NETLAS NEWSLETTER 7-2022

NETLAS PhD Student Andrei Anikeev's experience during his secondment at Tampere University, Finland

Recruited by: **Superlum Diodes**

Secondment Period: 20th February 2022 – 15th July 2022

PhD Project: High power Master Oscillator Power Amplifier (MOPA) devices

"Initially, this secondment was planned for the first year of the project, but due to travel restrictions, it had to be postponed to this year. One of the main goals of my secondment in Tampere, Finland, was to work with a completely new spectral range of 2000 nm, which Superlum has not investigated with before. I am planning to create a master oscillator power amplifier system based on SLD with this spectral band.

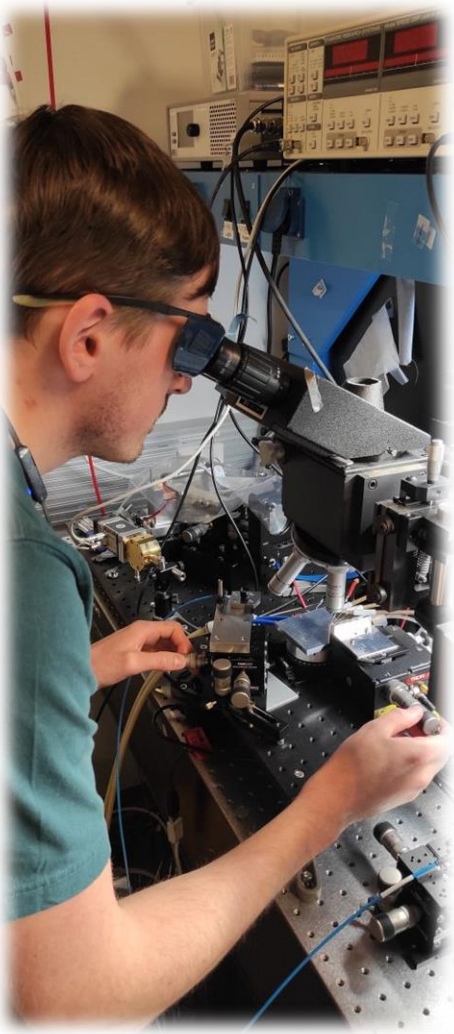
I've always wondered how this or that thing is created. This secondment trip made it possible to get acquainted with the complete cycle of semiconductor laser production: starting from the growth of the heterostructure on the MBE, the preparation of plates, and lithography, to the final stage of dicing crystals, mounting them on submounts and bonding. Another student from NETLAS, Ifte Khairul Alam Bhuiyan, helped me study all the technical processes. I am grateful to him for all the help he provided me during the assembly of my samples. I also met Philipp Tatar-Mathes, with whom we agreed on the possible use of red-band amplifiers developed at Superlum in his future work.

Currently, I have started conducting experiments under the guidance of Jukka Viheriälä related to the creation of so-called non-absorbing regions on the crystal faces, which allow increasing the threshold of optical degradation and increasing the output power. Previously, this technology has shown significant results in the operation of semiconductor lasers but

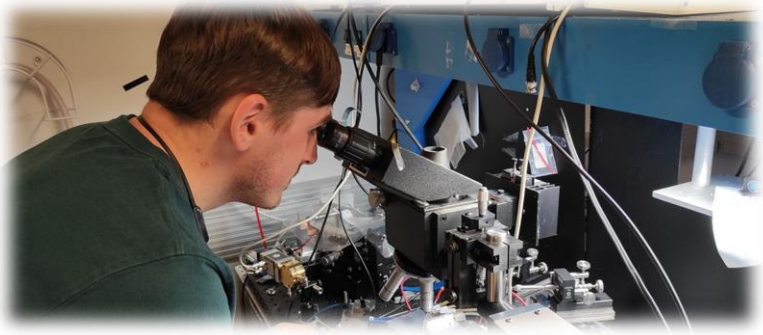
has never been used for SLD. I have already received the first results that showed satisfactory results. However, to create a final experimental sample, it is necessary to conduct many more experiments.

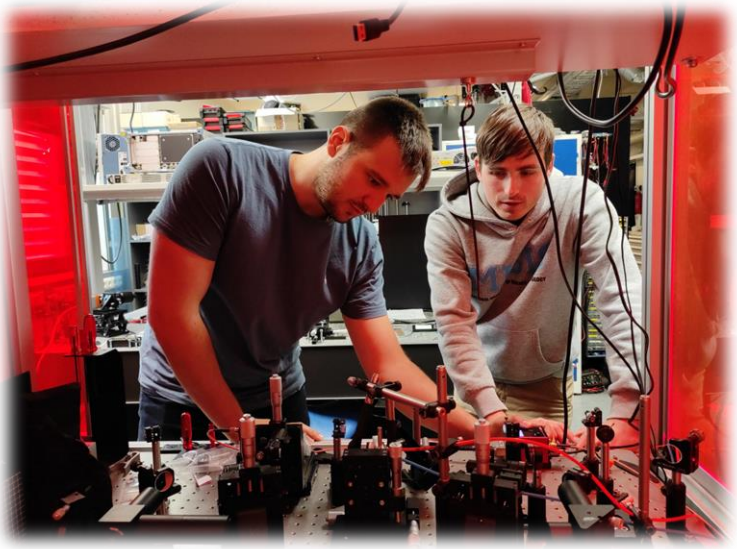
I liked the city of Tampere for its proximity to nature. Forests surround many lakes within walking distance, where you can spend your weekend on a picnic or BBQ. I often walked with my wife and dog in the woods. We also visited Helsinki, where we had a wonderful time. If there is an opportunity to visit this city, I advise you to visit the famous fortress Suomenlinna (Sveaborg), located on islands near Helsinki.

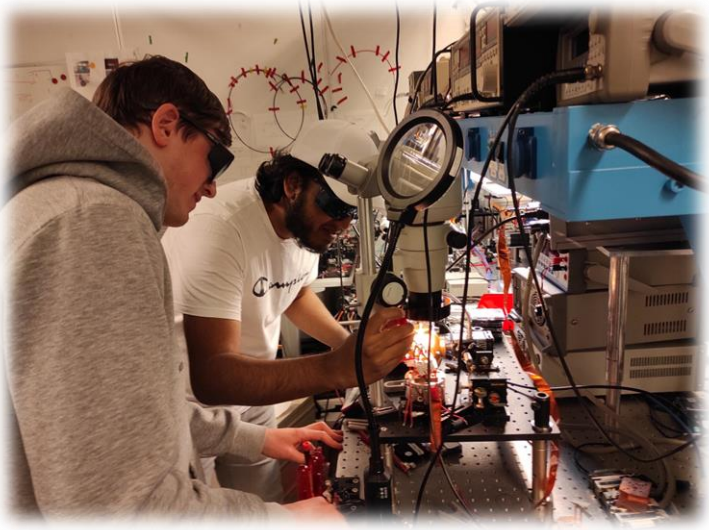
The accumulated experience was precious, and it will be helpful to me in the future. I will be glad to come back here to continue my experiments".



Photos @Andrei Anikeev







Andrei working in the lab with his NETLAS colleagues Philipp Tatar-Mathes (middle photo) and Ifte Khairul Alam Bhuiyan (bottom photo)

Photos @Andrei Anikeev

Andrei with his colleagues Philipp and Ifte at a BBQ organised by colleagues from the Optoelectronics Research Center (ORC) Tampere University, **Photos @Andrei Anikeev**

NETLAS PhD Student Esteban Andres Proano Grijalva's experience during his secondment at AOG, Kent University, UK

Recruiting institution: **Technical University of Denmark** (DTU)

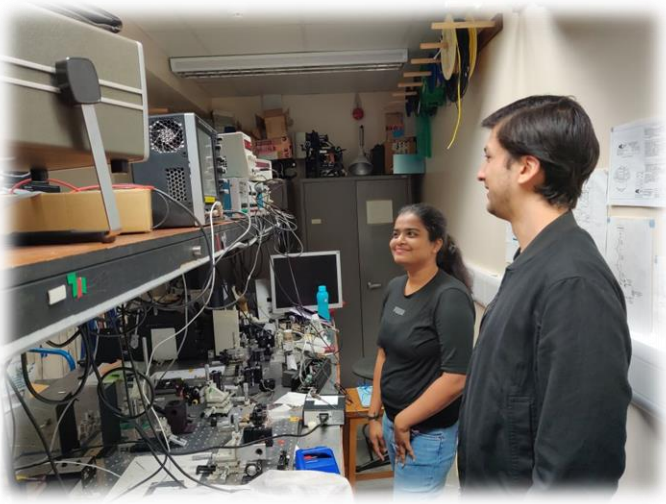
Secondment Period: 1st April 2022 – 30th June 2022

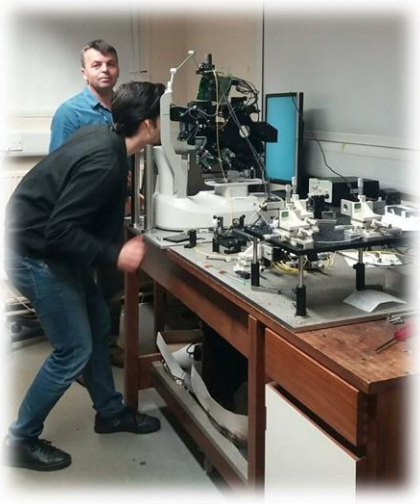
PhD Project: Electrically pumped **MEMS** (micro-electro-mechanical systems) **VCSEL** (vertical cavity surface emission lasers)

"During my secondment in the University of Kent, I worked with two lasers from OCTLight operating at 1060nm, one with a sweep speed of 800 kHz and the other one with a variable sweep speed of 10-50 kHz. From these sources, I obtained the sensitivity and resolution using Complex Master Slave OCT. Since I had very limited experience working in an optics lab, this was a great opportunity to learn to use different equipment for the characterization of the lasers and to learn how the algorithm to compute MS OCT works in practice.

The main goal was to obtain real time, in vivo OCT images of the retina. For this, Dr. Adrian Bradu modified the OCT software that was designed for slower sources to be able to use it with the 800 kHz source. The update was successful, and we obtained many images that will be used for future publications. Raw volumetric data was also captured for the generation of 3D images. Additionally, we assembled another interferometer to do Master Slave in hardware and obtain the axial range without the limitation of the digitizer speed.

Overall, it was a great experience to work in the Applied Optics Group under the supervision of the Prof. Adrian Podoleanu. I would like to say thanks to the AOG for all the support and especially to my NETLAS colleague Alejandro Martinez with whom I worked a lot and learned a lot. It was a pleasure to work in such a friendly and collaborative environment and I look forward to coming back with an improved source".

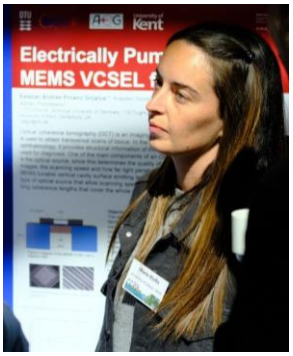




Esteban working in the lab with his NETLAS colleague Gopika Venugopal (photo top left) and AOG lecturer Dr. Adrian Bradu (photo top right)

Photos @ Esteban Andres Proano Grijalva

SECONDMENTS



Netlas PhD Student Marie Klufts

Host: University of Lübeck (Uzl)

Secondment started on 3rd July 2022 at Optores GmbH for three months

PhD Project: Short wavelength FDML laser

"Arriving in Munich after almost 2 years in North Germany feels like going to another country. Different traditions, a warmer climate and mountains only an hour away by car. I am now working at Optores GmbH in downtown Munich, where Tom Pfeiffer, Alexander Mlynek and Wolfgang Wieser have been there every day to point me in the right direction. We are currently working on improving my laser. Having a new perspective on the subject and the experience helps me to move forward quickly and learn a lot. We are currently facing some issues such as polarization mode dispersion which we are trying to solve in different ways. I've only been working here for a fortnight, but I feel like I'm back in the lab in Lübeck. These 3 months in Munich will go by very quickly and will even be too short to finish everything we are planning. The same goes for life here, Munich is an incredible city with a huge park in the centre, where everyone can enjoy the Eisbach river to cool off in the summer heat and can also surf if they feel like it. Finally, while waiting for the upcoming Oktoberfest, I familiarise myself with Bavarian beer in some biergartens".









Photos by @[Marie Klufts]

AOG Journal Club

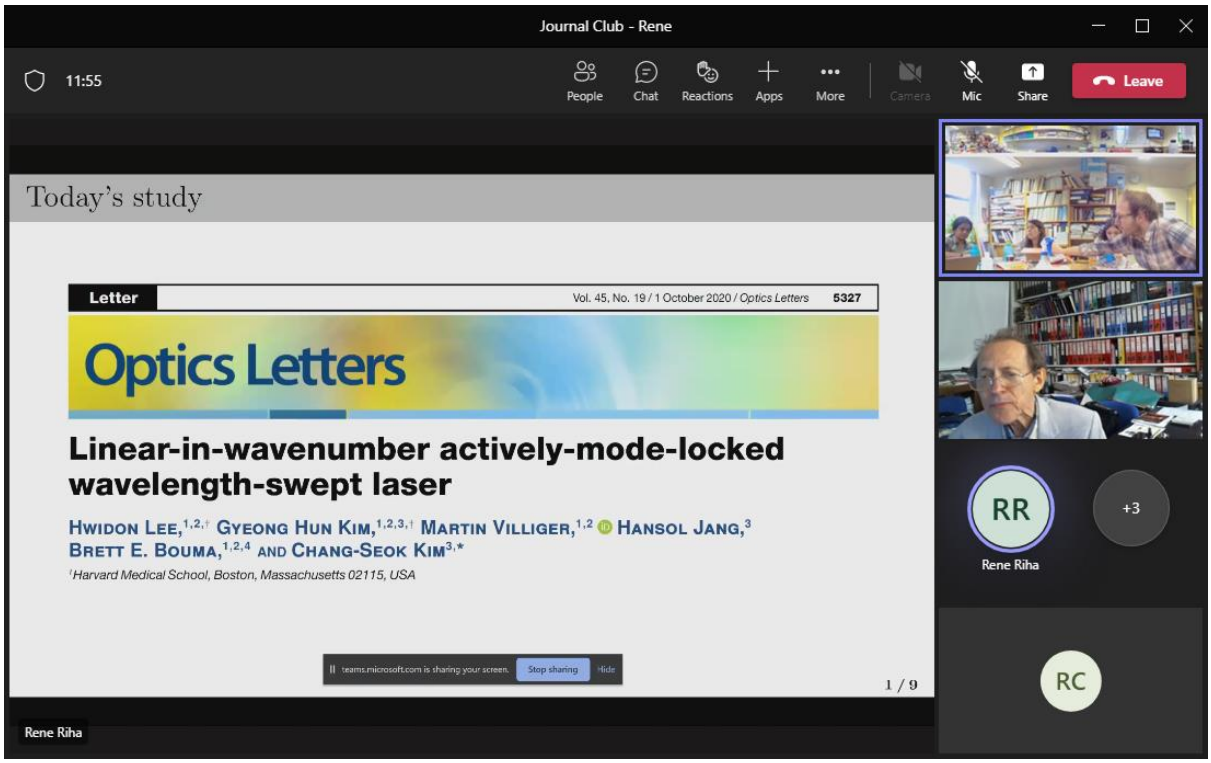
Presentation by NETLAS PhD Student Rene Riha

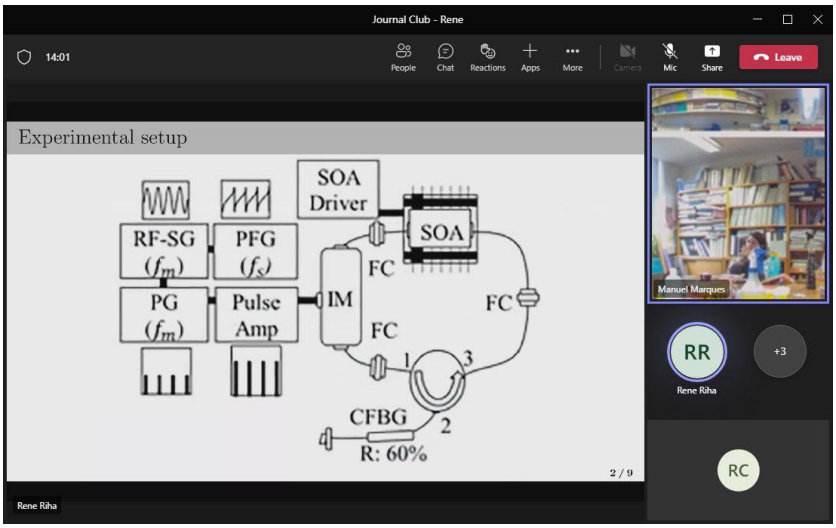
Friday 01/07/2022 at 12 pm

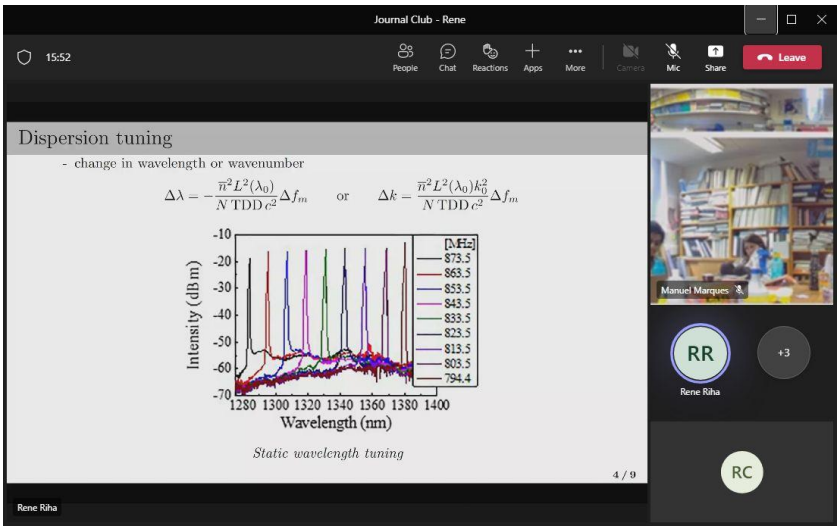
Paper presented:

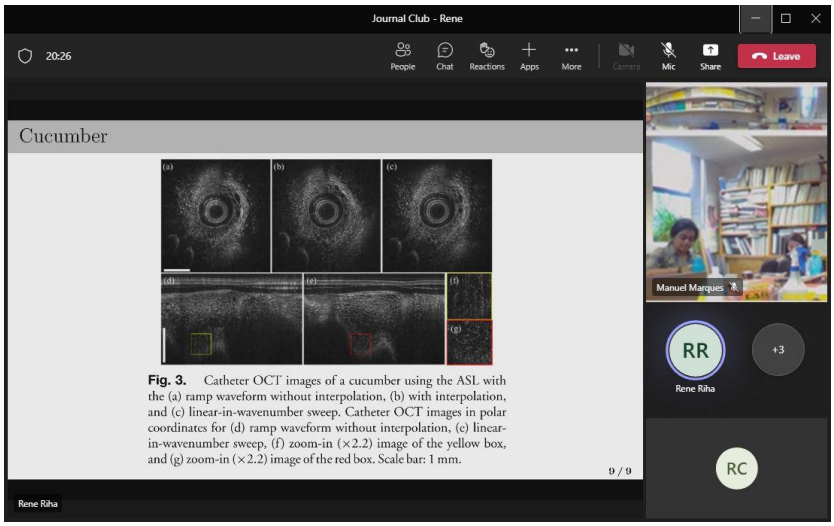
Linear-in-wavenumber actively-mode-locked wavelength-swept laser
https://doi.org/10.1364/OL.397715

A few slides from Rene's presentation are presented below:









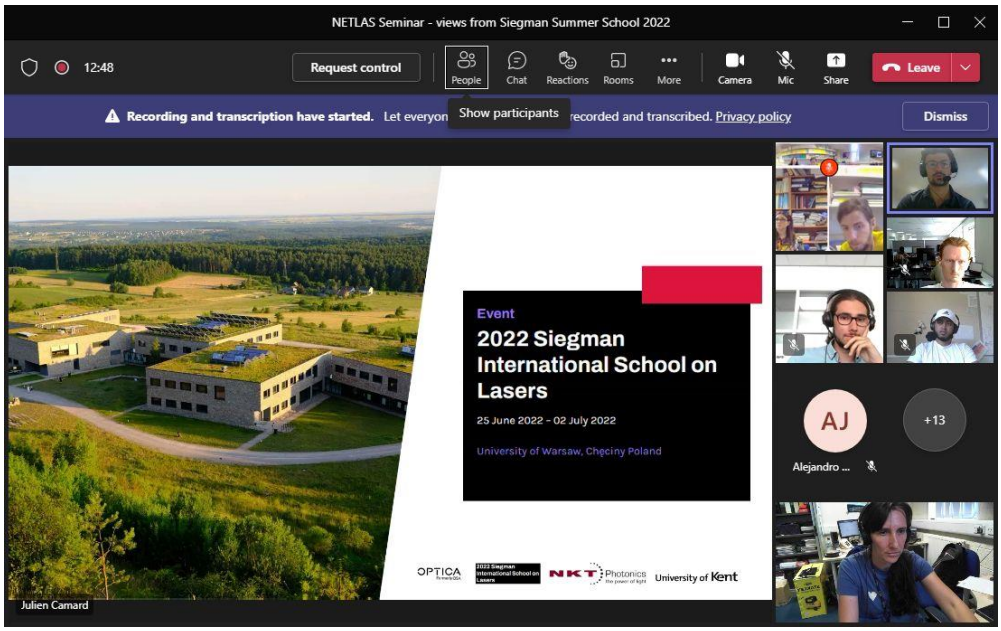
A few slides from the NETLAS PhD Student Rene Riha's presentation

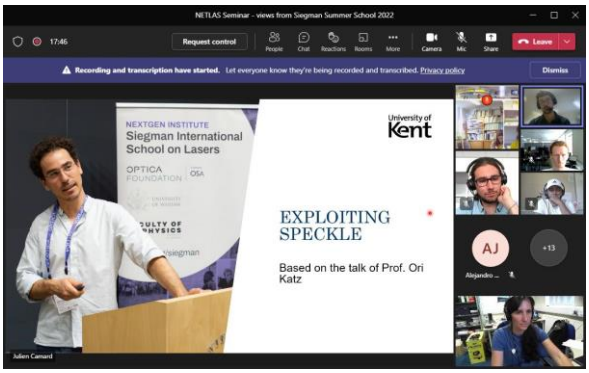
NETLAS Seminar

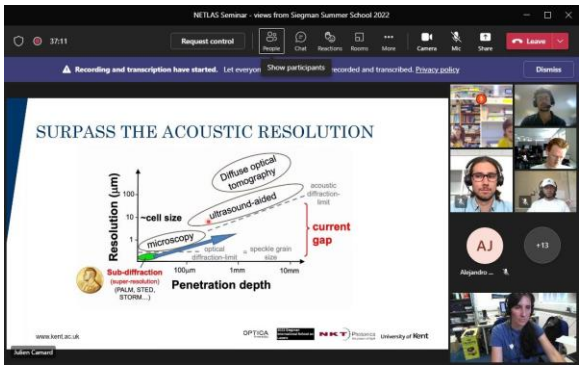
20th July 2022 at 10 am UK time

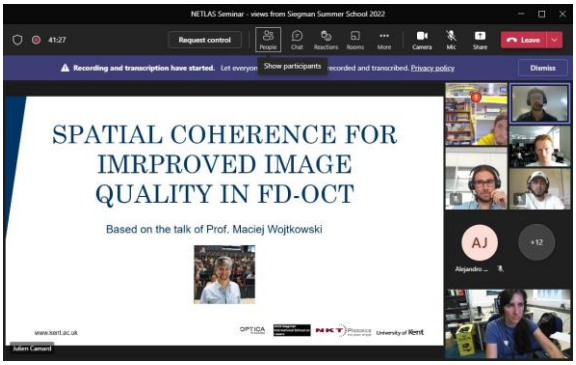
NETLAS PhD Student **Sacha Grelet** from NKT Photonics, Denmark and PhD Student **Julien Camard** from AOG, Kent University, UK, presented their views with what they have learned from **Siegman Summer school 2022,** organized by Optica and the University of Warsaw, Poland, 25th of June to 2nd of July 2022.

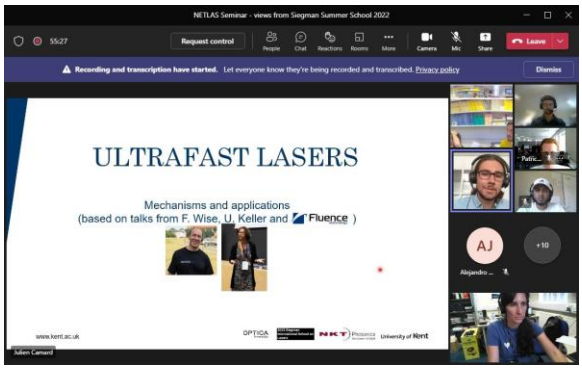
The Siegman International School is a week-long program that exposes students to in-depth learning of lasers and their applications from internationally recognized academic and industry leaders in the field. The Siegman International School on Lasers covers all aspects of lasers and photonics (Read More). Almost all Netlas PhD students attended the seminar (apart from two), which lasted about 90 minutes including the questions. As requested by the students, a copy of the presentation is going to be shared internally within NETLAS community through Teams channel. Print screens from the presentation will follow on the next page.

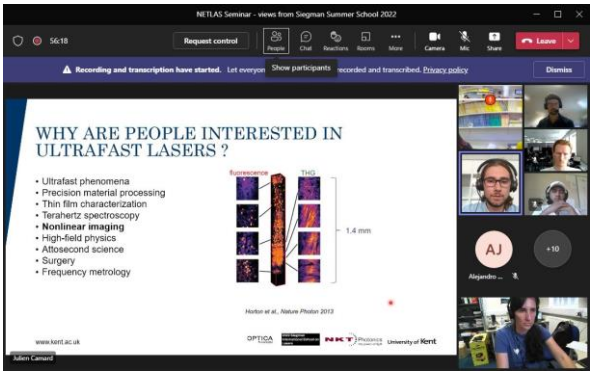


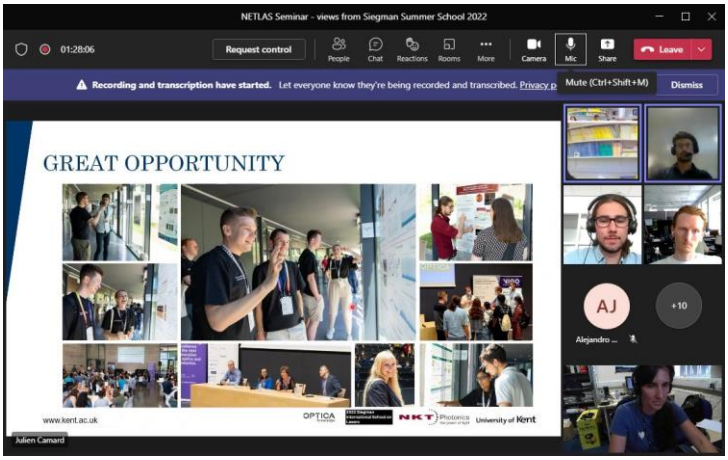












Print screens from the presentation given by NETLAS PhD Student Sacha Grelet (NKT Photonics, Denmark) and PhD Student Julien Camard (AOG, Kent University, UK)

CONFERENCES

Professor Adrian Podoleanu, NETLAS Coordinator, delivered a **plenary talk** to the 5th International Conference on Application of Optics and Photonics
July 18 to 22, 2022,
Guimarães, Portugal.

Title of his talk was "***Trends in Optical Coherence Tomography***"

Check the conference program here

AOP 2022 ***SCIENTIFIC PROGRAM***

	#	Title	1st Author or presenter	Type
MONDAY, JULY 18				
Oppening Session 13:45 - 14:25		The Vice-Mayor of Guimarães, Dr. Adelina Paula Pinto Prof. Dr. Humberto Michinel (Secretary General of ICO) Prof. Dr. Gilles Pauliat (President of EOS) Prof. Dr. Cesar Costa Vera (Counselour of RIAO) Prof. Dr. Luis Plaja (Vice-president of SEDOPTICA) Prof. Dr. Manuel Filipe Costa (Chairperson and president of SPOF)		
14:25 - 15:55 (1h30m)				
Plenary Pl1	6676	Trends in Optical Coherence Tomography	Adrian Podoleanu	Plenary (45 min=40+5)
Plenary Pl2	6534	The role of the laser technologies on the fabrication of organ-on-a-chip devices.	Maria Teresa Flores Arias	Plenary (45 min=40+5)
Chair(s): António Lobo				
Coffee Break				
Parallel Sessions Mo.1.a	6816	A touch of symmetry: High-harmonic generation from low-dimensional crystals.	Luis Plaja	Keynote (30 min=25+5)
16:30 - 17:50 (1:20 h)	6595	Towards 5-cycle, multi-mJ-level mid-IR capability at the L2I	Joana Alves	Invited (20 min=15+5)
Chair(s): Hugo Pires	6707	Scanning the flying focus of a tabletop vortex EUV beam	Patricia Estrela	Oral (15 min=12+3)
	6736	Various routes for VIS-to-UVC upconverted emission enhancement in lanthanide-doped nanoparticles	Patryk Falat	Oral (15 min=12+3)

PUBLICATIONS

Optical coherence tomography in the 2020s—outside the eye clinic

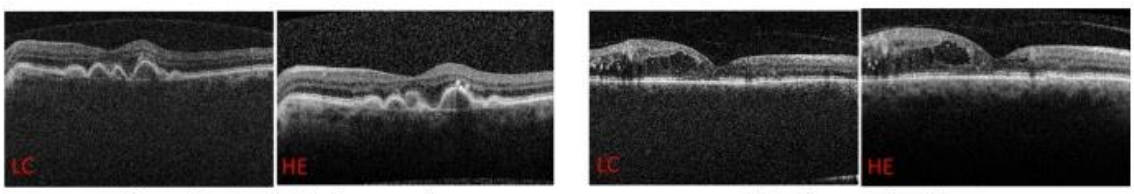
Reena Chopra, Siegfried K. Wagner & Pearse A. Keane

Eye volume 35, **pages 236–243 (2021)**

Abstract

Optical coherence tomography (OCT) is a paragon of success in the translation of biophotonics science to clinical practice. OCT systems have become ubiquitous in eye clinics but access beyond this is limited by their cost, size and the skill required to operate the devices. Remarkable progress has been made in the development of OCT technology to improve the speed of acquisition, the quality of images and into functional extensions of OCT such as OCT angiography. However, more needs to be done to radically improve the access to OCT by addressing its limitations and enable penetration outside of typical clinical settings and into underserved populations. Beyond high-income countries, there are 6.5 billion people with similar eye-care needs, which cannot be met by the current generation of bulky, expensive and complex OCT systems. In addition, advancing the portability of this technology to address opportunities in point-of-care diagnostics, telemedicine and remote monitoring may aid development of personalised medicine. In this review, we discuss the major milestones in OCT hardware development to reach those beyond the eye clinic. Read More

Fig. 2: Representative images from patients with pathology that were acquired by the low-cost OCT (LC) and the Heidelberg Engineering Spectralis (HE) systems.



Age-related macular degeneration | Diabetic macular edema

Scale bars: 500 µm. Images courtesy of Prof. Adam Wax, Duke University.

Hybrid silicon photonics DBR laser based on flip-chip integration of GaSb amplifiers and µm-scale SOI waveguides

Nouman Zia, Heidi Tuorila, Jukka Viheriälä, Samu-Pekka Ojanen, Eero Koivusalo, Joonas Hilska, and Mircea Guina

Optics Express, Vol. 30, Issue 14, pp. 24995-25005 (2022)
https://doi.org/10.1364/OE.460883

Abstract

The development of integrated photonics experiences an unprecedented growth dynamic, owing to accelerated penetration to new applications. This leads to new requirements in terms of functionality, with the most obvious feature being the increased need for wavelength versatility. To this end, we demonstrate for the first time the flip-chip integration of a GaSb semiconductor optical amplifier with a silicon photonic circuit, addressing the transition of photonic integration technology towards mid-IR wavelengths. Read More

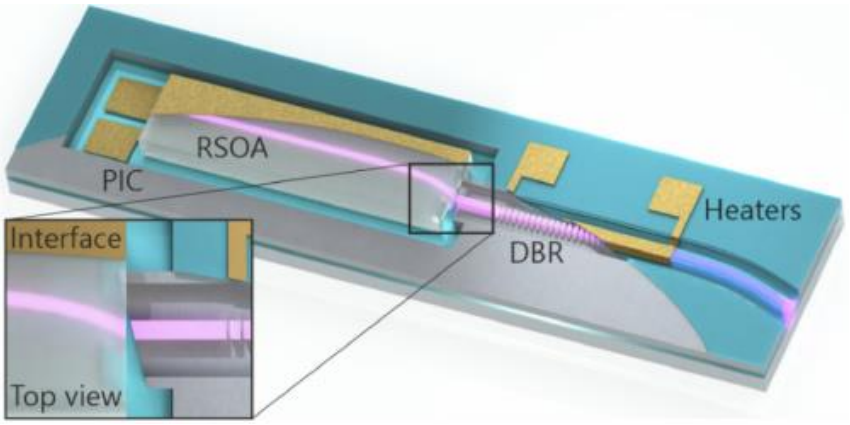
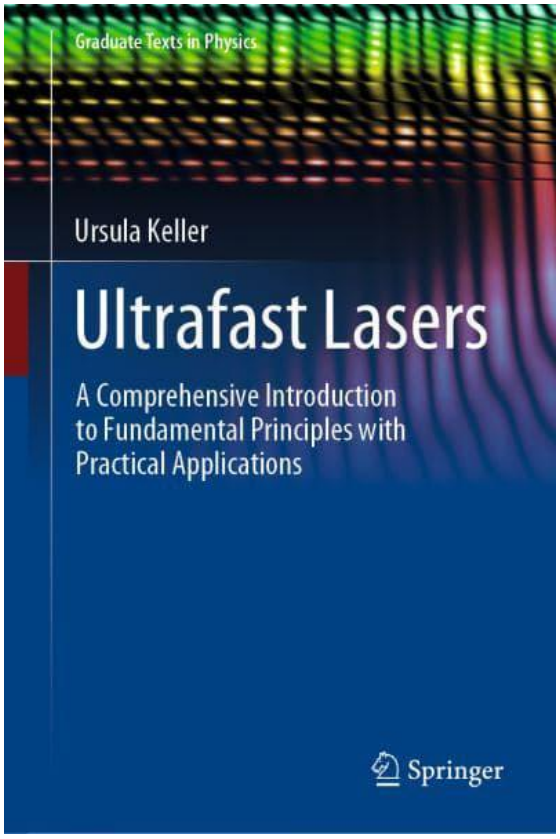


Fig. 1. **3-D model of the hybrid integrated DBR laser based on flip-chip integration and end-fire coupling between RSOA and SOI waveguides. The inset shows the top view of the optical interface between the waveguides.**

BOOK of interest for NETLAS PhD Students

Ultrafast Lasers : A Comprehensive Introduction to Fundamental Principles with Practical Applications - Graduate Texts in Physics

Author: Ursula Keller, Hardback (08 Mar 2022)



- Comprehensive and insightful textbook from the leading expert in ultrafast optics
- Covers fundamental theory and experimental design with a focus on applications and lab use
- Provides numerous worked examples and problems with solutions

DOI: https://doi.org/10.1007/978-3-030-82532-4

Order the book

Understanding tunable lasers: dedicated to young laser apprentices

Francisco Javier "Frank" Duarte

F. J. Duarte is a laser physicist, with interests in experimental physics and related theory, who has made a number of original contributions to the fields of tunable lasers and quantum optics. He introduced the generalized multiple-prism grating dispersion theory, has made various unique innovations to the physics and architecture of tunable laser oscillators, discovered polymer-nanoparticle gain media, demonstrated quantum coherent emission from electrically-pumped organic semiconductors, has pioneered the use of Dirac's quantum notation in classical optics, and derived the probability amplitude for quantum entanglement from transparent quantum interferometric principles, *à la Dirac*. The initial phase of his work, on quantum *N*-slit interferometry, led to the introduction of extremely-expanded laser beam illumination (2000:1) in interferometric techniques for microscopy and nanoscopy applied to industrial imaging measurements at the Eastman Kodak Company (1987). Read More

Published Research

- F. J. Duarte's firsts.
- Narrow-linewidth dispersive tunable laser oscillators.
- Development and characterization of organic gain media for tunable lasers.
- Generalized multiple-prism grating dispersion theory.
- Generalized refraction theory.
- Dirac optics: from quantum to classical optics.
- Interferometric imaging.
- Books on tunable lasers and quantum optics.
- Recent publications.
- Recent travels and lectures.
- US Patents.

Current Research Interests

- Fundamentals of quantum entanglement.
- Application of Dirac's quantum notation to classical optics.
- Application of quantum interferometric principles to imaging, microscopy, optical metrology, and free space communications.
- Secure space-to-space interferometric communications using *N*-slit interferometers.
- Development of compact high-power single-longitudinal-mode tunable laser oscillators.
- Physics and architecture of multiple-prism grating tunable laser oscillators.
- Application of tunable lasers, dispersive, and interferometric physics to: industrial measurements, aviation, and astronomical instrumentation.

With the occasion of the publication of IOP's 600th ebook, Quantum Entanglement Engineering and Applications [https://iopscience.iop.org/book/978-0...], IOP Publishing is asking some questions about optics and photonics to the lead author Dr F J Duarte, which was recorded and shared on YouTube channel.

Watch the YouTube video

(source http://www.tunablelasers.com/)

OPTICS & PHOTONICS NEWS

Optics & Photonics News Magazine July/August Issue

Optics & Art

Browse all Issues

Lasers for beryllium ion trapping from NKT Photonics

Trapped ions, especially 9Be+ ions, can be used for quantum computers and optical clocks.

Trapped 9Be+ ions can be used for quantum computers and optical clocks. For a good result, you need a kHz-linewidth low-noise 313 nm laser.

Read how you can get such a laser and see what other scientists have done with the NKT lasers.

GET MORE DETAILS

Imaging Spotlight

For more than 50 years ALRAD have been offering a wide range of Machine Vision, Photonics and Lasers, Vacuum related components and more recently Thermal Imaging and Medical electronics.

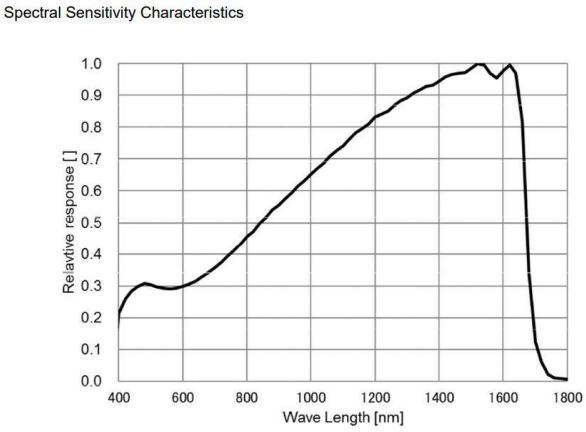
ALRAD NEW Technology - The Visible/SWIR Camera with seamless coverage from 400nm to 1700nm

ALRAD is pleased to announce the arrival of new two new 0.3 Megapixel and 1.3 Megapixel Visible/SWIR wavelength cameras from Omron Sentech. These cameras utilising the new Sony IMX990 and IMX991 sensors are available with 3 interface options: GigE Vision (PoE compatible), CameraLink and USB3 Vision.

Providing seamless coverage from the visible (400nm) throught to near infra-red (1700nm, these cameras are suitable for both Multispectral imaging and Hyperspectral imaging applications and can be combined with ALRAD's extensive range of machine vision lighting and Visible/SWIR lenses for a wide variety of applications.

Wide Visible/SWIR spectral sensitivity

- 0.3M, 1.3M SWIR sensor
- 400nm~1700nm wavelength
- GigE Vision, CameraLink, USB3 interface options



Webinars

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 12 2022 **Coming Soon!**

The Gravitational Wave Revolution

Dr. David Reitze, Executive Director at LIGO Laboratory and Research Professor at Caltech, joins us for an informative presentation on gravitational waves. He will provide an overview of gravitational wave astrophysics, highlight some of the most exciting discoveries, and discuss how we detect gravitational waves with LIGO using large interferometers capable of sensing displacements to a precision of better than 0.0000000000000001 meters.

Presented by Dr. David Reitze, Executive Director,
LIGO Laboratory
Bio

Click to Register!

LIGO Laboratory Detects Gravitational Waves Using Interferometers

Thorlabs Previously Recorded Webinars

Thorlabs' Digital Webinar series began in mid-2020. Each webinar and Q&A session is recorded and added to the archive on Thorlab's web page.

NETLAS Autumn School
Technical University of Darmstadt (TUDA)

NETLAS Autumn School is scheduled to take place at Technical University of Darmstadt (TUDA), Germany,

04-07 October 2022

Organizers are preparing the event and more details will follow soon.

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