

SEMICON® EUROPA

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semi

III-V Summit – Integrated Photonics

Opening Remarks

A. Manocha
President and CEO
SEMI, Milpitas, United States of America



Abstract

Coming Soon

Biography

Ajit Manocha is the president and CEO of SEMI. Headquartered in Milpitas, California, SEMI is the global industry association serving the electronics manufacturing and design supply chain. Throughout his career, Manocha has been a champion of industry collaboration as a critical means of advancing technology for societal and economic prosperity.

Manocha was formerly CEO at GLOBALFOUNDRIES. Prior to this he held the role of EVP of worldwide operations at Spansion and earlier served as EVP and chief manufacturing officer at Philips/NXP Semiconductors. He began his career at AT&T Bell Laboratories as a research scientist where he was granted more than a dozen patents related to semiconductor manufacturing processes that served as the foundation for modern microelectronics manufacturing. He has served on the boards of SEMI, SIA and GSA. Today, there is a much broader scope for SEMI to help foster collaboration and fuel growth than we could have ever imagined at its inception in 1970. This scope has to be accomplished without compromising the strong foundation of SEMI – the equipment suppliers and materials makers. Manocha feels SEMI must evolve as the industry's ecosystem rapidly expands to support smarter, connected applications based on artificial intelligence, machine learning and other disruptive technologies.

Manocha is active on global advocacy and workforce development issues and has served on the President's committees for "Advanced Manufacturing Partnerships" and the President's Council of Advisors on Science & Technology (PCAST).

In 2021, VLSIresearch added Manocha to its Semiconductor Industry Hall of Fame for his leadership of SEMI efforts to address geopolitical trade tensions as well as for his initiative in navigating the many challenges of the COVID-19 pandemic impacting SEMI and the microelectronics industry. In 2020, Manocha was inducted into the Silicon Valley Engineering Hall of Fame, and VLSI named him an "All Star of the Semiconductor Industry" for his visionary leadership in 2019 to restructure SEMI to represent the expanded electronics supply chain.

References

Welcome Remarks

L. Altimime
President
SEMI Europe, Berlin, Germany



Abstract

Coming Soon

Biography

Laith Altimime, as President of SEMI Europe, leads SEMI's activities in Europe and the Middle East and Africa (EMEA). Altimime has P&L responsibility as well as ownership of all Europe region programs and events, including SEMICON Europa. He is responsible for establishing industry standards, advocacy, community development, expositions, and programs. He provides support and services to SEMI members worldwide that have supply chain interests in Europe. He manages and nurtures relationships with SEMI members in the region and globally as well as with local associations and constituents in industry, government, and academia. Altimime has more than 30 years of international experience in the semiconductor industry. Prior to joining SEMI in 2015, He held senior leadership positions at NEC, KLA-Tencor, Infineon, Qimonda and imec. Altimime holds an MSc from Heriot-Watt University, Scotland.

References

Advancements in Photonic Integration Technologies: Meeting the Challenges and Expanding Opportunities

A. Rahim
Ecosystem Manager
PhotonDelta Foundation, Eindhoven, Netherlands



Abstract

Due to the exponential growth of Gen AI, photonic integration is becoming essential for creating high-speed, low-latency, low-energy optical connectivity. Photonic integration is a versatile technology with tremendous potential for use in healthcare, mobility, agrifood, and quantum computing markets. To realize this potential, advancements in photonic integration technologies are required in new process development, unique functional building blocks, integrating new materials with existing technology, and innovative packaging and assembly methods. This presentation will showcase examples of advancements in these areas.

Biography

Since February 2024, Dr Abdul Rahim has been the Ecosystem Manager at PhotonDelta - a growth accelerator for integrated photonics. In this role, he focuses on strengthening the PhotonDelta ecosystem through ecosystem development, fostering collaboration between the ecosystem partners, tracking the technology trends and aligning the PhotonDelta ecosystem with the market needs. Abdul Rahim holds a degree in innovation management and entrepreneurship from HEC Paris. In 2014, he earned his PhD from Technische Universitaet Berlin, Germany. His research focuses on silicon photonics for optical communication. From 2015 to 2024, Abdul Rahim managed ePIXfab - the European silicon photonics alliance and transformed it into an open alliance to promote silicon photonics science, technology, and application.

References

Paving the Way for High-Performance Electronics: The Future of III-V Semiconductors in Integrated Photonics

N. Singh
CTO
Compound Semiconductor Applications Catapult,
Newport, United Kingdom

Abstract

The future of electronics will be driven by III-V semiconductors requiring accelerators like CSA Catapult to help transform these materials into real-world applications.

Biography

Nick is the chief technology officer at CSA Catapult and is responsible for the technical strategic direction of the organisation, focusing on power electronics, photonics, quantum, RF and microwave, and advanced packaging. Prior to joining the Catapult, he was CTO of PhotonFirst (Netherlands), a pioneer of PIC sensing and advanced packaging in markets such as aerospace, medical, automotive and energy. He began his career in electronics and semiconductors in the mid-nineties in France.

He worked at Oxford Instruments Plasma Technology for over a decade, leading international teams to develop equipment and processes for epitaxy, ALD, PECVD, RIE, ICP etching. Nick was Group CTO at Scienta where he was responsible for technology and applications developments in XPS, graphene, OLEDs and plastic electronics. He was also CTO of a start-up for eight years which he helped scale up to deliver innovative Net Zero solutions.

Nick is a fellow and chartered engineer of the UK's Institute of Engineering & Technology (IET). He has a PhD in plasma physics and an electrical and electronics engineering degree, specialising in RF and power electronics, from University Paul Sabatier Toulouse.

References

Photonic Integrated Circuits: Industry Insights, Market Trends, and Technological Advances

M. Vallo
Senior Technology & Market Analyst
Yole Group, Villeurbanne, France

Abstract

Photonics integration is a growing trend, offering numerous advantages such as miniaturization, power efficiency, improved performance, cost reduction, scalability, high-speed data processing, and a platform for novel functionality.

AI data centers face unprecedented demand, driving a new era of scalable infrastructure and sustainable solutions. This trend opens up new and equal opportunities to various photonic integrated circuit (PIC) technology platforms.

Silicon PICs are compatible with CMOS (electronic) fabrication, allowing them to be manufactured using established foundry infrastructure. Additionally, new electro-absorptive materials for EO modulators, such as TFLN, BTO, or polymers, can be integrated into PICs, significantly improving energy efficiency.

The need for new materials in future photonic integrated circuits offer the possibility for alternative platforms like LNOI, InP, and SiN. Strong competition is expected since lithium niobate seems to be more efficient as an individual platform and InP is also waiting for its killing application where silicon run out of steam.

It is anticipated that recent progress in PICs will also create a highly competitive environment with discrete devices like VCSELs and EMLs. This talk aims to explore the positioning of photonic technologies in various communication and sensing applications and to provide roadmaps and market forecasts for industry.

Biography

Martin Vallo, PhD serves as a Senior Analyst, Photonics, specialized in optical communication and semiconductor lasers within the Photonics group at Yole Intelligence (Yole).

References

IBM Quantum System One

H. Riel
IBM Fellow
IBM Research, Science & Technology, Rüschlikon,
Switzerland



Abstract

Coming Soon

Biography

Coming Soon

References

The Art of Integrated Photonics Sensing

P. Kat
CEO
Amazec Photonics B.V., Oudkarspel, Netherlands



Abstract

Coming Soon

Biography

Pim Kat started his career at Sun Electric systems in 1982, developing automotive testing equipment. In 1987 he moved to Hoogovens research where he worked as researcher for 9 years. In the 1996 he co-founded the company BIHCA Systems as part of the HIT group. In 2003 this company became Technobis and eventually Technobis group in 2006. Technobis is one of the early pioneers using integrated optics for sensing applications. After the acquisition of the Technobis Group by ACC in 2019 he became the CTO of PhotonFirst (the new name of Technobis Fiber Technologies) and started a new company Amazec Photonics in 2020. This company will use the incredible resolution of Integrated Photonic Sensing for the development of new medical equipment for the early detection of heart failure.

References

An independent InP foundry in the integrated photonics supply chain

P. Maat
Senior Product Manager
SMART Photonics, Eindhoven, Netherlands

Abstract

The development and production of integrated photonic components and systems involves the design, manufacturing, assembly and system integration of photonic integration technologies. Currently, the integrated photonics supply chain that addresses each of these items is maturing. In the supply chain, SMART Photonics plays a crucial role as an InP photonic integrated circuit supplier. SMART Photonics is an independent pure-play foundry, producing high-end photonic integrated circuits for customers. As a foundry for integrated photonic circuits, SMART Photonics offers solutions for data and telecommunication, as well as for sensing – such as Lidar – and medical applications. The presentation explains the role of a foundry like SMART in the integrated photonics supply chain and describes our technology and the approach to aligning the business with the market needs.

Biography

Peter Maat is an integrated photonics specialist working at SMART Photonics as a senior product manager. He has 25+ years of experience in the design, fabrication, test and application of integrated photonics technologies, with a focus on applying integrated photonics in systems and applications.

References

L. Altimime
President
SEMI Europe, Berlin, Germany



Biography

Laith Altimime, as President of SEMI Europe, leads SEMI's activities in Europe and the Middle East and Africa (EMEA). Altimime has P&L responsibility as well as ownership of all Europe region programs and events, including SEMICON Europa. He is responsible for establishing industry standards, advocacy, community development, expositions, and programs. He provides support and services to SEMI members worldwide that have supply chain interests in Europe. He manages and nurtures relationships with SEMI members in the region and globally as well as with local associations and constituents in industry, government, and academia. Altimime has more than 30 years of international experience in the semiconductor industry. Prior to joining SEMI in 2015, He held senior leadership positions at NEC, KLA-Tencor, Infineon, Qimonda and imec. Altimime holds an MSc from Heriot-Watt University, Scotland.

References

BLACK Semiconductor : a journey to connect chips.

C. Huyghebaert
CTO
Black Semiconductor GmbH, Aachen, Germany



Abstract

This presentation will address the journey of Black Semiconductor and the pathway towards the development of a new enabling technology that targets to solve key industry data communication bottlenecks. Founded in 2020 by Dr. Daniel Schall and Sebastian Schall, Black Semiconductor is developing a new way to build networks of chips leveraging a novel material: graphene. These new chip networks will speed up data communication between chips for unparalleled performance, improved energy-efficiency, and reduced manufacturing cost. Black Semiconductor has the ambition to enable mass production of graphene semiconductors in full compliance with existing industry standards – a pioneering achievement for the industry. The company's technology and hardware facilitate optical chip-to-chip connections, allowing countless chips to interact almost as if they were one.

Biography

Cedric Huyghebaert is currently CTO at Black semiconductor a startup which wants to enforce a paradigm shift in chip to chip communication through graphene based photonics. Before that he acted as Program manager of exploratory processes and modules at imec, dealing with material exploration and early module integration for functional applications. He was the initiator and the technical lead of the 2D experimental Pilot line division in the Graphene Flagship, a project which has the ambition to enforce the adoption of 2D materials by the semiconductor industry. He started in 1999 as a junior researcher in the materials and component analyses group at imec. He studied the oxygen beam interactions during sputtering profiling of semiconductors. He received his PhD in Physics in 2006 at the KULeuven in Belgium. In 2005 he joined imecs pilot line as a support integration engineer, especially dealing with the process contamination control. He was part of the packaging group from end 2007 till begin 2010, working as a senior integration engineer dealing with 3D-stacked IC integration. From 2010 to 2019, he led the nano-applications and –material engineering (NAME) group at imec. He (co-)authored more than 200 peer reviewed journal and conference papers. He has a h-index of 42 and his work was cited >7000 times (google scholar).

References

Tracking the Supply Chain for Compound Semiconductor Materials

D. Scott
Vice President
TEHCET CA LLC, San Diego, United States of
America



Abstract

Coming soon

Biography

Diane is VP at TECHCET. She also maintains expertise in chemical-mechanical planarization (CMP) consumables and technology based on over 20 years of industry experience. Her work experience in CMP includes leadership and innovation at Rodel (now Dow) and NexPlanar (now Cabot Microelectronics), both CMP pad manufacturers. She also works in senior technologies at 3M in Texas. She was a co-founder of CMP Solutions LLC, a start-up company providing technical expertise and consulting services in the CMP technology area for semiconductor manufacturing companies. She holds a Ph.D. in chemical engineering from the University of Massachusetts, Amherst, a B.S. in chemical engineering from Clarkson University, and 13 patents.

References

Advancing Connectivity with III-V Materials

N. Collaert
Fellow and Program Director of the Advanced RF
Program
imec, Leuven, Belgium



Abstract

The relentless pursuit of advanced connectivity solutions has positioned III-V materials at the forefront of wireless, wireline, and photonic technologies in general. Characterized by their exceptional electronic and optical properties, III-V compounds such as GaAs, InP, and GaN are pivotal in the evolution of next-generation communication systems. In wireless applications, III-V semiconductors enable superior performance in high-frequency and high-power scenarios essential for 5G and beyond. These materials underpin the development of efficient power amplifiers, low-noise amplifiers, and high-speed transistors, which are crucial for enhancing signal transmission and reception.

For wireline communication, particularly in fiber optics, III-V materials offer unmatched capabilities. InP-based photonic integrated circuits (PICs) facilitate high-speed data transmission and low-loss signal processing, addressing the ever-growing demand for bandwidth in data centers and long-haul networks.

In recent years, the silicon photonics industry has experienced significant growth, enabling the integration of various optical devices on large-scale Si wafers with mature CMOS process technology. The integration of III-V materials and devices, including lasers and amplifiers, is crucial to complement these silicon photonics platforms.

Therefore, heterogeneous integration techniques, such as flip-chip bonding, micro-transfer printing, wafer reconstruction and selective area growth, play an essential role in designing future photonic and electronic integrated circuits. These methods meet high device density and production cost requirements while leveraging the advantages of III-V technologies.

This presentation provides an overview of how III-V materials are revolutionizing connectivity across various domains. These materials are central to overcoming the limitations of traditional technologies and offer promising solutions for the future of the global communication infrastructure. We will focus particularly on efforts to integrate III-V materials with silicon-based technologies.

Biography

Dr. Nadine Collaert is a program director at imec. She's currently responsible for the advanced RF program looking at the heterogeneous integration of III-V/III-N devices with advanced CMOS to tackle the challenges of next-generation mobile communication. Previously, she was a program director of the logic beyond Si program, focused on researching novel CMOS devices and new-material-enabled devices and system approaches to increase functionality. She has been involved in the theory, design, and technology of FinFET devices, emerging memories, transducers for biomedical applications, and the integration and characterization of biocompatible materials. She has a Ph.D. in electrical engineering from the KU Leuven, (co-) authored more than 400 publications, and holds more than ten patents in device design and process technology.

References

Next-Gen Telecom: Leveraging Advanced Packaging and Compound Semiconductors

J. Chandrappan
Head of Technology
Head of Technology - Advanced Packaging,
Compound Semiconductor Applications Catapult,
Newport, United Kingdom



Abstract

The rapid evolution of telecom networks, driven by the demand for higher data rates, energy efficiency, and enhanced connectivity, necessitates the integration of advanced materials and packaging technologies. Compound semiconductors, such as GaN and SiC, offer superior performance in power efficiency, high-frequency operation, and thermal management, making them ideal for next-generation telecom applications. This presentation explores the role of advanced packaging techniques, including heterogeneous integration and 3D chip stacking, in maximizing the potential of compound semiconductors. We will discuss challenges such as thermal dissipation, interconnect scaling, and signal integrity, and present solutions that leverage novel materials and integration strategies to improve performance, reduce power consumption, and accelerate the deployment of telecom innovations.

Biography

Dr. Jayakrishnan Chandrappan is the Head of Technology - Advanced Packaging at Compound Semiconductor Applications Catapult, UK. He established the packaging facility and team at CSA Catapult, focusing on semiconductor package design, modeling, micro-assembly, and rapid prototyping for NetZero, Future Telecoms, and sensing. Jay also spearheaded the establishment of the Driving Electric Revolution Industrialisation Additive Manufacturing facility for 3D packaging.

With over two decades of international experience in the semiconductor industry and industrial research, Jay brings a wealth of expertise spanning semiconductor material engineering, microelectronics, optoelectronics, advanced packaging, and reliability testing. Prior to his tenure at CSA Catapult, he held leadership and technology roles at esteemed organizations including Global Foundries Inc. (US), the Institute of Microelectronics (IME) at A*STAR Singapore, and served as a Scientist in the Ministry of Electronics & Information Technology, Government of India.

Jay is also a co-founder of two start-ups and has been honored with Europe's prestigious Marie Skłodowska-Curie fellowship. He is a recipient of the Royal Society of Chemistry's Emerging Technology Showcase Award.

He is an external advisory board member for the University of Bristol and the University of Leeds in the UK. Additionally, he contributes as a Board of Studies member for Cochin University of Science & Technology (CUSAT) in India. Jay is a valued member of SEMI, the Europe APC committee, and the International Microelectronics Assembly & Packaging Society (IMAPS) UK Chapter.

Integrated photonics in 6G

P. Annamaa
6G hardware technology lead
VTT, Espoo, Finland



Abstract

Presentation on potential applications and areas of technology development for integrated photonics for 6G

Biography

Petteri is 6G Hardware Technology Lead at VTT with a passion in turning research into business. He looks for exceptional opportunities and creates strategic commercial partnerships. Petteri has a background in research, product development, engineering and business development both from VTT as well as from the information technology hardware, cyber security and automotive industry. Petteri holds a degree in Lic Tech in Telecommunications Electrical Engineering from University of Oulu.

References

Packaging of micro-optical components for light coupling in silicon photonics

S. Wakeel
Ph.D. Researcher
Tyndall National Institute, Photonic packaging
and system integration, Cork, Ireland



Abstract

This presentation will focus on the development of novel packaging processes using micro-optics to achieve high levels of optical connectivity to photonic devices. Furthermore, using micro-optics enables directly pluggable fibre connections, avoiding the need to bond optical fibre arrays to the facet of the photonic device. My presentation will review the theoretical requirements for micro-optical packaging for photonic devices and experimental packaging processes, which have the potential to scale to high volume. These novel packaging processes are particularly suited to data centre applications where the massive growth in bandwidth densities presents significant challenges for photonic device packaging.

Biography

Saif Wakeel is a Ph.D. student in the Photonic Packaging and Integration Group at Tyndall National Institute, University College Cork. He received Master Degree from University of Malaya, Kuala Lumpur, Malaysia in 2022 and Bachelor Degree from Aligarh Muslim University, India, in 2018. Before joining Tyndall, He was with NXP Semiconductors, Malaysia, for two years. He was also a Research Intern at the National University of Singapore (NUS), Singapore. He has spent a year of research exchange at Dicle University, Turkey under Erasmus+ program. His research interests include wafer-level photonic and electronic packaging, novel micro-optics and integration methods, micro-transfer printing, and the reliability of photonic packaging. He has authored several publications, and two invited books with 400+ citations. He is a recipient of Wrixon Research Excellence Fellowship for attending Massachusetts Institute of Technology (MIT) as a visiting researcher.

References

Ellipsometry in Photonics Industry: Advancing Integrated Photonic Devices

A. Bölcskei-Molnár
Product Manager
Semilab, Ellipsometry Department, Budapest,
Hungary



Abstract

Ellipsometry is a valuable technique in silicon photonics industry, offering precise non-destructive measurements of film thickness, refractive index, and surface roughness which is critical for device fabrication. It enables precise characterization of multilayer structures, supporting process control and optimization during manufacturing. By ensuring uniformity and quality in optical components such as waveguides and modulators, ellipsometry is instrumental in advancing the performance and reliability of photonic devices.

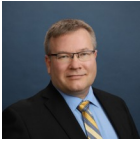
Biography

Anna Bölcskei-Molnár is a materials scientist MS since 2016. She has 7 years of experience in the semiconductor industry, rooted in experimental physics and skilled in application development. She is the product manager and software product owner of Semilab's industrial automated ellipsometer product line since 2020. Anna has a strong track record of developing customized measurement methodologies to address specific application needs. She is working closely with cross-functional teams to oversee product development, define requirements, and ensure timely delivery while maintaining product quality.

Biography

References

More than Photonics:SOI photonics platform with InP-chiplet heterogenous integration for multi-terabit datacom and telecom applications



J. Mellin
BL manager photonics
XFAB Group, Erfurt, Germany



Abstract

The photonixFAB project aims to empower photonics innovation by SMEs and large entities by providing low barrier access to both low-loss silicon nitride (SiN) and silicon-on-insulator (SOI) based photonics platforms with indium phosphide (InP) and lithium niobate (LNO) heterogenous integration capabilities. Micro transfer printing of InP chiplets on the SOI silicon photonics platform enables the combination of the best of the two worlds in a versatile manner. This opens the path to support multi-terabit datacom and telecom optical transceiver applications.

Biography

Mr. Joni Mellin is the **Photonics Business Line Manager** at X-Fab since 2022. Previously he served at ams OSRAM (2014-2021), where he held Engineering director and other positions in the Full Service Foundry division. Prior to that, he served at Microsoft (2014), Nokia (2008-2014), Micro Analog Systems (1999 – 2008) and Electron Physics Laboratory at Helsinki University of Technology (1997-1999). He received his Licentiate of Science (Tech) (2012) and Master of Science (Tech) (1999) degrees in semiconductor technology from the Aalto University and a dual GEMBA degree from WU Vienna and University of Minnesota in 2019.

X-FAB is one of the world's leading specialty foundry groups for analog/mixed-signal semiconductor technologies with a clear focus on automotive, industrial, and medical applications. As a pure-play foundry, we provide manufacturing and strong design support services to our customers that design analog/mixed-signal integrated circuits (ICs) and other semiconductor devices (inc. MEMS, power semiconductors and photonics) for use in their own products or the products of their customers. **www.xfab.com**

References

The Building Blocks for Latvia as a Regional Hub of Excellence in Integrated Photonics

T. Juhna
Professor and Rector
Riga Technical University (RTU), Riga, Latvia

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Abstract

Coming Soon

Biography

Professor and rector at Riga Technical University (RTU). Talis Juhna is one of the leading researchers in Latvia and has the trust and confidence of the local and international scientific community. He has proven his ability to combine research and pedagogical and administrative work. Talis Juhna has more than 15 years of experience in science and innovation management at the university and national levels. Actively involved in the implementation of support mechanisms for the development of start-ups and innovations in Latvia. He has introduced the technology transfer strategy that allowed RTU to become an innovative university in the region. He has developed various support mechanisms for promoting the innovation abilities of scientists and students and developing new technologies, such as the RTU Science and Innovation Centre.

Parallel to administrative work, he is active in science, leading and participating in local and internationally-funded science projects as a scientist. His research focuses on applying biotechnologies in drinking water, wastewater systems, renewable energy production, environmental biotechnology, biological kinetics, microbial viability, etc. He has created one of the most advanced Water Research laboratories in the Baltic States.

Talis Juhna is involved in several research boards in industry-academia clusters, including climate technologies, biotechnology, and material science. He has been appointed to the United Nations high-level group supporting the Technology Facilitation Mechanism, is the ambassador of the European Innovation Council, the chairman of the Advisory Council of the Latvian Science Council. He is a Board Member of Riga Water Company and co-founder of a high-tech biotech start-up.

References