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ILLUMINATE

IN THIS ISSUE:

LUX
PHOTONICS CONSORTIUM
SINGAPORE

CONSORTIUM HAPPENINGS

Highlight of LUX Quarterly Members Meeting

On 7 May, LUX members participated in the Quarterly Members Meeting, which included a networking lunch and three exclusive lab visits.

In the opening address, Eugene See (below photo), Director of the Consortium Management Office at A*STAR, shared that Prof Tjin Swee Chuan would be stepping down from his role as Chairman of LUX. Prof Tjin will remain a professor at NTU, as well as Director of the National Centre for Advanced Integrated Photonics (NCAIP). Eugene also shared that Dr Soo Choi Pheng would be appointed as the Consultant to LUX.

This was followed by a consortium update, in which plans were shared to promote research collaboration via the NCAIP at NTU, and the National Semiconductor Translation and Innovation Centre (NSTIC) at A*STAR; continue to focus on outreach to international photonics clusters in Europe, the USA/Canada, Asia and ASEAN; and build on strong partnerships with Asia Photonics Expo (APE) organizer Informa Markets and local trade associations such as the Singapore Precision Engineering and Technology Association (SPETA) and the Singapore Semiconductor Industry Association (SSIA).

There was also a look back at recent events such as the International Photonics Delegation Visit on 25 Feb, APE 2025 on 26-28 Feb, and the Photonics@SG 2025 Conference & LUX 10th Anniversary Dinner on 27 Feb.

In addition, the meeting featured four tech talks, as well as presentations by five LUX member companies.

CONSORTIUM HAPPENINGS

Presentations by LUX member companies

Dexerials Corporation, a Japanese manufacturer specialising in electronic components, bonding materials, and optical materials for applications in smartphones, automotive, and other industries. The company has a global footprint, with nearly 2,000 employees across Asia, America, and Europe.

Emerson NI: Emerson, a global technology and software company, completed the acquisition of National Instruments (NI) – a leading provider of software-connected automated test and measurement systems – in October 2023. The presentation looked at how Emerson is expanding its boundless automation vision into test & measurement.

PBA Systems, a leading provider of precision robotics and motion control solutions with over 30 years of experience. PBA is dedicated to developing innovative systems that integrate mechanical engineering, electronics, and advanced control systems for a wide range of industries, including semiconductor, automation, photonics/optics, and medical devices.

Micro Aire-Care (MAC) Pte Ltd, established in 1993, to provide sales and technical support for the cleanroom industry in Singapore and Southeast Asia. Today, MAC is a reputable distributor of high-quality cleanroom systems, laboratory furniture systems, fume cupboards, and many other life science and medical products, offering turnkey, value-added solutions ranging from custom design to installation and after-sales service support.

TeraHop Pte. Ltd., a world-leading optical solutions provider for AI and data centres. Founded in 2018, TeraHop offers high-speed optical transceivers, including 400G, 800G, and 1.6T, along with optical solutions for enterprise networking, metro and long-haul transport, and mobile access networks. The company is headquartered in Singapore, with research and manufacturing facilities in California, Thailand, and Taiwan.

CONSORTIUM HAPPENINGS

Tech Talk Highlights

From Automated Optical Inspection to AI-assisted Optical Inspection

Dr Cheng Fang, A*STAR Advanced Remanufacturing and Technology Centre

As AI becomes a megatrend for manufacturing, emerging challenges for automated optical inspection (AOI) include data availability, data quality, data explainability, and the balance between precision and callback. Dr Cheng Fang shared his insights and recent R&D work from his team in this space.

Single-Fiber Hyperspectral Endoscopic Imaging

Asst Prof Hu Guangwei, Nanyang Technological University

Asst Prof Hu's team is the first to demonstrate a single-fibre hyperspectral imaging via nonlocal flat optics. This offers a large field of view and fibre spatial mode invariance, while maintaining intrinsic robustness to fibre deformation. It also improves both imaging performance and device compactness. This breakthrough has important applications in endoscopy, quantum information, communications, and more.

CONSORTIUM HAPPENINGS

Tech Talk Highlights

Photodetection in Visible and Mid-Infrared with Optical Resonators

Prof Joel Yang, Singapore University of Technology and Design

Prof Yang presented a cost-effective, single-step binary lithography method for fabricating 16+ distinct spectral filters with 0.6 µm features. These CMOS-compatible filters integrate seamlessly into photodetectors. He also introduced thermoelectric photodetectors, leveraging phase-change materials Sb_2Te_3 and Bi_2Te_3, enabling high-performance photodetection and spectroscopy for biosensing, solar energy, medicine, and security. Scalable fabrication strategies for next-generation optical sensing technologies were also highlighted.

X-ray Quantum Nanophotonics for Imaging and Quantum Science

Assoc Prof Wong Liang Jie, Nanyang Technological University

Assoc Prof Wong presented his group's progress toward safer, sustainable, more compact and more efficient X-ray imaging, by leveraging the unique properties of free-electron interactions with van der Waals materials. The team achieved the first experimental demonstration of quantum recoil. Alongside their work on fundamental scaling laws for tunable X-ray generation, these findings lay the groundwork for next-generation X-ray technologies that combine the advantages of traditional X-ray tubes with those of enormous X-ray facilities.

CONSORTIUM HAPPENINGS

Exclusive Lab Tours – A Highlight of LUX Quarterly Members Meeting

The lab tours saw participants visit the Advanced Remanufacturing and Technology Centre (ARTC), the Centre for Fibre Optical Technology (COFT), and the Centre for Micro- & Nano- Electronics (CMNE).

At the ARTC (photo on the right), the group explored cutting-edge precision measurement technologies for manufacturing, the Two-Stage Stereo Vision System that enhances robotics and automation capabilities, synthetic data creation, and real-time inspection technologies for quality assurance on production lines.

The COFT tour (photo on the right) showcased functional fibres and wearables, cooling fibres (innovative textiles that reduce energy use via passive radiative cooling), as well as robust, wearable optoelectronic fibres that are enabling applications in healthcare, robotics, and smart apparel.

Meanwhile, at the CMNE (photo on the right), the group explored high-speed photonic systems, RF photonic configurations, advances in wafer-scale silicon photonics, and developments in hybrid III-V/silicon photonic integration.

CONSORTIUM HAPPENINGS

Dutch Delegation and LUX Companies Connect Over Integrated Photonics

An innovation mission brought a Dutch delegation to Singapore from 18–21 May to strengthen ties and foster collaboration between the Netherlands' integrated photonics ecosystem and partners in the Republic.

Beyond a focus on photonics R&D, the delegation sought to explore how this technology can address key societal challenges. Additionally, the Dutch ecosystem is seeking to connect with companies operating in end markets and application domains—such as classical sensing for medical and biosensors, spectroscopy for gas, chemical, and molecular analysis, automotive LiDAR, food and food safety, as well as applications that support quantum computers and networks.

An SME Matchmaking Session took place on 19 May as part of the delegation's visit, bringing together 11 LUX member companies and 15 Dutch companies and institutions. The Dutch delegation included companies involved in photonic integrated circuits manufacturing, optical system development, advanced packaging, testing, as well as a public-private investor, R&D centres and universities.

Representatives from the Embassy of the Kingdom of the Netherlands in Singapore and PhotonDelta opened the session with brief remarks on the event's purpose. PhotonDelta also shared its background as a non-profit organisation supporting an end-to-end value chain in the Netherlands for photonic chips—designing, developing, and manufacturing innovative solutions that contribute to a better world.

Dr Soo Choi Pheng, Consultant to LUX, then delivered an introduction to LUX and the local photonics ecosystem. This was followed by an introduction to Enterprise Singapore and the Eureka Network—the world's biggest public network for international cooperation in R&D and innovation, present in over 45 countries.

Each of the LUX member companies and Dutch delegation companies then delivered brief company introductions, before the attendees adjourned for a networking lunch to conclude the session.

RESEARCH HIGHLIGHT

Compact Tunable Water-Window X-Ray Source for High-Contrast Biological Imaging

Prof Wong Liang Jie from NTU and his team has developed a novel method for generating X-rays within the biologically significant water window regime (280 to 540 eV), a spectral region where water is transparent while organic compounds are absorbing. This water window is vital for achieving natural contrast in imaging biological cells and soft tissues in their near-native states—without the need for staining or potentially damaging sample preparation.

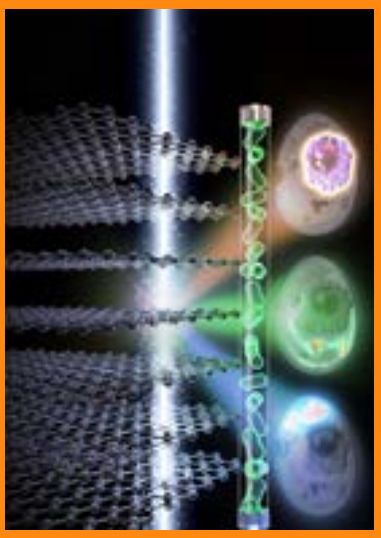

Photo: Artistic depiction of water window X-ray generation by free electron-driven van der Waals materials, and the use of these X-rays for cellular imaging.

Photo Credit: Nanyang Technological University, Singapore

By using record low-energy electrons (~4 kiloelectronvolts) from a compact table-top source, the researchers irradiate van der Waals crystals such as graphite to produce narrow-band, monochromatic water-window X-rays. Alongside this experimental advancement, the team has formulated a highly predictive front-to-end theoretical framework, establishing fundamental scaling laws that relate X-ray flux to incident electron current and material thickness. These laws were subsequently validated through experimental demonstrations.

Photo: NTU Principal Investigator Assoc. Prof. Wong Liang Jie and Research Fellow Dr. Nikhil Pramanik analysing the output of an electron microscope at the Facility for Analysis, Characterisation, Testing and Simulation (FACTS).

Credit: Nanyang Technological University, Singapore

Leveraging this framework, the team demonstrates that the X-ray imaging setup can achieve photon fluxes exceeding 10^8 photons per second on the sample—sufficient for most imaging and spectroscopy applications.

RESEARCH HIGHLIGHT

Compact Tunable Water-Window X-Ray Source for High-Contrast Biological Imaging

Like synchrotron-based sources, the system is continuously tunable, enabling real-time and high-precision adjustment of the peak wavelength across the water window. This tunability, often essential in water-window microscopes, is typically only available with large-scale facilities such as synchrotrons. In contrast, the new setup occupies only a table-top footprint, making it particularly suitable for scenarios where compactness and tunability are essential, while ultra-high flux is not a strict requirement.

Applications:

- **Soft X-ray Microscopy:** Enables non-destructive imaging of biological samples, such as cellular structures and individual cells, without the need for staining. Also supports elemental contrast imaging—for instance, calcium mapping in blood platelet cells to identify dense granules linked to bone disease diagnostics.
- **Structural Biology**: Facilitates the study of macromolecules, including proteins and nucleic acids.
- **Spectroscopy**: Supports near-edge X-ray absorption fine structure (NEXAFS) studies of both organic and inorganic materials.
- **Nanomaterials:** Allows non-destructive characterization of soft matter and thin films.

Advantages:

- Compact and energy-efficient design
- Tunable and versatile X-ray output
- Eliminates the need for intense lasers, high-energy electrons, or plasma sources—resulting in lower operational costs
- Potential for integration with high-harmonic generation (HHG), laser plasma X-ray, and synchrotron-radiation X-ray applications

INDUSTRY NEWS

Palomar Technologies Expands Asia Operations with New Facility in Singapore

Palomar Technologies' Advanced Solutions Division (ASD) in Asia has moved to a larger, upgraded facility to meet rising demand for advanced packaging services across the region.

The expanded site offers increased lab space and improved operational efficiency—enabling Palomar to better support customers with services such as:

- Process development & prototyping
- Prepare for manufacturing (PFM)
- Contract manufacturing
- Advanced field support

The move reinforces Palomar's commitment to supporting high-reliability industries—including semiconductors, photonics, aerospace, automotive, and medical devices—with end-to-end engineering expertise and localized service.

Palomar's ASD team in Asia will continue to provide:

- Engineering consultations
- Equipment demonstrations
- Process development support
- Localized service engagement
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About Palomar Technologies

Palomar is a global leader in advanced microelectronics packaging solutions, offering precision assembly, die attach, wire bonding, and full production services to accelerate product development and manufacturing success.

READ MORE HERE

NI Days 2025

Emerson-NI held their NI Days in Singapore on the 25th June 2025 with a showcase of cutting-edge technologies, hands-on demos, and expert insights. Engineers, researchers, and industry professionals gathered to explore the latest in test automation, data acquisition, RF systems, and AI-enhanced workflows.

The event opened with a keynote on the Future of Test, featuring leaders from Emerson Test & Measurement (NI) and the Solar Energy Research Institute of Singapore, who shared how open, modular platforms are enabling smarter, faster testing solutions.
Attendees also witnessed the signing of an MOU between Ngee Ann Polytechnic and Emerson, strengthening education-industry collaboration in test engineering.
With deep-dive technical sessions, tailored breakout tracks, and hands-on demos of NI's newest innovations, NI Days 2025 proved to be more than a tech event—it was a platform for collaboration, knowledge exchange, and future-forward thinking.

READ MORE HERE

UPCOMING EVENTS

17 September Quarterly Members Meeting

We're at the **NTU Innovation Centre** for our next Quarterly Member Meeting!

Connect with fellow industry professionals, gain fresh perspectives through thought-provoking technical talks, and discover cutting-edge technologies at our technical showcases. Don't miss this opportunity to network and be inspired!

12 November Quarterly Members Meeting

Save the Date: Our Nov Quarterly Member Meeting is just around the corner!

Get ready for a day of insightful discussions, peer networking, and exclusive company visits that offer a behind-the-scenes look at innovation in action.

UPCOMING EVENTS

4-6 FEB Asia Photonics Expo 2026

- 3-day event with 15,000 sqm of exhibition space
- Featuring LUX Photonics Consortium's Annual Conference, **Photonics@SG**
- International photonics delegation visit led by Europe Photonics Industry Consortium European Photonics Industry Consortium (EPIC) and The International Microtechnology Business Network (IVAM)

Venue: Marina Bay Sands Expo & Convention Centre, Level 1

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