DVN
Lidar

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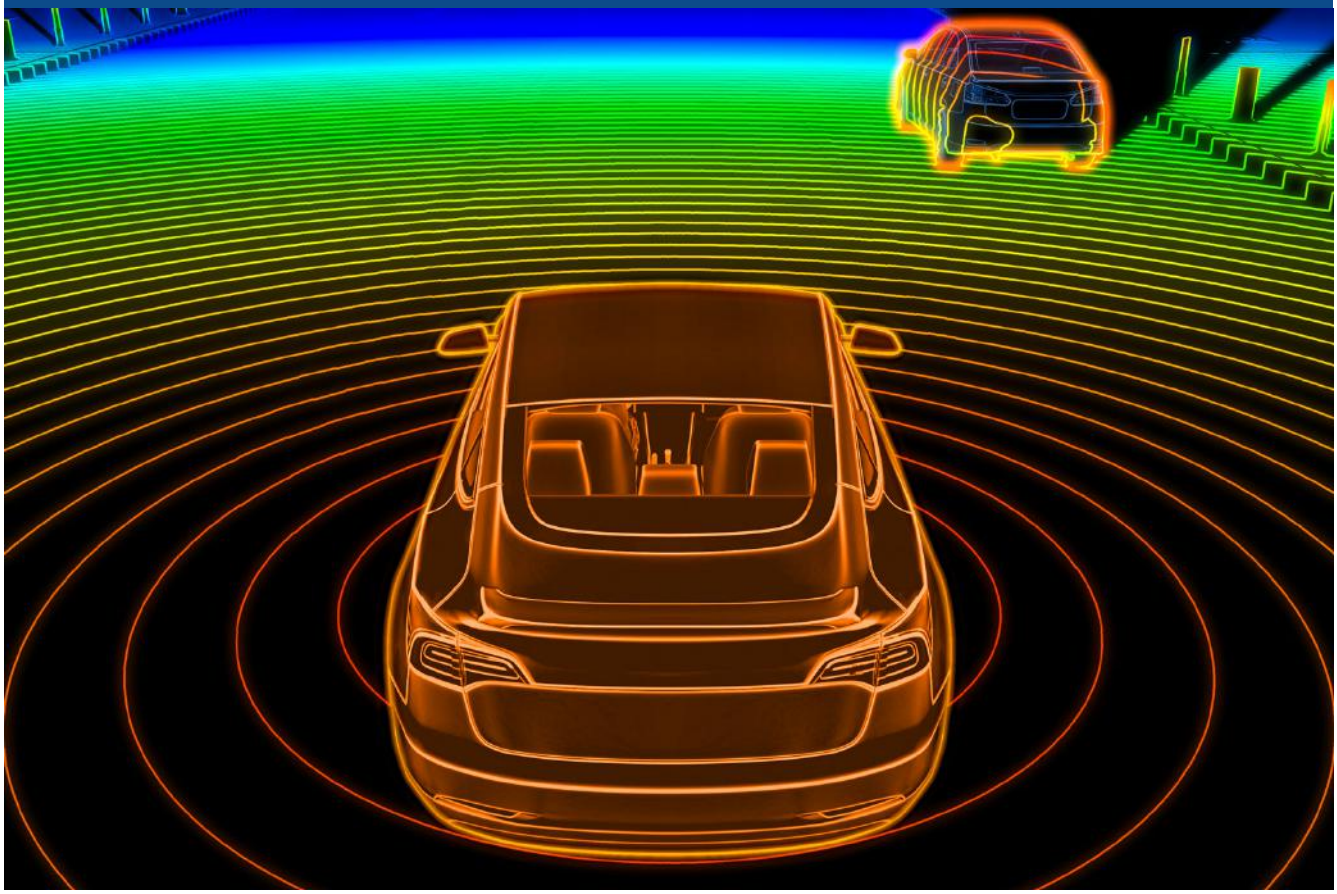
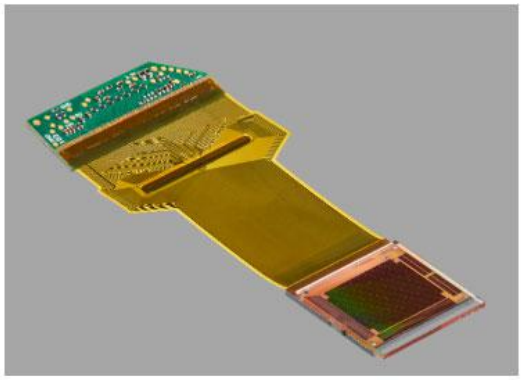
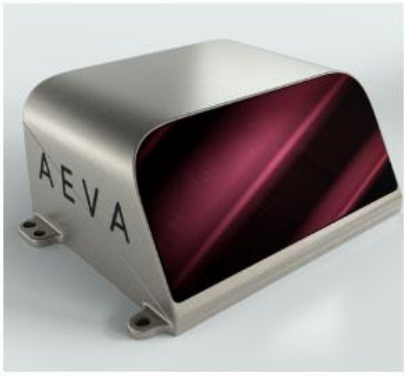


EDITORIAL

Lidar Innovations On the Market and In the Pipeline





Great lidar breakthroughs are under development for commercialization in the foreseeable future, and meanwhile new innovations are here now, with more coming every day. A new solid state beam-steering technology from Lumotive, for example, of which we bring you coverage in this issue of your DVN-Lidar Newsletter.

FMCW lidar is heating up as an imminent technology; today you'll read all about a SiLC SoC supporting cheap FMCW lidar designs, and AEVA's new Aeries II 4D lidar, presented at the IAA.

You'll also find our special report of the Autosens conference in Brussels, where we found—among many other things—that thermal cameras are expected to gain traction in the near future, for short- to long-range perception and 360° AV seeing systems.

We've also got the preliminary docket for the DVN-Lidar conference to be held 29-30 November in Wiesbaden for you to look over, **register now** to attend!

We're ever so glad you're here with us in the DVN-Lidar community. Enjoy this newsletter!

All best,

Alain Servel

DVN LIDAR ADVISOR

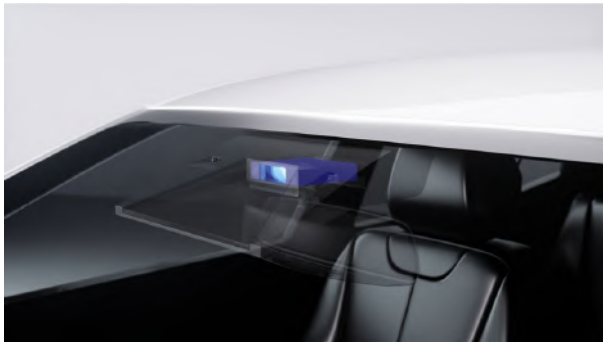
LIDAR BUSINESS

Lidar Business News Briefs

The German federal government and the Free State of Bavaria will provide Important Projects of Common European Interest funding for microelectronics and communication technologies to drive development of optoelectronic semiconductor technologies from AMS Osram in Regensburg. The company expects to receive more than €300m in public funding over the next five years, to enable the creation of several hundred new high-tech jobs in Regensburg.

FAW and Mobileye have agreed to cooperate on intelligent driving, based on the Mobileye SuperVision and Chauffeur platforms. The launch of SuperVision is scheduled for late 2024, and Chauffeur by the end of 2025.

Hesai has partnered with Webasto for roof-mounted lidar sensor integration. Hesai will provide automotive lidar for Webasto's roof-mounted sensor modules designed for ADAS-enabled mass production vehicles. The AT128 lidar seamlessly integrates into the roof sensor module, while the slim ET25 lidar can be discreetly placed behind the windshield, offering a unique interior installation that complements vehicle design, maintains aerodynamics, and remains resistant to dirt and debris.



Hesai lidar will equip FAW's their next-generation EV under the Hongqi brand. It marks the 13th automaker to choose Hesai lidar, and the first series production design-in for their ultra-thin long-range ET25 lidar. The program is expected to begin mass production and delivery by H1-2025.

Sony Semiconductor Solutions will release their IMX735, a new CMOS image sensor for automotive cameras with what they're calling the industry's highest pixel count—17.42 megapixels—enabling high-definition capture of far-off objects. Most CMOS sensors read signal output from pixels one vertical line at a time, but the IMX735 outputs signals horizontally, one row at a time. This lets automotive cameras more easily synchronize with mechanical scanning lidar.

Smart is collaborating with Mobileye for advanced automation, and also planning a special edition vehicle which will integrate the Mobileye SuperVision system, encompassing the Navigation Smart Pilot and numerous other driving-assistance features.

Aeva has launched their Aeries II 4D FMCW lidar, which simultaneously captures of each point's velocity along with its accurate 3D position. It is immune to interference like direct sunlight and other lidar sensors, retroreflector bloom, and ghosting.

INTERVIEW

DVN-L Interview: Ralf Muenster, SiLC VP Business Development & Marketing

Ralf J. Muenster is Vice President of Business Development and Marketing at SiLC. With over 20 years in high-tech business growth and commercialization, his past roles include Director at Texas Instruments' CTO office and leadership positions at National Semiconductor, Micrel, and AMD. He founded a successful startup and conducted photonics research at UC Berkeley, and holds a master's degree in physics and several US patents.

DVN-Lidar: How did SiLC come to be?

Ralf Muenster: SiLC Technologies was officially founded in June 2018, but its roots extend back over three decades. Our team is a seasoned group of professionals with a history of successful startups and a proven ability to bring products from concept to market, including scaling up production. The core founding team, led by our CEO Mehdi Asghari and VP of R&D Jonathan Luff, began their journey in the field of silicon photonics at Bookham, the pioneering Silicon Photonics company based in England, back in the 1990s. They played a pivotal role in leading Bookham to its multi-billion IPO in 2000. They subsequently joined the executive team at Kotura, a Los Angeles-based company, to further apply this groundbreaking technology, which was acquired by Mellanox in 2013. This makes the SiLC team one of the most experienced teams globally in commercializing silicon photonics products. SiLC has also developed a strong intellectual property portfolio and a proprietary manufacturing process for high-performance optical components.

DVN-L: What industrial sectors are you targeting, with your solutions?

R.M.: SiLC targets a diverse range of vertical market segments with its groundbreaking silicon photonics solutions, designed to equip machines with human-like vision capabilities. These sectors include:

Mobility and ADAS: SiLC's technologies are crucial for the development of autonomous vehicles and ADAS. Our solutions provide these systems with the ability to perceive depth and motion much like the human eye, enhancing both autonomous navigation and driver assistance.

Robotics: SiLC is a significant player in the robotics revolution, particularly in automating warehousing and logistics. Our Eyeonic Vision Sensor enables robots to perceive their environment in a nuanced manner, akin to human vision. Labor shortages have led to a surge in demand for industrial robots, with over 3 million already in operation worldwide.

Smart Cameras: Our solutions can be integrated into smart camera systems to improve performance and add new functionalities. Equipped with SiLC technology, these cameras capture more than just images; they understand depth and motion in a scene.

Security: In the security sector, SiLC's technologies offer more accurate and reliable monitoring and detection capabilities. Our sensors can differentiate between a wide range of objects and movements, closely resembling human perception.

DVN-L: Your photonics are designed for FMCW lidars. Could you explain more technical details of your chips?

R.M.: Our silicon photonics solutions, tailored for Frequency-Modulated Continuous Wave (FMCW) lidars, stand out in a crowded lidar market. While many companies venture into lidar technology, only a select few have the capability to develop FMCW or coherent lidar, often hailed as the ultimate solution. The primary challenge in realizing coherent lidar lies in the intricacy and cost of the required optical components. The solution to this challenge is integration. However, most existing integration platforms, designed for datacom applications, fall short in meeting the stringent performance levels demanded by coherent lidar. Unlike datacom applications that operate with digital signals and have link budgets in the 20-30 dB range, lidar is inherently analog. It doesn't allow for noise-free regeneration, and amplification can adversely affect the Signal-to-Noise Ratio (SNR). lidar typically operates with a 80 - 100 dB link budget, making it significantly more challenging.

To address these challenges, SiLC employs a unique integration platform. Our process is more of an analog silicon photonics process, optimized across 10 or more parameters crucial for FMCW. This results in performance metrics that are 10-100× superior to what our competitors can achieve. Essential attributes like super low losses, minimal noise, and high-power handling capacity are integral to our platform, ensuring the SNR and dynamic range necessary for practical long-range applications.

What truly sets us apart is our manufacturing approach. We produce our wafers in Japan using a proprietary process that remains inaccessible to our competitors. This unique process ensures that we can deliver the performance levels essential for FMCW lidar systems across various industries.

Moreover, our silicon photonics chips are highly integrated, featuring lasers, amplifiers, detectors, meters of waveguides, and even solid-state beam steering. This level of integration further enhances the performance and versatility of our solutions.

DVN-L: Could you tell us more about your most recent innovative products?

R.M.:At CES 2022, SiLC proudly unveiled the Eyeonic Vision Sensor, distinguishing itself as the market's sole chip integrated FMCW lidar transceiver. Then at CES 2023, we introduced the groundbreaking Eyeonic Vision *System*, which was honored with the CES Innovation Award. This system is not just another lidar solution; it boasts the highest resolution, precision, and range in the industry. Uniquely, it's the only lidar system that provides polarization information, enhancing material detection and surface analysis capabilities. The Eyeonic Vision System is designed to deliver unparalleled visual perception, capable of identifying objects even beyond a kilometer's distance. It ensures eye safety, operates without interference from other users or ambient light, and its polarization intensity data further aids in material detection.

Currently, our portfolio showcases four specialized versions of the Eyeonic Vision System, catering to different needs: short-range (for range detection of up to 50 meters), medium-range (up to 150 meters), long-range (up to 300 meters), and ultra-long-range (beyond 1250 meters). Each variant is meticulously crafted to address specific application requirements, ensuring that we offer solutions that align with the diverse needs of the industries we serve.

DVN-L: What do you see as the advantage of a 4D point cloud (fourth dimension is relative speed) for objects detection and tracking?

R.M.: The addition of a fourth dimension, relative to speed or velocity, to the traditional 3D point cloud in object detection and tracking offers a multitude of advantages. This 4D point cloud enables more robust and dynamic environmental understanding, significantly enhancing the performance of systems in applications like autonomous vehicles, robotics, and security.

Firstly, the velocity data allows for immediate differentiation between static and moving objects, which is crucial for real-time decision-making. For example, in an autonomous driving scenario, the system can instantly determine whether an object in the vehicle's path is stationary, like a traffic light, or moving, like a pedestrian or another vehicle. This helps in making more informed and quicker decisions, such as whether to slow down, stop, or maneuver around an object.

Secondly, the velocity information aids in predictive analytics. Knowing the speed and direction of an object can help the system anticipate future positions of that object, thereby allowing for more proactive and intelligent responses. This is particularly useful in high-speed or rapidly changing environments.

Lastly, the 4D point cloud simplifies object tracking over time. Traditional 3D point clouds may require complex algorithms to track object movement from one frame to the next. The inclusion of velocity data makes this process more straightforward, reducing computational load and improving system efficiency.

In summary, the 4D point cloud not only enriches the data set but also enhances the system's ability to understand its environment to make real-time decisions, and predict future events, thereby making it a game-changer in object detection and tracking.

DVN-L: What does the cost of your silicon photonics look like versus other solutions?

R.M.: SiLC's silicon photonics technology significantly impacts the cost structure of lidar systems. Our chips integrate multiple functionalities—lasers, amplifiers, detectors, waveguides, and even solid-state beam steering—onto a single chip, reducing the number of discrete components and lowering overall system cost. The use of silicon wafer processes similar to CMOS imaging chips allows for high-volume manufacturing, further driving down per-unit costs. Additionally, the integrated nature of our chips simplifies assembly and calibration, reducing manufacturing expenses. Our unique, proprietary manufacturing process, carried out in Japan, ensures high performance while maintaining cost competitiveness, providing us with a distinct advantage over competitors.

In summary, SiLC's silicon photonics technology offers a compelling cost advantage by integrating more functions onto a single chip, enabling high-volume manufacturing, and simplifying both assembly and long-term maintenance. This makes our lidar solutions not only technologically superior but also economically viable for widespread adoption.

DVN-L: Your company recently announced a partnership with Indie Semiconductor. Will you tell us more about that?

R.M.: The partnership between indie Semiconductor and SiLC Technologies is a strategic alliance aimed at revolutionizing the lidar landscape. By integrating indie's Surya SoC with SiLC's Eyeonic Vision Sensor, we've created the industry's most compact and high-performing coherent vision system. This collaboration offers a 10× advantage in performance, power, and cost, setting new benchmarks for lidar technology.

The Surya SoC brings software-defined, high-performance analog and digital processing to the table, while our Eyeonic Vision Sensor offers unparalleled integration, resolution, and precision. Together, we provide a complete 4D FMCW imaging solution that's ready for mass-market deployment across various applications, including driver assistance, autonomous mobility, and industrial automation.

This partnership has already garnered attention from lead automotive and industrial customers, and we're actively developing new reference platforms to showcase the scalability and flexibility of our combined technologies. It's a collaboration that not only meets the current market demand but also anticipates future needs, ensuring that we stay ahead of the curve in next-generation sensing applications.

DVN-L: How do you foresee the deployment ramp-up of automotive lidars over the next few years?

R.M.: The current automotive lidar market is in its infancy, characterized by limited volumes and the predominant use of a first-generation lidar technology known as Time of Flight (ToF). This scenario is reminiscent of the early days of radar deployment in the automotive sector. As radar technology became more widespread in vehicles, interference issues arose among pulsed radars. This interference problem ended up costing automakers hundreds of millions of dollars, prompting a shift to FMCW technology. Just as chip integration played a pivotal role in significantly reducing the costs of radar systems, making them a common feature on today's roads, we anticipate a similar trajectory for lidar. As the industry progresses, we expect chip-integrated solutions to drive down the costs of lidar systems, paving the way for broader adoption. Over the next few years, as the limitations of ToF become more apparent and the benefits of FMCW technology are realized, we foresee a significant ramp-up in the deployment of automotive lidars, eventually becoming as ubiquitous as radar systems are today.

DVN: What are the ambitions of SiLC for the next few years?

R.M.: SiLC is laser-focused on pioneering the future of silicon photonics and FMCW lidar solutions. Our mission is to empower machines with human-like vision capabilities, revolutionizing sectors from autonomous vehicles to industrial automation. We're actively pushing for broader market adoption of our Eyeonic Vision Sensor and System, both of which deliver unmatched depth, velocity, and polarization data. A pivotal advancement we're pursuing is the integration of solid-state beam steering, aiming to phase out mechanical scanners for enhanced reliability and performance.

We're actively collaborating with industry leaders in each vertical market that we address, aiming to integrate our Eyeonic Vision Chip into their products. Our partnership with indie Semiconductor exemplifies this approach. As the lidar market matures, we'll continue to innovate, setting new standards in performance and cost-efficiency.

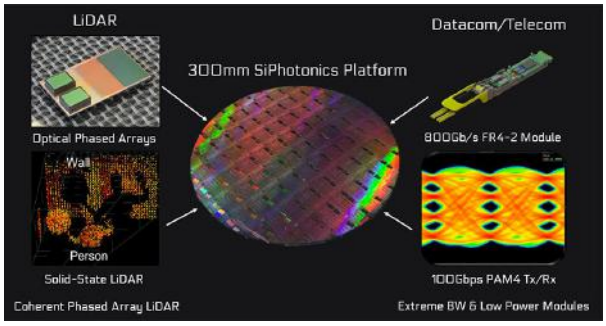
With accolades from Frost & Sullivan and Gartner, we're well-positioned for global expansion. Our ultimate goal is to make our Eyeonic Chip the default choice for coherent vision sensors, offering a compact, cost-effective, and energy-efficient solution.

SPECIAL REPORT

Special Report: Autosens '23

Autosens Brussels, held on 19 to 21September, was a major autonomous-vehicle and sensor technology event. It brought together about 270 automotive industry experts, researchers and policy makers to discuss the latest advances and future challenges of self-driving systems.

One of the main topics discussed at the conference was the integration of sensors into AVs. Participants discussed in detail different sensor technologies—visible-light and thermal cameras, lidars, and radars—and their role in AV perception. Presentations and exhibitions covered challenges related to sensor reliability and accuracy, as well as ways to improve their performance. Here is what we retain from the conference:

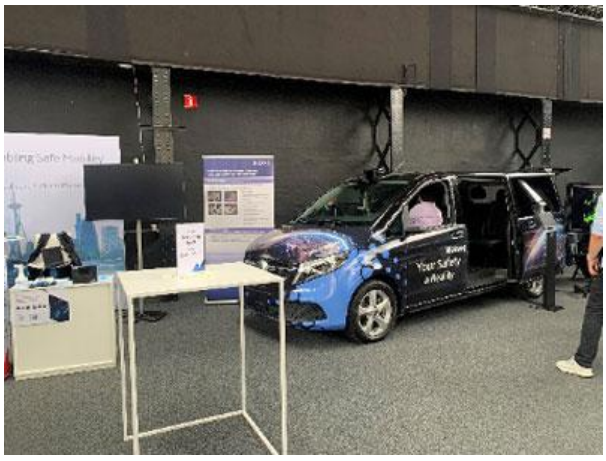


Analog Photonics has developed proprietary and patented integrated photonics technology within a 300-mm wafer platform. Wavelengths from the visible to the near-infrared are supported, and integration with CMOS ASIC drivers and lasers enables complex chip-scale systems. They've integrated a FMCW lidar to scan the road scene with an OPA structure, and they describe it as giving range up to 225 m @ 10-per-cent albedo; angular resolution of 0.05 × 0.05°, FOV 20°H × 24°V, velocity measured in every pixel, and size 4.5 × 4.0 × 1.5 cm.

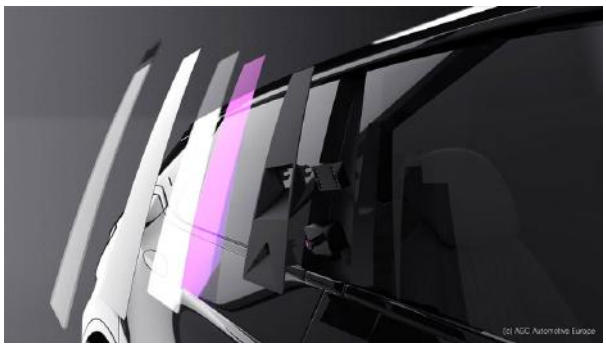
Lynred offers infrared detectors covering the entire spectrum, from SWIR to VLWIR. They have longstanding partnerships with Umicore and Saint-Gobain Sekurit to create FIR-transparent windshields for thermal cameras in addition to the visible camera and potentially a NIR lidar. Within this cooperative activity, **Saint-Gobain Sekurit** has developed crystal-based technology to create a transparent area within the windshield, aligning both the visible and thermal cameras. The crystal meets applicable safety regulations and is integrated while retaining the original performance of the wiper system and the thermal comfort of the passenger compartment. And **Lynred** provides a 640 × 480 VGA thermal sensor with Umicore lenses, and configures the camera data input with the pedestrian detection algorithm.

This co-development is in response to Euro-NCAP and other vehicle safety initiatives requiring autonomous emergency braking and pedestrian autonomous emergency braking systems to work reliably both day and night, at speeds up to 100 km/h for car-to-car crash avoidance and up to 65 km/h for pedestrian avoidance.

Onsemi: This major silicon supplier demonstrated their Hyperlux automotive image sensor. With a 2.1 µm pixel size, 150-dB ultra high dynamic range and LED flicker mitigation across the full automotive temperature range, the Hyperlux provides high performance and speed and advanced features for ADAS. This technology enables L^{2+} driving automation.



Sony'sexhibition showcased advanced AD and automotive safety technologies. The Sony Depth Sensing demonstrator had Sony's advanced DepthSense IMX556PLR 3D ToF imager; a dashboard-integrated lidar DMS to detect signs of driver fatigue or distraction, and a ceiling-integrated lidar passenger monitoring system to detect misuse of safety belts.



A 3D perception system developped with AGC Wideye was also installed in each B-pillar of the Sony demo car to complete the lateral field of view for overtaking-vehicle detection, blind-spot monitoring, and smart door unlocking.

Teledyne Flir demonstratedthermal cameras that can see through a wide variety of conditions including darkness, sunlight, headlight glare, shadows, and fog. They are especially good at detecting pedestrians, bicyclists, and other vulnerable road users, as well as large animals. Cameras working in the far-IR spectrum can fill the performance gaps where existing vision sensors are challenged. They offer redundancy, and complement existing visible-light, radar, and lidar sensors to improve detection and classification algorithm performance via multispectral sensor fusion.

LIDAR AND IMAGING RADAR TECHNOLOGY NEWS

Bosch Drops AV Lidar Sensor Development Efforts

Bosch has decided to halt their three-year-old work on AV lidar sensor development, after considering the complexity and time-to-market for the technology. The supplier will shift the resources that had been devoted to lidar research to other technologies such as radar. Bosch still views lidar technology as important for fully autonomous vehicles, and will continue seeking to integrate lidar products into automated driving functions, but without devising their own sensors.

DVN comment

Lidar technology is still expensive, and demand is low, especially since fully automated driving will not arrive as soon as expected. Some automakers have delayed the deployment of lidar-equipped vehicles. It was the same story in the first years of radar deployment. But we can reasonably expect that costs will decrease eventually, and on-the-road lidar volumes will increase.

LIDAR AND IMAGING RADAR TECHNOLOGY NEWS

Hesai Win Major FAW In-Cabin Lidar Supply Contract

Hesai Technology announced a new design win with FAW Group, one of China's larges automakers, for the next generation of the maker's Hongqi-brand EVs—the first series production design win for Hesai's ultra-thin long-range ET25 lidar. The program is expected to begin mass production and delivery by the first half of 2025, and FAW plans to officially unveil the in-cabin lidar solution at their innovation technology conference this month.

The ET25 is Hesai's first ultra-thin long-range lidar designed for ADAS series production vehicles. At only 25 mm in height, it fits seamlessly behind the windshield. The unique in-cabin solution improves aerodynamics, and keeps the lidar sensor dust- and dirt-free, while contributing to a sleek vehicle design. Powered by Hesai's high-performance transceiver module, the ET25 has a detection range of over 250 meters @10-per-cent reflectivity, enabling smarter decisionmaking in complex road scenarios.

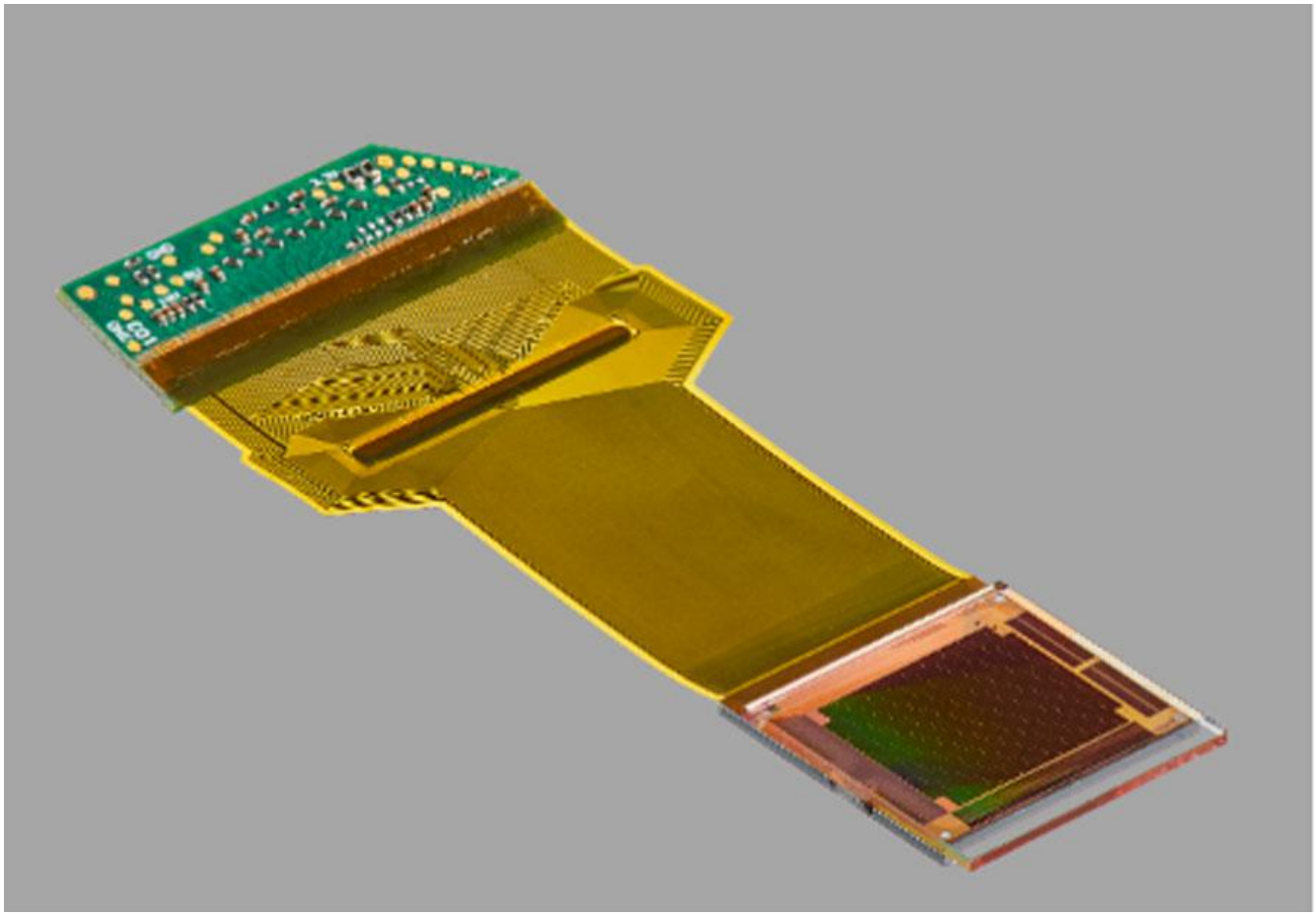
According to the latest report by international research firm Yole Intelligence, Hesai has been the global leader in the automotive lidar market for two consecutive years, holding 47 per cent of the total market share. Hesai is rapidly expanding their ADAS series production programs, securing design wins for multiple production vehicle models, and ADAS development projects with automakers in North America and Europe—a total of 13 automakers worldwide.

DVN comment

The size of this ET25 lidar facilitate its integration at the top of the windshield area. Despite some attenuations due to the windshield structure, this location has many advantages, especially the existing cleaning system (wipers).

LIDAR AND IMAGING RADAR TECHNOLOGY NEWS

Lumotive's World-First Optical Beam Steering Semiconductor



Lumotive has launched their LM10, the first full-production offering of their LCM (Light Control Metasurface) technology, which they say is the world's first digital beam steering solution, which is smaller and more reliable and costs less than mechanical systems.

Lumotive's LCMs are purely solid-state optical semiconductors which can be manufactured in high volume, which the maker says will enable the next generation of lidar to expand into new applications and become standard equipment for intelligent 3D sensing worldwide. Designed for mid- and short-range uses, the LM10 is suited for a wide range of solutions from object tracking to autonomous navigation.

The LM10 is available now and is "primed for large-scale production", Lumotive says, by dint of top-tier manufacturing partnerships and the company's patented fabrication processes which use widely-available silicon manufacturing techniques. Lumotive also offers the M30 Reference Design, a production-ready lidar sensor built around the LM10, which sensor makers can adopt to rapidly and efficiently bring their own LCM- powered products to market.

Lumotive founder and CTO Dr. Gleb Akselrod says, "LCM technology, which uses the revolutionary physics of dynamic metasurfaces to actively steer light without any moving parts, is enabling never before seen capabilities in 3D sensing and many other applications where software-controlled optical beamforming is critical". CEO Dr. Sam Heidari added that with the LM10, Lumotive is "democratizing high-quality, software-definable 3D sensing".

With even smaller, more performant beam steering chips in development, Lumotive continues striving to make optical 3D sensing as pervasive and accessible as cameras are today.

DVN comment

The solid-state nature of meta-surfaces increases system reliability by eliminating mechanical scanning. Electronic control of beam direction enables faster pixel acquisition, versus scanning systems where pixel refreshment depends on a complete 3D image frame period. Here the acquisition cycle of a specific part of the 3D image can change, depending on the road context.

LIDAR AND IMAGING RADAR TECHNOLOGY NEWS

Hesai Lidar on HiPhi Z at European Sales Launch

Hesai Technology has announced their European market lidar debut; their AT128 lidar equip the Human Horizons HiPhi Z electic car's ADAS. The luxury electric vehicle is now available for sale in Germany and Norway.

The HiPhi Z combines the latest technological innovations with the comforts of a luxury vehicle. It operates with a multi-sensor ADAS, featuring the Hesai AT128 lidar. It's seamlessly integrated with the car's roof design, providing a futuristic look while empowering high-resolution 3D perception capability.

The AT128's long-distance perception delivers fast reaction time for the ADAS, helping the vehicle identify and respond to risks under complex road conditions. It has a ranging capability of 200 m (@10-per-cent reflectivity) and a 1200 × 128 overall resolution. With a point rate of over 1.53 million per second, it can conduct ultra-precise scanning of the environment to form consistent, unstitched point clouds that help vehicles 'see' the 3D world clearly in real time.

Hesai's AT128 has won several million units of expected volume from 11 leading automakers. Beginning mass production and delivery in 2022, the AT128 has reached a monthly delivery of over 10,000 units. By Q2 2023, with a total delivery of over 190,000 units since inception (including ADAS and autonomous-mobility lidar products), Hesai has set a record in the global automotive lidar market.

Hesai cofounder and CEO David Li says his company is "very excited to enter Europe's passenger car market with our AT128 as a core ADAS lidar sensor. By working with high-end automotive OEMs such as HiPhi, we are able to provide European customers an intelligent driving experience empowered by our world-leading lidar technology".

And HiPhi CTO Mark Stanton says, "The lidar's powerful perception is irreplaceable for the safety features in ADAS, protecting our cars and us from accidents. We are thrilled to equip our vehicles with AT128 thanks to its high reliability and performance, and Hesai's ability to meet our mass production demands".

With offices in Stuttgart and Palo Alto, Hesai is actively expanding their global reach and mass-production capability. In addition to the Hiphi Z, Hesai's AT128 also equips the Lotus Eletre E-SUV, currently available in 9 European countries including the UK, Germany, France, Italy, Switzerland, and the Netherlands.

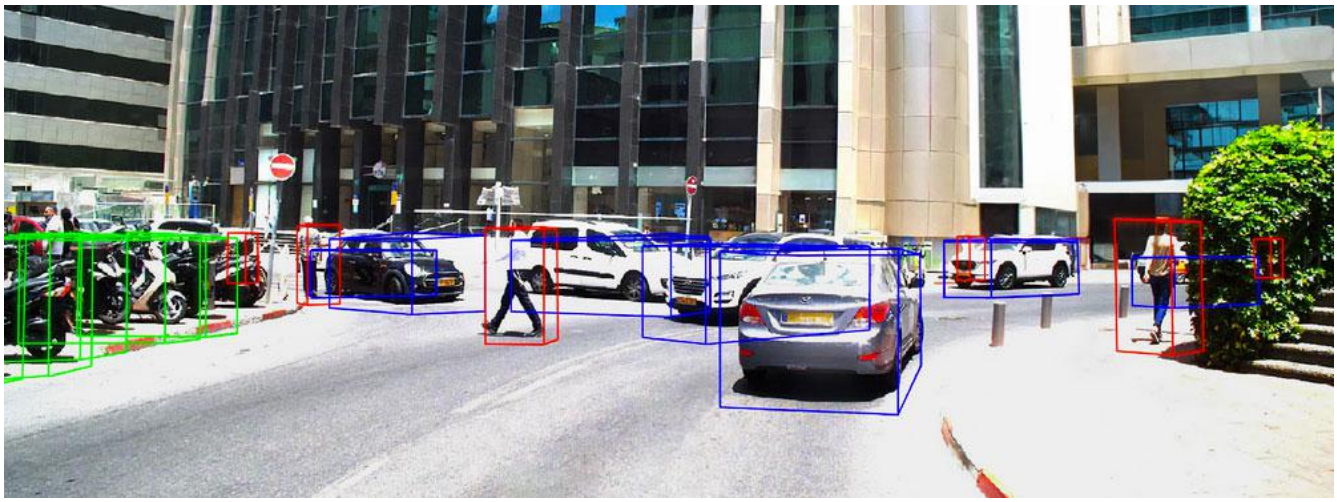
At IAA Mobility this year, Hesai showcased their lidar solutions in the HiPhi Z intelligent vehicle.

DVN comment

The AT128 has secured several million orders from other automakers including Li Auto and JiDu. It entered volume production toward the end of last year at Hesai's brand-new Maxwell superfactory.

LIDAR AND IMAGING RADAR TECHNOLOGY NEWS

Mobileye, Valeo in Imaging Radar Pact



At IAA Mobility in Munich, Mobileye and Valeo announced a new partnership to deliver software-defined, best-in-class imaging radars for next-generation driver assist and automated driving features.

By joining forces, Mobileye and Valeo aim to quickly bring a promising new technology to automakers worldwide that enables more intelligent vehicles. As a key part of sensing systems for automated driving, imaging radar will be an enabling element for more advanced hands-off ADAS solutions and eyes-off automated driving features on highways and urban streets.

Mobileye Executive VP of Business Development and Strategy Nimrod Nehushtan says, "In this collaboration, automakers gain access to the latest cutting edge technology from Mobileye that they can trust will exceed industry expectations as we have proven before, while benefiting from the customization, industrialization, testing and support capabilities brought by Valeo. Our collaboration to deliver imaging radar to automakers benefits the industry, and ultimately, drivers globally".

And Valeo Comfort and Driving Assistance Systems unit Marc Vrecko says, "We are proud to collaborate together on Imaging radar technology, which will be essential in the future of autonomous mobility. This is a great illustration of Valeo's technological leadership in ADAS and of its capability to produce innovative technologies at scale. This collaboration will contribute to Valeo's commitment to offer affordable, smarter and safer mobility".

Mobileye's imaging radars use advanced architecture, including Massive MIMO (multiple-input, multiple-output) antenna design, a high-end radio frequency design developed in-house, and high-fidelity sampling. These all enable accurate object detection and higher dynamic range. With an integrated system-on-chip design that maximizes processor efficiency, and world-leading algorithms for interpreting radar data, the imaging radar delivers a detailed, four-dimensional image of surroundings up to 300 meters away. With a 140-degree view field at medium range (170 at close range), the radar enables more accurate detection of pedestrians, vehicles, and obstructions, even on crowded urban streets.

Mobileye has already seen high market interest for their Imaging radar as automakers look to expand the operational design domains of their automated driving features. Valeo has simultaneously received indications of strong demand from the market for imaging radar that achieves optimal performance.

Valeo will lead the system design of the new imaging radar product by integrating Mobileye's imaging radar technology and corresponding software and algorithms embedded in the Mobileye radar chipset into Valeo's automotive software and hardware radars. Valeo, who have been developing and mass-producing radar technologies since 2006 with a big global footprint and long expertise in technology production at scale, will produce the complete imaging radar solution.

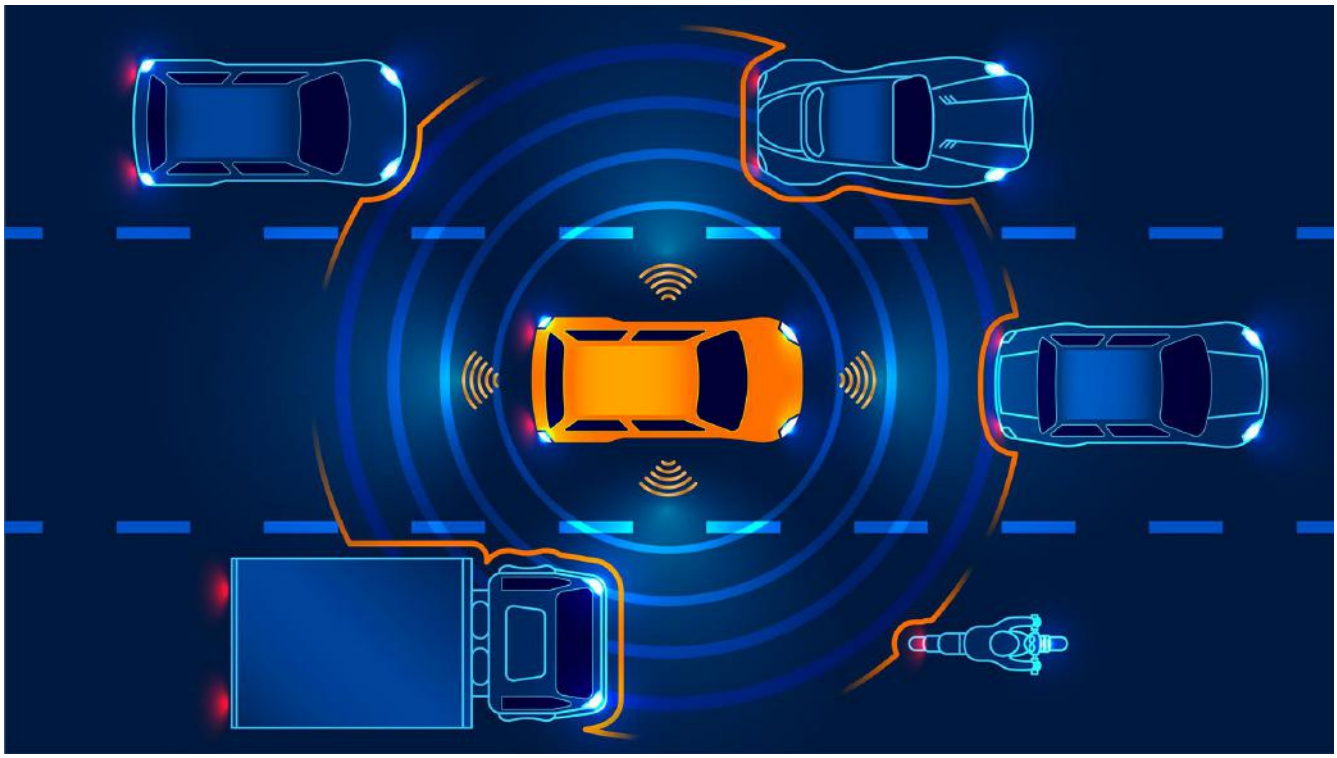
This new partnership expands on the two suppliers' successful collaboration on front-facing cameras and other driver assist solutions. Since 2015, the partners have delivered more than 15 million smart front cameras worldwide.

DVN comment

Lidar does not function well in rain, snow, or fog—that's when radar technology is the best and most precise for ADAS and AD applications. But radar angular resolution must be improved during the next years. Artificial Intelligence-based deep learning could maybe also compensate for the present lack of resolution.

AUTOMATED DRIVING

Autonomous Driving News Briefs



Pony.ai obtained Shenzhen's first-ever demonstration application license for unmanned autonomous driving services. The approval allows Pony to offer L^4 autonomous ride-hailing services to the general public within the city's central areas. Pony also got approval to charge the paying public for pilot unmanned robotaxi commercial service in Beijing, with only remote monitoring and no safety operator in the car. Pony presently is running L^4 autonomous unmanned tests simultaneously in Beijing, Shanghai, Guangzhou, and Shenzhen.

Beijing has started city-airport autonomous shuttle testing with **Baidu’s Apollo Go** robotaxi. As the world's largest autonomous driving service provider, Baidu's Apollo Go had processed over 3.3 million orders as of 20 June, 2023. In the second quarter of 2023, Apollo Go provided 714,000 rides.

Pony.ai has initiated robotaxi service test from Beijing Daxing International Airport. In the current phase, Pony primarily conducts road testing among over 600 locations within the Beijing Economic-Technological Development Area and Daxing Airport terminals, with a human safety driver in each car.

Baidu Apollo Go has been approved for trial operation of unmanned commercial robotaxi service in Beijing. This will allow residents to buy autonomous driving services with no safety operator in the vehicle. Users can summon an Apollo Go robotaxi through the Apollo Go App, Baidu Maps, and the Baidu App. User satisfaction ratings, for what they're worth, are running at 4.9 out of 5.

Construction of China's first L^4 autonomous driving smart highway is wrapping up. The project covers the Suzhou-Taizhou Expressway S17 over 56 km, from the Huangdai Interchange to Yangchenghu North Interchange, with system integration and testing completed the end of September. 270 perception devices have been installed, including lidar, millimeter-wave radar, cameras, and road-side unit (RSU) antennas.

Ford has filed an application with the U.S. Patent Office for technology related to machine-vision detection of automobile brake lights. Ford is developing software to use camera and lidar sensing to determine when vehicles ahead have their brake lights on. This information will then be used by the ADAS or autonomous driving system to take appropriate actions.

Mercedes-Benz has launched Drive Pilot, the world's first certified L^3 system for conditional automated driving, in the U.S. market. The system will make its initial debut in California and Nevada this year in the EQS sedans. By early 2024, MB aims to roll out 2024-model EQS sedan and S-Class models equipped with Drive Pilot. The system will be available as a perpetual-pay subscription via Mercedes Me store, starting at $2,500.

The UK has launched evolvAD, a state-of-the-art AD research initiative supported by Nissan and the UK Government. The project's primary goal is to enhance autonomous driving capabilities in diverse and challenging road conditions, spanning from urban residential settings to complex rural terrains. The government's £100m Intelligent Mobility fund, overseen by the Centre for Connected and Autonomous Vehicles (CCAV), is managed by Innovate UK.

A study sponsored by Waymo has concluded that Waymo's AVs are safer than human-operated cars. This study was a collaborative effort begun last year between Waymo and insurance company Swiss Re, and concluded that Waymo's AD tech slashed property damage claims frequency by 76 per cent relative to human drivers (3.26 versus 0.78 claims per million miles). The Waymo AD eradicated bodily injury claims altogether, versus Swiss Re's baseline of 1.11 human-driver claims per million miles.

Chinese auto brand Zeekr has executed a significant OTA update to 110,000 Zeekr 001 EVs. The update incorporates upgraded ADAS features powered by the Mobileye SuperVision platform. The newly enhanced Navigation Zeekr Pilot has garnered favorable feedback from over 1,000 beta users. Initial availability is in Shanghai and Hangzhou, with plans for expansion to multiple cities in the coming months. A similar OTA update is expected for Zeekr 009 multipurpose vehicles later this year.

LIDAR CONFERENCE

Lidar Conference, 29-30 November in Wiesbaden: Preliminary Docket

DAY 1 - Wednesday, 29 November (Applications; Ecosystem)

Following speakers are planned & partly tbc.

11:30 Registration and light welcome lunch

13:00 Opening of conference by DVN CEO

Keynote / Day 1: VALEO
Dr Benazouz Bradai, Innovation Director for Autonomous Driving

13:30-14:45 Session 1: Lidar Applications I
Stellantis, Rivian, Ford Continental, Yole

14:45-16:00 Session 2: Lidar Applications II
TORC robotics, Volvo Trucks, EC commission, ZKW,

16:00-16:30 Coffee Break

16:30-17:30 Session 3: Lidar Ecosystem
ACG Wideye, Canatu, Chasm, Fraunhofer

17:30-18:15 Discussion Panel I
Lidar Growth Engine, the key-factors

18:45-20:00 Social Cocktail

20:00 Welcome Dinner

DAY 2 - Thursday, 30 November (Technology; Use-cases & Testing; Perception SW & Simulation)

Following speakers are planned & partly tbc.

07:30 Breakfast

08:30 Opening of conference.

Keynote/ Day 2:
HESAI / Bob in den Bosch, Sales VP of Global Sales

09:00-10:15 Session 4: Lidar Technology I
Microvision, Cepton, Valeo, Opsys, Innovusion, Scantinel

10:15-10:45 Coffee Break

10:45-12:00 Session 5: Lidar Technology II
Hamamatsu, ams OSRAM, Vertilite, Elmos

12:00-14:00 Lunch

14:00-15:15 Session 6: Lidar Use Cases & Testing
Trioptics, Dekra, FKA GmbH

15:15-16:30 Session 7: Lidar Perception Software & Simulation
Ansys, Actasys, Siemens

16:30-17:00 Plenary Discussion Panel II
Affordable Automotive Lidars & Validations

17:00 Closure