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LUX seals SEIPI partnership

LUX signed a Memorandum of Understanding (MOU) with the Semiconductor and Electronics Industries in the Philippines Foundation, Inc. ("SEIPI") at the 3rd LUX Quarterly Members' meeting of 2021 on 9 September.

SEIPI is the largest organization of foreign and Filipino electronics companies in the Philippines and aims to make the country a globally competitive business environment for semiconductor and electronics technologies.

LUX Chairman Prof Tjin Swee Chuan and SEIPI President Dr Danilo C. Lachica signed the MOU to kick-off the event, which was held virtually over Zoom.

The MOU will see the two organisations support one another in reaching out to the Philippines and Singapore markets and innovation ecosystems, government representatives, public funding bodies and other consortia; organize joint participation and increase synergies in trade shows, conferences, workshops and exhibitions; facilitate the exchange of information; and more.

It is the fifth MOU that LUX has signed with global partners, the previous ones being with EPIC, OPTITEC, Optronique and OptoNet.

The 3rd LUX Quarterly Members' meeting of 2021 was attended by 85, including representation from the SEIPI team and its members, as well as Enterprise Singapore.

The event also saw a breakout session where LUX Industry and Faculty members formed sub-groups in seven areas (optical sensor, flat optics/meta materials, SIMTech optics capability sharing, deep UV fibre laser, optical metrology, flat optics/metalens, high power laser) to discuss ideas for potential Industry Alignment Fund – Pre-Positioning Programme project collaboration, as a prelude to the Photonics Workshop to be held on 6 January 2022.

There were also company presentations by the four new LUX member companies:

Leuze, an international sensor expert for automation technology, shared its diverse product range which includes switching and measuring sensors, data transmission / control components, and for applications such as safety, identification and industrial image processing.

Masstron, which provides total communication solutions in fiber optics and network infrastructure, discussed its industry solutions for data centre, transport, oil & gas, marine & offshore, industrial automation, surveillance, military, OEM, and local manufacturing & assembly services.

Message from the Chairman/Co-director:

It has been an exciting and fruitful few months for us at the LUX Photonics Consortium.

In August, we held our LUX Faculty Members' Meeting, where the 32 members in attendance were able to hear from A*STAR and the Singapore Economic Development Board (EDB) on the Lasers & Optics Technology Roadmap and the focus areas for research and industry collaboration.

September saw us hold our 3rd LUX Quarterly Members' meeting of 2021 via Zoom. While we originally planned for a hybrid virtual-physical event, we had to alter our plans due to the tightened government measures for COVID-19. Still, I was heartened by the strong turnout of 85 attendees and would like to take this opportunity to thank you for your continued support.

During the event, I also represented LUX in signing a Memorandum of Understanding with the Semiconductor and Electronics Industries in the Philippines Foundation, Inc. ("SEIPI"), our fifth with global partners.

Last but certainly not least, LUX is proud to have been a supporting partner for the German Business Delegation visit to Singapore, in Electronics and Photonics, from 20 to 24 September. It was a great opportunity for our members to meet with the 10 companies in the German delegation and we were more than happy to play our part in facilitating business meetings.

Next up, we will be holding a Photonics Workshop on 6 January 2022 to explore industry-aligned funding opportunities – I hope to see you there. In the meantime, take care and stay safe!

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

PROTOKING shared its background as a one-stop solutions hub that connects design and manufacturing, with applied design thinking for product innovation from lab to market.

Innowave Tech discussed how it can provide end-to-end Industry 4.0 solutions for AI-driven automation. The company utilizes a combination of at least two of the following four technological verticals (computer vision, industrial IoT, data ecosystem, robotics automation) for its products and solutions.

Tech Talk Highlights

"Integrated Light Sources for Photonic-Integrated Circuits"
Asst Prof Nam Donguk, School of Electrical and Electronic Engineering, NTU
Asst Prof Nam Donguk shared how Graphene computers can work 1,000 times faster, yet use far less power. He also discussed his research on strained Graphene, where strong pseudo-magnetic fields of →100T are found to significantly decelerate the relaxation processes of hot carriers by more than an order of magnitude.

"Development of compact single-pixel spectrometers based on Hadamard Transformation", Assoc Prof Zhou Guangya, Department of Mechanical Engineering, NUS
Assoc Prof Zhou Guangya discussed his development of a single-pixel mid-IR spectrometer, which is low-cost (single-pixel), compact (20cm x 20cm x 8.5cm), has wavelength of 3 um ~ 4 um (easily configured to other wavelengths), resolution of 5 ~ 8 nm, is robust for field uses, and offers accurate detection with built-in self-calibration wavelengths.

"On-chip Laser Sources"
Prof Sun Handong, Division of Physics and Applied Physics, School of Physical and Mathematical Sciences, NTU
Prof Sun spoke about the positives of semiconductor lasers: miniature, turnkey, and offering wide wavelength coverage. He discussed Vertical-cavity surface-emitting lasers (VCSELs) which offer compatibility, low cost, power-efficiency; exciton polariton lasers; and tunable microcavity lasers.

"Reprogrammable Visible Photonics Materials and Applications"
Assoc Prof Robert E Simpson, Advanced Chalcogenides Technologies and Applications Lab, SUTD
Assoc Prof Simpson discussed how Sb2S3 has excellent phase change properties for visible PCM programmed photonics. His research group is developing displays, beam steering devices, waveguide routers, and optical neural network memory that exploit Sb2S3 properties.

Introducing SEIPI

The Semiconductor and Electronics Industries in the Philippines Foundation, Inc. (SEIPI) is the leading organization of multinational and Filipino-owned semiconductor and electronics companies in the Philippines with 350 members, including manufacturing firms, allied and support industries, and the academe. The Philippine semiconductor and electronics industry is a significant driver of the Philippine economy and the largest contributor to the country's manufacturing sector. In 2020, the industry accounted for US$39.67 billion, or 62.2%, of the country's total commodity exports and employs over 3 million direct and indirect workers. Cumulative electronics exports as of July 2021 year-to-date reached US$ 25.99 billion, or 61.30% of the total Philippine exports.

SEIPI, through its vision and mission, aims to make the Philippines a globally competitive business environment for semiconductor and electronics technologies. This is supported by its mission of enhancing and promoting the Philippines' competitive advantages and growth opportunities through Training, Research and Development, Advocacy, Information, Networking, and Services (TRAINS).

SEIPI has been working closely with key partners in government and private sectors for export and investment promotion initiatives. Moreover, it is implementing its roadmap aptly named PATHS (Product and Technology Holistic Strategy), which identifies specific products and technologies the industry must pursue in the growing sectors during the next five years to increase its share in the global market.

Moreover, SEIPI is helping establish a partnership model on sharing R&D technology between Philippine and French Universities, through its collaboration with ACSIEL Alliance Électronique, the biggest electronics industry association in France. Aside from ACSIEL, SEIPI has also been collaborating with several industry organizations in China, Singapore, Taiwan, and the USA for events and trade promotions, B2B and R&D projects.

To keep its members and partners engaged, SEIPI holds virtual quarterly General Membership Meetings (GMMs) that address pressing industry issues, technology trends and company best practices, as well as webinars to equip the industry workforce.

LUX Rallies Research Community to Support Government Agencies' Drive in Laser & Optics R&D

Singapore's photonics scene can only continue to thrive, with strong national-level efforts – underpinned by the Research, Innovation and Enterprise 2025 (RIE2025) Plan – to build up industry capability and encourage innovation.

And the LUX Photonics Consortium Faculty Members' Meeting on 25 August afforded an opportunity for the research members in attendance to hear from representatives from the Singapore Economic Development Board (EDB), A*STAR and Enterprise Singapore on what the government is doing to support this important agenda.

Mr Lionel Lim (centre), VP & Head of Technology Hardware & Equipment, EDB

Mr Gavin Tan, Account Manager, Technology Hardware & Equipment, EDB

Mr Lionel Lim, VP & Head of Technology Hardware & Equipment, and Mr Gavin Tan, Account Manager, Technology Hardware & Equipment, of EDB, kicked off the session with a presentation on the Lasers & Optics Technology Roadmap, which EDB co-developed with A*STAR for the Lasers & Optics Joint Industry Sector Planning (L&O JISP) for Precision Engineering Industry Transformation Map.

They discussed Singapore's strong interest in Precision Engineering sector, with Lasers & Optics an enabler for industries the Republic occupies global leadership positions in (semiconductor equipment, industrial machinery, consumer electronics and life science tools) and industries Singapore is looking to grow (automotive, aerospace, security and food & nutrition).

*Dr John Yong, Coordinating Director (Industry), A*STAR SIMTech*

*Dr Gary Ng, Deputy Director, Sustainability & Emerging Applications Centre, A*STAR SIMTech*

Next, Dr John Yong, Coordinating Director (Industry), and Dr Gary Ng, Deputy Director, Sustainability & Emerging Applications Centre, of A*STAR SIMTech and co-lead for L&O JISP technology roadmapping, spoke about the four research focus areas (Flat Optics/ Metalenses, Fibre Laser, Imaging Systems & Metrology, and Functional Coatings) that have been identified to help boost the manufacturing and precision engineering sectors.

These four areas will also receive funding support, including under the Industry Alignment Fund – Pre-Positioning Programme (IAF-PP) and Industry Alignment Fund – Industry Collaboration Projects.

There was also sharing on the support available to spin-off/start-ups and SMEs by Mr Gaius Lim, Deputy Director of Advanced Manufacturing at Enterprise Singapore, which looks after enterprises in the Laser & Optics industry. He spoke about the Startup SG Tech and Startup SG Founder schemes. The former grant fast-tracks the development of proprietary technology solutions, and catalyses the growth of start-ups based on proprietary technology and a scalable business model, while the latter aims to help aspiring founders start right and nurture more promising start-ups in Singapore.

Mr Gaius Lim, Deputy Director, Advanced Manufacturing, Enterprise Singapore

LUX Chairman Prof Tjin Swee Chuan discussed the Singapore photonics landscape and explained how the National Photonics Innovation Centre (NPIC) will serve three key functions:

- Centralised Grant/funding programme for IP prototyping and productization, translation support
- LUX Photonics Consortium – industry collaboration lead generation, facilitation of research/industry partnership, etc.
- Engineering Translation – (a) in-house (b) coordination/collaboration with partners

The NPIC will also help to coordinate the focus areas of flat optics, imaging systems & metrology fibre lasers, sensors, integrated photonics and displays & lighting at the national-level.

Prof Tjin Swee Chuan, LUX Photonics Consortium Chairman

The session concluded with a briefing on the Singapore Photonics Workshop to be held on 6 January 2022. Assoc Prof Wei Lei, of NTU's School of Electrical and Electronic Engineering and The Photonics Institute, will chair the workshop, which seeks to be a platform for LUX faculty members, company representatives and funding agencies to hold in-person discussions, form strong teams for industry-aligned funding opportunities and eventually translate cutting-edge research into photonics industries.

Key takeaways from the session:

- The Lasers & Optics Technology Roadmap focuses on four key areas: Flat Optics/ Metalenses, Fibre Laser, Imaging Systems & Metrology, and Functional Coatings
- National Photonics Innovation Centre (NPIC) aims to drive/execute efforts to translate IP into product realisation
- Singapore Photonics Workshop will be held on 6 January 2022 to seek ideas and topics for collaboration projects and form strong teams for industry-aligned funding opportunities
- Available support for start-ups include the Startup SG Tech and Startup SG Founder schemes

Assoc Prof Wei Lei, NTU School of EEE and The Photonics Institute

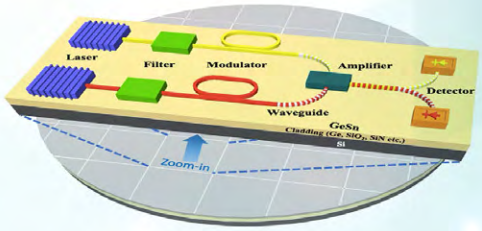
Series of Photonics Research Capabilities

Epitaxial growth of Germanium-Tin (GeSn) with high Tin (Sn) content for mid-IR applications

Group IV semiconductors are well known for their excellent electrical properties and CMOS compatibility, which could provide the semiconductor devices with higher frequency operation and to be incorporated into complementary metal-oxide-semiconductor (CMOS) foundry line for mass production of the next generation of metal-oxide-semiconductor field-effect transistor (MOSFET).

However, group IV semiconductors suffer from poor optical applicability due to their indirect bandgap in nature.

Incorporation of Sn atoms into Ge lattice could result in changing the semiconductor material from a fundamental indirect bandgap material to a direct bandgap material, but it is very challenging to do so due to extremely limited solid solubility of Sn (<1% in Ge) and as Sn is prone to segregation at higher concentration and growth temperature.



Several potential optoelectronic applications such as amplifiers, lasers, photodetectors, electro-optical modulators and routing switches can be fabricated and integrated on the GeSn films as shown schematically in the above. The Sn incorporation decreases the bandgap which results in a red shift in the absorption and enables the optoelectronic devices to operate in mid-infrared (MIR) region.

However, Prof Tan Chuan Seng's research group has achieved epitaxial growth of GeSn films with Sn content varying from 4 to 11% using digermanium (Ge_2H_6) and tin chloride ($SnCl_4$) as precursors in a commercial Chemical Vapor Deposition (CVD) system under reduced pressure condition.

The epitaxial GeSn films with various Sn contents can be utilized for different applications (photo-detector, light emitter and passives) operating in different wavelength ranges, from Near-Infrared (NIR) to Mid-Infrared (MIR).

LUX a proud partner for virtual German delegation visit

Ten German companies and suppliers in the field of electronics and photonics components and solutions met with our LUX Industry members during the recent virtual German Business Delegation to Singapore.

LUX was a supporting partner of the 20-24 September visit, organised by SBS systems for business solutions GmbH and the Singaporean-German Chamber of Industry and Commerce (SGC) under the auspices of the Federal Ministry for Economic Affairs and Energy (BMWi).

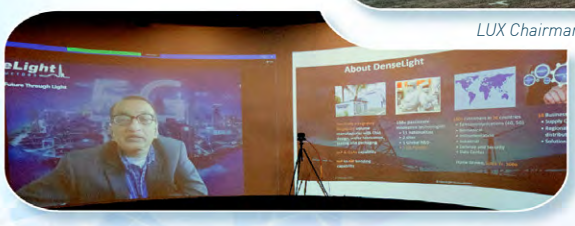
A two-day Electronics And Photonics Virtual Symposium & Networking, themed "New Opportunities Through Digital Transformation" was held from 21-22 September as part of the visit.

LUX Chairman Prof Tjin Swee Chuan presented on the Singapore photonics landscape, and there were also presentations from the participating German companies and LUX member companies (AMF, DenselIght Semiconductors, LightHaus and WEO) on technologies ranging from optical measurements, precision manufacturing & tools, to electronics, automation, laser diodes and intellectual property.

WEO R&D Manager, Mr Liew Wee Chang

LightHaus CTO/Founder, Dr Phua Poh Boon

LUX Chairman, Prof Tjin Swee Chuan



DenseLight Semiconductors VP Sales & Marketing, Mr Soma Sankaran

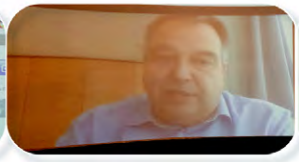
AMF Co-Founder/Director Business Development, Ms Kavitha Buddharaju

LUX organised themed breakout sessions on both days of the Virtual Symposium & Networking, for LUX member companies to explore new business and collaboration opportunities with the ten German companies (Beetz & Partner, blue automation, BrandProtec, CDA, Gigahertz Optik, Heidelberg Instruments, Innolite, Instrument Systems, Phaseform, and TOPTICA Photonics) in attendance.

Beetz & Partner Patent Attorney, Dr Wilhelm Heuer

BRANDPROTEC Patent Attorney, Ms Antje Heuer

blue automation CEO, Mr Thomas Grahl



CDA CTO, Dr Nicolaus Hettler

Gigahertz Optik Sales Manager, Mr Florian Schropp

Heidelberg Instruments Sales, Mr Mitsunori Saito

INNOLITE CEO, Dr Christian Wenzel

Instrument Systems VP Sales Asia Pacific, Mr Stefan Schindlbeck

Phaseform CEO, Dr Stefan M. Weber

TOPTICA Photonics VP Sales, Dr Manfred Karlowatz

Photo credit: Singaporean-German Chamber of Industry and Commerce (SGC)

The following LUX members participated in these business meetings: Acexon Technologies, AMF, AXISTEC, CompoundTek, DenseLight Semiconductors, DSO National Laboratories, Edmund Optics, Endofotonics, GDS Instruments, Hylax Technology, II-VI Incorporated, In.D Solution, KIAST, KLA Corporation, LightHaus Photonics, Lumerical, Phaos Technology, Photonik Singapore, SG Dynamic Optronics, Sintec Optronics, TNC Optics & Technologies, Wavelength Opto-Electronic, and WEO Corporation.

Industry News

US$8 million boost for Meridian Innovation

LUX Industry member Meridian Innovation has secured US$8 million in its latest round of funding, inclusive of a bank loan. This brings the total investment in the pioneering developer of advanced CMOS Thermal Imaging solutions to over US$18 million and will enable Meridian to ramp up production of thermal sensors and development of the second generation of its SenXor™, a low-cost, low-power thermal imaging sensor that can be built into any device.

New investor Best Ever Pte Ltd participated alongside existing investors Creative Technology Ltd, Excelpoint's investment arm PlanetSpark, and SEEDS Capital, in this funding round.

Said Meridian's CEO and Co-Founder Hock Leow: "Meridian is honored to have Best Ever joining Creative, Excelpoint and SEEDS Capital as investors. With Best Ever, a premier manufacturer investing in Meridian and partnering with us to ramp up production to meet the increasing demand, we are well positioned to have an explosive growth in the coming years."

"We have been shipping for a full year to our customer base and seen a rapid adoption of our thermal sensor. We are committed to constant innovation and, with this new investment, we are accelerating our second-generation sensor development. We will be sampling our second generation SenXor product in early 2022."

Temasek backs LUX Industry member AEM

AEM Holdings Ltd. will raise S$103.1 million in aggregate gross proceeds through a private placement to global investment company Temasek. The proceeds will enable AEM – a global leader in test and handling solutions for companies serving the advanced computing, 5G, and AI markets – to invest in next-generation capabilities, deepen research & development to accelerate product portfolio expansion, and fund its mergers and acquisitions plan.

The subscription agreement will see AEM issue 26.8 million new ordinary shares (9.5% of its total number of issued shares as of 6 August) at an issue price of S$3.8477 per share to Temasek. Russell Tham, Joint Head, Enterprise Development Group and Joint Head, Strategic Development at Temasek, has also been nominated to AEM's Board of Directors. Prior to joining Temasek, Mr Tham spent a total of 26 years with ST Engineering and Applied Materials.

Loke Wai San, Non-Executive Chairman of AEM, said: "As a global technology company based in Singapore, it is extremely meaningful to have Temasek come on board as a new investor at this juncture in our journey."
"At a time of significant change and opportunity in the semiconductor industry, the backing by a globally connected investor such as Temasek allows AEM to lean more purposefully into our growth plans. The Board of Directors at AEM looks forward to working with Russell and tapping on his vast industry experience."

Upcoming Events

LUX PHOTONICS CONSORTIUM SINGAPORE

Singapore Photonics Workshop

Lighting the Way Towards the Next Wave of Photonics Innovation

Date: 6 January 2022, Thursday • Venue: NTU, In-person Participation

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NUS National University of Singapore

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Agency for Science, Technology and Research SINGAPORE