



DVN STUDY

NEW LIGHTING FUNCTIONS 2020-2030

To Improve Safety, Communication, Comfort, and Styling

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Editorial

Right Now: Two Important DVN Events

Two DVN events are up on the marquee: the first-ever fully online Workshop, and the release of the 2020 DVN Study, one of the greatest technical works we have ever done.

First, the e-Workshop: the DVN-I team are all set for this Thursday, when the **online Workshop on car smart interiors** gets started. Among the 200 registered attendees, we find PSA, Renault, Audi, BMW, Mercedes, Geely, Ford, Honda, Nissan, Toyota, Hyundai Motors representatives. The event is centred around the theme New Technologies for Car Interior & Mobility, and will feature three keynote speeches, a fine collection of technical sessions, and 15 exhibits.

The keynotes will be done by Valeo CTO Geoffrey Bouquot on Smart Technology for Smart Interiors; Faurecia CTO Christophe Aufrère on Cockpit of the Future, and Dave Muyres, Mobility Futurist and Streetscope VP, on future mobility's challenges.

The technical sessions' rubrics are:

- Interior as a System;
- Any Surface Becomes Functional;
- Seating;
- Interior Lighting;
- Interior Design;
- Simulation, Software, and Electronics.

The **interior lighting** session, chaired by BMW Interior Lighting Chief Robert Isele, will comprise four lectures:

- *Lighting to support future use cases*, by Hella's Dr. Ana Bizal, Head of Interior Lighting Pre-Development;
- *Smart Interior Projection*, by Osram Continental's Dr. Michael Rosenauer, Head of Advanced Development;

- *Next generation of Smart LED*, by Inova Semiconductors' Senior Application Engineer Stefan Hoffmann, and
- *Automotive Interior Surface Backlighting*, by DesignLED CTO Dr. James Gourlay.

Startups will present their pitches during a virtual lunch, with the ISELED Alliance and EPIC organisation front and centre during virtual coffee breaks. Attendees will have the opportunity for digital expo visits, business meetings, and chats.

We think it's going to be just as big a success as every previous in-person DVN Workshop. 150 attendees from 60 companies are already registered among which representatives from Audi, BMW, Geely, Honda, Mercedes, Mitsubishi, PSA, Volvo, Faurecia, Marelli, Valeo.

See the conference program [here](#), and register [here](#) to attend—hurry; as this issue of DVN goes live the event is just a couple of days away!

Second, a significant event is the release of the 2020 DVN Study, which thoroughly analyses and assesses new lighting functions in context of new automotive use cases and new realities. This week's in-depth report contains more information; give it a look.

Sincerely yours,

A handwritten signature in black ink, appearing to read "J. Frally". The signature is written in a cursive, slightly slanted style.

DVN PRESIDENT

In Depth Lighting Technology

DVN Study on New Lighting Functions is Now Available.

The new DVN Study **New Lighting Functions 2020–2030** describes, in 125 detailed pages, how safety, communication, comfort, and styling with light can most feasibly be improved in context of today's and tomorrow's realities on the ground around the world. It's now available for purchase.

This study, made by eight automotive lighting experts, each with more than 30 years experience, will materially help lighting and driver-vision decisionmakers to build and optimise their long-term strategies and plans while simultaneously helping specifiers, researchers, engineers, designers, stylists, and regulators focus and target their work efforts. The study was built because all of us at DVN are convinced that new functions will be the main challenge of vehicle lighting in the next decade.

The eight experts are:

Geoff Draper, elected GTB President in 2008 after a renowned career in the vehicle lighting industry working for Lucas Lighting, Carello, Magneti Marelli, and finally as Technical Director of Koito Europe. In 1989 Geoff was elected chairman of the GTB Harmonisation working group and subsequently he led the GTB Front Lighting group, CIE TC 4-45, and the SAE Pedestrian Visibility Taskforce.

Rainer Neumann, who joined Bosch where he spent 13 years in vehicle lighting R&D. In 1997 he became the global director of lighting development at Magneti Marelli, then he joined Visteon as Head of the European Lighting Group. In 2012 Dr. Neumann became VP of Global Technology at Varroc, who had bought Visteon's lighting division.

Ralf Schäfer joined Philips Research in 1977 gathering experience on halogen and HID light sources, then becoming Head of Xenon development. As his final position, Ralf was VP for OEM marketing of Philips Automotive Lighting with the task to balance LED technologies versus conventional light sources. He now works as a freelance consultant.

Jean-Paul Ravier worked for over 41 years at Valeo, including 29 years at Valeo Lighting where he held a variety of management positions first in IT and finance, and then in R&D, projects, and innovation, including in Japan from 2005 to 2009 at Ichikoh as a board member and managing director. Then he was appointed chair of the ELS Advanced Master's Degree Program in Lighting. He held that position through the end of 2017 and is now Development Advisor for DVN.

Carsten Befelein is a vehicle lighting expert with enthusiasm for styling aspects. He likes to work out cognitive and connected lighting innovations and concepts with feasibility and economic studies for a successful serial implementation. He worked from 1987 to 2009 at BMW in the lighting, electronics, interior components, and styling departments. From 2012 to 2019 he worked at Toyota Boshoku Europe and

Techniplas-Weidplas to develop smart trim parts with innovative lighting and electronic integrations in plastic components.

Daniel Stern, DVN’s Chief Editor based in Vancouver, Canada, is considered as one of the five greatest lighting experts in North America. He is a member of the US National Academy of Sciences Transportation Research Board, which steers North American research on automotive conspicuity, lighting performance and regulation. He is an active member of the SAE Lighting Systems Group, and attends and participates in the world’s symposia and technical conferences.

Leo Metzemaekers worked 29 years at Philips (then Lumileds), holding various international assignments in product development, marketing and sales, and strategy and business development. Since 2016 he works as an independent advisor in automotive sales and marketing, strategy, and business development.

Hector Fratty made his illustrious career in vehicle lighting. From 1995 to 2006, he was Valeo Lighting Systems’ chief of R&D. His level of expertise in lighting gained him recognition as one of Valeo’s five Master Experts. He presides over the biennial VISION Congress and is also a member of the ISAL steering committee. He founded Driving Vision News (DVN), the vehicle lighting, ADAS and car smart interior industry’s journal of record, dedicated to keeping the involved community informed and communicating about the latest progress and developments.

The main reasons to buy the study:

- It's prefaced by one of the great minds of vehicle lighting regulation—Ir. Michel Loccuffier, the Chairman of GRE—who explains how to manage regulatory issues, and by Dipl. - Ing Stephan Berlitz, Audi's acclaimed head of lighting innovation, who presents the challenges of new lighting functions in the next decade;
- It presents in detail the new exterior and interior lighting functions to improve safety, comfort and styling, considering the regulatory implications;
- It provides a working answer to three key variables: car demand in the coming months and years considering the pandemic; the shape and size of the overall vehicle lighting market in medium and long terms, and the influence of lighting in fatalities today and in the future with new lighting functions.
- It's packed with relevant new information, efficiently and accessibly presented as 11 best bets.



COMPANIES INTERVIEWED FOR THE STUDY

These best bets form the position of DVN after extensive interviews with 35 companies including automakers, lighting suppliers, research institutes, and consortiums involved in lighting. Some of these best bets are broad-stroke descriptions of major goals and trends; others are key challenges and opportunities. For example, one of them centres on vulnerable road users and the evolution of lighting to drive down the unacceptably high rate at which they're killed and injured in

traffic at night. Another looks at the future of a certain technological category and its applicability to new exterior and interior lighting functions using HR resolution from matrix, DMD, μ LED, MLA . Another explores differences of styling imposed by brands as decorative illuminations, considering regulation and still another develops evolution of digitalization and personalization for new safety and styling features.. That's just a quick description of four examples out of a list of eleven!

Pre-Release Feedback

Stephan Berlitz, Head of Lighting Innovation & Functions at Audi, says with "big challenges for the vehicle lighting family, the DVN Study gives us an overview about the possibilities and first steps into a bright future".

Michel Loccufier, Chairman of GRE, says "With the accelerating rate of innovation in car lighting and the potential for safety benefits, I encourage everyone to share their expertise and actively work together under the GRE umbrella. Together we can strive toward true global harmonisation and hasten the reduction of crashes and traffic-related deaths and injuries".

[Contact DVN's Salomon Berner](#) to buy your copy. Meanwhile, here's the table of contents to whet your appetite:

Chapter 1: Preface

Chapter 2: Acknowledgements

Chapter 3: Management Summary and DVN Best bets

Chapter 4: Market view and business opportunities

Chapter 5: Lighting and Traffic-Related Fatalities

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Chapter 7: Overview of technologies for new safety and communication lighting functions

Chapter 8: Importance of Styling for Exterior Lighting

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Chapter 10: Regulatory Impacts and Considerations

Chapter 11: Research Studies on New Functionalities

Lighting News

DVN and EPIC: MoU to strengthen Photonics/Lighting

LIGHTING NEWS



DVN, Driving Vision News the journal of reference on vehicle lighting, ADAS and car interior innovations and the European Photonics Industry Consortium ([EPIC](#)) signed a collaboration agreement to strengthen the photonics industry on an international level, bringing together members and knowledge to better serve the industry.

The Memorandum of Understanding (MoU) signature was officially announced at the EPIC Online Technology Meeting on Micro-LED for Automotive Lighting on 21 September 2020. The collaboration between DVN and EPIC is focused on cooperative activities involving industry endorsement of standards and support the development of an efficient and sustainable industry.

The partnership will encourage cooperation between the experts, including participation at events, collaboration on information exchange and promotion, and advisory mandates to develop an efficient and sustainable industry.

Dr. Jose Pozo, CTO of EPIC, said: “Having DVN on board as a partner brings the opportunity to EPIC members to build potential collaborations and partnerships with the key players of the automotive industry. The main goal of this cooperation is to facilitate the communication between different parts of the value chain towards building common voice for the vehicle lighting.”

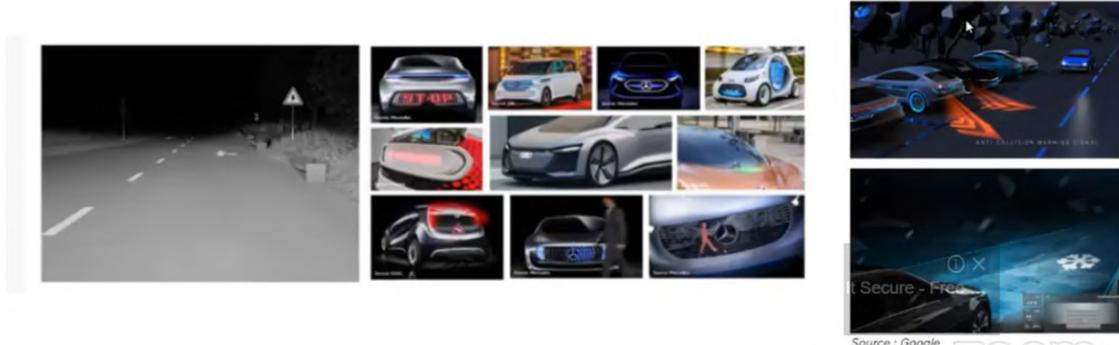
Hector Fratty, CEO of DVN said: “The collaboration with EPIC and its members helps DVN and its network to optimize regulations and standards and to move innovations

out of the labs and onto the road to maximize vehicle occupants' safety, comfort, and convenience.”

EPIC is an industry association with over 600 members that promotes the sustainable development of organisations working in the field of photonics. Its members encompass the entire value chain from LED lighting, PV solar energy, Silicon photonics, Optical components, Lasers, Sensors, Displays, Projectors, Optic fiber. EPIC fosters a vibrant photonics ecosystem by maintaining a strong network and acting as a catalyst and facilitator for technological and commercial advancement.

Volvo's Matha at EPIC: μ LED Module in the Next Decade

LIGHTING NEWS



EPIC, with the collaboration of DVN, organized yesterday, Monday 21 September, an on line technology meeting on μ LEDs for automotive lighting, Two car makers, Volvo and Audi, one Tier 1 lighting supplier AL Marelli, and three Tier 2 Osram-Continental, Lightworks, SUSS microOptics made a lecture concerning μ LED technologies.

Volvo's Paul-Henri Matha started with *μ LED for automotive lighting, OEM stakes insight.*

His proposal of target for the next decade is to have a module allowing a good ADB and possible light communication :

- Dimension : 80 x 80 x 100(depth) vs 150 x 150 x 150
- Energy consumption per side: 30w vs today (60W + additional 40W which means a total of 200W and 4gCO₂)
- Horizontal spread +/- 45° vs today +/- 7°
- Vertical spread +/- 10°
- 1,000Lm for Low Beam and additional 1,000Lm for High Beam

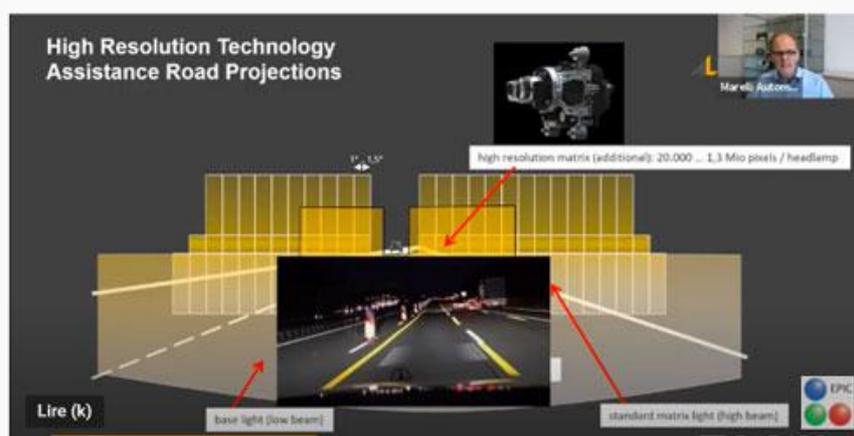
He also suggest to work of the efficiency of μ LED, to achieve 2-3 times the today 15-20Lm/W.

He concluded his lecture explaining the need to work on the cost decrease of electronics which is now the biggest cost of a ADB HD module.

Big part of the discussion was about the number of pixels with a range of 5,000 - 50,000 pixels depending of the functionalities, the spread and the resolution.

Audi's Johannes Reschke made a lecture on *Integration of μ LEDs in automotive glazing for light communication* explaining the possible light communication from the front, to improve pedestrian and car visibility, from the side for a better visibility of the side of the car, and from the rear for communication and displays.

In the second part, he presented his roadmap on car body, in car window, and in displays locally and in the totality of the car.



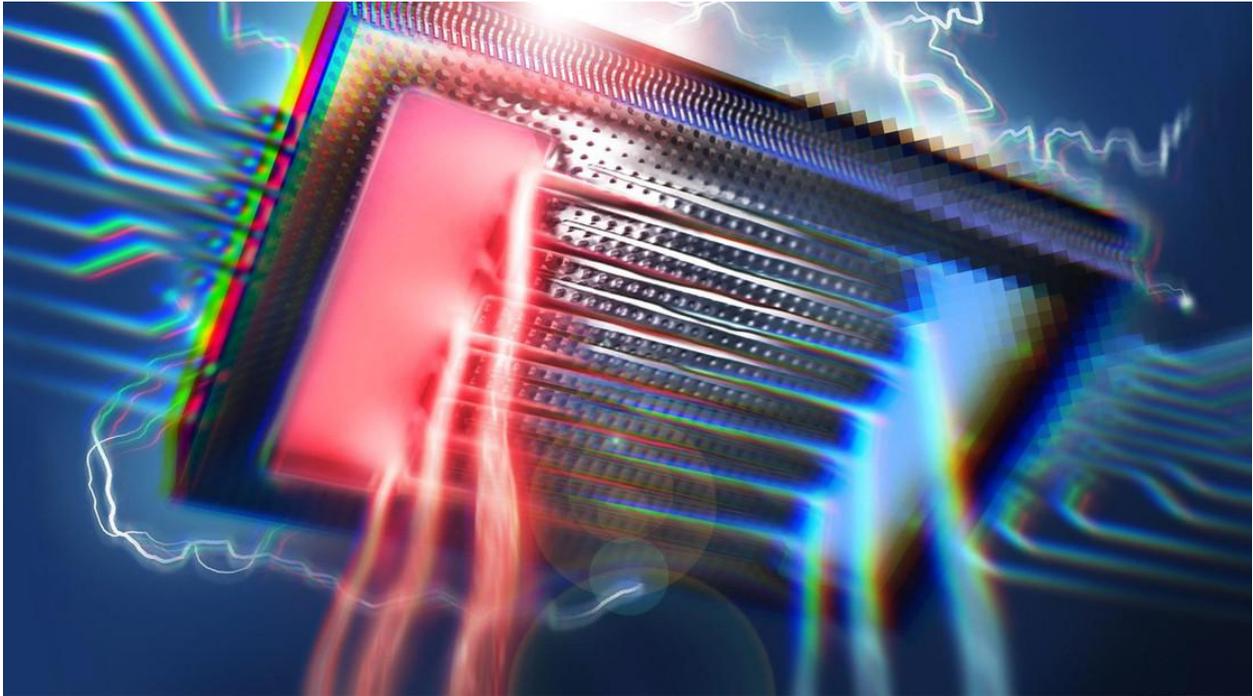
AL Marelli's Ernst-Olaf Rosenhahn made his lecture on μ LED for HR main lighting functions, presenting the last module now equipping Audi e-Tron and Mercedes-Benz S-Class. He explained the two benefits, first to improve lighting by optimizing the width of the shadow for opposite car, and the possibility to offer projection signs (guiding éléments, collision warning and speed limit) or construction zone. He concluded presenting the ways for improvement: for the light source to improve efficiency and for the projector to improve efficiency, sharpness, contrast and cost.

In the next newsletter, we will present the three other lectures.

Link to get the two hours video : <https://www.youtube.com/watch?v=3tztSsqzCMvY>

Swiss Tech in Major Chip Cooling Breakthrough

LIGHTING NEWS



A team from the Swiss Federal Institute of Technology in Lausanne (EPFL) say they've manufactured an electronic chip directly integrating a cooling system, for heat dissipation 50 times more efficient than the records in this area.

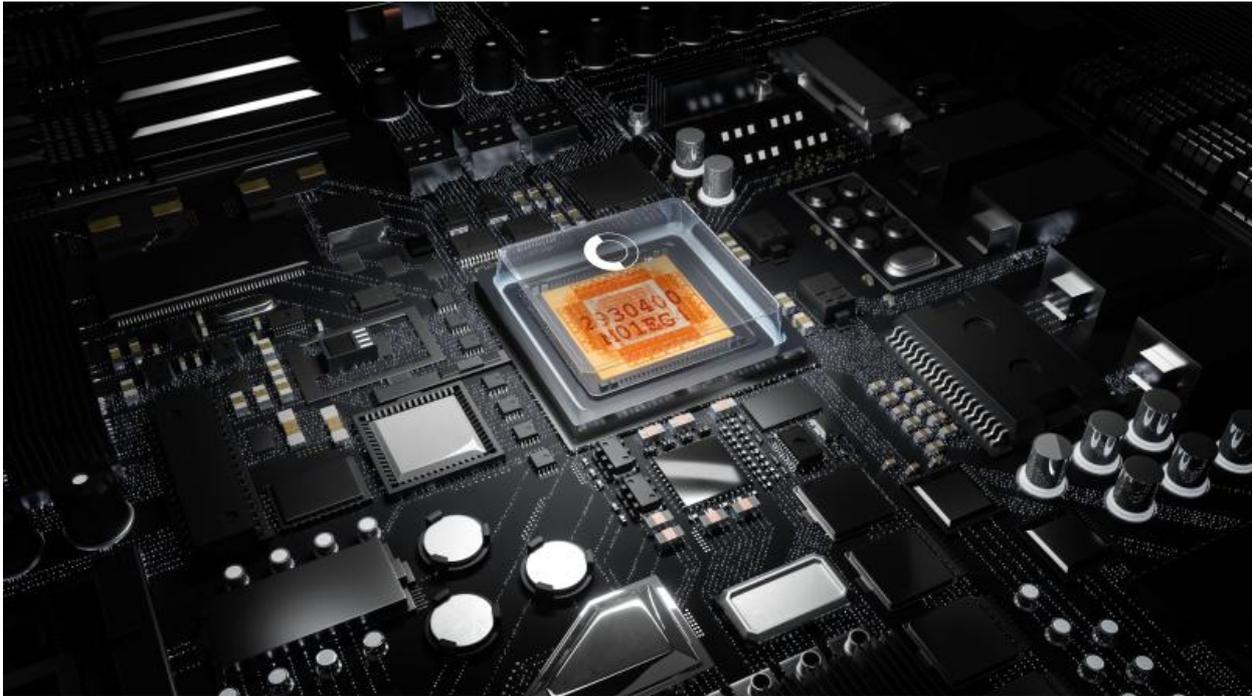
"We are reaching a point where the thermal management of electronics is a problem says Elison Matioli, director of EPFL's PowerLab and co-author of this new work. The cooling of the components is therefore essential. To do this, the heat is dissipated with fans, metal heatsinks, or liquid cooling systems. The new approach is to make electronic components with directly-integral cooling systems, which reduces the number of heat transfer junctions (e.g., from chip to heatsink and from heatsink to atmosphere). Junctions inevitably exert efficiency penalties.

The Swiss team's approach is based on the integration of channels of a few μm directly under the chip. Water circulates inside, capturing the heat emitted by the transistors located just above. The arrangement of the channels has been specially designed to optimise the cooling: the entire surface of the chip is squared so that each of the microscopic transistors is individually cooled, which is much more efficient than the usual systems, which work at the scale of the whole chip.

"This work is an important step towards efficient, compact and inexpensive cooling systems. Their method outclasses the most sophisticated techniques", says Tiwei Wei, a specialist at the Institute of Microelectronics and Components in Leuven, Belgium. Thanks to this extraordinary new cooling performance and the extreme miniaturisation it permits, "for the first time we can integrate power electronics in a chip", says Matioli.

Celsius: Osram Continental's New Fail-Safe LED Driver

LIGHTING NEWS



Fail-safety is increasingly essential as the complexity of modern lighting systems is increasing, especially with extended functions such as dynamic light adjustment. Osram Continental's new Celsius LED driver guarantees fail-safety and offers great flexibility in capabilities and applications. The driver monitors lighting functions such as brake lights and indicators.

The Celsius precisely diagnoses and evaluates the lighting functions, and takes over control in case of a system error to current gets to the LEDs. Even if signals are missing or the microcontrollers fail, the Celsius maintains operation of safety-critical vehicle lights.

The Celsius has a three-level safety system. While most drivers only see faulty microcontrollers, not other faults, the Celsius takes measurements every single trip to ensure that the lighting is either fully operational or at least working to some degree in a fail-safe state to ensure that the driver and his surroundings are continuously supplied with light in every situation.

In first stage, the Celsius checks the status of its own functions, the security mechanisms, and its operating infrastructure and determines parameters of the environment from the hardware to the LED. In second stage, the software algorithms evaluate the determined parameters and start operation. In third stage, the LED driver monitors whether the software system is still functional.

Osram Continental have implemented a self-test in the integrated circuit to check the circuit responsible for the correct amperage (and thus the light) each time it is started up. Other test routines measure internal variables such as reference values or external components, for example the shunt and the coil. Finally, all external components related to the LED driver are analysed.

Subaru Eyesight Scans the Road for Unexpected Dangers

LIGHTING NEWS



Subaru have partnered with Silicon Valley tech company Xilinx—who make flexible and adaptive processing platforms—to enhance the automaker's EyeSight safety system with new features that will first launch in the Japanese market.

EyeSight, a stereo vision-based advanced driver-assistance and safety system, will be powered by Xilinx's UltraScale multiprocessor system-on-chip. This provides the power to process the stereo images into 3D point clouds with ultra-low latency.

Subaru's EyeSight system, a stereo vision-based ADAS and safety system, will be powered by Xilinx's UltraScale multiprocessor system-on-chip. This provides the power to process the stereo images into 3D "point clouds" with "ultra-low latency and functional safety," said Willard Tu, Xilinx's senior director of automotive. There are two outward-facing interior cameras placed toward the top of the windshield, above the rearview mirror, that scan the road ahead for objects, including vehicles and pedestrians. Introduced in 2012, it includes adaptive cruise control, pre-collision braking, pre-collision throttle management, lane-departure and sway warning, lane-departure prevention and lead-vehicle start alert, which tells the driver that the vehicle stopped ahead has resumed moving. A [video posted](#) on Xilinx's website describes the newest EyeSight upgrades.

Other Xilinx customers include the likes of Daimler, Continental, Magna and Veoneer, as well as startups like Pony.ai.

Antolin's New China Innovation Centre

LIGHTING NEWS



Despite the crisis caused by the pandemic, Grupo Antolin have just opened a new innovation centre in Shanghai to bolster their R&D, innovation, and technological development capabilities.

The centre houses the new Antolin headquarters in China, bringing together all the corporate departments and the engineering and technological development teams. There's an advanced electronics laboratory and a modern showroom where customers can see the company's latest technological advances and most important products, both physically and by using virtual reality devices. More than 100 people work at the company's new facility.

In July, Grupo Antolin announced a strategic partnership with Germany-based AED Engineering, who supply built-in electronic systems, with the aim of improving Antolin's electronics capabilities. Antolin's sales between January and June stood at €1.55bn, compared to the €2.68bn in the same period of the previous year. After the severe impact of COVID-19 in March and April, Antolin's activity resumed with new COVID-19 prevention protocols. Currently, all plants are operational and revenue in July was positive; analysts forecast a progressive market recovery if the evolution of the pandemic allows for it.

EV Hot-Up is Focal at Beijing Show

LIGHTING NEWS



BEIJING AUTOSHOW 2018

The Beijing Auto Show, to be held from 26 September to 5 October, will give Chinese consumers a glimpse of what's coming as the competition between local automakers and international brands has begun to heat up.

Among the companies to attend are Volkswagen Group and General Motors, Toyota, Honda, Nissan, Ford, and PSA. The missing-makers roster will include big names, too: Audi, BMW, and Daimler are sitting this one out, even though China is by far the largest market for each of them.

Nissan will show their forthcoming Ariya EV, which they're calling their most important new product. The Ariya, expected to go on sale in China in late 2021, is one of several new EVs Nissan plan to roll out in that market. Toyota's exhibits will be dominated by EVs; they plan to expand local production capacity of electric and plug-in hybrid vehicles, along with their Chinese JV partners China FAW Group and GAC Motor. The VW Group, meanwhile, has only two EV models in their Chinese-market portfolio: the Bora and Laida sedans. VW say they will accelerate EV introduction in China by launching four crossovers under their ID EV brand before the end of next year. And GM have only three EVs right now: the Buick Velite 5 extended-range sedan and Velite 6 sedan, and the Chevrolet Menlo crossover. More than 40% of GM's new launches in China over the next five years will be electrified vehicles.

As for the Chinese domestic makers: BAIC, China's largest EV maker, will launch sales of their Alpha-T, an SUV engineered by Magna for Arcfox. Dongfeng, a major state-owned automaker, will unveil an electric sporty sedan concept called the i-Land. Geely will show their first electric vehicle, a crossover to be sold under their premium "Lynk & Co" brand (any similarity of that name to Ford's Lincoln Motor Company is surely

purely coincidental; what other conclusion is possible?). Seven EV startups will be present at the show as well, including Nio, XPeng, and Human Horizons.

Watch for the main takeaways of the Beijing Auto Show to be presented and analysed in a DVN Report to be released in October.

Optimism Grows at Osram

LIGHTING NEWS



Osram are putting up an optimistic new forecast, feeling a firmer footing due to their latest business developments and recovering business in China and the USA. Accordingly, last week in Munich they announced new expectations of a drop in sales of around 14% compared to last year. The adjusted margin of earnings before interest, taxes, depreciation and amortisation (EBITDA) should be around 8%.

Above all, the Automotive and Opto Semiconductors divisions will benefit from an improved business situation in the core markets. From the point of view of analyst Sandeep Deshpande from the US bank JPMorgan, Osram's Austrian owners AMS should benefit from the better Osram expectations with regard to earnings and free cashflow, since Osram have been consolidated in the AMS balance sheet since the third quarter.

Driver Assistance News

Lidar, Simulation Specialists in AD Development Pact

DRIVER ASSISTANCE NEWS



dSpace have teamed with Velodyne Lidar to accelerate the development of lidar technologies for autonomous driving. dSpace, experts in simulation and validation, have joined the "Automated with Velodyne" program for this purpose.

This enables dSpace to model new laser sensors from Velodyne in simulation solutions and develop simulation models for testing and validation at an early stage—long before they come on the market. dSpace's target platform is the in-house simulation environment Sensor Simulation. With this software, camera, lidar and radar sensors can be validated along the entire development process.

The simulation platform generates point clouds in real time that represent objects. Using simulation models, development engineers can determine, among other things, the most effective "sweet spot" positioning of a sensor on the vehicle. In addition, the simulation can be used to determine the corner-case limits of sensors' capabilities. The cooperation of both companies enables Velodyne to seamlessly adopt sensor models from dSpace for new Velodyne developments.

FLIR Thermal Imaging for Pedestrian Safety

DRIVER ASSISTANCE NEWS



FLIR are developing higher-resolution, lower-priced solutions than competing night vision systems. To test their new sensors in real world conditions, FLIR have teamed up with VSI Labs, a technology research company who scrutinise the building blocks for AV technologies and provide research on the hardware, software and connectivity systems necessary to support advanced safety and AV systems.

VSI and FLIR ran through the tests used for the EuroNCAP protocol, plus several new tests designed to replicate some of the more challenging real-world scenarios.

A Ford Fusion equipped with FLIR's system was tested versus a BMW X7, Subaru Forester, Toyota Corolla, and Tesla Model 3.

	DAY DARK CLOTHING	DAY WHITE CLOTHING	SUNRISE TUNNEL EXIT INTO SUN GLARE	NIGHT CHILD SPT	NIGHT DARK CLOTHING
Thermal Ford Fusion	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓
BMW X7	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✗✗	✓✗✗
Subaru Forester	✓✓✓✓✓	✓✓✓✓✓	✓✗✗	✗✗	✗✗
Toyota Corolla	✓✓✓✓✓	✓✓✓✓✓	✗✗	✗✗	✗✗
Tesla Model 3	✓✓✓✓✓	✓✗✗	✗✗	✗✗	✓✗✗

TEST RESULTS OVERVIEW (IMAGE: FLIR)

The night time test demonstrated the fruits of FLIR's work: the BMW and Tesla avoided the target only once, and all four non-FLIR competitors knocked down the target multiple times. On nine of ten night tests the FLIR car avoided the target completely and tapped it without knocking it down just once.

FLIR aren't alone in pursuing this line of development. Adasky also are developing a similar type of LWIR sensor, and expect their first production program as soon as next year. And TriEye are developing SWIR sensors that cost even less, but have a shorter detection range.

DVN will make soon a paper on Adasky products.

Instrument Systems VCSELs for Automotive Lidar

DRIVER ASSISTANCE NEWS



KONICA MINOLTA Group

VCSELs (Vertical-Cavity Surface-Emitting Lasers) are expected to become a key technology for lidar applications for autonomous driving.

Instrument Systems' solutions include near- and far-field testing as well as the spectral analysis of VCSEL devices with highest precision and accuracy, with traceable reference to national standards. Their PVT (Process-Voltage-Temperature) system can drive and detect very short optical pulses down to 1 ns, perfectly suitable for time-resolved VCSEL applications.

Baidu Launches Apollo Go Robotaxi Service in Beijing

DRIVER ASSISTANCE NEWS



Baidu launched the Apollo Go Robotaxi service in Beijing, becoming the first company to allow people in China's capital to use robotaxis. The service encompasses the largest total area and longest road network of about 700 kilometers for a manned autonomous driving test area in China, with nearly 100 pick-up and drop-off stations covering residential and business areas in Yizhuang, Haidian, and Shunyi districts.

As the first company to provide robotaxi service in Beijing, Apollo Go will launch 40 vehicles. Beijing users can experience the Apollo Go Robotaxi service after registering on Baidu Maps or the Apollo website. In addition to Beijing, Apollo Go has opened services to the public in cities including Changsha and Cangzhou, making Baidu the only company with robotaxi pilot operations in multiple cities across China.

Beijing, the technology and innovation center of China, is a strategic location for AI and autonomous driving development. As the first city in China to regulate and open autonomous driving road test zones, Beijing has comprehensive infrastructure and policies to foster high-speed development of the industry. In 2019, Beijing ranked first in China for numbers of test licenses and vehicle categories, as well as diversity of test scenarios. In addition, Beijing has issued the most stringent safety requirements for manned autonomous driving tests in China to ensure the safety and reliability of the industry.

The launch of Apollo Go Robotaxi service in Beijing marks a new stage of autonomous driving development for both Baidu and Beijing.

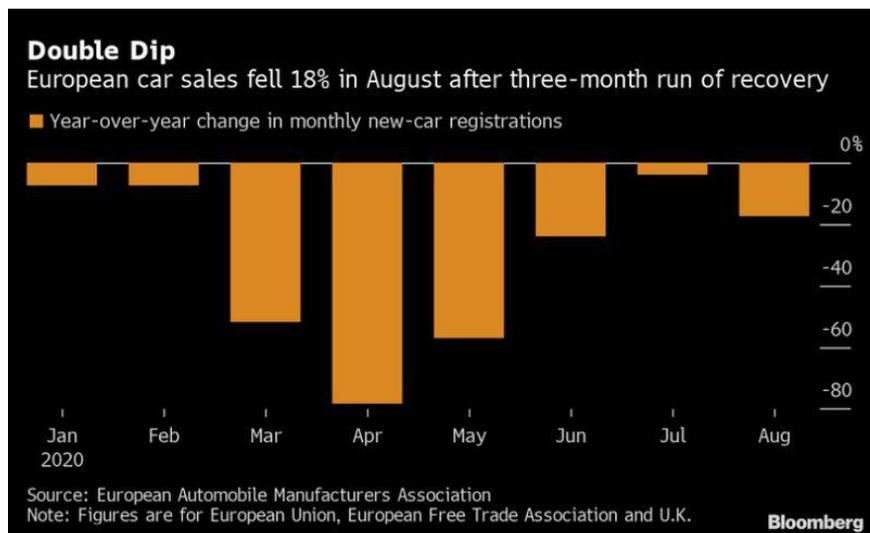
General News

Europe Sales Slump Continued in August

GENERAL NEWS



Sales in the European Union dropped by 18% year/year to 884,394 vehicles, according to data released last week by industry association ACEA.



All countries in the region recorded losses compared to the previous year.

BMW and Kia were the only automakers to make sales gains in Europe in August. Kia sales rose 19% percent, while BMW brand registrations were up 8%. Volkswagen Group saw sales fall 24%, with SEAT down 33%, Audi down 28%, VW brand down 25%, Porsche down 16% and Škoda down 14%. Sales at PSA Group declined by 19%. Opel fell 37%, DS sales were down 17%, Citroën fell 14%, and Peugeot was down by 6%. The Renault Group reported a drop of 23%, with Dacia down 34% and Renault brand down 12%. Fiat Chrysler posted a 7% decline with Jeep down 12% and Fiat down 3%. And Ford's registrations were down 13%.