



## Imaging & LiDAR for Automotive Forum 2020 PROGRAM

September 10th AM, 2020

### Yole Développement

Alexis Debray

*Technology & Market Analyst, MEMS, Sensors & Photonics*

*Alexis Debray, PhD is a Technology & Market Analyst, Optoelectronics at Yole Développement (Yole). As a member of the Photonics, Sensing & Display division, Alexis is today engaged in the development of technology & market reports as well as the production of custom consulting projects dedicated to the imaging industry.*

*After spending 2 years at the University of Tokyo to develop an expertise focused on MEMS technologies, Alexis served as a research engineer at Canon Inc. During 15 years he contributed to numerous projects of development, focused on MEMS devices, lingual prehension, and terahertz imaging devices.*

*Alexis is the author of various scientific publications and patents. He graduated from ENSICAEN and holds a PhD in applied acoustics.*

Pierrick Boulay

*Technology & Market Analyst, Solid-state Lighting*

*As part of the Photonics, Sensing & Display division at Yole Développement (Yole), Pierrick Boulay works as Market and Technology Analyst in the fields of Solid State Lighting and Lighting Systems to carry out technical, economic and marketing analysis. Pierrick has authored several reports and custom analysis dedicated to topics such as general lighting, automotive lighting, LiDAR, IR LEDs, UV LEDs and VCSELs.*

*Prior to Yole, Pierrick has worked in several companies where he developed his knowledge on general lighting and on automotive lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO – Angers, France).*

### How automotive vision is becoming essential to mobility

Robotaxis are on the road. Personal cars with autonomous features are on sale, such as the Full Self-Driving feature from Tesla, which will soon be available as a subscription.

Automotive vision is a key enabler of this revolution in automobiles and mobility. Cameras have been integrated into cars for years. Infrared imaging is powerful to detect people in various lighting conditions. LiDAR is key in object detection. Artificial intelligence and sensor fusion are the missing links between sensors. This revolution will deeply impact the imaging industry. The LiDAR market for robotaxis will reach \$639M in 2025, while that for cameras \$228M. For ADAS cars, the LiDAR market will reach \$1.6B in 2025, while cameras will reach \$4.9B. Computing hardware for ADAS cars will have a market of \$2.3B in 2025 and \$1.3B for robotaxis. These huge market shifts will profoundly impact the associated technologies as well as the industrial landscape and supply chain.

## ON Semiconductor

Yolanda Xi

*Regional Marketing Director*

*Dr XI Yunxia Yolanda, is with ON Semiconductor, responsible for regional automotive and industrial market business development of intelligent sensing products in Greater China. Prior to joining ON Semiconductor, she worked for Infineon, Freescale and NXP, covering the chip architecture design, system application development and market business development. Dr. XI has rich professional experience and achievement in embedded SOC architecture design, automotive system application solutions, intelligent sensing solutions of autonomous driving (imaging, radar, Lidar). Dr XI holds a Ph.D. in electronic and electrical engineering from National University of Singapore.*

郝蕴侠博士现就职于安森美半导体，

负责大中华地区汽车和工业智能感知产品市场开发工作，包括自动驾驶领域的拓展工作。加入安森美半导体之前，她在英飞凌，飞思卡尔，恩智浦等多家半导体公司任职，涉及芯片架构设计，系统应用开发和市场开发工作。郝博士在嵌入式芯片架构设计，汽车系统应用解决方案，自动驾驶智能感知解决方案（成像，毫米波雷达，激光雷达）等领域拥有丰富的专业经验和项目成果。郝博士拥有新加坡国立大学博士学位。

### **Intelligent Sensing Technology of Imaging and LiDAR for ADAS and AD**

With the development of Advanced Driver Assistance System (ADAS) and Autonomous Driving (AD), the demand for various sensors continues to increase. Imaging and LiDAR are key technologies enabling ADAS and AD, but they also face many challenges and need better solutions.

Automotive imaging is far from only pursuing imaging quality. ADAS and AD need to collect data inside and outside the vehicle in a variety of environmental conditions, for the identification of static, dynamic objects, timely detection and tracking, so as to be able to identify possible hazards in the fastest time, with highly active safety technology. Therefore, imaging technology need to face the challenges of extreme environmental conditions outside and inside the vehicle, high dynamic range, LED flickering, functional safety, cybersecurity, the European New Vehicle Assessment System (NCAP) standard, which require suitable image sensors to meet these requirements.

Commercial LiDAR systems also face the challenges to meet the needs of autonomous driving. This includes the need to design a compact, reliable and low-cost system. Single Photon avalanche diode (SPAD) and SPAD- based Silicon photomultiplier (SiPM) technology have the technology advantages of high gain, high photon detection efficiency and manufacturing consistency compared with the existing APD. These technologies are the key sensing devices to realize the receiver function in Lidar system. High gain, low-cost, excellent uniformity SiPM and SPAD array sensors adapt to the challenges of low light detection from a variety of distances from LiDAR, paving the way for the commercial landing of LiDAR.

In addition to the discussion of key intelligent sensing technologies of Imaging and Lidar, this presentation will provide further sensor solutions of imaging and Lidar, including the sensor fusion.

## **System Plus Consulting**

Wilfried Theron

*Director of Department Electronic Systems*

*Wilfried Théron is Director of Department Electronic Systems for Reverse Costing analyses at System Plus Consulting (part of our Yole Group of companies).*

*Since 1998, Wilfried is in charge of costing analyses of Electronic Systems and Integrated Circuits.*

*He has significant experience in the modeling of the manufacturing costs of electronics systems and components.*

*System Plus Consulting focuses on Reverse Costing analysis of electronics, from semiconductor devices to electronic systems.*

*Supporting industrial companies in their development, we are offering a complete range of services, costing tools and reports. we deliver in-depth production cost studies and estimate objective selling price of a product, all based on a detailed physical analysis of each component in System Plus Consulting laboratory.*

*Wilfried holds a master's degree in Microelectronics from the University of Nantes, France.*

## **Automotive LiDAR: Physical & cost review of actual solutions and future evolutions**

LiDARs are now on the roads thank to Audi, the first automaker to introduce a commercial car, the Audi A8, with the Valeo Scala long-range LiDAR. Some new manufacturers like Livox propose also new products.

Based on pictures extracted from teardown and physical analyses of LiDAR from Valeo and Livox, the presentation will highlight the latest trends and the evolutions in term of system integration and components choices.

## **Hitronics Technologies Inc.**

John Ling

*Chairman and CEO*

*For over 30 years, John Ling has committed himself to promoting the growth and innovations of photonics. His background spans across academics, technical innovation, commercialization, and executive management. Some brief snapshots of his career include co-founding Casix in early years. He went on to cofound and serve as CEO of Photop until being acquired by II-VI, where he continued to serve as President of the Photonics Division. In 2017, John joined Hitronics Technologies as CEO and Chairman. He currently also serves as the chairman of the Fuzhou Photonics Society.*

## **Next-Generation Lasers for LIDAR Applications: Striking a Balance Between Cost and Performance**

Although the adoption of 1.5um wavelength by several major LiDAR companies has helped to reduce the size and cost of fiber lasers, they remain far too expensive for mass deployment within the automotive industry. In order to meet the demand for more compact and cost-effective 1.5um lasers, people have been making consistent and incremental improvements. Innovation from Hitronics Technologies has caused a recent shift in focus towards entirely new lasers that strike a more ideal balance between cost and performance. The unveiling of its proprietary high-rep Q-switched lasers and mini-fiber lasers offers an intriguing glimpse of the next generation of lasers that LiDAR companies will be utilizing in their pursuit of building a system that is both compact and cost-effective enough to be scaled for self-driving, and more widespread ADAS and AGV adoption.

## **SmartSens Technology**

James Ouyang

*Deputy General Manager*

*Mr. James Ouyang is Deputy General Manager of SmartSens. In this role, he is responsible for the integration of its corporate strategic resources.*

*Mr. Ouyang joined SmartSens from Goke Microelectronics, where he served as Vice President and was responsible for overseeing its primary security control chip. Previously, he served as the General Manager of Fujitsu Semiconductor's Asia Pacific sales department, successfully launching the first 360° surround view solution in the automotive electronics field. He also spearheaded the development of Fujitsu's ISP image processing chip, which was widely utilized by its customers. Mr. Ouyang has many years of semiconductor investment experience as well as an executive background in industrial supply chain and strategic resource integration.*

*Mr. Ouyang holds a master's degree in VLSI Circuit Design at Zhejiang University and a bachelor's degree.*

## **CIS in Automotive Application and the Future of CIS in China**

With the automotive sales once again on the upswing after a period of slump in 2019, the future of the industry is propelled by three major trends: electricity, intelligence and lightweight. Among them, the rapid rise of intelligent vehicles - which is projected to grow 9.3% annually - brings along the fast-growing demand for car cameras and video applications, from enhancing driver's experience to crucial safety features and broad-based integration with other intelligent devices. At the center of this boom are the image sensors inside each and every camera installed in these vehicles. SmartSens is in the position to take advantage of it with the company's complete line of AI image sensors that produce the highest quality images and videos under any situation.

## **Surestar Corporation**

Claire Zhang

*Director of Overseas Business*

*Claire Zhang is Director of Overseas Business of Surestar LiDAR. She holds a master degree in Economics of University of International Business and Economics. She focuses on overseas sales and marketing in Surestar and has been engaged in promoting best-in-class LiDAR to the global users.*

张寒青 北科天绘国际业务总监

为对外经贸大学经济学硕士，负责北科天绘激光雷达产品在海外市场的拓展和销售，致力于为国际用户提供优质的中国智造激光雷达。

## **Surestar Moves on to Produce High Resolution Automotive LiDAR with Low Cost**

Surestar strives to produce high resolution automotive LiDAR with low cost LiDAR has been regarded as the indispensable “eyes” for autonomous vehicles. However, the high cost of LiDARs is the biggest challenge for each LiDAR user. The unique know-how and 15-years of LiDAR R&D experience make Surestar stand out among the peers. We will focus on several development phases of Surestar LiDARs and illustrate how we could keep cost low for our automotive LiDARs through I/C technologies and semi-conduct process. Such Innovation enables the mass production of LiDARs in high efficiency and makes the autonomous vehicles part of daily life.