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Editorial

DVN Study: A Must-Read Report

DVN started working early this year with intent to inform executives, engineers, and decisionmakers in the vehicle lighting world on new applications in the 2020–'30 timeframe. Eight experts, each with over 30 years' experience in vehicle lighting, met with prominent worldwide automakers, lighting suppliers, researchers and leading research institutes; did extensive, careful literature review from congresses and workshops, and sifted through the amassed information to put together the best and most apposite findings, innovations, and research results.

This new DVN study, just released, is 125 pages of the best-informed view on development and market introduction of new vehicle lighting functions and technologies in the coming decade. It's a sturdy framework and foundation for the vehicle lighting and vision community to discuss future prospects.

Lighting research has begun to explore new functions with high definition systems, road light projections, displays for exterior lighting, and whole new kinds of interior lighting. Although the pandemic has moderated this impulse, the lighting community must still prepare—perhaps now more crucially—what will be the major innovations during the decade 2020-2030. These will be mainly orientated toward improved safety and design flexibility for exterior lighting with new means of communication by light and new styling approaches. Interior lighting will become smart and complex, personalised, digital, and orchestrated with many other interior component functionalities to create a completely new passenger experience.

What's in it for you?

- Insights from the minds of an experienced regulator—the President of GRE—and an experienced innovation chief at an automaker, who present the challenges of new lighting functions in the next decade;
- Detailed descriptive analysis of the new exterior and interior lighting functions to

improve safety, comfort, and styling, with assessment of the regulatory implications;

- Thoughtful analytical forecasts of car demand in the coming months and years;
- overall vehicle lighting market topographies and trends in the medium and long term, and Influence of lighting in fatalities with new lighting functions;
- 11 best bets from eight experts, to support strategic long-term plans.

One of the experts who worked to put together this report, GTB President Geoff Draper, says

"I wanted to take this opportunity to inform you about this study. Normally GTB avoids the promotion of commercial activities but I have decided to make an exception because this study gives details of the status and future expectations concerning innovation in the next decade. As you know GTB is working on its vision for the next decade and clearly the DVN conclusions are particularly relevant.

This DVN study includes my personal views on the regulatory situation and it also includes a summary, produced by Dr Rainer Neumann (GTB-SVP Chair), of the research sponsored by GTB. These contributions to the DVN study have resulted in a much-welcomed promotion of the role of GTB in the innovation process."

I think this study is my greatest success (so far!) at DVN, because I am convinced that the new functions will be the main challenge of lighting in the next decade. This week's in-depth on the new functions in the Mercedes-Benz S-Class exemplifies the matter.

Find more information about the DVN Study in [the brochure](#) and on the [DVN website](#).

Sincerely yours

A handwritten signature in black ink, appearing to read 'G. Draper', written in a cursive style.

DVN PRESIDENT

In Depth Lighting Technology

New S-Class is Highest-Tech-Ever Mercedes: Chairman

Mercedes-Benz Chairman Ola Källenius revealed the seventh-generation S-Class sedan, new for 2021, describing it as the most technically advanced car Daimler have ever brought to series production.



NEW S-CLASS WITH SLIMMER HEADLAMPS AND ANGULAR TAILLAMPS

The exterior shows an evolutionary redesign with slimmer headlamps and taillamps. The headlamps characterise the front aspect of the car. They have the three-point DRL signature typical of the S-Class, but the DRL array is flatter and somewhat smaller overall. **The previously optional Multibeam LED headlamp system is now standard equipment; a light module with 84 LEDs arranged in three lines creates the matrix grid.**



The optional Digital Light system enters series production for the first time, allowing completely new functions like projection of guidelines or warning symbols onto the road ahead.

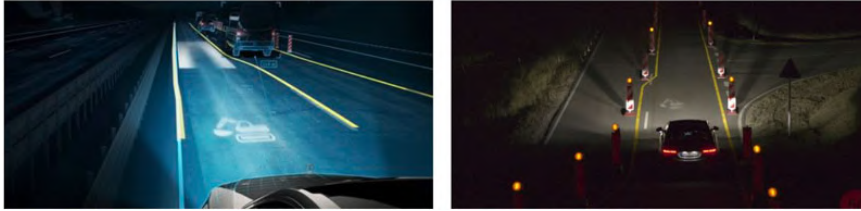
In each headlamp, Digital Light has a light module with three extremely powerful LEDs whose light is refracted and directed by 1.3 million micro-mirrors; together all of them occupy the same area as a thumbnail. A control unit with a powerful graphics processor uses an HDMI-like connection to generate a continuous video stream to the mirrors—this is video projector technology brought into the automotive realm.

This innovative headlamp in the S-Class can be recognised by its concave lens and shining blue floor facing. The beam composed of 1.3 million pixels makes absolutely precise light distribution possible. It makes the ADB over 100 times more precise than the 84-pixel light when excluding oncoming traffic or road signs from the light beam. Light/shadow graduations and the light distribution of all the other adaptive light functions are also realised with considerably more precision, optimising illumination for whatever traffic, road, and weather conditions might present.

Several new lighting functions

With the help of intelligent front headlights that play a black and white video, much like a movie projector, the S-Class can display the likes of:

- symbols on the road



- Images to alert the driver to a construction site in darkness and warn of recognised roadworks by projecting an excavator symbol onto the road surface



- Illumination and driver-attention guidelines on a pedestrian detected on the side of the road to mitigate the hazard
- Traffic lights, stop signs, no-entry signs, and other suchlike are pointed out by projecting a warning symbol onto the road surface
- Red flashes in the door panel to warn the exiting occupant and prevent cyclists being "doored"

In interior



The ambient lighting has 250 LED light sources. The contour lighting in the instrument and door panels form a continuous line as brand identifier of the S-Class interior. The contour lighting below the overhead and the center console and below decor trims and armrests create floating effects of the components and amplify the styling language of the interior. The illuminated loudspeaker grills underline their claim for high quality. The dynamic ambient lighting in the door panels is flickering as soon as traffic approaches from behind when getting out.

These new lighting functions, exterior and interior, are analysed in technical and market detail in the new [DVN Study](#) just released.

Lighting News

LRC's John Bullough on New Car Light Tech

LIGHTING NEWS



John Bullough, Director of Transport and Safety Lighting Programs at Rensselaer Polytechnic Institute's LRC, shared his thoughts about some of the topics covered in the newly-released DVN Study on vehicle lighting technology in the 2020–30 timeframe:

On new lighting functions:

"I think the high-resolution systems that can project useful information onto the road will be able to provide numerous safety benefits to drivers as well as other users outside the vehicle. Functions can be very promising, projecting the vehicle's width ahead on the road, warning other drivers about a car turning into a lane, and informing driver about the safe stopping distance ahead.

"The lighting communication will be increasing in importance especially as more autonomous functions displace the usual activity performed by a driver. In order not to cause inattention, these systems will need to help keep drivers and vehicle occupants engaged.

"In the near term (2020-2025) emphasis will be on tweaking existing regulated functions, until the regulatory frameworks can catch up with the technological possibilities. In 2025-2030, new communication functions about intent, interaction, and often without assuming a human operator is present, will become more important."

On decorative lighting:

"The line between interior and exterior lighting will blur, so functions illumination to help make a person reaching inside a car visible to approaching traffic will be more than merely decorative but will have a quantifiable safety benefit.

"Dynamic temporal control of lighting will allow for lighting in decorative/comfort applications to move beyond subjective enjoyment and actually help vehicle occupants adapt to the motion of the vehicle, helping reduce car sickness and provide a smoother riding experience.

"It seems clear that personalisation, which is related to brand differentiation, will differ when shared vehicle versus a EV or an AV.

"Welcome scenarios can adapt to serve multiple functions including security, preparation for loading the vehicle or picking up passengers. Illuminated logos on front and back are to be expected. It seems that a more sophisticated and nuanced type of branding based on different market segments will be used in the future.

"Light projection on the sides is another function that may evolve from purely decorative to informative and safety-driven. Identifying when an occupant is about to enter/exit the vehicle would be useful information to other drivers and cyclists.

"Foreground lighting at doorways is an example of the blurring of exterior and interior lighting. It is not only useful to help people avoid stepping in puddles or picking up dropped objects, but the lighting can help other drivers avoid colliding with occupants entering and exiting their vehicles."

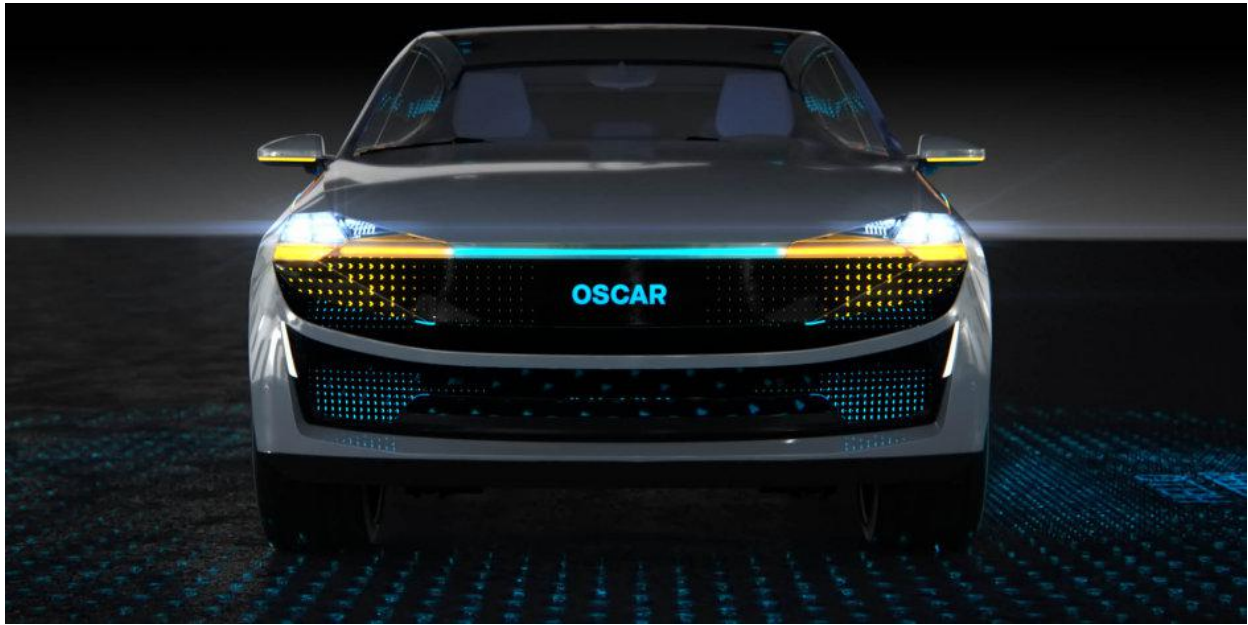
On what the future topography of vehicle lighting:

"I see an increasingly integrated role of lighting, less segregated between interior and exterior functions, working in concert to first provide for safety and wellbeing of occupants and others around the vehicle, then to enhance comfort and mental sharpness by supporting the freedom of the vehicle occupant whether acting as a driver, or a passenger, to make choices based on the available visual information."

These new lighting functions and more are analysed in technical and market detail in the new [DVN Study](#) just released.

Osram's New, Brighter Automotive LEDs

LIGHTING NEWS



There's a new generation of Osram Opto Semiconductors' Oslon Compact PL and Oslon Black Flat S automotive LEDs.

Like all LED manufacturers, Osram are working to continually improve the optical, thermal, and energetic/efficiency characteristics of the LEDs they offer for vehicular applications.



Like their predecessors, the ceramic components in the new Oslon Compact PL have an electrically insulated pad that makes it much easier to dissipate heat from the package. This means higher current is possible, which allows the 1-chip version to produce an outstanding 395 lumens at 1A with a chip area of 1mm². Thanks to the very small dimensions of 1.9 × 1.5 × 0.73 mm, the product is ideal for ADB applications and in extremely space-saving system designs.

The different technology concepts of the Oslon Black Flat S and Oslon Compact PL enable customers to choose the best possible combination of LED and PCB for their systems. Due to the product family's outstanding efficiency values of up to 130 lm/W at 1A, headlamps with smaller heat sinks—or even with none at all—become conceivable, leading to a potential reduction in system cost and packaging volume.

DVN-I Expo Sneak Preview: Elmos Ambient Lighting & Gesture Control

LIGHTING NEWS



The first [DVN-Interior Workshop](#) on 24 September will be held as a virtual event with leading automakers and suppliers showing their newest innovations. Elmos, for example, will present solutions for ambient lighting and gesture control; Their virtual booth features products such as their E521.36 for flicker-free ambient lighting and their E909.21/22 for gesture control with the best ambient light immunity available on the market.

The Elmos IC E521.36 enables a variable, cost-efficient and compact design of RGB LED modules for connection to a LIN bus. Possible applications include vehicle interior ambient lighting. The device includes a powerful 16-bit microcontroller with 32 kbyte NVM, 128-byte EEPROM, and a LIN transceiver that meets the requirements up to LIN 2.2. The integrated microcontroller can be programmed with IAR's widely-used software development platform. The addressing in the network takes place with integrated bus-shunt autoaddressing. The device has three current sources, each with up to 40 mA, and three 16-bit PWM generators. The 48-MHz PWM clock ensures full 16-bit colour resolution at a 732-Hz repetition rate, enabling flicker-free applications and meeting all known automaker requirements.

With the Elmos ICs E909.21 and E909.22 it is possible to easily integrate a high-performance proximity and gesture control. Recognised actions include approach, wipe, Air Slider™, zoom in and others. The object detection and motion evaluation operates in real time based on affordable infrared technology.

Elmos develop, produce, and market semiconductors, primarily for the automotive industry. Their components communicate, measure, regulate, and control safety, comfort, powertrain, and network functions. For over 30 years, Elmos innovations have been bringing new functions to life and making mobility worldwide safer, more comfortable, and more energy efficient.

Ceres: Holographic Optical Elements

LIGHTING NEWS



Recent developments have brought holography within reasonable reach for automotive display applications. Holographic displays can provide operator information safely as windshield HUDs, for example, or use other surfaces to display information, entertainment, and advertising for people inside and outside the vehicle.

Ceres, based in Saint Andrews, Scotland, have developed a first-of-its-kind method to produce holographic optical elements (HOEs) that can be embedded in film that is then layered into vehicle glass, providing an affordable and low-disruption way to offer vibrant displays. Ceres work closely with others in the vehicle display ecosystem—film makers, glass producers, and projection technology providers. Their skill is a novel way to essentially print HOEs to make production better, faster, cheaper, and more scalable for wider commercial adoption.

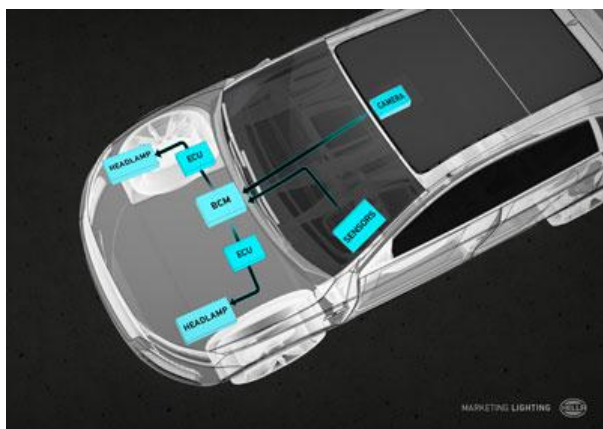
Founded in 2009, Ceres have developed their own digital design, origination, and mastering process, as well as the necessary replication technology for mass-production.

Chinese Carmaker Place Big Hella Order for ADB Tech

LIGHTING NEWS



Hella have been commissioned by a leading Chinese EV manufacturer to produce integrated lighting systems. The customer project includes two vehicle series; the first has recently been launched, the second is planned for the end of the year. The system solution is based on the modular principle "Light Design" developed by Hella, consisting of matrix LED headlamps, light control electronics, and the necessary sensor technology. A software tool designed by Hella was also used in the development process. It allows front lighting functions to be digitally simulated and individually adapted.



Hella Management Board member responsible for global lighting business Dr. Frank Huber says "Intelligent lighting functions, such as ADB, which is already used extensively in the premium segment, are also becoming more and more common in the volume segment. As a result, automotive lighting technology is becoming increasingly more sophisticated, because numerous lighting and electronic components have to be integrated and coordinated with each other".

All lighting and electronic components for complex lighting systems can be combined using a modular principle and integrated by Hella into a complete system. The first customer project involves a matrix headlamp with 24 individually controllable LEDs, which is produced in the plant of the Chinese lighting JV Hella BHAP Sanhe Automotive Lighting, and lighting electronics and level sensors, which roll off the production line in the electronics plant in Shanghai. Furthermore, a front camera, including the relevant image processing software, is integrated into the complete system. The lighting and electronics divisions of Hella collaborated closely to develop the complex system solution within about a year and a half.

Hyundai reveals next generation Tucson

LIGHTING NEWS



Hyundai's next-generation Tucson crossover will feature a new design language, a waterfall-inspired center stack and two wheelbase options, short and long.



The exterior design aims to convey a "kinetic jewel-like surface," highlighted by angular exterior styling and an intricate grille accentuated by a daytime running light signature that juts out from the center like a pair of wings.

"We want our customers to feel moved," SangYup Lee, senior VP and head of global design for Hyundai, said in a statement. "With the all-new Tucson, we are introducing its ultimate evolution and a definitive statement about Hyundai's unstoppable forward momentum."

Hyundai said the fourth-generation Tucson will be the first nameplate in the compact SUV segment to be offered with two wheelbase options. One or both options will be available depending on the market.

According to market researcher JATO Dynamics, the Tucson was Hyundai's best-seller in Europe in 2019, with a volume of 140 thousand units, and the n°5-selling compact SUV in Europe during the first half after the Volkswagen Tiguan, Nissan Qashqai, Peugeot 3008 and Toyota C-HR, according to JATO.

The ISELED e-Conference

LIGHTING NEWS



Last week, the 3rd ISELED Conference was held as a combined on-site and livestream e-workshop.

The ISELED Alliance comprises Allegro MicroSystems, Brightek, Cemm Thome, designLED, Dominant Opto Technologies, Dräxlmaier, Dr. Schneider, Elmos, Everlight, feno, Grupo Antolin, Hella, Inova Semiconductors, iSYS RTS, Itswell, Lightworks, Lucie Labs, Magna Lighting, Marquardt, Melexis, Microchip, novem, NXP, Osram Opto Semiconductors, Pforzheim University, Preh, Prettl Group, TactoTek, Techniplas, TE Connectivity, UG Systems, Valeo, and Xingyu.

Various solutions focussing on the automotive market are continually being developed by alliance members. The product range includes smart LED modules, standalone drivers/controllers, dedicated microcontrollers and development kits. Systems combining ISELED components with optics are under development. The new products will feature higher colour point accuracy over the complete temperature range and higher current classes.

A further milestone is the expansion of the original local ISELED protocol to a true field bus across the automobile. This was done by the development of the ILaS bus concept (ISELED Light and Sensor network). With ILaS not only LEDs - RGB or Infrared for example - but also other components such as Matrix LED lights, sensors and actuators can be controlled in large numbers via a simple unshielded two-wire cable. A first test chip of ILaS already is available fully proving all objectives set including the targeted high EMC robustness.

Driver Assistance News

Lidar's Expanding Roster of Rolling Roles

DRIVER ASSISTANCE NEWS



Lidars have unique characteristics that provide improved capability and redundancy. Unlike camera-based systems, lidar makes its own light and therefore requires no illumination to operate.

"There are more than 50 lidar companies, 20 of which are startups, and we're one of these," explained Dr. Jun Pei, CEO of Cepton Technologies, founded in 2016 and based in San Jose. "Lidar will be introduced in the mass automobile industry, and will be proliferated through a Level-3 or even a Level-2.5 type of application. It's the redundancy in the technology that propelled the OEMs to think of other things we can add into the sensor. If you have a camera, in order to defeat the camera, you cannot just have two cameras. That's not redundant because you can just have a heavy fog and none of the cameras will work." he said.

Rather than develop 360° lidar systems, Cepton focused on their forward-looking sensors. "What we have is a frontal-view lidar with a limited field of view. In layman's terms it works like a camera. If you have cameras and radars, you will actually be able to take care of 99% of the scenarios. Lidar is only for that 1%, or maybe only 0.1%," Pei figured. "Unfortunately, that fractional percent, as you hear from many of the autonomous-vehicle companies or software developers, are the corner cases that actually kill people."

"The angular resolution between lidar and radar is about one order magnitude or higher for lidar. Both radar and lidar can see there's an obstacle in front, but lidar can see it much clearer. Radar will tell you there is a car stopped 200 metres away from you, but it does not know in which lane. A lidar will tell you there's this car stopped, and it will tell you whether it's in your lane or on the shoulder." Pei said.

Cepton have partnered with Koito; Pei explains "We have a deep partnership with the biggest headlamp maker in the world. Naturally, the intention is for our lidars to be buried inside the headlamps so you have a very nice front view with plenty of redundancy for safety reasons."

OmniVision's Full HD Image Sensor for Cameras

DRIVER ASSISTANCE NEWS



OmniVision Technologies announced their OS02G10 security image sensor, which they say provides the best value for mainstream, high-volume security cameras requiring 1080p resolution and excellent low-light pixel performance. The OS02G10 offers best-in-class low-light captures via a 2.8 μ m pixel built on the OmniPixel3-HS architecture, which features high quantum efficiency and an optimal signal-to-noise ratio. Compared with OmniVision's prior-generation mainstream security sensor, it has a 60% better SNR1 and 40% lower power consumption.

OmniVision are using 12" wafers to produce this image sensor, instead of the 8" wafers that are in tight supply but are typically used for 2MP, 1080p sensors.

"The OS02G10 builds on the success of our previous-generation OmniPixel 3-HS sensor, which has been widely adopted in the mainstream security markets," said Cheney Zhang, senior marketing manager for the security segment at OmniVision. "With this new generation, we have significantly improved low-light performance while continuing to offer the market greater value in the popular 1/2.9" optical format."

ZF Start Lidar Sensor Production

DRIVER ASSISTANCE NEWS



ZF Friedrichshafen have begun producing lidar sensors, including control units for Ibeo Automotive Systems, in whom ZF hold a 40% stake. The first sensors will be delivered in October.



Ibeo Automotive Systems, based in Hamburg, have commissioned supplier ZF Friedrichshafen with the production of the IbeoNEXT lidar system. The first batches will be delivered to partners and customers worldwide from October 2020, including Chinese vehicle manufacturer Great Wall Motor, who will be using the IbeoNEXT in series production in their Wey premium SUV from 2022.

The IbeoNEXT lidar sensor is based on a new type of photon laser measurement technology and does not have any moving parts. By processing many laser pulses in parallel, the sensor generates a high-resolution 3-D model of its surroundings in real time, which detects crash barriers and lane markings as well as vehicles, cyclists and pedestrians as well as their position and movement.

The compact solid-state sensor design of the IbeoNEXT was developed by Ibeo according to automotive standards. Ibeo commissioned ZF with the production of both components. The first batches are currently being produced in Plouzané near Brest (France).

"We are convinced that lidar systems are a key technology in automated and, in particular, autonomous driving, as they deliver high-resolution 3D point clouds of their surroundings and, thanks to their laser technology, also function under poor weather conditions," explains Aine Denari, Senior Vice President and General Manager of ZF's Electronics and ADAS Division

The lidar system Great Wall Motor will use enables L³ automated driving with a highway pilot. The Wey will thus be able to drive longer highway stretches independently, according to ZF. The system includes the IbeoNEXT solid-state lidar, a control unit, and perception software developed by Ibeo that detects objects and thus enables safe driving in conjunction with other systems.

Gentex Mirror Camera Now Has DVR Feature

DRIVER ASSISTANCE NEWS



Gentex have added a new feature to their camera-based rearview mirror: a built-in digital video recorder that automatically preserves accident footage.

The first vehicle to use the built-in DVR is the Toyota Harrier, a RAV4-based crossover sold in Japan, Korea, China and other markets. The system builds on Gentex's Full Display Mirror, which uses a rear-facing camera to project images behind the vehicle. To that, engineers added a front-facing camera as well as a slot in the mirror for the DVR card.

The system automatically records as much as two hours of driving video before overwriting the images with new video. If there is an accident, the system captures 20 seconds before and 20 seconds after a crash and saves the video as a separate file.

The system is standard on most trim levels of the Harrier. As a stand-alone option, it costs roughly USD \$830, said Craig Piersma, Gentex's director of marketing.

The Full Display Camera is available in North America on such vehicles as the 2020 Chevrolet Corvette.

Hella 24-GHz Radar in Suzuki Swift

DRIVER ASSISTANCE NEWS



The Suzuki Swift and Swift Sport's ADAS suite relies on 24-GHz radar sensor technology from Hella.

After debuting on the Suzuki Vitara in 2018, Hella's 24 GHz radars are now featured on more Suzuki models, enabling safety-relevant driver assistance functions such as Blind Spot Monitor and Rear Cross Traffic Alert.

"Our radar technology is an essential part of advanced driver assistance systems. We are therefore grateful for the opportunity to work with Suzuki, to develop specific safety features for the new generation of the Swift and Swift Sport," says Lonny Chick, who is a Managing Director of Hella Japan. "This is an important step to grow our relationship with Suzuki and to further expand our presence in the Japanese automotive market. Based on this, we look forward to continuing our efforts collaborating with our customer and to providing value-added solutions for both Suzuki and its end consumer."

Allegro Buy Voxel

DRIVER ASSISTANCE NEWS



Allegro MicroSystems announced their acquisition of Voxel, a company specialising in advanced photonic and 3D imaging technology including lidar. With the acquisition, Allegro aim to integrate Voxel's expertise in laser and imaging to enhance ADAS technology.

Voxel are experts in photonics and has provided solutions for military, space, automotive and surveillance applications. Their ultra-miniature lasers, read-out integrated circuits (ROICs), and near-infrared (NIR) and short-wavelength infrared (SWIR) photodetectors are supported by more than 38 US patents. Allegro's portfolio of motor drivers, position sensors, regulators, and current sensors, when combined with photonics, provides most of the key semiconductor components in the transmit and receive blocks of automotive lidar systems.

As a result of this acquisition, Allegro's photonics portfolio now includes devices made in silicon and InGaAs, providing components for both eye-safe, long-range 1D or 2D scanned front-facing lidar and side- or rear-facing flash lidar.

Devices based on InGaAs operate at wavelengths at which the human eye is less sensitive (1500 – 1600 nm), enabling higher laser power levels for longer range object detection beyond 200 metres.

General News

Renault Work To Develop Brand-Centred Organisation

GENERAL NEWS



RENAULT

Groupe Renault have announced plans to develop their organisation around their brands, grouping them mainly into four business units:

- Renault, piloted by Luca de Meo, Groupe Renault CEO
- Dacia, piloted by Denis Le Vot, EVP, regions, sales and marketing
- Alpine, piloted by Cyril Abiteboul, Managing director of Renault Sport Racing
- New Mobility, piloted by Clotilde Delbos, Deputy CEO and chief financial officer

The objective would be to give each BU an autonomous organisation. This project aims to create a simpler and more results-oriented organization, while strengthening the cohesion, motivation and sense of belonging of the teams grouped by brands.

CEO Luca de meo explains: "The company needs to change its 'game module' and move from a search for volume to a search for value and profitability. The organization around four strong brands and large crossfunctional functions would make it possible to work in a simpler way, more oriented to the markets and customers, with a team spirit, to seek the best possible result. This is an essential lever for the Group's recovery".

VDA President Hildegard Müller: "Exchange between companies, trade unions and politics is so important"

GENERAL NEWS



VDA-PRÄSIDENTIN HILDEGARD MÜLLER

The automobile association VDA does not see the crisis in the industry as over yet. "The situation of many companies is still tense," said the President of the Association of the Automotive Industry (VDA), Hildegard Müller, of the German Press Agency.

"That is why the exchange between companies, trade unions and politics is so important." Concrete resolutions are not to be expected. Above all, it is about strategic questions about the future of the industry, such as digitization, networking and autonomous driving.

GM, Honda in North American Pact

GENERAL NEWS



GM and Honda have signed a MoU to form a North American automotive alliance that may include a range of vehicles sold under both brands and facilitate coöperation in purchasing, R&D and platforms.

Under the nonbinding agreement, co-development of common platforms, including for electrified and internal combustion vehicles, will begin early next year. Honda have been gradually expanding their coöperation with GM in recent years.

GM President Mark Reuss says "This alliance will help both companies accelerate investment in future mobility innovation by freeing up additional resources. Given our strong track record of collaboration, the companies would realize significant synergies in the development of today's vehicle portfolio".

Honda representative Koji Watanabe said the pact "does not entail a capital alliance or purchase of shares. The objective is to raise the efficiency of operations in North America and a capital tie-up was not deemed necessary to achieve that".

Under the proposed alliance, Honda and GM would collaborate on a variety of segments for the key North American market. The companies will also coordinate on new technologies, vehicle platforms, connectivity, propulsion systems, joint purchasing and manufacturing.