DrivingVisionNews.com
Automotive lighting and driver assistance technologies

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Editorial

DVN Lidar Study Goes Live

The DVN Lidar Conference is now finishing up.
Close on its heels is the DVN Lidar Study that's gone live just now, looking at whether automotive lidar is hype or a must-have. The answer isn't obvious or simple; a great deal of uncertainty exists around lidar technology.
For just a few examples of the questions at hand, addressed in the DVN Report: What will be the winning technologies? How will the lidar market and adoption rate develop? What demands are coming from customers and automakers? What are the new business opportunities for the lighting industry?

Whether you are a car maker, a tier-1 or -2 lighting or lidar component or system supplier, this extensively-researched study will help you identify new business opportunities and make well-informed strategic decisions in the evolving automotive lidar market.

We assembled a team of five experienced automotive ADAS and lighting experts to build the study; their work included 27 interviews with experts and industry leaders at lidar and lighting companies, additional interviews with four leading research institutes, and extensive literature research and review.

The DVN Lidar Study includes expert advice in seven chapters:
• *Why automotive lidar?*
• *Lidar system and component technology*
• *Automotive lidar applications*
• *Integration of automotive lidar and lighting*
• *Standardisation, Regulations, Testing, and Release*
• *Automotive lidar market development and new business opportunities*
• *Scientific contributions*
• *DVN Best Bets*
You'll find ordering information **on the DVN Website**.

Meanwhile, in this issue of Driving Vision News we bring you an in-depth article about our night drives in the Mini and the BMW 5 Series, with an interview of BMW's exterior lighting development chief Jörg Kälble.

Sincerely yours

DVN President

In Depth Lighting Technology

Two Interesting New Lighting Systems From BMW

DVN had the chance last month to visit BMW in Munich, spending a fruitful time with Jörg Kälble, Rene Übler, and Johannes Aulbach. Before a night drive, Jörg organized a meeting in a brainstorming room with blackboards everywhere, very comfortable seats, and all provisions to be able to have relaxed conditions for creativity. We talked about BMW strategy on lighting, and on the feedback of BMW about the information received from DVN. A very fruitful time!

Then, two lighting systems were assessed in night drives: the Mini and the 5 Series equipped with ADB and laser.

Mini

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Technologies involved in the Mini's lighting system

Full-LED Headlamps with glare-free high beam, done by a matrix Bi-LED module with eight matrix segments, four in each headlamp. The main goal of BMW here is to bring ADB functionality to the Mini customer. The benefit of a glare-free function is not only to shadow out other cars but also to provide further visibility for upcoming curves and dangerous situations; there is a clear safety gain by illuminating this curve in front of the driver.

Performance

Low beam flux: 800 lm
High beam flux: 1,800 lm
I_{max} = 93,750 cd

Lighting functions

Adaptive low beam distribution
Full high beam Glare-free high beam (called "Selective Beam" by BMW)Cornering lightStatic bending lightCity light

Night drive impressions

All the functions are useful.
• The low beam gives homogeneous luminance in the road and a good spread, like a carpet. Indeed, a pleasant light.
• The high beam is also homogeneous and a great quantity of light for this class of car.
• The ADB gives a feeling of a glare free high beam mainly when we have trees on the sides but has a low efficiency because the shadows are too large; they reduce the effect of good visibility at the immediate side of the car when you overtake or meet another car.
In conclusion, I have seen a very good light in low and high beam, maybe higher than we could expect from such a range. The number of segment is probably too low to have a good ADB.

BMW 5 Series

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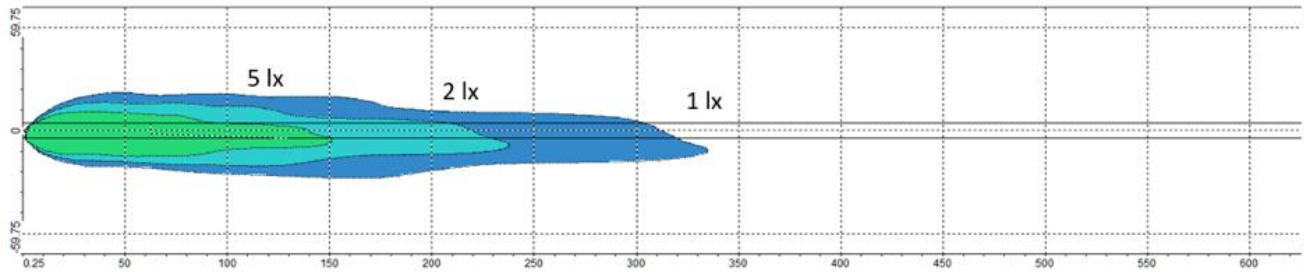
Technologies involved

This is the latest BMW laser headlamp, which combines a high-resolution glare-free high beam (0.1°) with a high range of visibility by activating the laser in full high beam as well as in glare-free high beam situations.

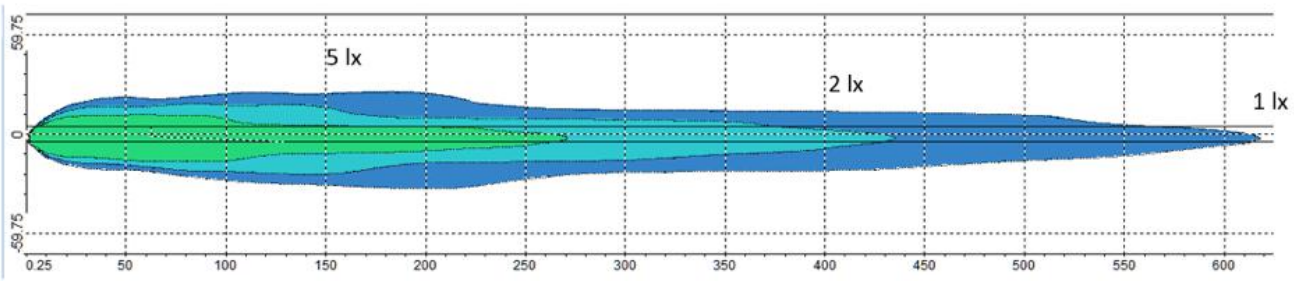
The laser high beam booster extends the seeing distance by nearly 300m. It's activated only if the car is exceeding 50 km/h.

Performance

Low beam flux: 1,000 lm
(Full) high beam flux: 3,800 lm
(Glare-free) high beam flux: 3,200 lm
Full high beam I_{max}: 200,000 cd
Glare-free high beam I_{max}: 175,000 cd
Glare free high beam resolution 0.1°
Because of the 175 kcd intensity in the glare-free high beam distribution we achieve up to 400 m seeing distance with resolution of 0.1° while driving in glare-free mode!



BMW 5 series LED without laser beam



BMW 5 series LED with laser beam

Lighting functions

Adaptive low beam
Full high beam (including high beam laser boost)
Glare-free high beam (BMW "Selective Beam" including high beam laser boost)
Cornering Light
Adaptive bending Light
Predictive bending Light
Roundabout light
City Light

Night drive

In this car we have very efficient low and high beam, comparable with the best lights from Audi or Mercedes-Benz. The ADB uses an interesting concept with a vertical cutoff just at the right side of the opposite car for the right headlamp, a vertical cutoff just at the left side of the opposite car for the left theadlamp, and a laser spot at the position of the vertical cutoff, able to have high level of light just at the right/left side of the car. So the quantity of light is quite great and the system is very efficient.

We took the opportunity to ask questions to Jörg Kälble. After studying mechanical engineering, Jörg Kälble started at BMW Motorrad in 1998 and was involved in the development of the new C1 scooter. From 2009 to 2013 he was group leader for the pre- and function development, simulation and protection of the exterior lighting on all models. After a 5-year excursion into quality work, in August 2018 he assumed overall responsibility for the exterior lighting development.

DVN: What is your feedback on the worldwide regulation process? Do you expect good progress with the strategic GTB committee?
J.K.: There is good coöperation in the GTB strategy team, and the initiatives on legislation proposed in connection with HAF have to be continued. New approaches need to be developed for cooperation with the Chinese regulatory authority.

DVN: How do you work with stylists? Are they the kings as in most automakers, or can you influence them?
J.K.: There is a continuous exchange between the designers and lighting designers, in which we show the technical possibilities and the designers represent their ideas. In that sense, I would like to call the coöperation good.

DVN: To make ADB, we have now different technologies including DMD, µLED, LCD, LCoS, laser scanning, and others. What is your vision with these technologies? Do you think one of them will come to dominate?
J.K.: All these techniques are interesting and have their advantages and disadvantages. In the end, the technology will prevail, which offers the customer a tangible added value and for which the customer is willing to pay the corresponding surcharge.

DVN: At ISAL, there were many lectures on road projections. How do you see road projection light in front of head-up displays?
J.K.: BMW has been offering HUD to the customer since 2003 and was thus for a long time the only European automaker to do so. Light projection is an interesting technique, but has against HUD the disadvantage that only at night there is a visibility. As such, light projection is a good way to support HUD functions (for example in hazardous situations) but will not replace them.

DVN: BMW presented at ISAL an interesting lecture on dynamic projection with welcoming light. Do you see a future with this function?
J.K.: The exterior lighting has a strong design character, the theme of light production is increasing—especially in Asia—in importance. I see the possibility that we can use functions like these in our cars at some point.

DVN : About the styling differentiation, BMW started with the innovative light rings, which have over the years evolved as a strong familial identifier. What do you think are the main axes of the DRL in the future?
J.K.: BMW was the first automaker who created a light icon with the "Angel Eyes" in the headlight. This can be found in advanced form to today in our cars and is a distinctive identifier. The customer will continue to recognise the BMW icon in the future, but of course we will continue to develop it further.

DVN : After one year at the head of lighting at BMW, what are your broad thoughts on headlamps and rear lamp systems?
J.K.: My vision is that the customer is optimally supported by our exterior light in every driving situation and he feels safe. The symbiosis of technology and design should make each BMW, Mini, and Rolls Royce unique and desirable, and surprise customers with BMW's innovative own ideas.

Lighting News

Ford Ranger Recall: Rear Lights

Ford are recalling 2019-model Ford Ranger trucks in North America over rear lighting malfunctions: misaligned or improperly-seated terminals can cause the taillights to work intermittently or not at all, resulting in the loss of stop, direction-indicator, rear position, and reversing lights.The recall includes about 72,000 vehicles in the U.S. and 5,000 in Canada.

In affected vehicles, the inline electrical connector terminals for the tail lamps may be misaligned or improperly seated. Misaligned or improperly seated terminals can result in intermittent or inoperative tail lamps. Dealers will inspect the underbody inline connector on recalled trucks, and if a terminal is loose, it will be repinned into a replacement connector. Ford say they are not aware of any reports of crashes or injuries related to this condition.

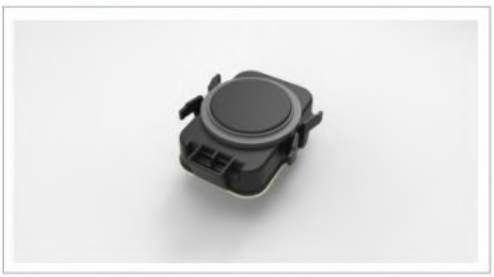
Hella SHAKE in New Porsche 911

Hella have put a wetness-detection function into series production to support the world premiere of Porsche's new "WET-Mode". This allows considerable moisture to be detected on the road surface and the driving systems to be adjusted to a more stable driving behaviour as a preventive measure.

For this wetness detection, a Structural Health And Knock Emission (SHAKE) sensor from Hella has now been incorporated in the front wheel arch liners on the new Porsche 911. The SHAKE sensor identifies the condition of the road and detects a film of water on the surface.

Drivers often underestimate wetness on the roads. Accidents frequently occur when tires lose contact with the roadway causing them to lose traction when it is very wet. "If we are to reliably prevent this, drivers must be made aware of road conditions in good time so they can adapt their behaviour", says Michael Jaeger, a member of the executive board at Hella's electronics division, responsible for actuators and sensors.

In the field of ADAS, Hella have therefore further developed SHAKE technology. This supplements existing assistance and safety systems, as it allows the vehicle not only to "see" its surroundings (e.g. via radar and camera systems), but to also "feel" them, thereby covering the invisible area between all driver assistance systems in the immediate vicinity of the vehicle. Using a piezoelectric element, the SHAKE sensor for example detects vibrations and airborne noise from water droplets swirled up in the air and determines the degree of wetness between tyre and road.



If the system of the new Porsche 911 detects a wet road, the response behaviour of Porsche Stability Management (PSM) and Porsche Traction Management (PTM) will be preconditioned. The driver also receives a warning and a recommendation to switch to WET-Mode..

Marelli CEO is Automotive News All-Star

Marelli President and CEO Beda Bolzenius has been named an All-Star by *Automotive News* in the "CEO, Global Supplier" class.

The annual award is determined by the editorial staff of the international auto industry publication, to honour top executives who have made a difference in the automotive field over the previous 12 months.

Bolzenius was recognised for his contribution at an awards ceremony yesterday. Judges chose to recognise him for "*weaving a single global organisation called Marelli out of multiple business lines in 170 locations with 62,000 employees, blending a culture that's half Japanese, half Italian and led by a German with a North American background. His task is to leverage the technologies of both companies—from lighting to exhaust-emission controls—to move forward in the coming decade of electrification.*"

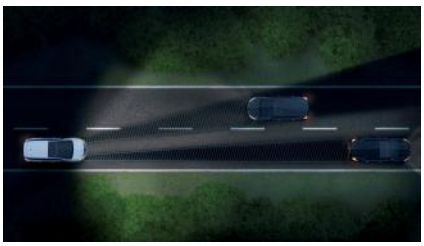
Over the last year, Bolzenius has led the integration of Magneti Marelli and Calsonic Kansei, two successful global automotive suppliers with world-leading reputations for innovation and manufacturing excellence. In May 2019, the two companies united to create one of the world's largest independent automotive suppliers, Marelli.

Epistar and FitTech Seek Growth in '20 with µLEDs

As mini-LED products are entering the market, equipment producer FitTech, who specialise in LED probing, sorting and testing, are predicting brisk business next year. Mini- and micro-LED technologies have matured quite a bit this year, they say, leading to higher demands and requirements for back-end manufacturing processes such as testing and probing. That, FitTech say, is driving orders for their products by LED companies in Taiwan and China. Currently FitTech say they have more than a 50% market share for LED probing equipment and 80% for LED sorting equipment in China.

Meanwhile, Taiwan-based LED chip maker Epistar see rising demand for mini LED products in the near future. So they're planning to increase capital expenditure to over USD $163.83m, versus $82m.
The increased investment, Epistar say, is mainly for inspection and testing.

Renault's Gen-5 Espace



The newest Renault Espace features adaptive LED Matrix Vision, a first in Renault's range, with glare-free high beams for more efficient and safer lighting.

Each optical unit is made up of vertical LED segments which turn on and off automatically and separately according to different situations. The front camera identifies oncoming vehicles at from 550 m and leading vehicles at 350 m.

Connected to the Renault Multi-Sense system, the headlamps adapt when the vehicle is in Sport mode to ensure the best possible visibility for sporty driving. The high beams are automatically activated with a transition phase called a "curtain effect" from 30 km/h in Sport mode, compared with 40 km/h in the other modes.

At the rear, the New Espace features include stylish LED lights giving a new lighting signature.

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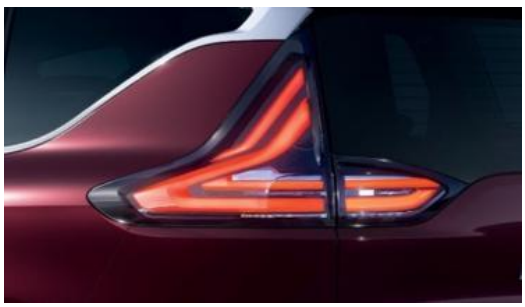
- 

IMS' Lighting Build Line Lights

IMS develop and produce assembly lines for small innovative products. The company designed and recently built for a tier-1 lighting supplier a fully-automated assembly line for matrix light modules. This 15-metre machine has some of the technologies required for production of future generations of light modules.

IMS say the newest headlamp light modules—matrix lights, DMD-based units, µLED, and suchlike—need new assembly technology they call active optical alignment, because such lights require highly accurate alignment of the optical elements to each other, as well as to the light source. The technology is new for most of the tier-1s, but was already developed by IMS by the time a lighting maker wanted it.

IMS foresee that the same new technology is needed for the upcoming markets of side projectors and lidar. They say another aspect of higher-resolution headlight modules is the upcoming need for assembly in a cleanroom environment—another new production expertise departure for most of the headlamp manufacturers.

Dominant's SeddLED for Interior Lighting

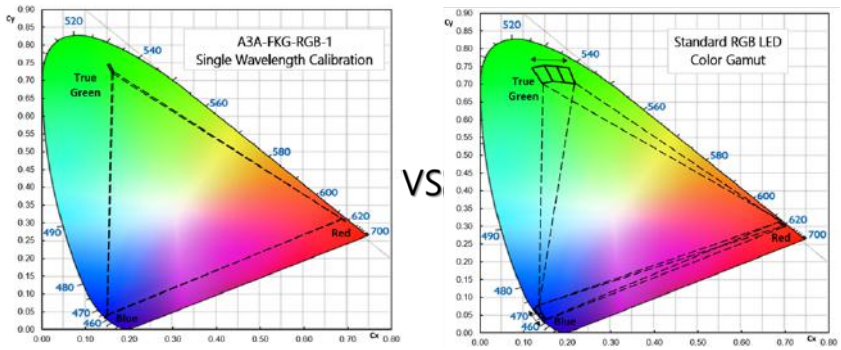
Design engineers are always facing the challenge of variation in mixed color output of RGB LEDs. This is caused by variations of intensity and wavelength within the colour & brightness groupings as well as forward current and temperature dependencies.

Dominant Opto Technologies recently launched a new LED package family called seddLED (for **S**mart **E**mbedded **D**igital **D**river LED) which combines RGB LEDs, an LED driver, and advanced ISELED® communication protocol integrated into a single package for automotive ambient lighting with fully-calibrated RGB LEDs to target coördinates.

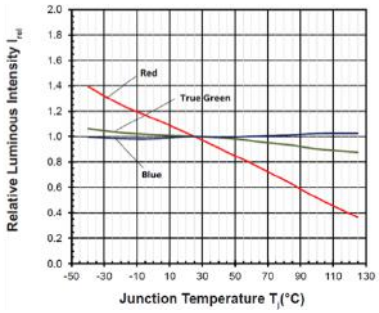
The first introduction is seddLED 3.0 part № A3A-FKG-1400-1, which is pre-calibrated to a D65 white point with accuracy within 3 SDCM steps at 1,400 mcd.

This year Dominant are presenting the A3A-FKG-RGB-1, which is pre-calibrated to individual red, "true green", and blue colours at 400, 1600, and 250 mcd (respectively). Notably, the "true green" and blue colours are pre-calibrated to within a single 1-nm wavelength! Most standard RGB LEDs are binned for both colour and intensity of each chip in a package. Usually there will be three to six bins. This kind of binning significantly reduces colour-mixing inconsistencies, but does not fully remove them. The advantage of the A3A-FKG-RGB-1 is that it can fine-tune the variation of colour and intensity by controlling the LED peak current by dint of PWM, wavelength calibration, and temperature compensation.

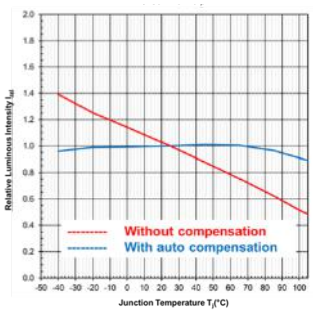
The figure below shows the colour gamut comparison between standard RGB LEDs and the A3A-FKG-RGB-1. Standard RGB LEDs have multiple colour groupings, and each grouping consists of a 4-nm wavelength range. The standard RGB colour gamut varies from each colour grouping which will affect the accuracy of the admixed light. A3A-FKG-RGB-1 with pre-calibrated green and blue clearly have excellent and stable colour gamut.



The SeddLED 3.0 products have embedded temperature sensors to enable brightness compensation for the red LED. This next figure below shows the intensity versus temperature characteristic for all three chips used in a standard RGB LED. The luminous intensity of red LEDs decreases as operating temperature increases. For blue and green LEDs the decrease in luminous intensity is less noticeable:



Relative luminous intensity vs junction temperature for the 3 chips (std RGB LED)



Relative luminous intensity vs Junction temperature

The SeddLED 3.0's automatic temperature compensation can maintain red LED intensity across an unusually broad temperature range, as shown by the blue line in the plot above.

Both the A3A-FKG-1400-1 and the A3A-FKG-RGB-1 help to reduce costs, simplify control and expand the functionality of RGB lighting in automobiles. The A3A-FKG-1400-1 is an excellent choice for applications that require high accuracy of white colour, for example: D65 white. The A3A-FKG-RGB-1 is perfect for applications that require high brightness for individual colours. Each RGB LED is calibrated to maximum brightness which has better dimming resolution. Prototype samples of A3A-FKG-RGB-1 were slated to become available this past October.

Driver Assistance News

Ford's Air-Based Dirt Blocker for Lidar Turrets

Ford have developed an "air curtain" to remove debris from obstructing the lidar sensor and lens that are held in the turret that sits atop the roof of most autonomous vehicles. There, the lidar enables the autonomous vehicle to "see" its surroundings.

The air curtain, which sits near the lidar sensor, blows air in the direction of the sensor and the lens, forcing debris away from the lens and thus preventing it from covering the sensor. Alone, the air curtain is not yet entirely effective, so Ford added 16 high-pressure sprayers to locations along the top of the vehicle's turret. Connected to an AI (artificial intelligence) system, the sprayers work independently of each other. Once the system detects debris the appropriate sprayer will be activated, precisely targeting the affected location with high-pressure fluid.

As soon as the AI system determines the type of debris that needs to be removed, it will adjust the water pressure accordingly—for instance, bug residue removal might require more water pressure than dust removal. After the material has been removed, the air curtain blower will dry the lens.
Ford will continue to develop the system so that ultimately the debris can be removed in less than a second.

General News

Audi to Cut 9.5 Kilojobs by '25

Audi have announced a major restructuring plan, cutting about 9,500 jobs by 2025 in an effort to adapt production to future electrification, while saving billions. "The resulting savings of around €6bn will secure the strategic operating profit margin corridor of 9% to 11% and will be invested in projects of the future such as electrification and digitalisation", the company said, adding that the cost savings would be achieved by 2029.

The Board of Management and employee representatives have reached a fundamental agreement within the framework of Audi.Zukunft. The decisions relate in particular to the optimisation of production capacities at the two German plants and socially responsible workforce adjustments while extending job guarantee up to the end of 2029. The €6bn will flow into future projects such as electrification and digitalisation.

CEO Bram Schot says "With the Audi Transformation Plan, we have already anchored a successful program of measures. And with Audi.Zukunft, we are now also tackling structural issues in order to prepare Audi for the challenges ahead".

FCA, PSA Merger Working Groups Established

Fiat Chrysler and PSA Group told their employees they will sign a binding merger agreement in coming weeks. Reuters described corroborated, documented reports that the two groups told their employees that more than 50 people are involved in the process.

The documents say nine working groups have been established, led by FCA Group Treasurer and Global Head of Business Development David Ostermann and by PSA Executive Vice President for Program and Strategy Olivier Bourges.

FCA and PSA are working to finalise a merger that would create the world's fourth-largest carmaker. FCA Chairman John Elkann last week said he was confident of reaching a binding merger deal with Peugeot owner PSA by the end of this year.

Faurecia Forecast Record Sales, Profits in 2022

Faurecia are targeting record sales, profits, and cash generation in 2022 as a result of their strategy program and the boost from their acquisition of Japanese company Clarion.

The supplier expect annual average sales growth of above 5% between 2019-2022, with sales reaching above €20.5bn in 2022, and that their operating margin should rise to 8% in 2022 versus their target of a 7% margin in 2019.

CEO Patrick Koller said the company's new business group, Faurecia Clarion Electronics, is a "strong enabler for the cockpit of the future and has a robust roadmap for profitable growth…in 2022, we will see record sales, profitability and cash generation. From a longer-term perspective, we are preparing for the next major disruption and target carbon neutrality by 2030".