



Scantinel Photonics GmbH Recognized for

2021

Technology Innovation Leadership

European Automotive Photonic-integrated
FMCW LiDAR Industry

Excellence in Best Practices

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Scantinel Photonics excels in many of the criteria for photonic-integrated FMCW LiDAR in the European automotive space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

Scantinel Photonics: Leader of the Photonic-integrated FMCW LiDAR Market

In autonomous driving vehicles, light detection and ranging (LiDAR) is one of the vital systems used for detecting and measuring the distance between the vehicle and targeted objects on the road. Typical LiDAR for autonomous vehicles is based on the time-of-flight (ToF) working principle, where a laser pulse illuminates a scene, and the time for the light to travel from an object to a photodetector is measured. This LiDAR system is used to detect any object on the road, scan the object, and channel the beam of light to generate a 3D map of the surrounding environment into point cloud data, which is then analyzed by sensor software for manipulating the mechanical operation of the vehicle.

The first wave of ToF-based LiDAR technology operated at 905 nanometers (nm), which could be harmful to human eyes, was restricted to short-range object detection, subject to ambient light interferences, and was unable to measure the velocity parameters of targeted objects. The second wave of ToF-based LiDAR technology operating at 1,550 nm had limitations as well, such as the requirement for high peak power (greater than 1 kilowatt) to achieve a long-distance range of 200 meters and subject to interferences with other LiDAR systems deployed on oncoming vehicles.

Frequency modulated continuous wave (FMCW)-based LiDAR can address the above shortcomings by operating at a low power, in addition to being highly immune to interference from ambient light and

other LiDAR and providing a direct velocity measurement of the targeted object in every pixel; however, the size and cost of conventional solutions hinder the far-reaching deployment of FMCW-based LiDAR.

Scantinel Photonics, a spin-off of ZEISS, has developed a highly integrated, coherent FMCW LiDAR module based on photonic integration (patent pending) that overcomes the obstacles of ToF LiDAR systems for autonomous vehicles to reach a higher level of automation. Conventional ToF-based LiDAR contains a larger number of discrete optical components that need to be assembled with sub-um accuracy, which is expensive, and potential misalignments during operation can lead to device malfunction.

Providing Automotive Customers with an Industry-leading, Solid-state FMCW LiDAR Solution

Scantinel Photonics combines a novel set of skills to bring solid-state, coherent FMCW LiDAR to the market, focusing on the four key competency areas of laser technology, photonic integration/scanning, optics, and software. Scantinel Photonics’s Optical Enhanced Arrays (OEA™) approach includes a 1,550-nm solid-state, coherent FMCW LiDAR with distinctive benefits that combine a silicon nitride-based

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- Varun Babu, Industry Analyst, TechVision

photonic-integrated chip (PIC) with an optical collimator (see Figure 1), with an indium phosphide-based laser as the light source to achieve low power, fully solid-state scanning operation. Unlike competing imaging solutions, the OEA™ approach leverages a highly parallel, multichannel solid-state scanning FMCW LiDAR module to achieve a long range of more than 300 meters and generate a 5D point cloud (see Figure 2) of 3D image data (e.g., xyz, velocity, and reflectivity), compared to up to 200 meters with competing solutions. In addition, Scantinel Photonics believes that a collaborative business strategy can bring innovative ideas; therefore, it works with the best development partners, such as ZEISS, Imec, and

PHIX, all of which have supported the development of the coherent FMCW LiDAR system.

Figure 1: Solid-state 1,550-nm FMCW LiDAR

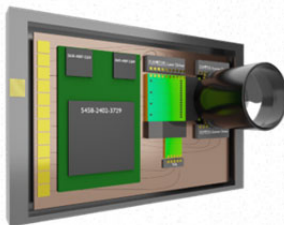
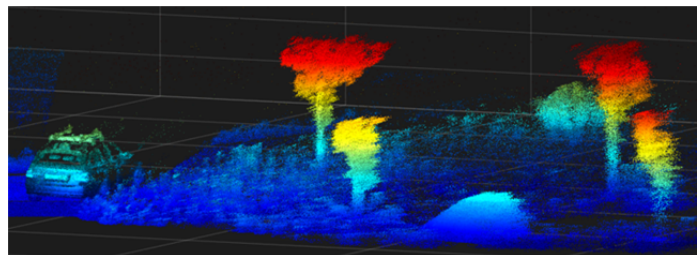


Image Source: Scantinel Photonics

Figure 2: 5D Point Cloud Data



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Setting a High Standard for Autonomous Vehicles

Scantinel Photonics's coherent FMCW LiDAR technology, based on photonic integration, is mainly used in the mobility segment, particularly in the following markets:

- **Private vehicles:** The technology can be leveraged in advanced driver-assistance systems (ADAS) in autonomous vehicles to enable safety and comfort driving features. In addition, the technology can be used in traffic jam pilots and urban area autonomous mobility applications.
- **Delivery vehicles:** The technology aids in highway piloting, thus reducing labor costs and halt times and enabling last-mile delivery vehicles, such as robo trucks, to move goods from one place to another autonomously.
- **Mobility services:** The technology opens up new business models, such as mobility-as-a-service in urban environments, robo taxis, and shuttles.
- **Industrial:** The technology is expected to be highly adopted in off-public roads, mining, agriculture, logistics, and applications that require enhanced environmental awareness and object detection. Scantinel Photonics's coherent PIC-integrated FMCW-based LiDAR module can be leveraged to provide 3D data from the industrial surrounding environment to enable smart decision making.

The technology is expected to have a high impact in the gaming industry as well, where it can be used to build augmented reality (AR) and virtual reality (VR) headsets to provide an immersive gaming experience.

Scantinel Photonics is well associated in the automotive sector and is gaining substantial traction with leading companies in the mobility and autonomous mobility segments. For example, the company has demonstrated the coherent, PIC-integrated FMCW-based LiDAR solutions to undisclosed original equipment manufacturers (OEMs) and Tier I suppliers in the United States, Europe and China to pave the way for the mass production of its LiDAR products. Through its technology roadmap, the company expects to sample its LiDAR products by September 2022 to its lead customers and plans to launch its new product on a mass-production scale globally by 2024.

Frost & Sullivan finds that Scantinel Photonics's focused technology development in the PIC-integrated FMCW-based LiDAR solution, which offers a reduced size, weight, and cost in mass production, is a major factor in attracting more customers. The combined strength of the technology's attributes and its wide applicability, including in the gaming sector, enables Scantinel Photonics to impact the LiDAR market significantly and capture an impressive market share.

Looking Ahead

Scantinel Photonics's leadership team includes Andy Zott (managing director), Dr. Michael Richter (commercial managing director), Vladimir Davydenko (Head of Photonics), and Dr.-Ing. Jan Horn (Lead System Engineer), all of whom have led new product development projects in coherent FMCW-based LiDAR systems, advanced laser ranging, system engineering, and optical and mechanical design across other global electronic companies, including ZEISS. With more than 40 years of experience and several patented titles to their names, these leaders bring significant power to Scantinel Photonics's overall development, paving the way for strategic direction, business culture evolution, and business execution.

The company attributes its success to a strong team of close to 30 people who bring significant technical experience in laser technology, photonic integration/scanning, optics, and software, thus positioning the company to set a high industry standard and gain a competitive advantage.

In May 2021, the company secured €7.5 million (\$8.82 million) in a Series A funding round from Scania Growth Capital, enabling the company to continue accelerating and commercializing its coherent FMCW-based LiDAR technology. Frost & Sullivan finds that the combination of Scantinel Photonics's proven expertise and patent-pending technology has resulted in an impressive commercial success that will boost the company's ability to gain a position as a trusted global partner in the emerging LiDAR space.

Conclusion

Scantinel Photonics is poised to emerge as a forerunner in the coherent PIC-integrated FMCW-based LiDAR solutions space, with its fully solid-state solution that can be designed for high-volume manufacturing at a highly competitive price because the competition for LiDAR solutions continues to grow across new applications and market trends, such as autonomous vehicles.

The company's technology is poised to satisfy the demands of vehicle manufacturers that want to produce high-resolution 3D images with an object detection range of over 300 meters. Scantinel Photonics's dynamic management team and its development partners, such as ZEISS, Imec, and PHIX, enhance its ability to form strategic alliances and gain considerable market share in the future. Scantinel Photonics continues to prosper, with its recent funding going toward upcoming projects to help multiple industries in automation and transportation.

For its strong overall performance, Scantinel Photonics is recognized with Frost & Sullivan's 2021 Technology Innovation Leadership Award for photonic-integrated FMCW LiDAR in the European automotive industry.

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

