

Well-Attended Q3 Meeting Offers LUX Members More Networking Opportunities

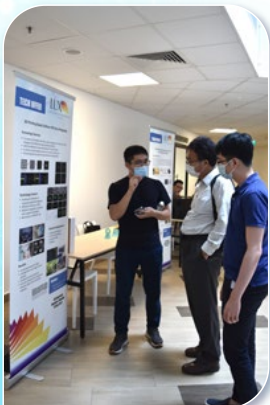
The LUX 3rd Quarter Members' Meeting of 2022 on 28 September saw a huge turnout of 87 attendees comprising representatives from 34 companies, 12 members of academia from NTU, NUS, SUTD, A*STAR and SERI (Singapore National Eye Centre), as well as ecosystem partners from the National Research Foundation Singapore, Enterprise Singapore, A*STAR's Consortium Management Office, IPI Singapore, the Singapore Health Technologies Consortium (HealthTEC), and NTUitive.

The LUX members in attendance welcomed the opportunity to network in-person, particularly with the strong turnout. The attendees enjoyed a buffet lunch, and the easing of Covid-19 measures meant that they were also able to interact with their masks off throughout the session.



In her opening address, Dr Soo Choi Pheng, Programme Director for LUX, welcomed new members CTmetrix and LightSpeed Photonics whom have just joined; and members from overseas flying in to attend the event: QRT from Korea and Synopsys Optical Solutions Group from Taiwan. She also called for submissions for the LUX Seed Grant 10th Call and promoted key upcoming events: the Industry Transformation Asia-Pacific (ITAP) 2022 from 18 to 20 October, where LUX will have a pavilion, and the annual Photonics@SG conference on 10 November.

In conjunction with the conference, LUX will welcome an international photonics cluster (EPIC, Optonique, Optonet) to Singapore, with C-suite executives from 20-30 companies also meeting EDB, Enterprise Singapore and LUX members, as well as participating in pre-arranged B2B meetings.



The Q3 Meeting also saw presentations by five of the new LUX member companies, as well as five Tech Talks and seven Tech Demonstrations by members of academia, which you can read more about below.

Message from the Chairman/Co-director:

With the improving Covid-19 situation, our LUX 3rd Quarter Members' Meeting of 2022 on 28 September saw a fantastic turnout of close to 90 attendees. It was great for all present to be able to network in-person, and with masks off.

We were also pleased to welcome three new LUX members (two Industry and one Faculty) at the event, which you can read more about in this issue. This takes us to 74 Industry and 72 Faculty members!

As I've mentioned previously, we are anticipating a busy end to 2022. From 18 to 20 October, we will be participating in the Industry Transformation Asia-Pacific (ITAP) 2022. Together with four member companies Component Technology, Hakuto Singapore, OIP Technology and Opto Precision, LUX has put up a pavilion of 48 square meters. Do visit the LUX Pavilion (Booth 2G25) at Singapore EXPO Hall 2 and discover the latest photonics solutions for Industry 4.0.

The following month we will have our annual Photonics@SG conference held on 10 November 2022. In conjunction with this, LUX will be welcoming our international photonics cluster delegations (EPIC, Optonique, Optonet) to Singapore from 9 November 2022. During their time with us, they will be visiting various LUX members' facilities as well as meeting government agencies to get a sense of the industry support that Singapore Government gives to local industries. We have also pre-arranged B2B meetings for our international delegates, comprising C-suite executives from about 20-30 companies, on 11 November.

I hope to see you at some of these upcoming events, let's help our vibrant photonics scene scale new heights together.

Prof Tjin Swee Chuan
Chairman, LUX Photonics Consortium
Co-Director, The Photonics Institute



Presentations by new LUX member companies



Industrial Vision Technology, which designs, develops, and deploys Electronic Measurement and Inspection systems for the photovoltaic and semiconductor industries. Its expertise is in spectral tunable or broadband spectral lighting source.



IVT, Managing Director, Mr Wang Yu Chang



JM VisTec, a Machine Vision specialist established in 2004 and that carries over 20 renowned brands globally. The company distributes industrial components such as cameras, lenses, sensors, and frame grabbers.



JM VisTec, Managing Director, Mr Eugene Goh



Origgin Ventures, which focuses on the investment and commercialisation of defensible patents from universities and research institutes. Since 2017, Origgin has successfully spun-off more than 30 deep-tech start-ups from local and overseas universities.



Origgin Ventures, Venture Creator, Ms Lum Yi Chyi



QRT, a laboratory in Korea that provides device reliability evaluation, physical / electrical / optical / material analysis to leading semiconductor / automotive companies globally.



QRT, CMO Dr Jung Sung Mun and Ms Han Su Jin



Synopsys, which offers advanced technologies for chip design, verification, IP integration, and software security and quality testing. Its Optical Solutions Group is a leading developer of optical design and analysis tools that model all aspects of light propagation.



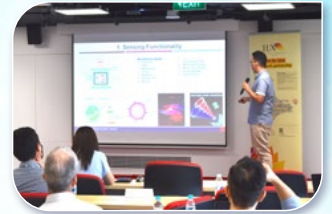
Synopsys, Account Sales Manager, Mr Thomas Chen

Tech Talk Highlights

Living Lasers: Transforming Biologicals into Tiny Lasers for Healthcare and Information Technology

Asst Prof Chen Yu-Cheng, NTU

Asst Prof Chen discussed the recent development of biological lasers and how this emerging technology bridges lasers photonics and biology to tackle biomedical problems, such as sensing and imaging diseases. He also shared that living biologicals can be applied to control and design photonic devices with intelligent functions for optical information. Asst Prof Chen painted a vision of the future where intelligent tiny lasers are used in wearable medical devices with smart functions, injectable sensors for health monitoring, and implantable biosensors.



Strain-Engineered Integrated Light Sources for Photonic-Integrated Circuits

Asst Prof Nam Donguk, NTU

Asst Prof Nam shared that the second quantum revolution will herald the development of powerful quantum computers, which will solve complex problems that even the most powerful supercomputers cannot. While photonics-based platforms are promising candidates for realising quantum computers, the realisation of a photonic quantum processor integrated on a single chip still faces several crucial challenges. He seeks to develop scalable and integrated photonic quantum processors using hybrid silicon photonics technology with various 2D materials.



VCSEL Advances at NUS

Assoc Prof Aaron Danner, NUS

Assoc Prof Danner discussed how Vertical Cavity Surface-Emitting Lasers (VCSELs) – with advantages including high beam quality, low cost, no moving parts, huge redundancy, possibility of mutual coherence – are well-established for optical communications, and increasingly used for LIDAR and sensor applications. His lab has fabricated high power laser arrays with a variety of possible applications.



Optical Coherence Tomography for Blood Flow Imaging

Assoc Prof Liu Linbo, NTU

Assoc Prof Liu shared that the optical coherence tomography market is worth USD\$1-2 billion, but that there remain limitations – such as limited field of view, lack of quantitative flow information, and suboptimal motion correction – with optical coherence tomography angiography (OCTA). He discussed the spectrally extended line field (SELF) OCTA that his team has developed to overcome these technical challenges in blood flow imaging. These new technologies will make non-invasive, wide-field, quantitative, and low-cost angiographic imaging more widely available.



Mid Infrared Nanophotonic Sensors

Assoc Prof Vincent Lee Chengkuo, NUS

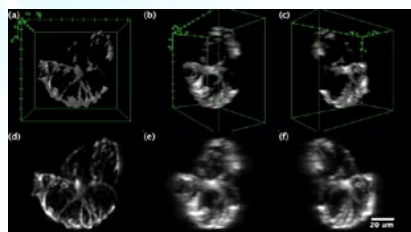
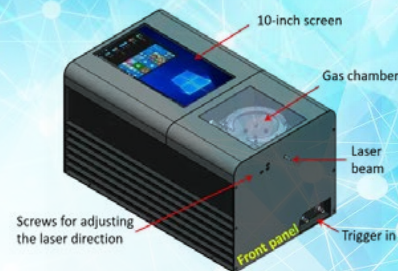
Assoc Prof Lee discussed his team's work at the Center for Intelligent Sensors and MEMS, NUS, towards chip-scale integrated photonic sensing systems offering higher level of on-chip integration, ultrasensitive MIR absorption-based waveguide sensors, wearable photonics platform, and more widespread and emerging sensing applications (e.g. IoT, smart buildings, healthcare monitoring, human-machine interface).



Tech Demonstrations

High-performance, compact **Mid-infrared Quantum Cascade Lasers for Gas Sensing Spectroscopy** can overcome the critical weakness (i.e. they are not selective and have intrinsic problems in differentiating a mixture of gases) associated with existing approaches. Potential applications include environmental monitoring and industrial process control, indoor air quality monitoring and oil & gas, detection of greenhouse gases, as well as monitoring of gas leakages.

Principal Investigator: Prof Wang Qijie

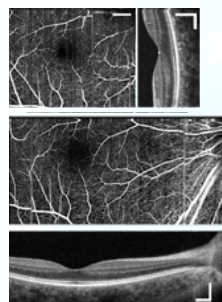
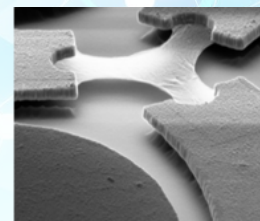


Advanced Optical Imaging Platform: Focal Modulation Microscopy and Beyond – the technology features include proprietary background rejection mechanisms (focal modulation); high contrast, fast multi-dimensional image acquisition; excellent cost-performance ratio; and being scalable and adaptive. Potential applications include life sciences research and clinical tests; photovoltaics & semiconductors; pharmaceuticals, cosmetics and food industries; materials science; and forensics.

Principal Investigator: Assoc Prof Chen Nanguang

Integrated Quantum Photonics: Fabrication and Measurements – quantum light sources are fabricated and measured using both 3D and 2D materials including aluminium nitride, and transition metal dichalcogenide (TMD). The ultimate goal is to integrate the quantum light sources developed with industry-ready photonics chip for the realisation of integrated photonic quantum processors.

Principal Investigator: Asst Prof Nam Donguk

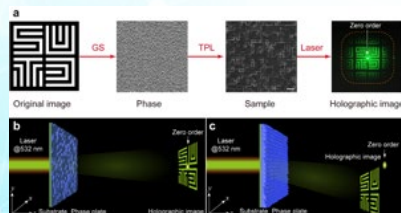


Spectrally Extended Line Field OCT for Imaging Retinal Blood Flow – optical coherence tomography angiography (OCTA) is a powerful tool for investigation and diagnosis of ocular diseases, but it has limitations in the scanning field of view and ability to quantify blood flow. SELF-OCT offers double the field of view and enables quantitative blood flow velocity measurement.

Principal Investigator: Assoc Prof Liu Linbo

A Single-pixel Mid-infrared Spectrometer for Solid, Liquid and Gas Sensing – technology features include single-pixel detection which provides higher sensitivity in MIR, while also being lightweight and portable (weighing 1.8kg and measuring 200mm x 200mm x 84mm) as well as robust. The spectrometer has a wavelength range of 3000-4000nm and spectral resolution of 6nm, and can be used in testing of liquids, plastics and pharmaceuticals; agriculture and food processing; as well as single/multi-gas sensing.

Principal Investigator: Assoc Prof Zhou Guangya

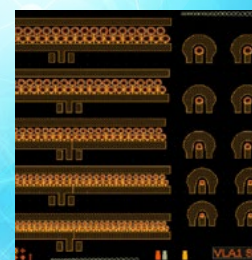


3D Printing Based Uniform Off-Axis Holography – technology features include pixel-level modification of computer-generated holograms, diffraction efficiency of 86%, arbitrary holographic projection with a specific wavelength, as well as micrometer to millimetre size. Potential applications include augmented reality, anti-counterfeiting measures, and security labels.

Principal Investigator: Assoc Prof Joel K. W. Yang

Vertical Cavity Surface-Emitting Laser (VCSEL) Arrays – the lasers are high-power and high-speed, offer high-reliability, and can be customised for particular applications, which include LIDAR for self-driving cars, as a source for dot projector (face recognition), triggering high-power semiconductor switches, and fiber-optic communication.

Principal Investigator: Assoc Prof Aaron Danner



New Industry Members Introduction

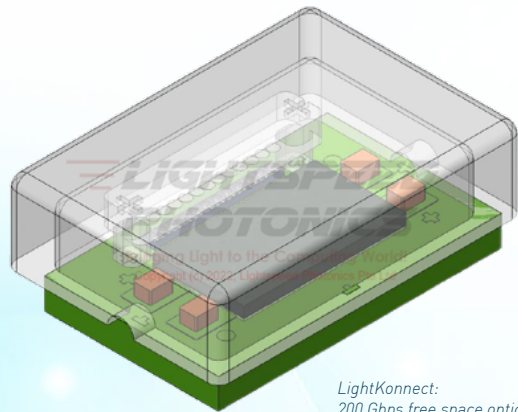


LightSpeed Photonics addresses the Demand for real-time processing of large data applications with Processor-Optics Integration.

LightSpeed Photonics is working to create a higher performance, more reliable photonics semiconductor that will help to create computing chips solve pressing bandwidth problems across industries. We are headquartered in Singapore and have operations in India.

LightSpeed Photonics is building optoelectronic processors and interconnects for data bandwidth intensive applications that require real-time processing. Our processors are scalable and field programmable so that customers can use them for multiple applications simultaneously to process data ten times faster and at a lower power. There are considerable applications and market demands like AR/VR, Metaverse, real-time video analytics, cybersecurity, Industry 4.0, AI, cybersecurity, and smart NICs.

3D packaging and heterogeneous systems are emerging technologies. LightSpeed Photonics addresses these markets by heterogeneous system in package approach combining computing and interconnects into a package. Our team has experience in the domains of distributed computing, high data rate interconnects, FPGA etc. In addition, Computer Hardware is a high-volume business with short development time. We plan to establish product market fit and plan for scaling up the volumes in the near future.



LightKconnect:
200 Gbps free space optical Interconnect

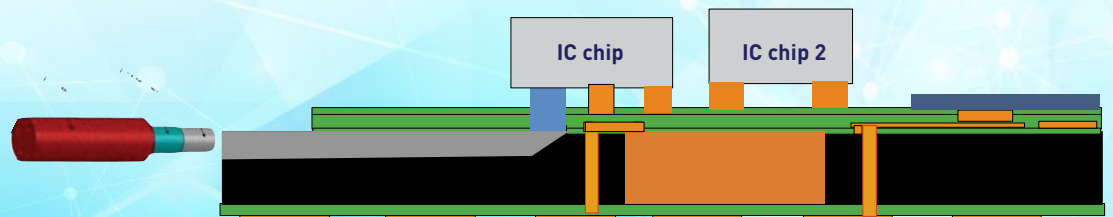


OIP Technology is a start-up company aiming high growth margin market, such as mobile, wearable product, new display and 5G data centre.

OIP is using panel-level based platform and semiconductor thin film process, the third generation of embedded chip technology. A key process developed by OIP is top/backside IC chip exposed, which is suitable for embedded glass filter, glass light guide and chip with backside metal.

With OIP's advanced optical packaging technology, optical module size is reduced by 10% in area and 30-50% in thickness for optical product including super thin optical sensor, integrated photonics package, super thin under-screen finger ID and new type of display.

OIP is also developing new substrate, which is able to integrate glass light guide, heat dissipation structure in the innovative low CTE substrate for silicon photonics Co-package.



CO-Package

Industry News



Meridian Innovation one of Forbes Asia 100 To Watch

LUX member Meridian Innovation, which provides thermal imaging solutions for safer and better living, has been selected from over 650 submissions to be part of the second Forbes Asia 100 To Watch list. The list spotlights "100 small companies and start-ups across the region that are addressing real-world challenges with fresh thinking and innovative products and services".

Meridian, which made the shortlist in the Enterprise Technology category, was singled out for its line of "low-cost thermal sensors" and products that are "used in healthcare, transportation and smart home markets".

"I am proud that Meridian Innovation has been selected to be one of the 100 small companies by Forbes," said Meridian's CEO and Co-Founder Hock Leow, "this is in recognition of the innovative design by our talented team in Singapore and Hong Kong. We are working with some of the Fortune 500 companies to incorporate our innovative thermal sensors for a safer and better living environment."



A global leader in materials, networking, and lasers is born

Two LUX members, II-VI Incorporated and Coherent, Inc., have combined to form a global leader in materials, networking and lasers: Coherent Corp.

On 1st July, II-VI, which manufactures optical materials and semiconductors, completed the acquisition of Coherent, a global provider of lasers and laser-based technology for scientific, commercial and industrial customers.

Coherent Corp. will have a global workforce of over 28,000 associates in 130 locations. Its combined business is organised into three business segments of Materials, Networking and Lasers, serving four key markets – industrial,

communications, electronics, and instrumentation – that represent a fast-growing, total addressable market of \$65 billion.

Said Dr. Vincent D. Mattera, Jr., Chair and CEO of Coherent Corp: "With our foundation in materials and our unstoppable imagination, we will enable the next evolution of the cloud, 3D sensing, electric vehicles, additive manufacturing, the commercialisation of space, and the personalisation of healthcare, just to name a few."

"We are together on a journey towards a future that will be increasingly mobile, intelligent and electric, accelerating the pace of innovation."



LUX members partner to develop Si Photonics Wafer Level Testing System and Methodology

Advanced Micro Foundry Pte Ltd (AMF), a leading commercial pure-play Silicon Photonics specialty foundry, and Axis-Tec, which develops automatic wafer level test equipment for optical and optical-electrical couplers, are combining their expertise to jointly develop Silicon Photonics Wafer Level Testing System and Methodology for standard industrial solutions.

Under a Memorandum of Understanding, Axis-Tec will develop these solutions via metrology systems equipped with Active Alignment Probe, while AMF will validate them in its volume manufacturing environment.

Silicon Photonics has applications including data communication, telecommunication, as well as Solid-State LiDAR and other leading-edge sensing technologies. According to AMF's Chief Technology Officer, Dr Patrick

Lo, wafer level testing is a key component to make Si Photonics the de facto solution for such technologies.

He added: "The testing solutions that will be developed through this partnership will help our customers shorten their development cycle time by providing a rapid insight into the performance of their devices and products and will also play a key role in supporting high volume production with high yields."

Said Mr Vincent Ong, Axis-Tec's Managing Director: "Together with AMF, we strongly believe that this new step in our partnership will enable a quantum leap forward in the drive towards standardisation of wafer level testing procedures for Silicon Photonics and will lead to more efficient and cost-effective solutions."

Annual Photonics Conference

PHOTONICS@SG CONFERENCE

10 NOVEMBER 2022 | Nanyang Executive Centre, NTU

Theme : Advances in Integrated Photonics

- International speakers from Industry and Academia
- Student Poster presentation
- Don't miss the Conference Dinner to network with international delegates.

GOLD Sponsor package
Speaking opportunity
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Exhibition space to showcase
your products/services



International Delegation Visit

Date: 9 ~ 11 November 2022

Delegation of ~20 C-suites executives from ~15 companies

Tentative program: 9 Nov – Companies Visit

10 Nov – Annual Photonics Conference, Dinner

11 Nov – Pre-arranged B2B meetings

Don't miss the B2B
meeting opportunities!



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