FOR IMMEDIATE RELEASE:

# Imaging technologies are transforming the automotive industry

Extracted from: Imaging for Automotive 2019 report, Yole Développement, 2019 | ZF S-Cam 4 – Forward Automotive Mono and Tri Camera for Advanced Driver Assistance Systems, System Plus Consulting, 2019

Webcast on June 24 at 5:00 PM CET: Automotive Imaging on its Way to Sensing powered by Yole Développement & System Plus Consulting - REGISTER

LYON, France – June 20, 2019: Cameras are now standard equipment for automobiles, with 124 million image sensors shipped in 2018. Automotive camera modules have reached US$3 billion and are expected to grow at an 11% CAGR[1], reaching US$5.7 billion by 2024, announces Yole Développement (Yole) in its latest imaging report, Imaging for Automotive.
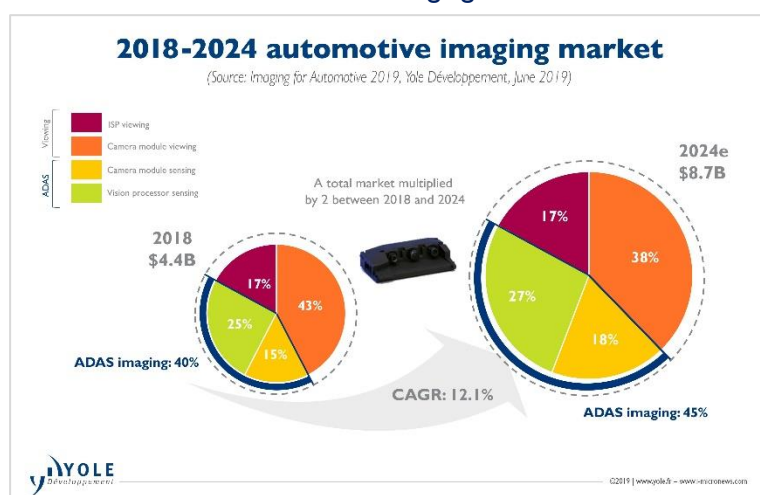
Over the past five years, viewing applications have been at the core of market growth – with rearview, surround-view, and black box becoming ubiquitous. ADAS [2] cameras, which currently represent 40% of the business, will provide additional growth for years to come thanks to growing adoption rates.

As an example, ZF, one of the largest tier one suppliers of automotive systems, last year released its fourth Generation S-Cam with two solutions, one with a mono camera and the other with a triple camera set-up…

Both companies, Yole and System Plus Consulting are working together to propose a deep understanding of the imaging technologies and their automotive applications. Their analyses include an AI-powered vision computing to reveal additional momentum to numerous automotive applications and imaging technologies.

From a market and technology perspectives, analysts are offering today a wide collection of reports to describe the imaging industry, innovative technologies and emerging market segments. In addition to the Imaging for Automotive report announced today, they present both reverse engineering & costing reports: ZF S-Cam 4 – Forward

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[1] CAGR : Compound Annual Growth Rate
[2] ADAS : Advanced Driver Assistance Systems

Automotive Mono and Tri Camera for Advanced Driver Assistance Systems.

Yole and System Plus Consulting, both part of Yole Group of Companies combine their expertise to point out technical breakthroughs and market opportunities. What is the status of imaging technologies within the historical automotive industry? What will be the tomorrow's industry? How will the car manufacturers and Tiers-1 manage this evolution? Analysts invite you to discover the future.

Formerly considered as a secondary market for imaging companies, the automotive industry is now central to every key player's strategy: firstly because revenue and volume have reached a significant level even when compared to mobile, and secondly because of AI[3] far-reaching impact, which powers ADAS.

"As the first full-scale edge computing application, imaging for automotive has positioned itself as a key "center of gravity" for imaging technologies during the transition from imaging to sensing applications", comments **Pierre Cambou, Imaging Activity Leader at Yole**. And he adds: *"New functionalities and novel technologies are today transforming the entire automotive industry."*

Yesterday, automotive applications used to be straightforward: rearview cameras and forward ADAS cameras, for the most part. Today, the situation has dramatically changed and the technological consequences may prove dramatic as well.

"For example, on the viewing side of the market, surround-view cameras crave expansion in lower-end markets, which should change the number of ISPs[4]", explains **Yohann Tschudi, PhD. Technology & Market Analyst at Yole**. *"Then there are the mirror replacement cameras, also called "e-mirrors" requiring anti flickering and HDR. That is why technical performance should far transcend the current viewing cameras."*

The fourth Generation S-Cam proposed by ZF, with its two solutions, one with a mono camera and the other with a triple camera set-up features the Omnivision CMOS image sensor.

"This technical choice made by ZF, demonstrates the shift in the procurement strategies of ZF and Intel Mobileye," comments **Audrey Lahrach, Cost Analyst from System Plus Consulting.** *"The use of the latest Mobileye EyeQ4 vision processor allows to combine the information from 3 cameras to improve security thank to a computing capacity multiplied per 10. All in one of the smallest and lightest products in its category."*

On the ADAS side of the market, the in-cabin application is being highly scrutinized by many CIS[5] players, mostly pushed by regulations. Moving forward, market acceptance will be interesting to monitor. The big

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[3] AI : Artificial Intelligence
[4] ISP : Image Signal Processor
[5] CIS : CMOS Image Sensor

question for reaching Level 3 autonomy is the technology selected for ADAS surround cameras. Data overload is obviously around the corner, and brute-force computing approaches, i.e. using a 180Tops ASIC (such as the FSD from Tesla) will not be possible or preferred for every OEM[6].

A new technology paradigm is brewing, but typical of automotive technology's slow rate of introduction, it could take 3 – 5 years to manifest… The collection of imaging reports is available on i-micronews.com, imaging reports section.

Next weeks, Yole Group of Companies will be part of key trade shows, conferences and webcasts. Its aim is to present its vision of the imaging industry, with an automotive focus.

Make sure to save these dates right now and book a meeting with our analysts:

- Yole and System Plus Consulting, both parts of Yole Group of Companies announce a dedicated online event on June 24, titled: **Automotive Imaging on its Way to Sensing.** Pierre Cambou from Yole and Audrey Lahrach present the status of imaging technologies and related automotive applications.
  Click here and register today!
- On September 4 at European Machine Vision Forum, Yole proposes a relevant presentation titled: **Technology transitions in the Machine Vision industry**.
- From September 4 to 6, in Shenzhen, alongside the 21th China International Optoelectronic Expo. (CIOE), Yole is organizing its **4 Executive Forums: 3D Sensing for Consumer – LiDAR for Automotive – Si Photonics – And IR Imaging.** Each forum will last half a day and include 7+ presentations of the main industry players. Attendees will then be able to access more than 25 exclusive talks during the four forums and networking times… More info.

To discover Yole's agenda, please click, I-Micronews.

Stay tuned!

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[6] OEM : Original Equipment Manufacturer

ABOUT THE REPORTS:

- Imaging for Automotive 2019

Paramount to the future of safety and autonomy, the automotive imaging market is at a key crossroads. – A technology & market report performed by Yole Développement (Yole)

List of companies

Aisin Seiki, Ambarella, ams, Apple, Aptiv, Baidu, Blablacar, Bosch, BYD, BrightWay Vision, Continental, Denso, e2v, Ficosa, Flir, Fuji Heavy Industries, Fastree3D, Fujitsu, Google, Ibeo, IMI, Infineon, Innoviz, Jabil, Kalray, Kingpak, Leddar Tech, Inilab, Inivation, LFoundry, LG, Magna, Magneti Marelli, Melexis, Mobileye, Movidius, NXP, Nvidia, Omnivision, ON Semiconductor, Panasonic, PMD Technologies, Prophesee, Quanergy, Samsung, SensL and more.

- ZF S-Cam 4 – Forward Automotive Mono and Tri Camera for Advanced Driver Assistance Systems

Fourth generation of the S-Cam family from the leading ADAS camera player – Two structure, process & cost reports, Mono & Tri Systems and Lens Module and CIS performed by System Plus Consulting.

Based on a teardown of the system, these reports detail a complete bill of material and describe the electronics and housing assembling. Moreover, a specific report describes the camera's manufacturing and packaging processes. They present also a detailed physical analysis of the CMOS image sensor, with a cross-section of the complete camera modules.

These reports also include a comparison with the previous version in the S-Cam series, the S-Cam 3. It estimates the manufacturing cost and selling price for both the mono and tri-camera.

The teardown and the cost analysis of the System On Chip (SOC) is available in the related report "Mobileye EyeQ4 Vision Processor Family".

About the authors

- **Pierre Cambou** has been part of the imaging industry since 1999. He first took several positions at Thomson TCS, which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012 Pierre founded Vence Innovation, later renamed Irlynx, to bring to market an infrared sensor technology for smart environments and interactions. He has an Engineering degree from Université de Technologie de Compiègne and a Master of Science from Virginia Tech. Pierre also graduated with an MBA from Grenoble Ecole de Management. In 2014 he joined Yole Développement as Imaging Activity Leader.

- As a Software & Market Analyst, **Yohann Tschudi**, PhD is a member of the Semiconductor & Software division at Yole Développement (Yole). Yohann is daily working with his team, to identify, understand and analyze the role of the software and computing parts within any semiconductor products, from the machine code to the highest level of algorithms. After his thesis at CERN (Geneva, Switzerland), Yohann developed a dedicated software for fluid mechanics and thermodynamics applications. Afterwards, he served during 2 years at the University of Miami (FL, UnitedStates) as an AI scientist. Yohann has a PhD in High Energy Physics and a master degree in Physical Sciences from Claude Bernard University (Lyon, France).

- **Wilfried Théron** is Head of Department Electronic Systems & QA Manager. Wilfried holds a master's degree in Micro-electronics from the University of Nantes, France

- **Audrey Lahrach** is in charge of costing analyses for IC, LCD & OLED Displays and Sensor Devices. She created display reverse costing activity for System Plus Consulting and developed the camera activity. She holds a Master degree in Microelectronics from the University of Nantes

- **Guillaume Chevalier** performs physical analyses. He holds a two-year university degree in technology of physical measurements and instrumentation technics.

ABOUT YOLE GROUP OF COMPANIES

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product.

System Plus Consulting engineers are experts in Integrated Circuits - Power Devices & Modules - MEMS & Sensors - Photonics – LED - Imaging – Display - Packaging - Electronic Boards & Systems. Through hundreds of analyses performed each year, System Plus Consulting offers deep added-value reports to help its customers

understand their production processes and determine production costs. Based on System Plus Consulting's results, manufacturers are able to compare their production costs to those of competitors. System Plus Consulting is a sister company of Yole Développement. More info on www.systemplus.fr and on LinkedIn and Twitter.

Founded in 1998, **Yole Développement (Yole)** has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS & Sensors - Imaging - Medical Technologies - Compound Semiconductors - RF Electronics - Solid State Lighting - Displays - Photonics - Power Electronics - Batteries & Energy Management - Advanced Packaging - Semiconductor Manufacturing - Software & Computing - Memory and more...

The "More than Moore" market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. . For more information, visit www.yole.fr and follow Yole on LinkedIn and Twitter.

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