MEMS & Imaging Sensors Summit

Welcome Remarks

L. Altimime
President
SEMI Europe, Berlin, Germany

Abstract
Welcome Remarks

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

SEMI MEMS & Senors Industry Group (MSIG) Update

P. Carey
Director, SEMI MEMS & Sensors Industry Group
Semi, MEMS & Sensors Industry Group, Milpitas, CA, United States of America

Abstract
The MEMS & Sensors Industry Group (MSIG), a SEMI technology community, continues to drive innovation and collaboration across the global MEMS and sensors ecosystem. In this presentation, MSIG will provide an update on its latest initiatives, strategic priorities, and industry engagement efforts. Highlights will include progress on key working groups and its R&D funding program. Attendees will gain insights into MSIG's role in shaping the future of sensing technologies, fostering cross-sector collaboration, and supporting emerging applications in automotive, healthcare, industrial, and consumer markets. This update will also outline upcoming opportunities for member involvement and preview MSIG's roadmap for the coming year.

Biography
Dr. Paul Carey has been the Director of the SEMI MEMS & Sensors Industry Group, MSIG, since 2021. He is responsible for managing MSIG including its US Government funded 2022-2027 (5-year) $25M Positioning, Navigation, and Timing (PNT) R&D program, online webinars, member outreach, and promoting MSIG's mantra, "we help member companies sensorize the world!"

Before joining SEMI, he worked at X-Ray imaging backplane supplier, dpiX (now called InnovaFlex Foundry) in process and equipment engineering management roles, Applied Materials, and FlexICs, a start-up company he co-founded. In earlier positions he was a postdoc at Siemens corporate research labs in Munich as well as a staff scientist and program leader at Lawrence Livermore National Laboratory where his group initially developed the low temperature polysilicon-on-plastic TFT technology.
Dr. Carey received a double major BS from UC Berkeley in Electrical Engineering and Computer Science (EECS) and Materials Science and Engineering (MSE). He received his MS in EECS from UC Berkeley and Ph.D. in MSE from Stanford University.

References

Inertial and Beyond – High performance for location and navigation

E. Abel
VP Engineering
Robert Bosch GmbH, ME-SE, Reutlingen, Germany

Abstract
Inertial and magnetic sensors are essential pillars of a wide range of location and navigation applications. MEMS has conquered most of the inertial sensors market with good spec values at continuingly competitive prices and form factors thanks to CE synergies – where are the limits and how does this approach compare to other solutions? Leveraging increased accuracy of innovative magnetic sensors based on TMR and quantum technologies has the potential to open new navigation use cases and more.

Biography
Emma is VP Engineering at Robert Bosch GmbH in Reutlingen Germany and heads R&D for MEMS Sensors there. She joined the Bosch Group in 2002, and has since held various positions in field of MEMS, semiconductors and sensor R&D within various business units within Bosch
She is a MEMS enthusiast, with previous roles including inertial sensor development, functional safety and MEMS Sensor industrialization for consumer electronics. Her current focus is on diversification in MEMS Sensors and their use in intelligent systems.
Emma received her Masters Degree in Electronic and Electrical Engineering from the University of Strathclyde, in UK

References

Is ultrahigh-vacuum technology potential to develop surface passivation for imaging sensors?

E. Z. Jahanshah Rad
SisuSemi Ltd, Turku, Finland

Abstract
Even if high-vacuum (HV, $5{\cdot}10^{-8}$ - $1{\cdot}10^{-4}$ mbar) technology has been used in the current silicon technology, ultrahigh vacuum environment (UHV, $1{\cdot}10^{-12}$ - $5{\cdot}10^{-8}$ mbar) is still rare in the Si industry. So far UHV has been utilized, particularly, in industrial UHV-CVD (chemical vapor deposition) instruments to grow SiGe transistors and highly doped source/drain contact areas. However, UHV methods have been often considered complex for large scale Si industry. On the other hand, a problem with HV is that time for adsorbing impurity (or contamination) atoms from HV environment on a solid surface to cover it completely is very short: e.g. about 1 s when the background pressure is $1{\cdot}10^{-6}$ mbar. In other words, it is very difficult in practice to avoid the incorporation of impurity atoms into Si-device surfaces and to prepare atomically clean Si surfaces with the current industrial methods. In contrast, UHV provides ultraclean environment to modify well-defined Si surfaces or interfaces before they become contaminated by environment impurities. For example, if the background pressure is $1{\cdot}10^{-10}$ mbar in UHV instrument, then surfaces remain clean for 10 000 s during a fabrication process. When an atomic level control of Si device surfaces and interfaces is considered, UHV environment could provide a clear benefit to the Si technology. For instance, performance of the CMOS-based imaging sensors depends strongly on atomic level point defects at Si interfaces [1-4] because defect levels increase the dark (or leakage) current of sensors via increased thermal generation of carriers via defect levels. Thus, durable passivation of these defects is relevant to development of the devices. Here we present a feasible route to integrate benefits of UHV technology with industrial methods to develop the surface passivation. Our results show that applying UHV-based treatments reduces defect density, leakage current, and power consumption in Si based devices.

[1] M. Bigas, et al. Review of CMOS image sensors, Microelectronics Journal 37 (2006) 433.
[2] J. L. Regolini, et al. Passivation issues in active pixel CMOS image sensors, Microelectronics Reliability 47 (2007) 739.
[3] J.-P. Carrère, et al. CMOS Image Sensor: Process impact on Dark current, IEEE International Reliability Physics Symposium (2014).
[4] A. S. Alj, et al. Dark Current and Clock-Induced Charges in a Fully Depleted Charge Domain CDTI-Based CCD-on-CMOS Image Sensor, IEEE Sensors Journal 24 (2024) 25652.

Biography
Zahra (Elmira) Jahanshah Rad is a Ph.D. candidate at the University of Turku with over eight years of experience in high and ultrahigh vacuum systems, semiconductor device structures, and surface science. She has authored more than 26 peer-reviewed publications and is the inventor of six patents in semiconductor technology. Zahra is the Chief Technology Officer and co-founder of SisuSemi Ltd., a Finnish startup developing energy-efficient semiconductor solutions. Her work focuses on improving the power efficiency and operational lifespan of silicon-based devices through advanced surface and vacuum engineering. She is committed to translating scientific research into sustainable technologies with real-world impact.

References

Capture Images with Perfect Vision - Breaking Through the Color Filter Limits with Color Splitting

J. Hoet
CEO
Eyeo, Eindhoven, The Netherlands

Abstract
For over five decades, the core mechanism behind color photography has remained largely unchanged. At the heart of nearly every CMOS image sensor lies the Bayer color filter array—a grid of red, green, and blue filters that allows silicon-based sensors to interpret color. Using this mosaic of RGB filters to capture color, each pixel is covered by a red, green, or blue filter, meaning that only one-third of the incoming light contributes to any given pixel's signal. As a result, roughly 70% of photons are discarded before ever reaching the photodetector. This inefficiency leads to lower signal-to-noise ratios (SNR), a perpetual Achilles' heel for smartphone and compact camera users.
Now, a new frontier in imaging is emerging. New nanophotonic color splitting technology guides, rather than filters, light into sub-diffraction-limited waveguides. This innovative solution eliminates the inefficiencies of Bayer-based systems and unlocks a new era of ultra-compact, high-resolution, and light-hungry cameras across smartphones, XR, industrial inspection, and medical diagnostics.
This session will discuss this innovation that replaces the Bayer filter entirely with a nanophotonic waveguide layer that splits light based on its wavelength and directs it to the appropriate pixel. Rather than absorbing unwanted wavelengths, this system uses vertical waveguides designed to separate colors, guiding photons with minimal loss and maximal resolution.

Biography
Jeroen Hoet is co-founder and CEO of the disruptive image sensor startup, eyeo, which develops a breakthrough imaging approach to unlock maximum light sensitivity and unprecedented native color fidelity for image sensors used in mobile devices, industrial systems, XR and more. As former entrepreneur in residence at imec, he successfully led the transition of a research-stage photonics technology into a compelling vision and business opportunity, paving the way for the launch of eyeo in 2024.

Jeroen has extensive technical and business experience in the imaging and semiconductor industries with roles in engineering, marketing and executive management at companies such as Caeleste, KLA, and ICsense. He earned a master's degree in engineering with a focus on microelectronics at Ghent University and an executive MBA from Vlerick Business School.

References

Leveraging hardware enabled AI image analysis for rapid 3D X-ray

J. Malin
Senior Director Software Product Marketing
Comet AG, X-ray System Division, Product Marketing, Hamburg, Germany

Abstract
The global demand for high-end computing power driven by AI, smartphones, IoT applications, high-performance computing, and new mobility applications is constantly rising while facing miniaturization demands. The semiconductor industry is focused on solving this challenge – for example with innovation in advanced packaging. As a consequence, yield and process control as well as the speed of new product introduction continue to gain importance as prototyping and verification costs increase while node sizes decrease. Typical inspection methods like optical or FIB-SEM are, therefore, complemented by advanced non-destructive inspection techniques like 3D X-ray inspection. Ultimately, advanced packaging companies seek non-destructive automated inspection tools which are fast enough to provide value within their production processes, increase yield and reduce waste at an early stage. The speech will show how combining innovation in X-ray hardware with cutting edge AI software can achieve rapid 3D inspection of advanced packaging and highlight how this combination increases the range of application "sweet spots".

Biography
Joscha Malin is the Director of Product Marketing for Software Solutions at the Systems Division of Comet that specializes in supplying X-ray and CT inspection solutions with a particular focus on the Semiconductor R&D and production sectors. In his role, Joscha oversees the division's software product portfolio, with the goal to enhance customer productivity by automation and empower them by data-driven insights derived from X-ray and CT image data. Joscha started his career with an Engineering diploma in Microelectronics from the Technical University Hamburg-Harburg. Over the years, he has worked in multiple roles within R&D in Semiconductor frontend design and system architecture, and within product management, with a consistent focus on image processing solutions.

Originally from Scotland, Chris Nicholson has a background in experimental solid-state physics. He completed a PhD at a Max Planck Institute in Germany focusing on laser-induced phase transitions at metal-semiconductor interfaces. Following research in Switzerland on resonant inelastic X-ray scattering, he started his own research group before transitioning to an industry position as an application scientist for electron microscopy and spectroscopy in Berlin. In 2023 he joined Comet X-ray as the Product Manager responsible for the microfocus and nanofocus X-ray portfolio. Working at the international headquarters in Switzerland, his role has an emphasis driving new X-ray solutions for applications in the semiconductor and electronics markets.

References

EYE2DRIVE: Redefining Vision Sensors for Dynamic Environments with Native HDR Technology

M. Vatteroni
CEO
EYE-TECH srl, Carrara, Italy

Abstract
Vision sensors are at the heart of automotive, industrial, and mobility applications — yet they often face a critical trade-off between dynamic range, image quality, and robustness under non-ideal lighting. Traditional High Dynamic Range (HDR) approaches, based on multi-exposure fusion or logarithmic pixels, suffer from inherent limitations such as motion artifacts, flickering, and degraded signal-to-noise performance.
EYE2DRIVE introduces a paradigm shift in vision sensing through an innovative, patented pixel-level technology that enables native single-frame global shutter HDR. At the core of the sensor is a **linear pixel architecture combined with a smart conditioning circuitry**, capable of adjusting the charge discharge and pixel sensitivity dynamically in response to real-world light conditions. This behavior mimics the adaptability of the human eye — without requiring multiple exposures or multi-gain architectures, dedicated processing, or non-standard CMOS processes.

The result is a sensor that delivers:
- High-quality HDR images with no post-processing
- No flickering or motion-induced artifacts
- Full compatibility with existing global shutter architectures
- Ease of integration using standard CMOS flows

This talk will provide a **technical insight into the sensing principle**, alongside a **broader perspective on applications**, integration roadmap, and market relevance. From autonomous driving to in-cabin monitoring and beyond, EYE2DRIVE is designed to address the most critical challenges of vision under extreme and variable lighting — enabling new levels of safety, performance, and flexibility in embedded vision systems.

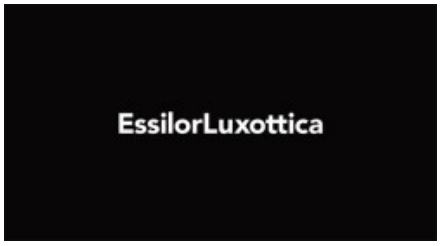
Biography
Monica Vatteroni is CEO and CTO of **EYE-TECH**, the company behind the **EYE2DRIVE** brand — an innovative vision sensing solution that delivers native high dynamic range (HDR) imaging with unmatched adaptability under challenging and fast-changing lighting conditions.
She holds a **Master's degree in Electronic Engineering** and a **PhD in Physics**, and brings over 20 years of experience in **CMOS image sensor design**, microelectronics, and innovation leadership. Monica is the **primary inventor of the patented technology** that powers EYE2DRIVE — a novel architecture enabling single-frame, real-time HDR at the pixel level, overcoming the limitations of traditional HDR approaches such as motion artifacts, flicker, and post-processing needs.
Her career spans both **academic research and industrial development**, with positions across the **medical, industrial, and semiconductor sectors**. From 2015 to 2016, she was a Postdoctoral Fellow at Université Claude Bernard in Lyon, working on a Marie Skłodowska-Curie Starting Grant project. Prior to that, she spent several years at the **Biorobotics Institute of Scuola Superiore Sant'Anna**, contributing to image sensors, vision systems, and sensorized platforms for biomedical applications. During the same period, she

also collaborated with **Eurotech S.p.A.** and **STMicroelectronics** on CMOS image sensing technologies. From 2002 to 2008, Monica worked at **NeuriCam**, an SME in Trento, where she was responsible for the analog design and later the full development of intelligent CMOS cameras.
She is the **author or co-author of over 30 scientific publications** in peer-reviewed journals and international conferences, and holds **nine international patents** in the field of image sensing.
At EYE-TECH, she leads a multidisciplinary team committed to developing **bio-inspired, highly adaptive vision systems** for automotive, industrial, and embedded applications — transforming research-driven innovation into scalable, real-world solutions.

References

Smart Eyewear and Augmented Reality: State of the Art and Future Challenges

T. Ongarello
Smart Eyewear R&D Manager
EssilorLuxottica, Milano, Italy



Abstract
Smart eyewear has emerged as a pivotal technology in the evolution of augmented reality (AR), merging advanced optics, sensor integration, AI capabilities, and wearable ergonomics into a single, user-centric platform. This talk will provide an overview of the current state of the art in smart eyewear, including leading-edge developments in display technologies (waveguides, microLEDs, holographic optics), optical combiners and integration into the smart eyewear, as well as the future challenges that must be addressed to fully realize the potential of AR eyewear.

Biography
Tommaso Ongarello is an Italian physicist and researcher specializing in smart eyewear technologies and photonics. He currently serves as the Smart Eyewear R&D Manager at EssilorLuxottica, where he leads research and development initiatives focused on integrating digital technologies, bioengineering, and artificial intelligence into next-generation eyewear.
Ongarello holds a Ph.D. in Physics and has a strong academic background, with research contributions in areas such as computer-generated holography and light–matter interactions. He has co-authored several scientific publications, including studies on wearable EEG devices and augmented reality applications.
In collaboration with Politecnico di Milano, Ongarello helped establishing the EssilorLuxottica Smart Eyewear Lab in Milan. This joint research center aims to bridge the gap between academia and industry by fostering innovation in smart eyewear through interdisciplinary research

References

Optimisation of supply chain of high-end optronics/photonics components in small quantities: is it possible in Europe?

O. Saint-Pé
Senior Expert
Airbus DS, Toulouse, France

Abstract
While most European institutions (EU, ESA, national governments...) fully recognize the strategic nature of Space business, it remains difficult in this area to meet the conflicting needs of developing high-performance custom components in very limited quantities at an affordable price. These demands are particularly contradictory for key optronics and photonics components such as image sensors, high data rates transceivers, and Photonics Integrated Circuits (PICs), whose production technologies are optimized for large volumes and require expensive non-recurring investments upstream of any production.
After an introduction recalling why Space is an increasingly strategic field for Europe, the authors will explain why Space needs are specific and broad based on the example of photon detectors and why COTS devices are not able to efficiently answer most of the needs. In the last part of the talk, examples of low-volume supply chains of detectors meeting space technical needs will be presented, as well as axes proposed to make such productions more efficient in Europe.

Biography
Technical expert in the field of optical detection, he has been highly involved in Phase 0/A-B1 studies for many TSEIO optical instruments since more than 35 years, successfully codesigning focal planes and corresponding custom detectors for missions such as Huygens, GAIA, GOCI, Sentinel 2, METimage, Trishna and LSTM.

As R&T and R&D study manager, he has contributed to passive and active optical instrument innovations in particular by pioneering several new detection technologies for space applications such as CMOS Image Sensors, microbolometers, T2SL, MCT APD and SPAD/SiPM, including the understanding of radiation effects on their performances and the developments of innovative methods and means for their characterizations

He has technically mentored many internships and young engineers within TSEIO in the field of optical detection and has been co-supervisor for 15 PhD thesis. He is the author or co-author of more than 100 papers in the field of space optical detection and instrumentation.

In the frame of internal and institutional R&D/R&T studies, he has set several collaborations with European industrial and academic stakeholders in the field of optical detection.

His deep knowledge about the physics and manufacturing processes of optical detectors regularly serves to find out anomalies root causes during projects Phase B2/CD and Phase E.

References