Editorial

Happy Holidays From The DVN Team!

Another year has flown by, and we, Hector Fratty and all the rest of the Driving Vision News team, wish you a season filled with joy, relaxation, love, and deliciousness with your family and friends.

Congratulations on all your successes in 2019, we're humbly proud to work in service to your continued success next year.
After our two very successful 2019 DVN Workshops in Detroit and Shanghai and our second Lidar Conference in Frankfurt, with vigourous high-level participation, we are now busily preparing our 2020 Workshops in Munich (28–29 January) and Tokyo (26–27 May).

The DVN Workshop in Munich, focused on high resolution lights, will emphasise the enormous progress being made by the vehicle lighting industry on lighting performance and dynamic road markings.

Lectures will be given by W.Huhn from Audi, J. Kaelble and R.Isele from BMW, S.Wickramasinghe from JLR, P.H. Matha from Volvo, F. Heitplatz from Ford, W. Goncalves from PSA, F. Bedu from Renault, I. Schneider from Opel, M. Kleinkes and M.Merkel from HELLA, R.Klaedtke from ZKW, Andrea Stella from Marelli, Todd Morgan and R.Neumann from Varroc, Benoist Fleury from Valeo and also from several experts in lighting and regulations.

For any more information, contact Salomon Berner at sberner@drivingvisionnews.com
Merry Christmas and Happy New Year.

Sincerely yours

DVN President

In Depth Lighting Technology

Dajac: Perfect Alignment for Every Lamp, Every Time

Dajac are an engineering company, specialising for two decades now in vehicle lighting alignment and validation. Their client list includes Valeo, Flex-N-Gate, Varroc, Hyundai, Myotek and more. Here we look at some of their products and talk with CEO David Novak.

Osprey
The Osprey is Dajac's sturdy, versatile industrial hardware-software system for aligning and validating lamps during manufacture (on lamp production lines) and during installation (on vehicle assembly lines). It comprises a PC, an optics head containing a high-resolution colour camera, an interface for external devices, and a wireless keyboard with built-in mouse control. An unlimited number of external cameras can be attached for inspection of secondary light sources like DRLs, position lamps, turn signals, and other non-headlamp lighting devices.
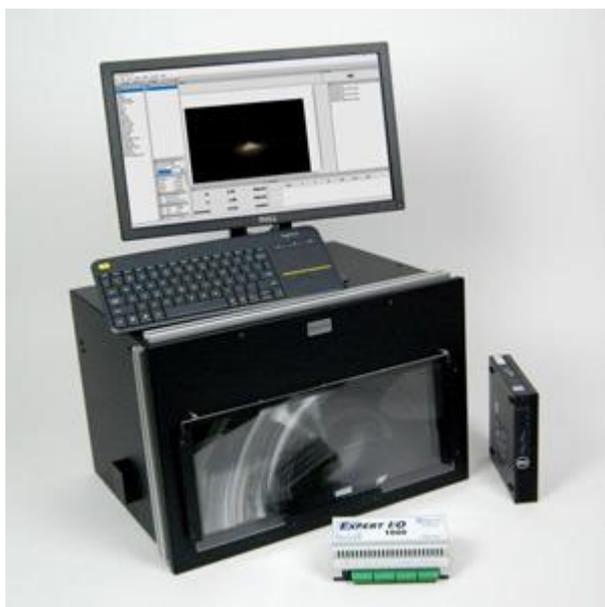
It has a variety of built-in alignment and validation algorithms and can interface with a variety of external components. In addition to the built-in algorithms, a software interface allows for custom algorithms. All this helps ensure every lamp is aligned and inspected exactly to the correct specification.

The Osprey system works with any beam pattern according to US, UN, and JIS regulations. The high-resolution USB camera provides bright, clear colour images with only a single connection to the optics head. Photo points allow inspection as well as photometric and colourimetric measurements at any number of locations within the image. It offers several methods for validating multiple aspects of cutoffs within images. And while Osprey was designed primarily for automated lamp alignment and testing by lamp and vehicle makers, it is also quite ideal for lighting labs as a quick, easy, accurate way to grab beam pattern images for measurement and certification.

IntelliAim

IntelliAim is the PC application used to control and configure the system. Algorithm parameters can be adjusted, tolerances can be set, and it also controls the interface to external manufacture/assembly devices such as electric screwdrivers, switches, sensors, and PLCs. Using IntelliAim's drag-and-drop scripting interface, it is simple to control and configure the Osprey.

During operation, IntelliAim shows a live image of the beam pattern, as well as the lamp's brightness and aim location. The image always fills the window, regardless of the window's size, so it's very easy for the operator to monitor the alignment and validation process.

Interview with CEO David Novak

David Novak

David Novak has always had a passion for electronics, software and graphics. He graduated from Kansas State University with a bachelor's degree in electrical engineering in 1993, then carried on at KSU, earning a master's degree in electrical engineering in 1994 with a speciality in machine vision and image processing. Novak went to work for Hopkins Manufacturing—an early pioneer in the U.S. headlamp alignment and validation industry, with lots of experience with the traditional American headlamp light pattern, who were struggling with the new Visual/Optical aim beam patterns. Novak helped them develop their Vision 1B, Vision 100, and Vision 2000 headlamp aiming systems.

Some time after Hopkins exited the headlamp manufacturing field, Novak was approached by Osram Sylvania to develop an inspection system for their plant at Seymour, Indiana plant (now a Valeo plant), and Dajac was born. Since then, Novak and his company in suburban Indianapolis, Indiana, have been consistently

developing new features and products to support the ever-advancing automobile lighting industry. Mr. Novak kindly spoke with us recently; here's what he had to say:

DVN: You count big names like Valeo and Sea Link among your customers. What do you deliver to them?

D.N.: Dajac's Osprey product line is designed to make lamp alignment and validation easy for our customers. It's a great tool for lamp assembly lines and automobile assembly lines as well as quality control. I've been amazed how this product has grown. We started with a single, very simple design and now we have five models ranging from basic to high end with many accessories.

Our Osprey NXT is an entry level product. It has the smallest optics head and lowest camera resolution. It was ample for most applications years ago, and is still a good choice for select programs. For more challenging programs, the Osprey SC includes a high resolution 10MP camera, enhanced optics and a wider field of view. The Osprey WT builds on the SC with a taller field of view and features to enhance mounting, including when motion of the optics head is involved.

Recently, we've introduced two new products, the Osprey LC and the Osprey LI. The LC is a lamp controller. It has no cameras and is intended to allow easy communication with lamps through scriptable CAN and LIN. More and more, CAN and LIN control is being added to all exterior lighting, not just headlamps. This is a great option when you need to control a lamp, but don't need to visually inspect it. And the LI is a lamp inspector. It has all the features of the Osprey LC, but additionally includes our secondary inspection cameras. This is an ideal choice when inspecting lamps other than headlamps where an optics head is not required. The secondary cameras can be mounted wherever needed, facing the lamp.

DVN: You recently visited Consumer Reports' automotive testing facility in Connecticut. What are your impressions?

D.N.: I found this a very interesting and informative trip. It was fun seeing their facility and learning their testing process. What surprised me the most was their testing procedure—it is very subjective. As an engineer, I prefer objective measurement, but I understand why they do what they do; they want to report the experience of an actual human sitting in the car.

IIHS, on the other hand, is completely objective. This creates confusion in the marketplace because there can be instances where IIHS rates a lamp above average, but Consumer Reports rates it bad or vice versa. It would benefit all if there were better correlation.

DVN: We were glad to see you at the Driving Vision News US Workshop in Michigan last January. How did you find it?

D.N.: It was a great event. We made many good connections. I particularly enjoyed the presentation on ADB. I'm anxious to see it adopted in the United States.

DVN: What makes your Osprey aimers better than the competition?

D.N.: TheOsprey product line is a culmination of twenty years of experience. Features such as high speed image processing, extreme high resolution colour cameras (10MP), advanced communication capabilities like CAN, LIN and Modbus TCP, not to mention the innovative lamp validation algorithms—hand-coded to perfection—ensure that we are meeting and exceeding our customer's needs in today's complex automotive lighting industry. All of this is tied together with a simple drag/drop scripting interface that is easy for a beginner and packed with power for sophisticated users. The system is designed for simple integration into an assembly line station, requiring only a handful of signals. This can be done by the customer or we partner with machine builders to provide full turnkey solutions.

**DVN: What can you tell us about the IntelliAim software?**

D.N.: IntelliAim is the Osprey control centre. It is used to define the process script and configure parameters. Then, during production, it communicates with the manufacturing station and lamp and performs the desired alignment and validation.Running on Microsoft Windows means that the user interface is instantly familiar to users. A list is provided of powerful tasks that can be effortlessly dragged and dropped into the script. Selecting the task in the script reveals parameters that can be configured to get the perfect result. The tasks include aiming, auditing, lamp validation, communications, script flow control, and many more. Tasks can make use of the optics head camera or any number of secondary inspection cameras. While executing the script, IntelliAim displays images and status. It also saves process data to a log file for later analysis. The user interface can be locked with a password to prevent unwanted access.

DVN: Aiming is paramount for on-road headlight performance. Does equipment like yours play a key role in getting the aim right consistently?

D.N.: Without a doubt! The Osprey achieves automated precision alignments through the use of two electronic screwdrivers to independently adjust horizontal and vertical alignment. This is done with brush DC motors, so integrating them is as easy as connected the armature plus and minus and a power supply. IntelliAim does the rest.Years ago, alignment was everything and is still a big part of the Osprey, but today's increased focus on beam pattern quality requires much more advanced processing. IntelliAim has several advanced features to perform this complex validation, such as photo points, photo areas, cutoff inspection, cutoff envelope, cutoff linearity, pattern matching, and colour inspection.

Lighting News

TechnoTeam LID systems
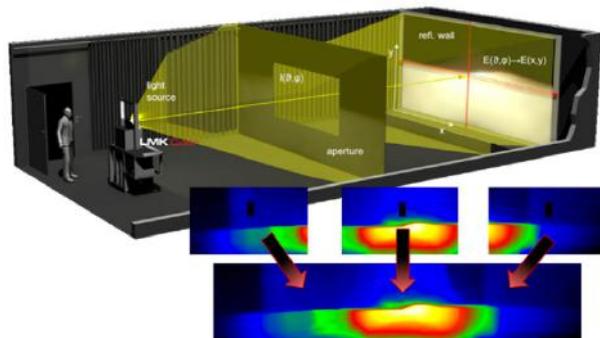
TechnoTeam offer indirect LID (luminous intensity distribution) measuring systems based on their LMK cameras. The main advantage of this technique is the feasibility of capturing a large segment of a LID with one shot in few seconds, rather than scanning sequentially for minutes or hours. The LID Room is one solution for the indirect LID measurement: a measuring object positioned on a stable measuring table illuminates a reflective wall with lambertian characteristics, which is placed at a typical measuring distance (10–25m for headlamps, for example). Thus, the projected luminance or colour distribution can be measured by using the LMK, which is mounted on the measuring table facing the measuring wall.

The geometrical and photometric relations between the light source and the reflective wall are calibrated so that the LID $I(\vartheta,\phi)$ can be calculated automatically from the image of the luminance $L(x,y)$.

This technique can be combined with conventional goniophotometers. TechnoTeam achieve this in coöperation with LMT of Berlin. The goal for the customer is a combination of the high resolution and speed of camera measurement with the positional freedom and accuracy of a goniometer. While the camera, in combination with a reflection wall, captures the data with more than 1 million pixels in one shot, the photometer provides unbeatable accuracy with better spectral $V(\lambda)$ adjustment and the high dynamic range. By using the goniometer, it is also possible to remove the limitation of the fixed camera structure in connection with the size of the measuring wall and to quickly obtain an overall light distribution through multiple exposure and composition.

Nichia–Infineon 16,000 pixels µLED Light Engine

Nichia and Infineon Technologies have announced collaboration on the development of a high-definition light engines with more than 16,000 microLED pixels for front lighting applications. The new device will provide high resolution light to the entire field of view of the driver.
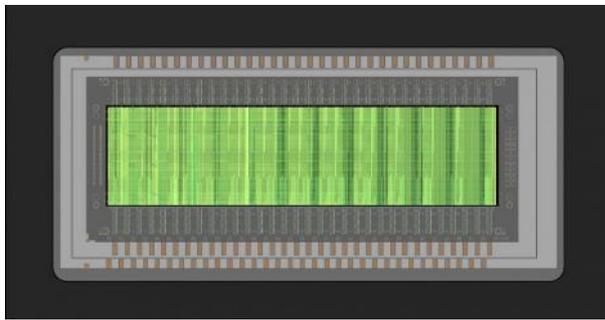
Nichia's Advanced R&D Centre director Kanji Bando says the new matrix light "will offer a resolution about 180 times as high as that of comparable solutions on the road today; this will pave the way for new and improved safety features and enhance driving comfort". HD light can be used to warn a driver of hazards by highlighting people or objects on the roadside. It can project markings on the road, such as to help the driver navigate through a construction site. And established features such as the glare-free high beam or bending lights run more precisely and smoothly.

The new HD light engine has µLED technology from Nichia and a new driver IC from Infineon. Infineon Automotive Body Power VP and GM Andreas Doll says the new chip will control and diagnose each of the 16,000 µLEDs: "In addition to the safety benefits, our new solution will also significantly increase energy efficiency because it allows us to turn on only those LEDs actually needed for a light pattern"—an additive system; current micro-mirror solutions turn on all LEDs and deflect surplus light, a less efficient subtractive technique.

The production launch of the new HD light engine is planned for 2023 as part of Nichia's automotive LED and laser portfolio.

ZKW Soar to New Heights

ZKW Lichtsysteme employ around 3,000 people, and the ZKW Group around 300 at the Wieselburg location, which the company consider their nucleus for innovation and an indispensible element for sustainable corporate success.

The ZKW Group are investing over €200m in production sites in Slovakia and Mexico. And there are also concrete plans for Wieselburg.

CEO Olivert Schubert says "In spite of the automotive crisis, we will be able to roughly maintain the sales of the previous year that means we are stable at an all-time high level and expect that we will be able to do that in 2020 as well.

"We have to distribute our competencies worldwide. Our strategy is to strengthen our innovative strength worldwide. Our growth engine is based on this. At the same time, we have to offer these innovations at competitive costs. Global strategy planning is based on Wieselburg. Here, too, we are about to make another major investment.

"We hope this year we can give the green light for an investment that optimises our logistics. This will strengthen the competitiveness at the Wieselburg location. Because nowhere is the complexity as high as at the Wieselburg location. We have articles for innovative products, series products and spare parts. Now is the time to improve the logistics and create space for additional value creation. In this tense economic situation in the automotive industry, it is important to invest as early as necessary, but also as late as possible.

"ZKW are pioneers in the lighting sector. We are expanding our portfolio, in the future also with rear lights, and we will increasingly focus on external lighting, that is, the light around the car. This is becoming increasingly important, especially when it comes to autonomous driving. The light is used for communication with the environment, especially at night systems only work if the lighting is matched to it.

The e-tron Digital Matrix LED Tech the US can't have

At the 2019 Los Angeles Auto-Show, Audi presented the new Audi e-tron Sportback equipped with the digital matrix LED headlights.
DVN published information on it, in its 25 November newsletter.

Below an extract of several papers published in US about the technology. «Don't expect the digital matrix LED headlights available in US any time soon. U.S legislation prohibits a vehicle from having anything more than normal low beams and high beams.

«Audi's system projects a literal carpet of light ahead. It's like having a guiding light from a spiritual being that constantly adjusts the edges of the beam to project, in real-time, a 10 to 50m carpet of light. The heart of the system consists of a DMD chip manufactured by Texas Instruments.

«Each headlight assembly is capable of projecting up to 1.2 million individual pixels of light, and for the future, we are thinking on communication in front of the car or communications around the car to warn bicycle riders on the right side of the car and pedestrians on the left side. We will also present a same technology but applied to rear lights," said Stephan Berlitz, Head of Lighting Innovation at Audi.

Audi Extend Elmos Partnership

Elmos Semiconductor and Audi are extending their partnership for LED rear light controls, and have announced sample availability of the new E522.95 IC.

The multichannel LED controller for exterior lighting with network interface capabilities allows direct control of LED lamps. Equipped with a 2-Mbps CAN FD protocol and a CAN FD physical interface, the E522.95 can be connected directly to a vehicle's BCM via the car in-vehicle network—that way, Elmos say, local lighting control units are no longer needed. "Enabling direct control between the BCM and LED lamps marks an important step towards realising centralised car lighting and domain driven architectures considered essential for styling, customisation, dynamic animation and autonomous drive by removing the need of localised lighting control units and thereby resulting into significant system cost savings and above all full application flexibility," said Audi Electrics/Electronics EVP Klaus Büttner. And Elmos Semiconductor CEO Anton Mindl says the new IC "marks a significant step in our collaboration with Audi in bringing system solutions based on our expertise in in-vehicle network interfaces".

Developed according to the ISO 26262 Functional Safety development process, the E522.95 offers a suite of diagnosis features to ensure system operation of LED drivers and enable achieving ASIL-B ratings at system level. The 16 channel controller has a maximum output current of 100 mA per channel, and supports Elmos' patented power management methodology ensuring a constant light intensity of the LEDs even under difficult thermal conditions. It is offered in a QFN40 package with an exposed die pad. Product features of the E522.95 will also be shown at CES 2020.

R&D Award for Valeo PictureBeam

Valeo have won an R&D award for their PictureBeam Monolithic technology, which they say is the first high definition LED smart lighting solution. The award was announced at the 2019 Innovation Awards for Franco-Chinese Teams, held at French business association MEDEF's Paris headquarters.

PictureBeam Monolithic will be available on the market from 2022. Capable of projecting around 4,000 pixels onto the road from a single lighting module, PictureBeam Monolithic produces a very wide beam of light for an optimal field of vision.
It also improves the driver's nighttime visibility of pedestrians, cyclists and obstacles on the road. If the vehicle's cameras detect a pedestrian, for example, the lighting system automatically shines more light on the surrounding area, enhancing visibility without blinding the pedestrian. PictureBeam Monolithic also offers driving assistance

functions, due to its ability to create road markings. The headlamps can be used, for example, to trace bends in the road.

Organised by the France China Committee and backed by the French Ministry of Economy and Finance, the French Ministry of Higher Education, Research and Innovation and the Chinese Chamber of Commerce and Industry in France, the Innovation Awards for Franco-Chinese Teams aim to recognise joint projects developed by French and Chinese bicultural teams in companies, universities or laboratories. The jury is chaired by the French National Centre for Scientific Research (CNRS).

Shuji Nakamura Awarded for LED Lighting
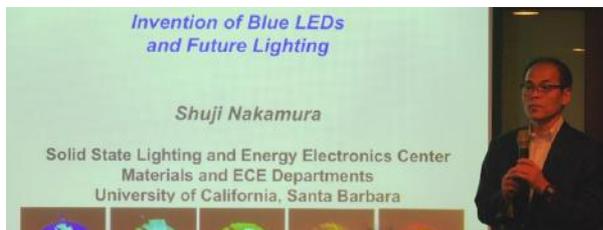
A pioneer in sustainable energy technology, professor Shuji Nakamura of the University of California at Santa Barbara has won the 2019 Leigh Ann Conn Prize for Renewable Energy from the University of Louisville. The prize recognizes outstanding renewable energy ideas and achievements with proven global impact.

Nakamura is recognized for scientific innovations and commercialisation of efficient solid-state LEDs. His innovations have enabled efficient use of energy, reduced the burden on the environment and helped create sustainable lighting worldwide. Next March, Nakamura will give a free public talk in Louisville about his work and achievements, trials and tribulations.
He will receive the Conn Prize medal and $50,000 award at a formal ceremony.

"Dr. Nakamura is a world-class scientist dedicated to the viability of LED technologies. His work and perseverance are inspiration to us all. The University of Louisville celebrates his research and its positive influence. In a world where energy use must be environmentally responsible, he is an outstanding winner of the Leigh Ann Conn Prize," says U of L President Neeli Bendapudi, who will confer the award.

The prize, administered by U of L's Conn Center for Renewable Energy Research at the J.B. Speed School of Engineering, is named for the late daughter of Hank and Rebecca Conn, who are centre supporters and the prize benefactors.

Driver Assistance News

Toyota Will Make Commercial AVs Before Private Ones

Toyota plan to deploy advanced self-driving features in commercial vehicles before adding them to passenger cars meant for personal use.

James Kuffner, chief of TRI-AD (the Toyota Research Institute for Advanced Development) says that's because it will be easier to apply self-driving technology that does not require constant and direct human-monitoring to taxis and non-passenger vehicles.

It will take more time to achieve Level 4 for a personally owned vehicle Kuffner said: "Level 4 is really what we are striving for to first appear in mobility as a service". Toyota will soon release their first Level 2 autonomous car capable of driving itself on the highway, as part of their strategy to develop self-driving cars over the next few decades

Toyota and their suppliers—including Denso, who also invest in Tri-AD—are adopting a longer view toward cars with self-driving technology and artificial intelligence than many competitors who already market vehicles at least nominally capable of autonomous highway driving.

Lidar Developers to Accelerate Tech Developments

The goal of launching full AVs and better ADAS is driving lidar developers to accelerate their technology developments. Draper, a U.S. lidar producer, unveiled their lidar with MEMS beam steering technology, for example. And Aeva, founded by two former Apple engineers, introduced 4D lidar-on-chip.

The two companies both focus on scaling down and simplifying lidar systems. Draper have developed a lidar-on-a-chip that uses patented, all-digital MEMS optical switches for beam steering. According to Draper, the all-digital switches provide

robustness for the harsh automotive environment, which carries advantages over competing solid-state approaches that rely on analog beam steering. In addition, the use of novel components, like optical switches, MEMS and integrated photonics, all on a single chip, allows Draper to surpass current lidars in range and resolution. Draper's lidar is being developed to image a range of hundreds of meters while providing a corresponding angular resolution targeted at less than 0.1-degree.

Meanwhile, Aeva introduced their FMCW (Frequency Modulated Continuous Wave) lidar system, Aeries, which integrates key elements of a lidar sensor into a photonics chip. Aeva's 4D lidar-on-chip reduces the size and power of the device by orders of magnitude while achieving full range performance of over 300 metres for low-reflectivity objects. According to Aeva, their lidar-on-chip will cost less than USD $500 —much less than most automotive lidars.

The VW Group are planning to use Aeva's 4D lidar for new models launching in 2022–23.
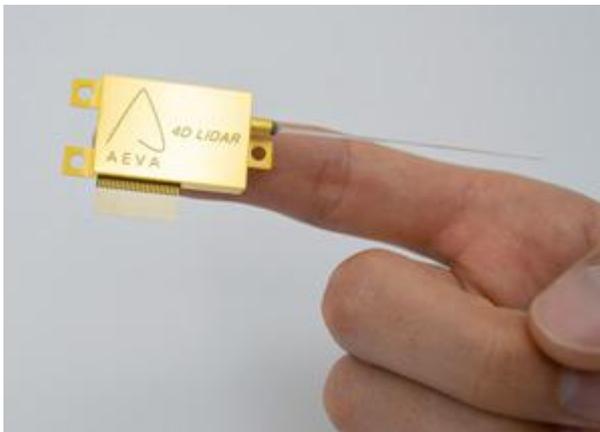
Safari Project: Aglaia for AV Environment Perception

Over the past two years, the SAFARI project has examined the exchange and update of digital road maps by AV. As a research partner, Hella Aglaia were responsible not only for requirements analysis and system design, but also for environment perception. At the closing event on December 10, the SAFARI project partners jointly presented their results.

From the point of view of AV, driving situations on motorways or country roads are usually clearly structured. The situation is quite different in urban areas: roadworks, closures of individual lanes, parking offenders or pedestrians on the road make navigation much more complex. The more up-to-date the navigation information for autonomous vehicles, the more likely it is that dangerous situations can be mitigated.

Hella Aglaia developed a camera-based environment detection system as part of SAFARI. The aim of the work package was not only the self-localisation of the vehicle, but also the perception and classification of its surroundings so that this information can be fed into a dynamic road map to be used by other road users as well. If vehicles are travelling autonomously, the comparison of information from map material and imaging sensors provides the basis for navigation. As in series-proven driver assistance systems, complex algorithms first evaluate the images from the front camera and detect, for example, vehicles, people, traffic lights or road markings.

In addition, Hella Aglaia developed a free space detection module for SAFARI that detects the navigable areas around the vehicle and thus allows to draw conclusions about available parking spaces, parking offenders or road works. The collected information on localisation and vehicle environment was transmitted to the map administration in real time via a wireless interface. For the functional test, Hella Aglaia specially equipped a test vehicle with camera technology ready for series production.

The SAFARI project is funded by the Federal Ministry of Transport and Digital Infrastructure (BMVI) within the framework of the funding guidelines "Automated and connected driving on digital test beds in Germany".

Quanergy, Geely in Smart City and AV Pact

Lidar sensors and sensing solutions developer Quanergy have been selected as a lidar partner for China's Geely Automotive Group. Geely and Quanergy will have a deep collaboration in developing and commercialising solutions for the broad deployment of smart city and autonomous vehicle systems.

The announcement follows an initial deployment of Quanergy's lidar-based smart city solution at intersections across the Hangzhou Bay Area, Ningbo City, and Zhejiang Province. This is the first smart infrastructure and intelligent vehicle deployment in China sponsored by the Ministry of Housing and Urban-Rural Development with 5G-V2X, autonomous driving vehicles, and vehicle-road cooperation techniques. With the project, Quanergy's lidar products and management system are used in roadside sensing system, allowing intelligent vehicles to receive details on roadside objects through 5G wireless communication networks.

The strategic partnership between Quanergy and Geely marks one of the first lidar partnerships specifically created for the commercial deployment of smart cities and autonomous vehicles. Their project will be presented at CES 2020 in the Quanergy booth.

General News

FCA, PSA Agree Binding Merger Deal

Fiat Chrysler Automobiles and PSA Group have signed a binding merger agreement that stands to create the world's 4th-largest automaker after VW, Toyota, and the Renault-Nissan-Mitsubishi alliance.

PSA and FCA say the new company will have an 11-person board, with five members nominated by PSA and another five by FCA and including labor representatives from both. PSA CEO Carlos Tavares will become CEO of the merged entity for an initial five-year term, and will hold the 11th seat on the board.

By merging, PSA and FCA aim to achieve annual cost savings of USD $4bn by combining technologies and through shared purchasing agreements. Before the 50-50 share merger is completed, one of PSA's shareholders—China's Dongfeng Motor Group—will trim their 12% stake in the French automaker (worth about €680m) by selling 30.7 million shares to PSA.

The merger means FCA will gain access to PSA's more modern vehicle platforms, helping to meet tougher new emissions rules, while Europe-focused PSA will benefit from FCA's profitable U.S. business that features brands such as Ram and Jeep. The deal could still face close regulatory scrutiny, as governments and unions are likely to be skittish about potential job losses from a combined workforce of about 400,000.

The merger will create a group with 8.7 million annual vehicle sales and a market value of about $46bn.

VW is the "Most Innovative" Car Company: CAM Survey

The Volkswagen Group are the leader in terms of innovative strength ahead of Daimler and BMW in the 2016–19 timeframe, while Tesla are establishing themselves in fourth place. That's according to a recent study by CAM, the Center for Automotive Management, analysig the vehicle technology innovations of 38 automotive groups. The comparison is based on more than 2,500 innovations that were produced in series models between 2016 and 2019. All innovations were evaluated according to

quantitative and qualitative criteria. Other findings from the survey: Hyundai (№ 5), Geely-Volvo (№ 6) and PSA (№ 8) have gained tremendous innovative strength compared to the 2013–15 survey.

Rank	Group*		Number of innovations	World-first innovations	Innovation strength
1	VW Group		462	73	466,9
2	Daimler		184	77	394,6
3	BMW		166	41	262,5
4	Tesla		50	23	146,8
5	Hyundai		149	9	146,2
6	Geely		131	10	144,8
7	Tata		95	9	113,1
8	PSA		126	9	112,5
9	Ford		90	12	110,7
10	GM		115	11	107,9

Rank	Group*		Number of innovations	World-first innovations	Innovation strength
11	Renault		86	4	88,1
12	Toyota		73	8	85,4
13	Fiat-Chrysler		88	4	75,7
14	Honda		61	8	75,1
15	BYD		41	5	72,5
16	Nissan		48	5	71,4
17	SAIC		75	3	68,8
18	GreatWall		52	2	62,4
19	Changan		51	1	59,5
20	BAIC		31	4	46,1

In contrast, for the American manufacturers Ford and GM as well as the Japanese companies Toyota, Honda, and Nissan the innovation strength has significantly decreased.

The Center of Automotive Management (CAM) is an independent institute for empirical automotive and mobility research and strategic consulting at the University of Applied Sciences in Bergisch Gladbach. The institute supports its customers on the basis of extensive automotive databases, in particular on the subject of automotive engineering innovations in the global automotive industry.

Europe Sales Up Yet Again

European new-car registrations rose 4.5% in November, marking the third consecutive month of growth this year for an industry that has been hit by economic woes, trade wars and a broader industry slowdown. Registrations rose to 1.21 million cars in the countries of the European Union.

- Volkswagen Group brands staged a recovery from last November. Registrations of Audi vehicles jumped 39% and Porsche'volume increased 280%, Seat sales rose 11% and VW brand gained 9%.
- PSA Group sales fell 8%, dragged down by a 22% decline in Opel/Vauxhall registrations. Peugeot and Citroën sales were down 1% and DS sales were up 31%.
- Renault Group sales increased 4%, with Renault brand up 11% and Dacia sales down 7%.
- Fiat Chrysler sales fell 2% with Jeep registrations dropping by 16%.
- Ford's volume was up 3.4%.

- The BMW brand was up 3.5% and Mercedes brand registrations rose 1.6%
- Among Asian brands, Hyundai registrations rose 9%, Toyota brand was up 6% and Kia's volume increased 5%. Nissan sales fell 4%.

Toyota Forecast: 10.77m Vehicles in 2020

Toyota are forecasting sales of 10.77 million vehicles worldwide during 2020, edging closer to № 1 automaker the VW Group.

According to a Bloomberg News report, Toyota's outlook—including vehicles sold by subsidiaries Daihatsu and Hino—shows slight growth from an estimated 10.72m units this year. VW, meanwhile, sold 10.8m units in 2018 and said in October they expect deliveries to be about the same for 2019.

As electric motors, autonomous capabilities, and new mobility services disrupt the industry, Toyota have been crafting alliances through partnerships and equity stakes with the likes of Suzuki, Mazda, and Subaru.

Bloomberg noted alliances are becoming ever more critical in the global auto industry as manufacturers seek to pool resources and save costs. Ford have teamed up with Volkswagen, for example, while Honda and General Motors are working together.

Marelli's Mobility Partnership with Plug and Play

Marelli have announced a partnership in mobility with Plug and Play, a global innovation platform that brings together the best startups with the world's largest corporations.

Marelli hope the partnership will strengthen their connections with startups, enabling the company to accelerate their innovation capabilities for future mobility technologies and solutions.

Headquartered in Silicon Valley, Plug and Play have a global footprint in over 25 locations. The company have developed a unique ecosystem of startups and entrepreneurs, and run what they call "Accelerator Programs": time-limited opportunities for major companies to collaborate and invest in startups as part of open innovation across a range of industries.

Through the Accelerator Program, Marelli can strengthen their connection to the startup sector through one-on-one meetings, deal flow sessions, and networking. Access will be targeted and based on a strict selection criteria relating to startups that are focused on the development of unique and advanced mobility technologies.

Ryoichi Hori, in charge of Marelli's Global Technology Centre, says the new partnership "will strengthen our capabilities to create innovative HMIs through the collaboration with cutting-edge startups in Silicon Valley".