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Editorial

Notes From GTB - Hot Trends In New Models

In this week's DVNewsletter, we cover the main decisions taken at the GTB Winter 2021 Intermediate Session by the Front Lighting, Installation, Safety and Visual Performance, Strategy, and Light Sources Working Groups. This was the first GTB meeting to be chaired by new President Valter Genone, following Geoff Draper's well-earned retirement. I thank Davide Puglisi, GTB Secretary General, for his involvement in DVN. His information to DVN allows lighting players to follow the GTB works.

Most autoshows have been cancelled on account of the pandemic, so we can't attend with our cameras as usual. Nevertheless, we're still working to keep you informed. This week's DVNewsletter contains our nine hot takes about lighting trends shown in new models launched over the last four months. The information is developed and detailed in the 60-page DVN Report published today; 22 models are presented with pictures and technical information—the latest models from Audi, Acura, BMW, DS, Genesis, Honda, Infiniti, Jaguar, Nio, Nissan, and Renault. [Download your copy](#) and take a look!

Sincerely yours



DVN CEO

In Depth Lighting Technology

DVN's Hot Takes From Recent Auto Launches



Audi



DS 4



BMW iX



Audi E-Tron GT



DS 4



BMW iX

Today the DVN Monthly Report is published. This month's edition presents the latest models launched over the last four months. While autoshowes are cancelled on account of the pandemic, the new report is your key to following the newest lighting. For a preview, here are our nine takeaways to summarise lighting trends on the newest models.

•1•

Lamps and lighting increasingly amplify style and design; brand signature, and technology differentiation.

Aerodynamics, pedestrian protection, crashworthiness, and benchmarking all exert homogenising constraints on what a vehicle is shaped like, so the identity, design, and technology content of cars like the Audi e-Tron GT, DS4, and BMW iX are expressed largely through the front and rear lights.



Audi



DS 4



BMW iX



Audi E-Tron GT



DS 4



BMW iX

•2•

Rear lamps with full-width light lines are a hot trend.

The Audi e-Tron GT, Mercedes EQA, Nio ET 7, and Nissan Ariya are among the increasing number of models with rear light bands spanning the whole width. This brings new possibilities for vehicle design and style, animated light effects, and augments the vehicle's perceived size and presence, while also providing lit area that would otherwise be missing due to the next trend, № 3.



Audi e-Tron GT



Mercedes EQA



NIO ET7

•3•

Rear lamps are growing slimmer and slimmer.

The BMW iX, the DS4, and the Jaguar GT Vision are just a few examples of vehicles with rear lamps in fine-line designs.



BMW iX



DS E-Tense



Jaguar GT Vision

•4•

Headlamps are growing slimmer and slimmer, too.

Stylists are insisting on ultra small headlamps, forcing engineers to find solutions for sufficient light performance. LED and laser light sources and new optical techniques unlocked by new materials are making it possible for headlamps to be vanishingly thin. Examples include the Acura, BMW iX, DS4, Genesis GV70, Infiniti QX55, and Nissan Ariya (optic modules just 2 cm high!)



Acura MDX



BMW iX



Nissan Ariya

•5•

DRLs, as well, are on a reducing diet.

The Jaguar GT Vision and the Nio ET7 have fine-line DRL designs. And Renault's 5 concept, too, with edge-emitting light guides looped into square shapes to evoke the under-bumper rectangular fog lamps of years past.



Jaguar GT Vision



Nio ET7



Acura MDX

•6•

DRLs are increasingly a central anchor point for brand signature.

The Jaguar GT Vision, the Nio ET 7, and the Dacia Bigster concept are far from the only ones, but take a look at these three models and the trend is clear: automakers are piggybacking brand and model identity on the presence-advertising technical function of the daytime running light. It's not just "I'm here", it's "I'm here and I'm an electric BMW" (for example).



Land Rover Discovery



Mini Cooper



Dacia Bigster

•7•

Segmented taillights are popular right now.

The Infiniti QX55 with its "digital piano-keys" taillights, Audi's e-tron GT, and the Renault 5 Concept are a few of many examples. Very few vehicles have OLED rear lighting (yet?), but other technologies and techniques are also providing attractive new designs—we like the triangular "fish scales" effect on the DS4. Which technology will transform the rear lamps into rear end communication displays?



Infiniti QX55



Audi E-Tron GT



Renault 5 Concept

•8•

Modularisation is well under way.

We see it heavily in the Kia Sorento, Land Rover Discovery, Mini Cooper, and Nissan Ariya; clearly the industry is finding a sweet spot, balanced between the cost savings of modular componentry and the exuberance of new lightstyles.



Kia Sorento



Land Rover Discovery



Nissan Ariya

•9•

Welcome and farewell displays are proliferating.

Shortly ago these kinds of dancing-light shows were just a functional test of the rear lamps. Now they become a "look what we can do!" fun party trick, as it seems. Clearly lighting animations are helping buyers bond with and appreciate their cars, so these kinds of displays appear to be in it for the long haul, not just a passing fad. But there might be some pushback coming; regulatory authorities in some countries are not happy with this trend.



BMW iX



Buick Envision



BMW Welcome Light Carpet

Lighting News

GTB Winter 2021 Intermediate Session

LIGHTING NEWS



Despite all the difficulties caused by the pandemic, GTB decided to maintain their regular working rhythm of two plenary sessions per year in May and November and two intermediate WG (working group) sessions in February and July.

This intermediate session was the first meeting chaired by new GTB President Valter Genone (photo). It was held via WebEx in a timeframe carefully picked to allow the convenient participation of GTB delegates from America, Europe, and Asia, and was attended by an average of more than 50 experts each day. The docket was:

Monday, 1 February: WG Front Lighting
Tuesday, 2 February: WG Safety and Visual Performance (*Scientific Group*)
Wednesday, 3 February: WG Strategy
Thursday, 4 February: WG Installation
Wednesday, 10 February: WG Light Sources



WG Front Lighting and WG Installation devoted most of their time to improve the GTB proposal to be presented at the next GRE session in April 2021 concerning "driver assistance projections". The proposal aims to allow light projections other than variously-shaped beams on the road ahead of the vehicle, as part of the ADB (adaptive driving beam) system. Such projections, visible only to the driver of the projecting vehicle, involve symbols and patterns to inform or warn the driver of specific kinds of situations and dangers. GTB hosted a dedicated special session on the subject on 15 January for interested GRE CPs (contracting parties; i.e., countries signatory to the U.N. 1958 Agreement and its lighting regulations). Using the feedback from that session together with the working group discussions, GTB revised the proposal to address the concerns raised by the CPs during the last GRE session.

In WG Installation, a comparative study was presented between UN Regulation № 48 and the recent edition of Chinese Standard GB 4785—both dealing with installation of lights on vehicles. The Chinese GTB experts will provide information and comments on the differences highlighted in the study. The WG will then complete the study and propose suitable alignments, as necessary.

WG Safety and Visual Performance reviewed the User Guide on Headlamp Safety Performance Ratings developed by the TU Darmstadt expert group. This work was mainly based on the CIE TC 4-45 standard CIE S021/E:2011 *Vehicle Headlighting Systems Photometric Performance - Method of Assessment*, updated by adding the evaluation method for ADB systems and a more suitable calculation method. The next step of this activity will be the definition of a calculation software for the global headlamp system evaluation, presently under preparation by the TUD expert group.

WG-SVP also considered the potential photobiological risk associated with the bluish content of automotive LEDs, as mentioned in the ANSES report. While IEC 62471 *Photobiological safety of lamps and lamp systems* covers this subject in general, there is no standard specific for the special properties of automotive lamp systems.

WG Strategy has given a status report about the outcome of the past research projects and their helpfulness for regulation development. The priority of the future research studies was updated. In addition to the studies related to discomfort glare from small headlamps; driver assistance road projections, and communication between AVs and other road users in complex scenarios, interest was also expressed for studies on light and light signalling technical solutions providing benefits for CO₂ reduction, as well as for studies demonstrating the absence of negative effect (confusion/distraction) caused by additional lights such as decorative lights.

WG Strategy endorsed the necessity of issuing GTB position papers on matters where GTB has relevant expertise, but the purpose is not directly aimed at producing a regulatory proposal. The position paper shall express the joint GTB opinion about an item of expert- or public discussion in the field of lighting. A GTB position for "Headlamp Safety Performance Rating Systems" or a position for the photobiological safety discussion could be examples for such future official GTB papers. Details of how to manage such position papers will be debated and decided in the Committee of Experts.

Next WG-S meeting is scheduled for mid of June after the 130th GTB session.

WG Signal Lighting was mainly focussed on the completion of the tasks associated with the delivery of Stage 2 simplification to GRE for its April 2021 session. One of the main points of discussion was related to the light source testing requirements, and a final decision will be taken by the GRE SLR (Simplification of the Lighting Regulations) Informal group who held their 45th session on 17-19 February.

WG Light Sources worked on topics related to updating the consolidated resolution on the common specification of light source categories (R.E.5). A proposal for a high-flux red replaceable LED light source was adopted and forwarded to the Committee of Experts for further consideration in May.

A concept was presented for laser-based light sources. The proposed target is a light source producing 1,100 lm (nominal) with high luminance since the emission area is smaller than that of

present LEDs. This opens the possibility to produce headlamps with a small emitting surface, around 10 mm high. The objective is to standardise this new kind of light source within the framework of IEC Standard 60809.

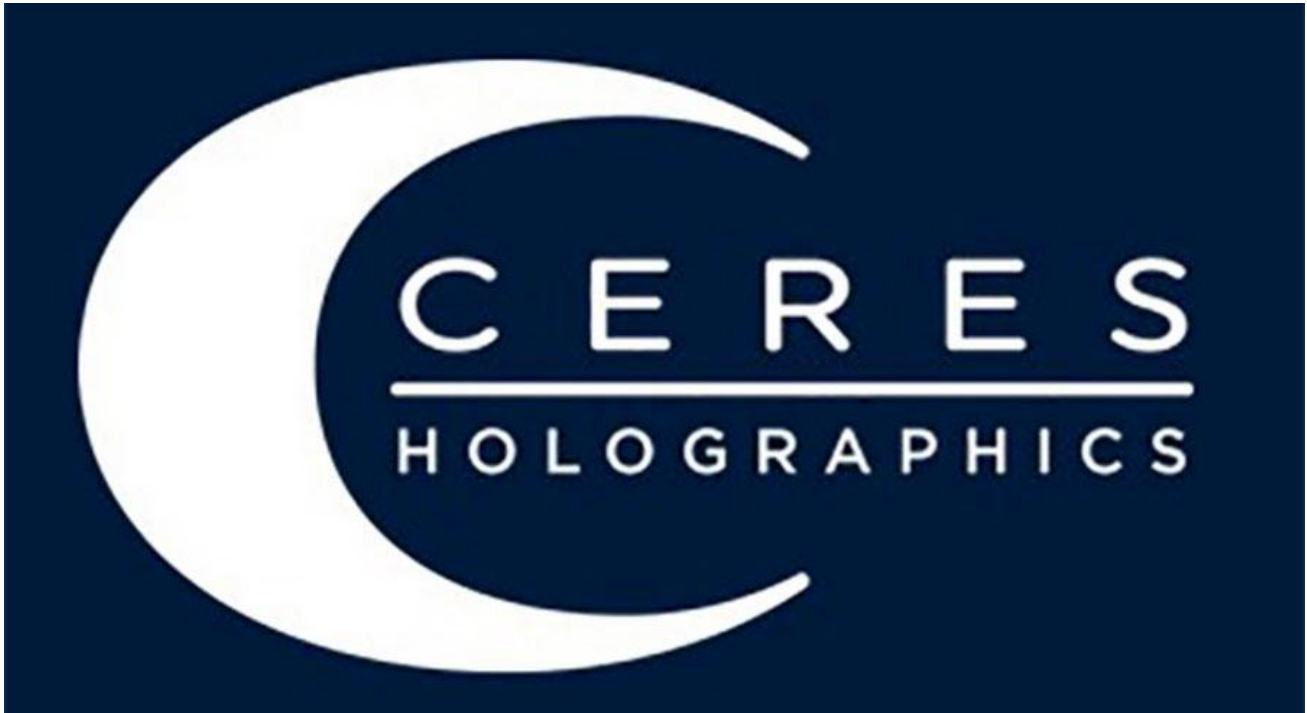
Future GTB Sessions

17-21 May 2021 GTB 130th session – WebEx
July 2021 GTB Intermediate WG Meeting session – Date TBD
15-19 Nov. 2021 GTB 131st session – Berlin (Germany)
February 2022 GTB Intermediate WG Meeting session – Date TBD
May 2022 GTB 132nd session – Tallinn (Estonia)

For further information, see the [GTB Website](#).

Ceres Holographics awarded €1.4m grant

LIGHTING NEWS



Ceres Holographics has been awarded a €1.4 million European Commission Horizon 2020 grant to accelerate the commercialisation of its holographic technology. The company is an innovative developer of thin-film Holographic Optical Elements (HOEs) for next-generation transparent display (TD) and augmented reality heads-up-display (AR-HUD).

The grant will allow the company to drive the development of replication and production technology to meet automotive OEM demand for advanced holographic AR-HUD and transparent display systems.

Ceres specialises in the design, mastering and replication of thin-film HOEs that enable new TD and AR-HUD systems. While the technology can be applied to a wide range of applications – the first beachhead, and target market is automotive.

Ceres technology is in demand from automotive OEMs as it delivers optical power into the windshield, enabling new display solutions and shrinking the HUD projector package size – a key challenge for automotive OEMs.

Andy Travers, CEO of Ceres Holographics, said: “This prestigious grant award underscores the significance of the market opportunity for advanced display technology, as well the disruptive innovation we are developing to address the most pressing challenges to wider-scale adoption of holographic-based displays. All major automotive OEMs are seeking small, low-cost transparent display and high-performance AR-HUD systems, that meet the quality, price and volume production required by the market.

Valeo 2020 Results: Financial Rebound in H2

LIGHTING NEWS



Valeo have released their 2020 results. Sales came in at €16.4bn in 2020 vs €19.5bn in 2019, a decrease of nearly 16 per cent. For year 2021, sales are forecast at €17.6bn to €18.3bn with an EBITDA of €2.25bn to €2.45bn, versus €2.50bn in 2020. Here are the 2020 vs. 2019 figures by business unit:

	2020	2019	Change
Comfort and ADAS	3.23	3.65	-11%
Powertrain	4.37	5.12	-14%
Thermal	3.70	4.58	-17%
Visibility	5.02	6.01	-15%
Total	16.4	19.5	-15%

Valeo Chair and CEO Jacques Aschenbroich (photo) says *"Following the unprecedented drop in global automotive production in the first half of the year, Valeo delivered solid results in the second half with EBITDA representing 13.9% of sales, free cash flow amounting to a record €1.34bn, and debt having been reduced to less than €3bn one year ahead of our objective. Now more than ever, the strategic decisions we have made over the past few years are delivering results. This gives us confidence in our ability to outperform the global automotive market over the long term and improve our margins, while remaining cautious in 2021 due to the shortage of electronic components triggered by the crisis. Our base scenario for the top end of our 2021 guidance range is 10% growth in global automotive production."*

ZKW Grow Revenues Despite Pandemic

LIGHTING NEWS



ZKW succeeded in generating revenues of €1.03bn in 2020. CEO Oliver Schubert says the company "were able to maintain production at our locations through a major organisational effort and by showing outstanding flexibility. We have the excellent teamwork and commitment of all of our employees to thank for our success. Now, we will continue to grow through our global development footprint".

With a new development office in Olomouc, Czechia, ZKW are taking advantage of the local supply of labor and automotive expertise on-site. Olomouc is home to Czechia's second-oldest university, with its own light technology department. This, it is felt, ensures ZKW's new employees will have a good technical background. In addition, the greater Olomouc region has a long tradition in developing and manufacturing automotive headlamps. Schubert: "The region offers a highly qualified workforce, which we plan to take advantage of in our development of premium lighting systems. Currently, we are looking for experienced engineers from the automotive industry in the areas of light, design, electronics and software".

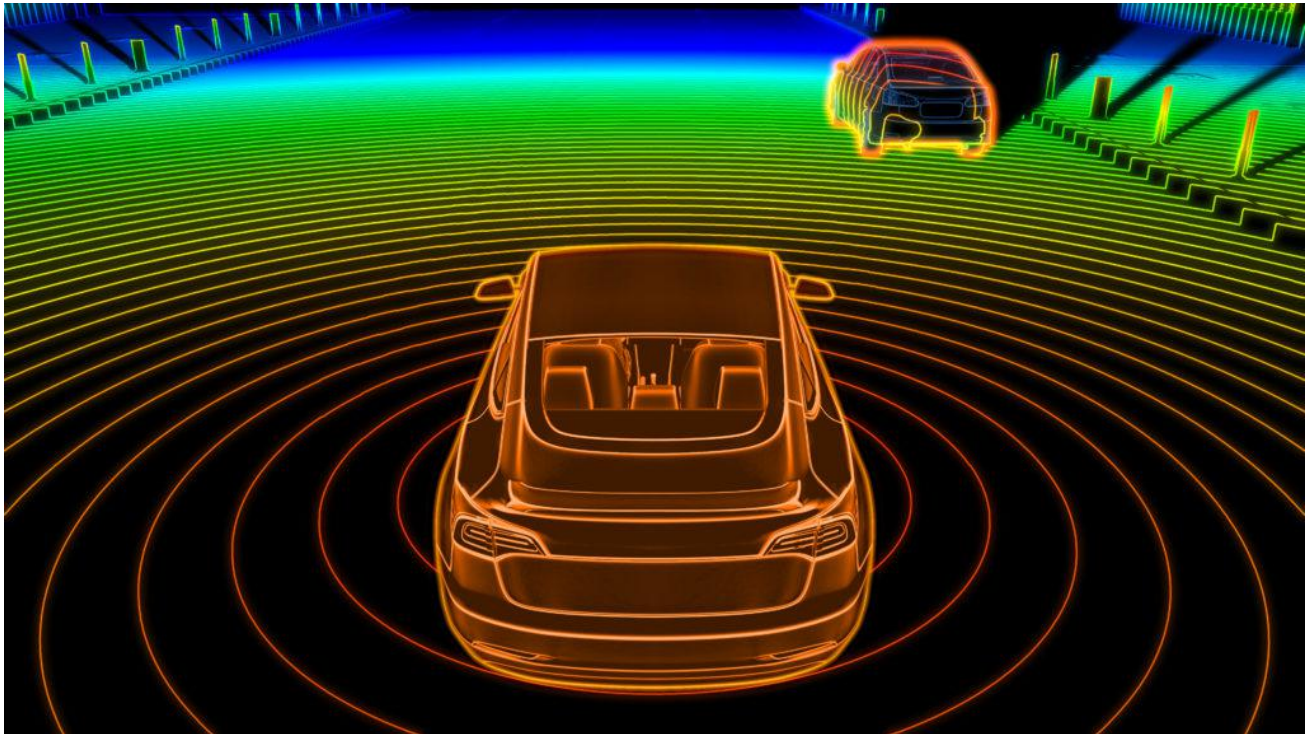
Despite the pandemic and difficult global economic situation, the ZKW Group remain well positioned. The special coronavirus taskforce are coördinating supply chain maintenance within the group. In late 2020, the company received €150m in financing from the EIB (European Investment Bank). ZKW will use the funds to expand their innovation activities, which are the key to the Group's success.

In addition, ZKW also plan to invest in sustainable manufacturing and green development. Schubert again: "Our order books are certainly looking very strong for the next three years; [we] expect to set a new revenue record in 2022. We are proud to have the highest order volume in the company's history, and feel positively about the future. We are certain that we will be able to manage challenges such as digitization, competitive pressure and sustainability alongside our employees".

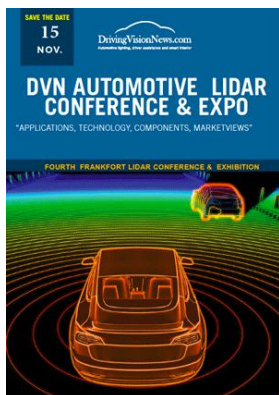
Driver Assistance News

DVN Lidar Conference in Frankfurt on 15-16 November, 2021

DRIVER ASSISTANCE NEWS



Since their inception, DVN Lidar Conferences have quickly become the must-go technical congress to see and hear all about the latest innovations amidst the galloping growth of the automotive lidar sector. The fourth DVN Lidar Conference is scheduled for 15-16 November in the Frankfurt am Main area. Please **SAVE THIS DATE**



After a long period without face to face meeting and networking, we expect this to be one of the first live events, provided the health and safety situation around the world allows it. So we are committed to delivering a strong lineup of high-calibre speakers and companies from every part of

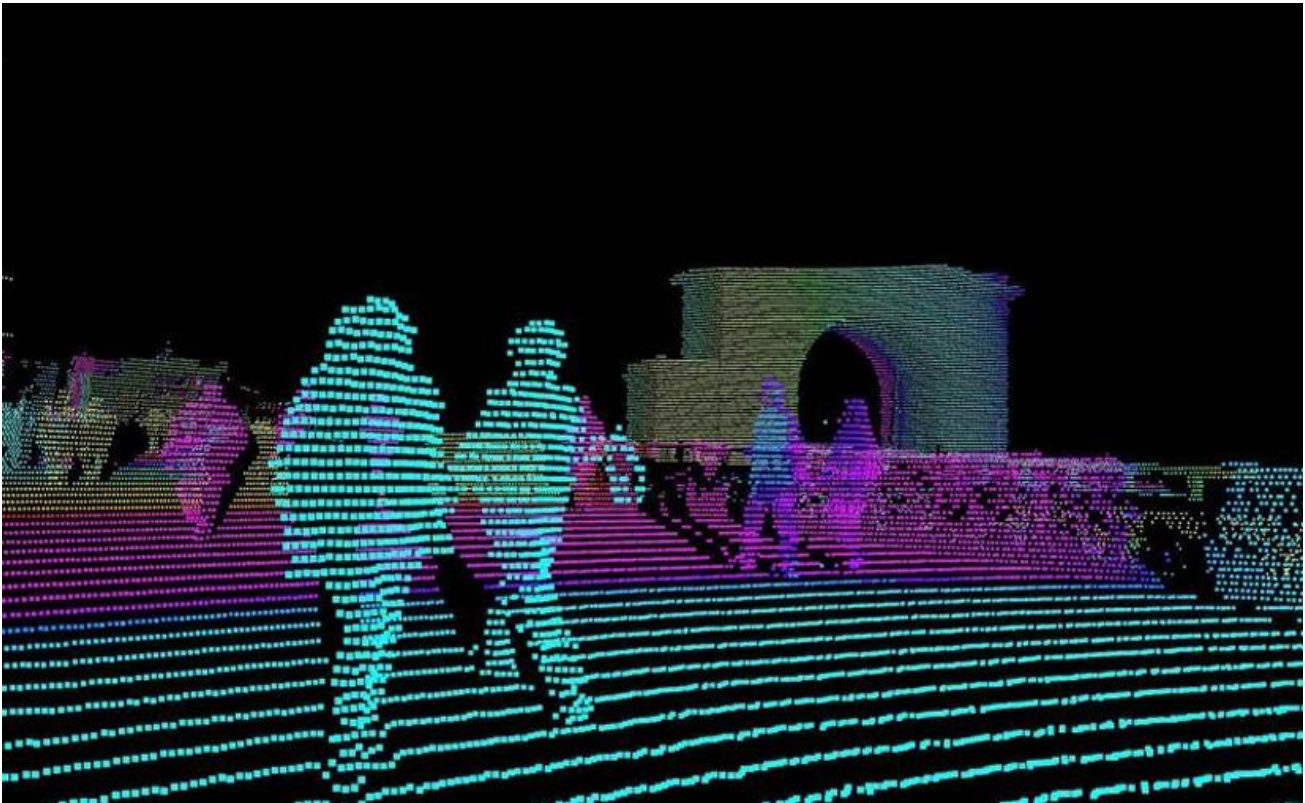
the automotive lidar ecosystem: automakers, lidar suppliers, tier lighting suppliers, research outfits, and analysts.

Along with a best in class lecture docket, we will also have top-notch exhibition and networking facilities, so exhibitors will have the opportunity to present their companies' latest technologies and techniques.

There will be room for about 200 attendees, with seats available on a first-come basis. If you want to present, exhibit, or attend, please contact Salomon Berner at sberner@drivingvisionnews.com

A Look at the Lidar Field

DRIVER ASSISTANCE NEWS



Velodyne: Company founder Dave Hall pioneered lidar for automotive purposes. Velodyne claim over 300 customers. In December, the company introduced their Velarray H800 sensor, based on their own micro-lidar array technology, designed for last-mile delivery and warehouse applications.

Ouster: Valued at \$1.9bn, the company say they have more than 800 customers within and beyond the automotive sector. CEO Angus Pacala says the company pioneered digital lidar, vastly reducing the number of needed parts, and that Ouster's revenue grew 350 per cent in 2020.

Luminar are partners with 7 global automakers, including Toyota and Volvo. They have also announced partnerships with Daimler Trucks and global supplier Mobileye. Luminar products will enter series production on Volvo vehicles in 2022.

Hesai: In September, this Shanghai-based company unveiled their latest Pandar128 mechanical sensor, which offers 200 metres of range at 10% reflectivity. They have raised \$231.2m, and they work with companies including Bosch, Nuro, and TuSimple.

Innoviz, set to go public next month, have worked with BMW and Magna on a production vehicle project for the past 42 months. Innoviz are backed by the likes of SoftBank Ventures Asia and Aptiv. Beyond automotive, they are working on lidar for space, agriculture, and operations in geographically-constrained areas such as college or office campuses.

Ibeo have been developing lidar for more than 2 decades. Founded in Germany, they partnered with Valeo to manufacture lidar for the Audi A8, the first production vehicle ever to contain lidar sensors.

Aeva: This venture, co-founded by former Apple workers, has homed in on 4D lidar, which allows the sensors to capture objects' velocity. Last September, the company made a deal with ZF to develop production lidar for driver-assistant systems and autonomous vehicles.

Opsys Tech: This Israeli startup founded in 2016 seek to combine the best of traditional scanning lidar (range and resolution) with the reliability and lower cost associated with flash lidar. They claim to scan the full field of view at 1,000 frames per second. Opsys received an investment from Hyundai last month.

Cepton: Last month, Cepton introduced a miniature lidar sensor called the Nova that detects objects at close range. It's intended for use in driver-assist applications and costs roughly \$100 per sensor. Each sensor measures about 7.5×3.5 centimetres.

Waymo: Their internally-developed Laser Bear Honeycomb lidar has, Waymo say, been vetted in more than 3.2 million kilometres of real-world testing. Waymo sell the Laser Bear to others, though they keep quiet about exactly which companies have been buying it.

Argo AI: In 2017, Argo AI purchased Princeton Lightwave, a lidar company in New Jersey. Backed by Ford and Volkswagen, Argo say their lidar development is proceeding on schedule and there will be more developments in the near future.

Cruise: Also in 2017, General Motors (now General Mobility)-backed Cruise acquired Strobe to help drive down lidar costs. Cruise co-founder Kyle Vogt is still watching the lidar space, noting last month that it is primed for consolidation.

Aurora: In May 2019 Aurora acquired Blackmore, a startup in the U.S. state of Montana who pioneered frequency-modulated lidar for automotive applications. Now, Aurora say the acquisition has underpinned their emphasis on autonomous trucking, by dint of the ability to detect objects at longer distances.

Mobileye are best known for supplying camera-based computer vision systems. Last month they said they are developing their own frequency-modulated lidar for use in AVs starting in 2025.

Xenomatix say they are ready to conquer the car market with their self-developed laser technology and their growth percentage of 405 per cent.

Apple in Talks with Lidar Suppliers

DRIVER ASSISTANCE NEWS



Extract from Automotive News

Apple is in discussions with multiple suppliers of lidars, a key milestone toward development of its first passenger vehicle. The technology giant is in active talks with a number of potential suppliers for these laser-based sensors that allow a car's computer to "see" its surroundings. The company has been working on a driverless vehicle project for several years and has developed on its own most of the necessary software, underlying processors and artificial intelligence algorithms needed for such a sophisticated system.

Apple is looking to outside vendors to supply critical hardware for a planned autonomous vehicle. The ongoing discussions are a sign that Apple has yet to settle on a preferred supplier for lidar and that it's likely mulling a range of options, including a heavily customized version of the sensors, as it moves toward developing a car design.

At least a half-dozen lidar companies have gone public via reverse merger in recent months, raising hundreds of millions of dollars by seizing on investor appetite for a bet on future demand for high-tech cars. The laser sensor technology is used by many top-tier players hoping to commercialize driverless vehicles, including Google parent Alphabet Inc.'s Waymo unit and General Motors' Cruise division.

Cepton Want Lidar in All Cars, Autonomous or Not

DRIVER ASSISTANCE NEWS



Cepton Technologies CEO Dr. Jun Pei says automakers are predicting that nine years from now, half of all cars produced will have lidar—maybe not for autonomous driving, but certainly for ADAS and other safety systems.

The Cepton Nova is designed to address major gaps in proximity detection of objects. The sensor includes 3D imaging with a field of view of 90° to 120° horizontal × 60° to 90° vertical, with angular resolution of down to 0.3° and a maximum range of up to 30 metres, making it applicable for ADAS and self-driving vehicles.

Pei says "One of the most dangerous situations to get into accidents is when the car starts, in a neighborhood with people around it. Slowly companies have realized lidar is a safety sensor and gives vehicles a full range of safety, especially when they begin their journey". Cepton say their Nova lidar sensor can detect small children, on-road objects, road edges, stationary objects and more, making it applicable for today's vehicle safety systems.

The Nova's low cost, around \$100, underpins Cepton's hopes for widespread adoption. Volume production of the Nova is slated to start in 2023, and samples will be available later this year through Cepton's early access program.

Bosch, Microsoft in Auto Connectivity Platform Pact

DRIVER ASSISTANCE NEWS



Bosch and Microsoft are collaborating to develop a software platform that aims at seamlessly connecting cars and cloud-based services. Bosch say this will turn in-car software into a dynamic object, ready to be developed further faster, more simply, and over the entire life of the car. It will be possible, they say, to download it to the ECUs and vehicle computers via the cloud, using the over-the-air (OTA) interface. The software platform is based on Microsoft Azure and also includes significant code contributions from Bosch.

Both companies are working on development tools to make software development significantly more efficient. Thanks to the new platform, innovation cycles can be shortened and the development costs for vehicle software reduced. New functions and digital services will thus reach car drivers more quickly. The development cooperation combines Bosch's software, electronics and systems expertise with Microsoft's know-how in the areas of software development and cloud computing. Both companies plan for the first vehicle prototypes to be able to use the new software platform by the end of this year.

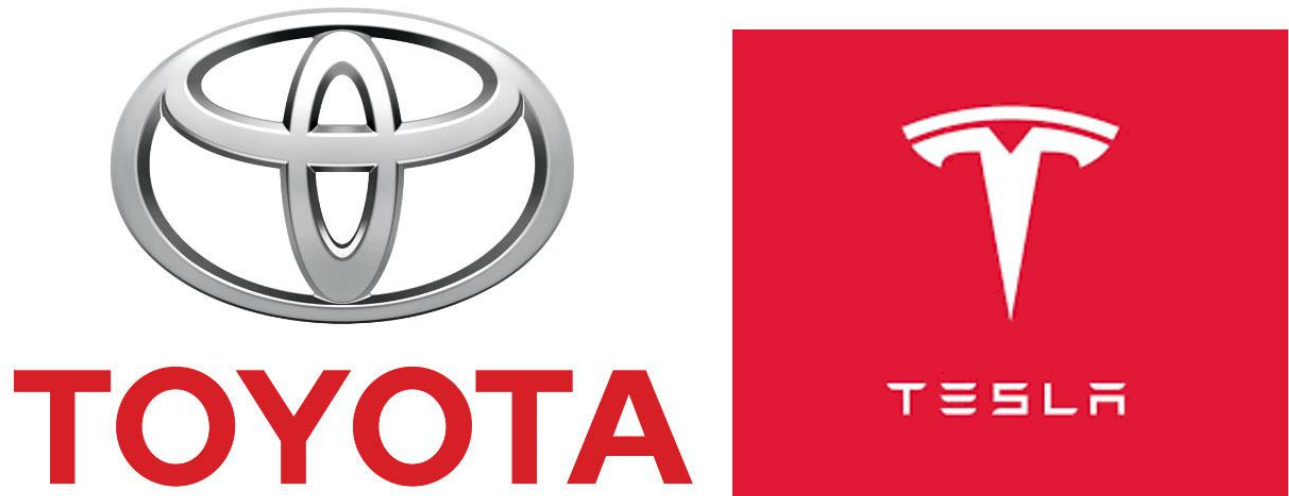
The background to the coöperation is the realisation that software will play an increasingly important role in future vehicles, and with trends such as electromobility, automated driving, and modern mobility services becoming possible only through software updates and upgrades will be much more frequent in the future.

Bosch and Microsoft also plan to further develop existing software tools. They are intended to enable automakers and suppliers to simplify and accelerate their own software development while still complying with the automotive sector's high safety requirements.

General News

Toyota, Tesla Take Tops in 2020

GENERAL NEWS



The pandemic allowed Toyota to overtake rival Volkswagen to claim the top sales slot for whole-year 2020. VW's greater exposure to Europe led to its overall decline of 15.2 per cent, a bigger dip than Toyota's (-11.3 per cent). The Renault-Nissan-Mitsubishi Alliance, who once dominated the standings and now seeks to improve its sales, fell back to № 3.

But according to IHS Markit's estimates, FCA (now Stellantis) sold 3.72 million vehicles last year, to which must be added the 2.51 million sold by PSA, for a total of 6.23 million vehicles in total. This is 21% less than the 7.9 million posted in 2019, on which the leaders of the two manufacturers were based to announce their union, supposed to form the 4th largest manufacturer in the world

PSA were penalised by their strong exposure to the European market, where they make 85 per cent of their sales. The pandemic has particularly crimped registrations there, with lockdowns forcing factories to close for several weeks at a go. While the world automobile market fell by 14 per cent overall last year, sales in Europe fell further (-23.7%) than in the United States (-14.8%) or China (-1.9%).

Top 10 automakers—million vehicles and change 2020/2019

Toyota	VW	Renault-Nissan	GM	Hyundai	Stellantis	Honda	Ford	Daimler	Suzuki
9.53	9.31	7.75	6.83	6.35	6.23	4.41	4.10	2.53	2.51
-11%	-15%	-23%	-11%	-12%	-21%	-15%	-22%	-24%	-17%

Top 5 Electric Vehicle

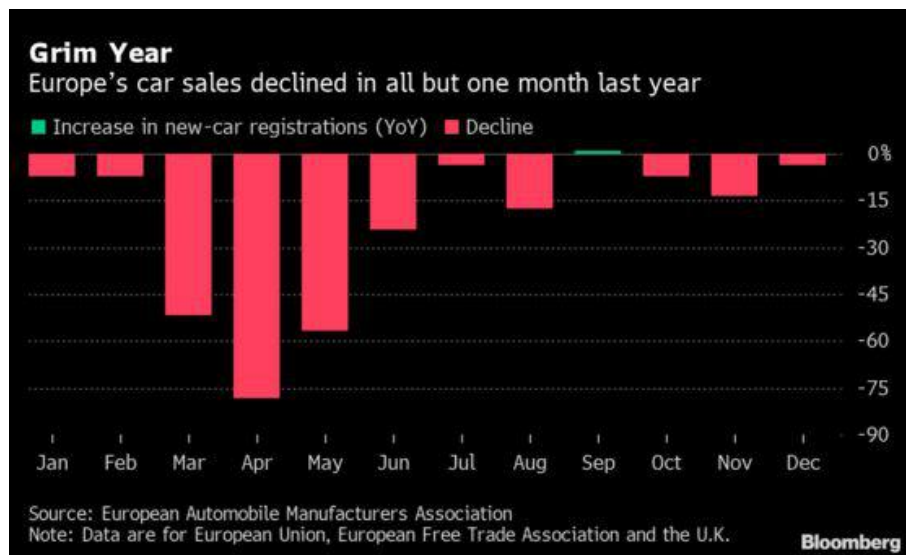
Tesla	SAIC	VW	BYD	Renault
500,000	243,000	232,000	131,000	121,000

Sales Down Hard in Europe's January Market

GENERAL NEWS



New-car sales in Europe's five biggest markets fell by more than 25 per cent last month after lockdowns to combat the pandemic closed dealerships and consumers put off large purchases. Registrations fell 28% in Germany, the UK, France, Italy, and Spain in January from the year-earlier period, according to Bloomberg. With lockdowns still in effect in several countries and automakers grappling with a shortage of semiconductors, Bloomberg forecast February sales dropping 10%. Still, overall car sales plunged the most on record in Europe last year as relatively resilient demand in the second half did only so much to make up for the collapse during the initial outbreak of COVID 19.



Mazda Tops Consumer Reports Brand Rankings

GENERAL NEWS



Mazda moved to the top slot in Consumer Reports magazine's auto brand rankings. Porsche, which won the top spot last time, fell to № 4. Honda had the biggest yearly gain, rising from № 15 last year to № 5 now. The lowest spots on Consumer Reports' rankings stayed about the same as last year, including for Mitsubishi, Jeep, Land Rover, and Jaguar. Tesla tumbled five spots to 16th place, on account of reliability issues with their Model S, Model Y, and Model X; Consumer Reports says only the Model 3 has an overall score high enough to be recommended.

Mazda	BMW	Subaru	Porsche	Honda	Lexus	Toyota	Chrysler	Buick	Hyundai
80	78	76	76	75	75	74	74	72	71