



## FOR IMMEDIATE RELEASE:

# LiDAR industry: high expectations for autonomous driving

Extracted from: LiDAR for Automotive & Industrial Applications report and Radar & Wireless for Automotive: Market and Technology Trends report, 2019 editions from Yole Développement | LiDAR for Automotive – Patent Landscape Analysis, 2018 edition from Knowmade | Valeo SCALA Laser Scanner, 2019 reverse engineering & costing report from System Plus Consulting

**LYON, France – April 4, 2019:** The LiDAR market reached US\$1.3 billion in 2018, announces [Yole Développement \(Yole\)](#). For the 2<sup>nd</sup> time, the market research and strategy consulting company, Yole releases a dedicated LiDAR technology and market report to point out the industry evolution and give insights about the latest innovations. With its [LiDAR for Automotive & Industrial Applications report](#), the company pursues its investigations to understand the latest technical challenges and the strategy of each players. Yole's analysts identified strong investments in this sector. Competition is fierce and lot of announcements related to innovative technologies and investments have been made towards the media community, all year long. From its side, [Knowmade](#) announced lot of new players within the LiDAR IP<sup>1</sup> landscape: Since 2010, Knowmade's analysts saw an impressive growth of the patenting activity. The swift development of autonomous vehicles has opened many opportunities, with the established and strongest IP players increasingly challenged by new pure players and international companies entering the IP landscape.

This year again, Yole Group of Companies proposes a comprehensive analysis of the LiDAR industry. Combining market, technology and IP data, the partners, Yole Développement, [System Plus Consulting](#) and Knowmade are offering a wide collection of reports to get a better understanding of the industry evolution, the latest challenges and related business opportunities.

In addition, the Group proposes a dedicated event taking place in Shenzhen, China: the 2<sup>nd</sup> Executive Forum on LiDAR for Automotive will take place on September 5, from 9:00 AM to 1:00 PM alongside [CIOE 2019](#). Discover [the past edition](#) and for more information about the 2019 program and sponsorships, please contact: [Julie Robert](#), **MarCom Coordinator, Yole Développement**.

The automotive LiDAR story began with a race. The DARPA<sup>2</sup> Grand Challenge was an autonomous vehicle race to encourage the development of fully autonomous ground vehicles. In 2005, for the second instance of that race, LiDAR was introduced. Two years later,

<sup>1</sup> IP: Intellectual Property

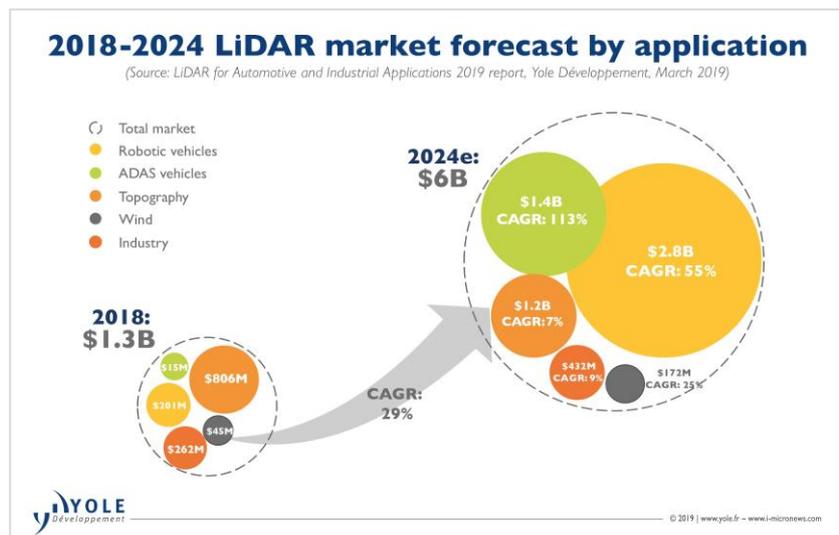
<sup>2</sup> DARPA : Defence Advanced Research Projects Agency

in 2007, five of the six vehicles finishing that race embedded a LiDAR on their roofs. Since then, many companies have made their own prototypes of autonomous vehicles using LiDAR and carmakers have showed their interest in this technology. The development of robotic vehicles is accelerating, and one leader has emerged.

“Waymo has a fleet of more than 600 vehicles today,” comments **Alexis Debray, PhD. Technology & Market Analyst at Yole**. “Several announcements have been made about increasing this number up to 82,000 vehicles using Chrysler Pacifica Hybrid minivans and Jaguar I-Pace SUVs<sup>3</sup>.” Alexis had the opportunity to give his vision of the industry and detail the latest technical issues for each type of LiDAR players at SSI International Conference 2019 last week. His “LiDAR: from space to roads” presentation is now available on [i-micronews.com, SSI International Conference post show report](https://www.micronews.com/ssi-international-conference-post-show-report).

On the carmaker side, Audi has integrated a LiDAR, supplied by Valeo, in the A8 since the end of 2017. It is now expanding this feature to other vehicles such as the Q8, A7 and A6 as an option.

“LiDAR adoption is so on track and other carmakers have announced or are expected to integrate this technology in future vehicles”, confirms **Pierrick Boulay, Technology & Market Analyst at Yole**. BMW with its partnership with Innoviz, for example is part of them.



Yole announces a total LiDAR market to reach US\$6 billion by 2024 with 70% of the total market dedicated to automotive applications. Highly and fully automated driving is about to become reality in the very near future. Driven by lower production costs and the emergence of new technologies, LiDAR is becoming a key component for automotive applications and we expect this market to explode, with a 64% CAGR<sup>4</sup> between 2018 and 2024.

<sup>3</sup> SUV : Sport-Utility Vehicles

<sup>4</sup> CAGR : Compound Annual Growth Rate

Under this dynamic context, System Plus Consulting, part of Yole Group of Companies including Yole and Knowmade has deeply



analyzed the innovative laser scanner developed by Valeo and Ibeo.

Named SCALA, this laser scanner was developed through the strategic partnership between both players, to propose a mechanical 3D scanner laser capable of identifying objects and measuring the distance in any environment. This innovation has been designed for vehicles with ADAS<sup>5</sup> and

autonomous driving functions.

*“An embedded rotating mirror deflects the beam emitted by a high-power laser diode through an emitting lens and receives the returned reflections through a condenser lens”,* explains **Sylvain Hallereau, Project Manager in charge of costing analyses at System Plus Consulting**. *“A three-element avalanche photodiode array then captures the reflections. ToF’s<sup>6</sup> measurement of the travel time of this pulse enables the system to determine the distance from the obstacle.”*

The laser selected by Valeo and Ibeo is a high-power pulsed laser diode based on EEL<sup>7</sup> diode technology from Laser Components. The three stacked active layers deliver a peak power of 75W in 150ns long pulses. The laser comes in a can package. In parallel, ToF is measured by an avalanche photodiode array developed by First Sensor. This company proposes a silicon-based device, assembled thanks to a low cost PCB<sup>8</sup> package with a glass window. The two main optical components are assembled on the same PCB.

System Plus Consulting’s [SCALA reverse engineering & costing report](#) is a complete teardown analysis, including BOM<sup>9</sup>, manufacturing cost and selling price estimation. It also includes a complete physical analysis of the laser diode and the avalanche photodiode.

Yole Group of Companies is strongly involved in the analysis of technical breakthroughs dedicated to automotive applications. Based on a smart combination of their expertise and knowledge, analysts help the automotive players understand markets, follow technology trends

<sup>5</sup> ADAS : Advanced Driver Assistance Systems

<sup>6</sup> TOF : Time-of-Flight

<sup>7</sup> EEL : Edge-Emitting Laser

<sup>8</sup> PCB : Printed Circuit Board

<sup>9</sup> BOM : Bill-Of-Material

and develop their business. They are able to propose a global analysis taking into account all current and emerging technologies and market updates. As an example, in both technology & market reports, [LiDAR for Automotive & Industrial Applications](#) and [Radar & Wireless for Automotive: Market and Technology Trends](#), Yole proposes an alternative scenario taking into account the whole sensing technologies: LiDAR, radar and camera. Technological requirements for autonomous driving are still blurred today and might evolve in a new future to more sensors, different types of sensors and much more computing capabilities. This ability to check and cross information is the added-value of Yole Group of Companies's analyses.

Make sure to get a clear understanding of the latest technology trends and business updates and discuss with our analysts right now!

**ABOUT THE REPORTS:**

- [LiDAR for Automotive & Industrial Applications](#)

*Is rationalization happening in the LiDAR market? - Produced by Yole Développement*

**Companies cited in the report:**

Aeye, Argo AI, ASCar, Ball Aerospace, Beijing Surestar Technology, Benewake, Blackmore Sensors and Analytics, Blickfeld, Bosch, Cepton Technologies, Continental, Daimler, Denso, Espros Photonics, Excelitas Technologies, Hamamatsu Photonics, and more ...

- [Radar & Wireless for Automotive: Market and Technology Trends](#)

*The radar and 5G/V2X markets will both grow – one through market pull, the other through prospective enablement – Produced by Yole Développement*

**Companies cited in the report:**

Acura, Ainstein, Alfa Romeo, Alps Electric, Analog Devices, Anzhi Auto, Aptiv, Arbe Robotics, Asahi Kasei Microdevice, Astyx, AT&T, Autoroad, AutoTalks, Audi, Azcom, Bentley, BAIC, BAW, BMW, Bosch, Bugatti, Buick, BYD, Calterah, CEI, Changan, ChengTech... and more.

- [LiDAR for Automotive Patent Landscape](#)

*From ADAS to autonomous and robotic vehicles, what are the LiDAR technologies and related IP of automotive industry players? –*

**Produced by Knowmade****Companies cited in the report:**

Denso, Mitsubishi, Robert Bosch, Nissan, Toyota, Sick, Daimler, Omron, General Motors, Valeo, Ford, Honda Motor, Hyundai, Continental, Mazda Motor, Sanyo, Ricoh, BMW and more...

- [Valeo SCALA Laser Scanner](#)

*The world's first automotive-grade LiDAR sensor for automated and autonomous driving – Produced by System Plus Consulting*

**About the authors:**

- **Nicolas Baron**, PhD. is CEO and co-Founder of Knowmade. He manages the company's development and strategic direction, and personally leads the Electronics & Telecom department. He holds a PhD in Physics from the University of Nice Sophia-Antipolis and a master's degree in Intellectual Property Strategies and Innovation from the European Institute for Enterprise and Intellectual Property (IEEPI Strasbourg), France.
- As part of the Photonics, Sensing & Display division at Yole Développement (Yole), **Pierrick Boulay** works as Market and Technology Analyst in the fields of LED, OLED and Lighting Systems to carry out technical, economic and marketing analysis. He has experience in both LED lighting (general lighting, automotive lighting...) and OLED lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO - France).
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- **Sylvain Hallereau** has been Project Manager at System Plus Consulting since 2000. He is in charge of costing analyses for Integrated Circuits, Power semiconductors and LEDs. He has significant experience in the modeling of manufacturing costs for electronics components, Sylvain holds a Master degree in Microelectronics from the University of Nantes, France.
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## ABOUT YOLE GROUP OF COMPANIES



Knowmade is a Technology Intelligence and IP Strategy consulting company specialized in analysis of patents and scientific information. The company supports the business development of R&D organizations, industrial companies, and investors by helping them to understand the competitive landscape, follow the technology trends, and find out opportunities and threats in terms of technology and patents. Knowmade is involved in compound semiconductors, power electronics, batteries, RF electronics & wireless communications, solid-state lighting & display, photonics, MEMS sensors, memories, semiconductor manufacturing & packaging, medical devices, medical imaging, biotech/pharma, and agri-food.

Knowmade's experts provide prior art search, patent landscape analysis, scientific literature analysis, patent valuation, IP due diligence and freedom-to-operate analysis. In parallel the company proposes litigation/licensing support, technology scouting and IP/technology monitoring service. Knowmade's analysts combine their technical and patent expertise with powerful analytics tools and proprietary methodologies, delivering invaluable patent analyses and scientific reviews.

More info on <http://www.knowmade.com> and follow Knowmade on LinkedIn.



**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](http://www.systemplus.fr) and on [LinkedIn](#) and [Twitter](#).



Founded in 1998, Yole Développement 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 and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

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](http://www.yole.fr) and follow Yole on [LinkedIn](#) and [Twitter](#).

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