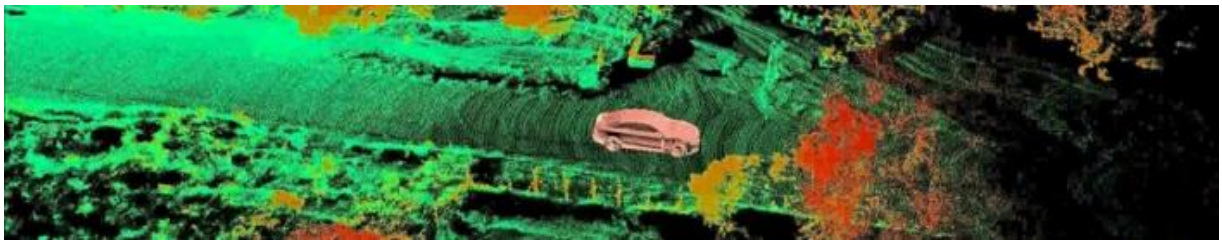

Imaging & LiDAR for Automotive Forum 2021

PROGRAM

September 16th AM, 2021

Yole Développement

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 LiDARs are being used by OEMs for automated driving

Since 2017, several car makers have put LiDARs on the road. Audi has made the first move, followed by Mercedes-Benz, Lexus, and more recently Honda. In coming years many more car makers will follow the same path and implement automated driving features. Different use cases are being implemented by OEMs and therefore different type of LiDARs will be necessary. This will impact the different LiDAR technologies but also their performances and cost. With the development of automated driving features, more sensors are being used, requiring a new car architecture and more software and computing power to process all the data produced. This presentation will give an overview of OEMs that will implement LiDARs and what type of LiDAR can be used. The evolution of the car architecture and the increasing need of software will be also discussed.

Ouster

Angus Pacala

CEO and Co-Founder

Angus Pacala serves as the Chief Executive Officer at Ouster, Inc. Mr. Pacala co-founded Ouster in 2015 in order to make lidar both digital and ubiquitous. Prior to Ouster, he co-founded lidar company Quanergy Systems in 2012 and served as Director of Engineering until 2015. Before that, he was a Battery Engineer at Amprius, Inc. He currently serves as a Member of the World Economic Forum's Global Autonomous Vehicle Council. Mr. Pacala holds a Bachelor of Science degree in mechanical engineering and a Master of Science degree in mechanical engineering from Stanford University.

Ouster: Enabling Revolutionary Autonomy With Digital Lidar

Ouster's presentation will cover: (i) trends and technology developments in the lidar market over the last few years; (ii) Ouster's digital lidar technology, including the benefits of VCSEL and SPAD technology compared to another technologies; (iii) the total addressable market opportunity for digital lidar; (iv) the automotive opportunity, including the specific product requirements; (v) the non-automotive opportunity, including the variety for applications and requirements; (vi) and finally, the future for digital lidar.

Innovusion

Dr. Junwei Bao

Co-founder and CEO

Junwei has a PhD in Electrical Engineering from UC Berkeley and has 20+ years of experience with precision instruments and optical sensors. He has managed technology ventures, having led the Autonomous Driving sensors & hardware team at Baidu, and as VP of Engineering at Tokyo Electron.

Empower safe and smart life

Why LiDAR (introducing the advantage of LiDAR, and the reason why L3+ autonomous driving require LiDAR as an important part of perceptual system)
Why Innovusion LiDAR (introduce LiDAR needs high resolution and 200m detection range (10% Lambertian) to achieve the requirements of L3+ autonomous driving
Three major elements of LiDAR pre-installation mass production (meet the demand for automatic driving; reliability, cost)

Vertilite

Xiaochi Chen

General Manager

Dr. Xiaochi Chen is the co-founder and general manager of Vertilite Co., Ltd. He and his team at Vertilite focus on the design and manufacture of VCSELs with world's leading performance and reliability. Dr. Chen has more than 10 years of experiences on design and manufacture optoelectronic devices. He has over 30 publications in leading international scientific journals and scientific conferences, and serves as a reviewer for Optics Express, Optics Letters, Optical Materials Express, and Photonics Journal.

Before Dr. Chen co-founded Vertilite, he was a senior R&D engineer at Globalfoundries engaged in the development of 7 nm technology node. Dr. Chen received his Ph.D degree from the Electrical Engineering Department at Stanford University. He dedicated to the design and development of photonic devices for silicon photonics in this Ph.D research.

New Breakthrough on VCSELs for Automotive LiDAR

VCSEL (Vertical-Cavity Surface-Emitting Laser) technology is a proven technology that has been widely used in consumer electronics for facial recognition and 3D sensing. A VCSEL is the best emitter choice for consumer electronics because it has various advantages over other types of semiconductor emitters such as edge-emitting diode lasers (EELs) and LEDs. These advantages include high power conversion efficiency, circular beam shape, high modulating rate, low temperature dependence of wavelength, long lifetime, wafer-level fabrication and testing, small footprint, flexibility in array design, and low cost. However, the low optical power density of VCSELs has been the major obstacle to its applications in automotive LiDAR which targets 30-300 meters of sensing range. This presentation will show our recent progress on automotive LiDAR-oriented VCSELs. The optical power density has been increased by 50 times compared to conventional VCSELs, reaching 5000 W/mm2, thanks to our cutting-edge multi-junction technology. This unprecedented optical power density by VCSELs is close to that of EELs. Together with other advantages above-mentioned, we conclude that VCSELs have great potential for automotive LiDAR applications.

System Plus Consulting

Romain Fraux

CEO

Romain Fraux is the CEO of System Plus Consulting.
System Plus Consulting focuses on Reverse Costing analysis of electronics, from semiconductor devices to electronic systems.
Supporting industrial companies in their development, Romain and his team are offering a complete range of services, costing tools and reports. They 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.
Romain has been working for System Plus Consulting for more than 15 years and was previously the company's CTO.
He holds a bachelor's degree in Electrical Engineering from Heriot-Watt University of Edinburgh (Scotland), a master's degree in Microelectronics from the University of Nantes (France), and a Master of Business Administration.

Technology and Cost comparison of Cameras and LiDAR for ADAS

With recent announcement by Tesla to remove radar from their cars and only to rely on cameras for its Autopilot and Full Self-Driving technology, it is obvious that cameras have a very important role to play in autonomous driving. Most of cars released on the market are equipped with multiples cameras, all around the vehicle with different fields of view. LIDARS are not yet broadly used, with only few car models integration. They seem to be unavoidable to achieve the next level of autonomy but have still to prove their cost efficiency. Based on pictures extracted from teardown and physical analyses of ADAS cameras and LIDARS from different automotive OEM and tier-1 including Valeo, ZF, Bosch, Continental, Livox, Denso, Tesla, Robosense and others, the presentation will highlight the latest trends and the evolutions in term of system integration, components choices and manufacturing cost.

BENEQ
Aaron Gao
Sales Director
Gao Zhi is sales director for Beneq Oy in China and responsible for semiconductor tools business market. Gao Zhi has more than 18 years of working experience in the semiconductor industry, holds technical and sales positions in mainstream semiconductor companies. Prior to join in Beneq Oy China sales team, he was technical manager at Qualcomm RF360 in Singapore and in charge of next generation wafer level packaging development for SAW/BAW filters. Gao Zhi's prior work experience also includes Micron Technologies (Singapore), UMC (Singapore) and SMIC (Shanghai).

Industrial Atomic Layer Deposition for Imaging and LiDAR

The demand for numerous automotive electronics is currently surging. This includes the emergence of innovative technologies such as Cameras. With safety being of primary concern, sensor fusion adding up the merits of LiDAR and Camera systems is a key factor toward fully autonomous driving (AD) as both systems are an important part of the advanced driver assistance system (ADAS). Automotive image sensors and the automotive LiDAR markets are both expected to grow with record CAGR of about 30% by 2027. CMOS Image Sensors for automotive require low light sensitivity (large pixel) and fast response. They benefit from stacking of logic, memory and image sensor layers in a 3D stacked BSI-CIS package. Solid state LiDAR (SSL) technologies, Flash and/or MEMS-based, are gaining traction thanks to higher resolution and speed as well as lower cost vs. mechanically scanning LiDAR. Depending on their type LiDAR systems consist of multiple components: laser sources and laser diodes, optical elements, beam steering elements for MEMS-based scanning or other SSL technology, photodetectors and signal processing units. Critical to the performance of Imaging and LiDAR devices are advanced thin-film deposition methods to maximize opto-electrical performance such as maximum efficiency or low leakage current and to guarantee operations meeting reliability specifications. High quality, dense and conformal layers deposited by Atomic Layer Deposition as well as processes controlling initial surface condition are addressing these challenges. This paper describes the leading edge ALD applications for Imaging – surface passivation, Anti Reflective Coating (ARC) and TSV barrier/seed of 3D BSI-CIS – and LiDAR devices – semiconductor surface passivation and encapsulation.