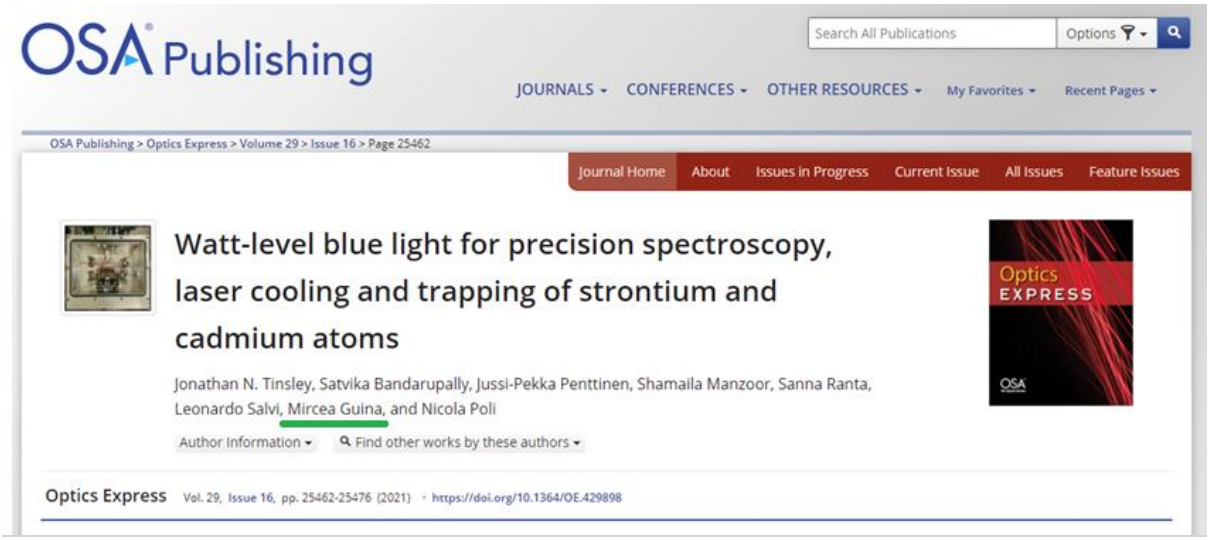


Watt-level blue light for precision spectroscopy, laser cooling and trapping of strontium and cadmium atoms

Jonathan N. Tinsley, Satvika Bandarupally, Jussi-Pekka Penttinen, Shamaila Manzoor, Sanna Ranta, Leonardo Salvi, **Mircea Guina**, and Nicola Poli

Optics Express, Vol. 29, Issue 16, pp. 25462-25476, (2021)

- https://doi.org/10.1364/OE.429898



Solar Energy Materials and Solar Cells, Volume 226, 1 July 2021, 111097

Nonselective etching of As and P based III–V solar cell heterostructures with aqueous solutions of HIO_3 and HCl

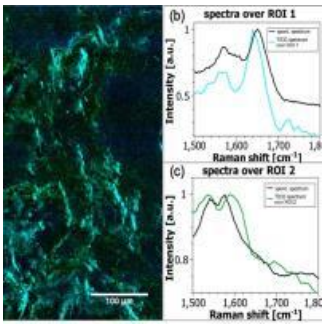
Marianna Raappana, Tomi Koikkalainen, Ville Polojarvi, Arto Aho, Timo Aho, Riku Isoaho, Antti Tukiainen, **Mircea Guina**

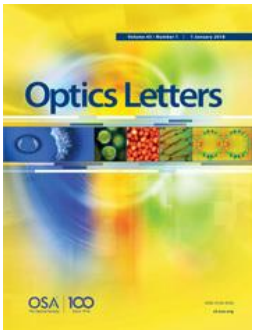
https://doi.org/10.1016/j.solmat.2021.111097

Wavelength conversion through plasmon-coupled surface states

Deniz Turan, Ping Keng Lu, Nezih T. Yardimci, Zhaoyu Liu, Liang Luo, Joong-Mok Park, Uttam Nandi, Jigang Wang, **Sascha Preu** & Mona Jarrahi

Nature Communications **volume 12**,
Article number: 4641 (2021), DOI: 10.1038/s41467-021-24957-1

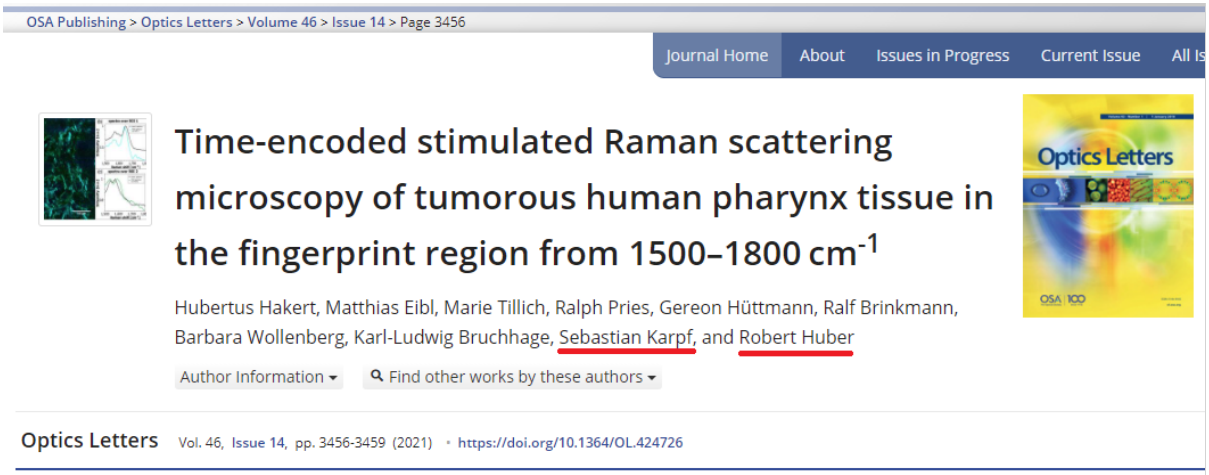




Time-encoded stimulated Raman scattering microscopy of tumorous human pharynx tissue in the fingerprint region from 1500–1800 cm^{-1}

Hubertus Hakert, Matthias Eibl, Marie Tillich, Ralph Pries, Gereon Hüttmann, Ralf Brinkmann, Barbara Wollenberg, Karl-Ludwig Bruchhage, **Sebastian Karpf,** and **Robert Huber**

Optics Letters, Vol. 46, Issue 14, pp. 3456-3459, (2021),
•**https://doi.org/10.1364/OL.424726**



New OEM MOPA SLDs at 840 and 910 nm by SUPERLUM

First OEM MOPA SLD type light sources centered at 840 nm and 910 nm are commercially available at SUPERLUM

A MOPA-like SLD light source design allows significant increase of SLD output power along with reduced SLD sensitivity to optical feedback. Optical feedback is a critical problem requiring 40 dB or better optical isolation of a stand-alone SLD at very high levels of output power for its safe and stable operation. **New MOPA SLD light sources of SUPERLUM provide 45 mW PM fiber output power and spectrum width of 40 nm at 840 nm and 60 nm at 910 nm.** Sources are intended for integration into customers' systems for OCT, low coherence interferometry, optical metrology, distributed optical sensing, and many other applications. More sources are under development and will be available soon.

More details about commercially available and future MOPA SLD light sources **are available here.**

SUPERLUM's new offer for SLD-mCS-371 and SLD-uCS-371.

SUPERLUM's **SLD-371-HP1 and HP2 with uCS or mCS compact current and temperature controllers are now offered at a very competitive price and available for one week shipment.**

* These products offer 50 nm spectral width at 840 nm and 7/15 mW output power.

* Our uCS and mCS drivers are ready for integration into Customer's system.

Click here to send a request to our research team for more information.

ULTRAFAST LASERS NEWS

ORIGAMI XP femtosecond laser series got better!

We have improved the ORIGAMI XP femtosecond laser to make it easier to use in ultrafast manufacturing and research.

The new ORIGAMI XP v5.0 has several improvements:

- Tunable pulse widths of 370 fs - 5 ps
- Improved laser monitoring and diagnostics
- Easy-to-use graphical user interface and Ethernet Communication

The ORIGAMI XP is ideal for ultrafast precision machining. You can monitor laser parameters e.g. peak power, to optimize material processing conditions and improve the quality. Choose your desired wavelength of standard IR (1030 nm), green (515 nm), UV (343 nm), or all three in one laser solution.

The ORIGAMI XP is still the same robust, compact, air-cooled laser that delivers market-leading beam pointing stability.

Get more info on the new laser

ORIGAMI XP summer clearance sale

We are clearing out our inventory of femtosecond ORIGAMI XP and XPSs to make room for the new generation!

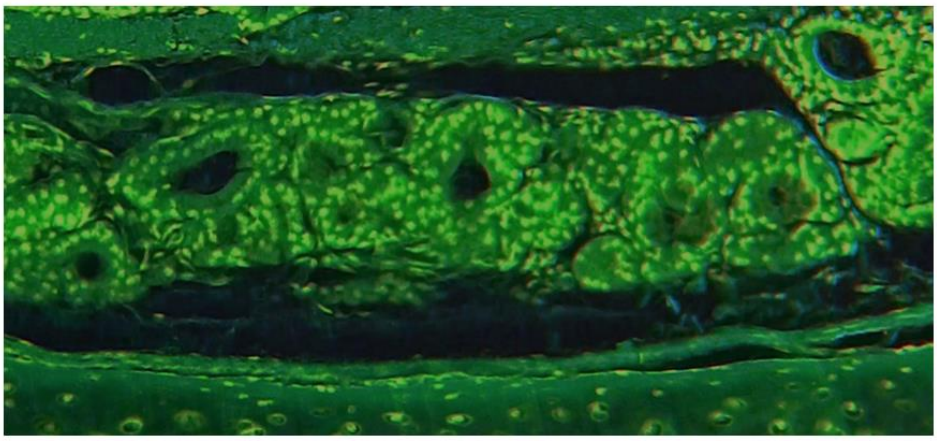
We still have a few lasers on the shelves and we've found a few demo units you can get at an extra discount.

So, if you ever dreamt of owning your very own high-power femtosecond laser, now is the time to get in touch.

Hurry up and find your local sales contact now.

Read how to get one

NEW LASERS FOR OPTICAL COHERENCE TOMOGRAPHY



New broadband, low-noise sources designed for optical coherence tomography and multimodality applications.

The new supercontinuum SuperK FIANIUM OCT series has the market's lowest noise. It is optimized for low-noise performance to produce high-contrast, low-noise images in Optical Coherence Tomography and multimodality applications.

Combined with a broadband spectrometer, the SuperK FIANUIM OCT can power OCT systems down to 1-2 µm axial resolution and matches the performance of the more costly and bulky Ti:Sapphire lasers.

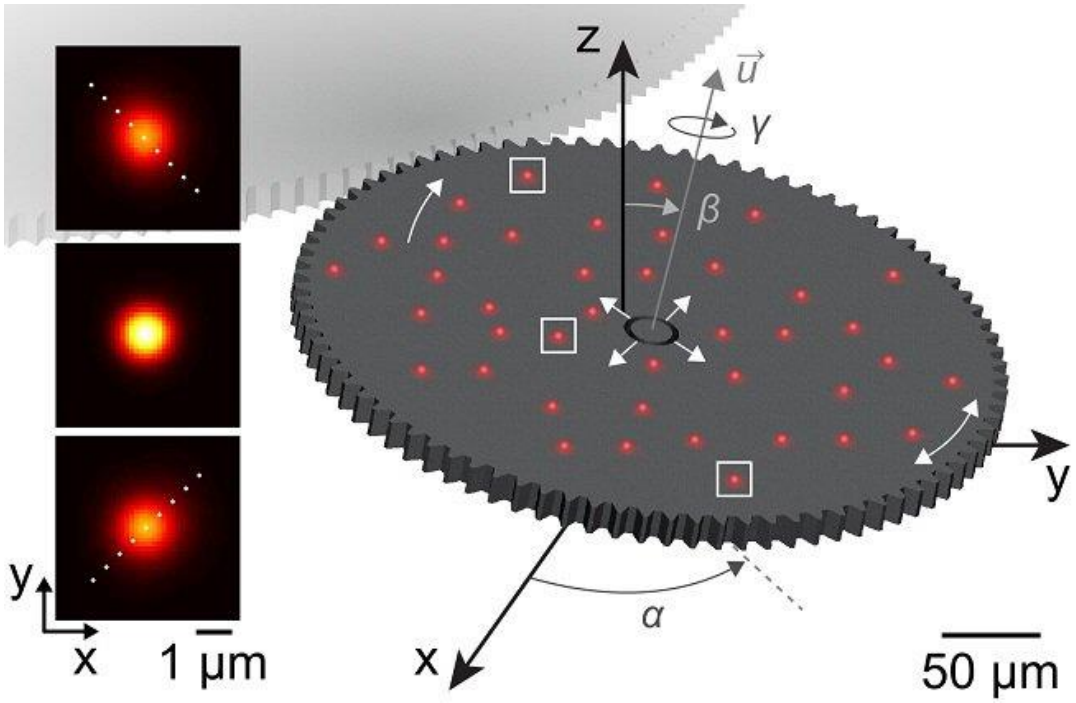
See Laser Spec

Microscopes make accurate measurements in 3D with new calibration method

Researchers at the National Institute of Standards and Technology (NIST) have converted the problem of lens aberrations, which cause imperfect focusing of light by optical microscopes, into an ability to accurately measure the positions of points of light in three dimensions instead of the two typical with conventional microscopes.
This opens up the possibility of gaining considerably more information about 3Dl structures such as biological samples including DNA, tissue, an organ or a microscopic organism.
Other methods that have enabled microscopes to provide detailed information about 3D structures have been expensive or required specialized knowledge. One such example is altering the microscope's optics with extra astigmatism, which requires reengineering and recalibration of the microscope.

With the new measurement method, the positions of objects can be located with greater accuracy and precision, pinpointing the positions of light-emitting particles within a region one-hundredth the size of what is normally possible with an optical microscope.

The NIST researchers carefully analyzed images of fluorescent particles that they deposited on flat silicon wafers for calibration of the microscope. Lens aberrations as the microscope moved along the third dimension (the vertical axis) made the images appear to change, creating large distortions even with just a few micrometers of movement in the lateral plane or a few tens of nanometers in the vertical dimension. By calibrating the changing appearance and the apparent location of a particle to its vertical position, they could accurately measure positions on three dimensions.



Left: Images of fluorescent particles that are above, at and below (top to bottom) the vertical position of best focus of a microscope. Calibrating the effects of lens aberrations on the apparent shape and position of the particle images enables accurate measurement of the position in all three spatial dimensions using an ordinary optical microscope. Right: Tracking and combining information from many fluorescent particles on a tiny rotating gear tests the results of the new calibration and elucidates the motion of a complex microsystem in all three dimensions. Source: NIST

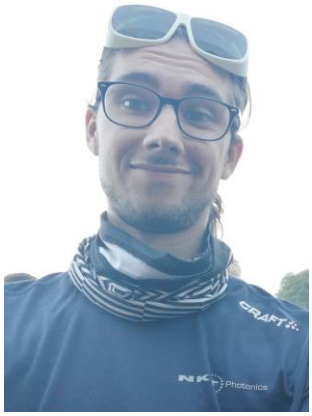
The calibration method was tested by using the microscope to image a constellation of fluorescent particles randomly deposited on a microscopic silicon gear that rotated in 3D. The model accurately corrected for the lens aberrations and provided full 3D information about the position of the particles. They extended their position measurement to include the full range of motion of the gear: rotating, wobbling and rocking.

Microscopy laboratories could easily implement the new method. "The user just needs a standard sample to measure their effects and a calibration to use the resulting data," added Stavis. Aside from the fluorescent particles or a similar standard, which already exist or are emerging, no extra equipment is needed.

The work described in Nature Communications includes demonstration software that guides researchers in how to apply the calibration.

SPORT EVENTS

Every year there is a big relay race for companies in Copenhagen. This year on 7th September 2021was DHL relay race, having teams of five people run 5 km (5x5 km) and where NKT Photonics took part on. There was a great opportunity to hang out with colleagues and cultivate team spirit while performing a bit of exercise. The event was also published by NKT in a quick post on LinkedIn here. PhD Students chose to wear laser safety goggles to add to the challenge. NETLAS PhD Student Sacha Grelet has taken the chance to join such a great sport event.



NETLAS PhD Student Sacha Grelet

Sacha with Andrea Pertoldi another ITN PhD student at NKT Photonics took part in the event

We recommend our NETLAS PhD students to attend these upcoming webinars (part of the free Thorlabs webinar series). Thorlabs' Digital Webinars are covering a variety of topics, each with a dedicated live Q&A session, and have a common goal of providing educational, engaging, and valuable content.

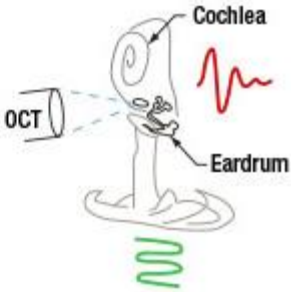
October
6
2021

Coming Soon! Using Phase-Sensitive Spectral Domain OCT for Nanoscale Vibrometry

In this webinar, Drs. Elizabeth Olson and C. Elliott Strimbu will discuss the role of cochlear dynamics in auditory science and highlight the need for phase-sensitve and depth-resolved imaging in this field. They will demonstrate the performance parameters of a Thorlabs Telesto OCT system, and elaborate on key findings from multiple case studies.

Presented by Dr. Elizabeth Olson and Dr. C. Elliot Simbu, Columbia University

Click to Register!



Schematic of Sound Entering Inner Ear

NETWORK EVENTS

We invite all partners to communicate events and ideas to place in our newsletter

Please send any piece of news, on NETLAS activities or anything else happening that may be of interest to the NETLAS community, to Ramona Cernat: R.Cernat@kent.ac.uk and to Adrian Podoleanu: ap11@kent.ac.uk