Tue, 19 December 2023
Weekly Newsletter

DVN
Lighting & ADAS

NEWSLETTER #834

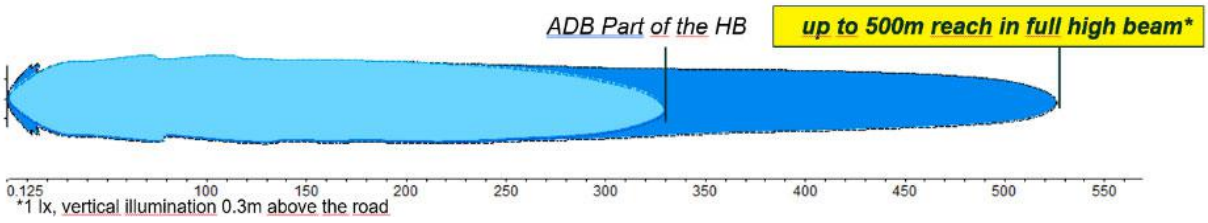
Editorial

Night Drive Test—The Best Part Of The Lighting Engineer's Journey

Lotus Eletre; Rouven Haberkorn, Paul-Henri Matha, Frank Langkabel

Last month, just after the Lidar event in Wiesbaden, Frank Langkabel and Rouven Haberkorn invited me to drive the Lotus Eletre at night. Of course I couldn't refuse; it is not every day one gets to drive 900-horsepower car!

During the San Francisco DVN Triple Workshop, we had an overview of the Eletre's lighting perfomance in Haberkorn's presentation. It's a featureful system: AFS Classes C, V (town light), and E (motorway); static and dynamic bending light, and ADB. It is also a very performant system on paper, with a high beam I_{max} of 125 kcd—far above the 56-kcd values with a halogen bulb—and a 500-metre range.



The Hella headlamp has a 2-row pixel setup, with 12 pixels for the low-beam hot spot/kink and 12 pixels for ADB. There are three modules with 3 cm height, providing 2,000 lumens *on the road* per headlamp in high beam mode. The illuminated field is ±19°H × +6.5°V.

Driving the car at night feels really safe; those fancy headlamps are doing the job. Even at high speeds on the unlimited Autobahn, you see far ahead thanks to the 500-metre range you get from the additional high beam module. Definitely what is needed to match those 900 horses!

ADB is really smooth and you can drive with really good visibility on curvy roads. This is not HD technology—no DLP, no microLED—but the 12-segment matrix has really good performance. The glare-free zone is inherently a bit larger than with HD, but not annoyingly so, thanks to advanced and finely-tuned software.

Enough subjective description with words; take a look at a 2-minute **video**, which shows you some of what I saw. And as a bonus, you get to see the welcome and goodbye sequence!

I encourage everyone in the lighting community, including R&D engineers from automakers and suppliers; designers, specifiers, and purchasers to do night drive tests every chance you get. I know it is not easy when you have a family, in summertime (especially at northern latitudes with very late darkfall), or when you live in a big city with a lot of street light. We always have a lot of excuses to say "maybe next time", but really, the night drive is the pure expression of the sense and the purpose of our job.

Sincerely yours,

Paul-Henri Matha
DVN Chief Operating Officer and Lighting General Editor

In Depth Lighting Technology

Laser Texturing at Reichle Technologiezentrum

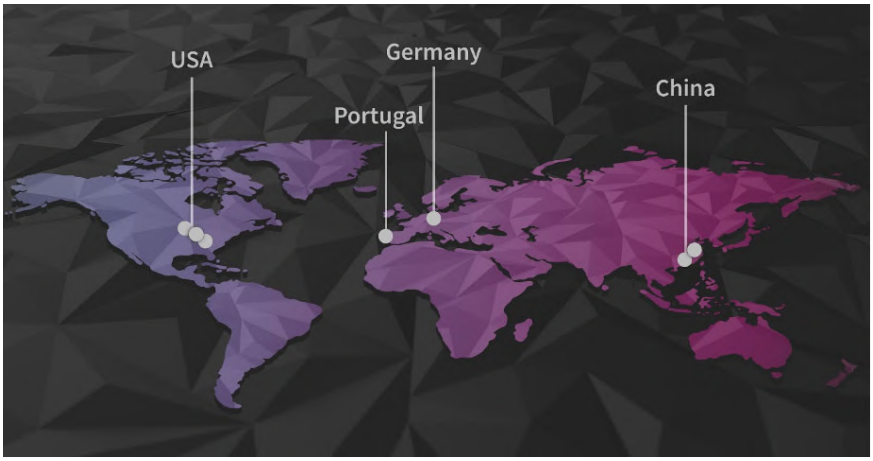
L-R: Paul-Henri Matha, Marco Reichle, Gerd Bahnmüller

At the end of November, Paul-Henri Matha and Gerd Bahnmüller were invited to Reichle Technologiezentrum in Bissingen an der Teck in the southwest of Germany. They're Europe's leading service provider for laser texturing. Marco Reichle, who is the second generation to run the company together with his sister Marina, gave us a very interesting insight into the history of the company, and an in-depth look at their state-of-the-art laser technology.

The company was founded by Volker Reichle, Marco and Marina's father, in 1981. It started out as a small engraving studio with a focus on manual engraving and milling, but soon expanded into a company with a broad range of services in mechanical processing. Today, Reichle offer expertise and innovative solutions in repair of cast parts; laser- and CNC-engraving and milling, laser- and TIG-welding, high-gloss polishing and contour restoration, grain repair and gloss level adjustment, laser texturing, lighting development, and they have an in-house design and R&D centre.

The company's speciality of laser texturing as one of their main services deserves special attention. In 2012, they invested in their first laser texturing system, and decided to completely discontinue traditional chemical etching only one year later—a bold move, considering that etching was common industrial practice at the time. As a pioneer in laser texturing, the first few years were challenging and required a lot of perseverance. Their continued confidence in the technology paid off, and Reichle now are the largest service provider for laser texturing in Europe, with more than 20 laser machines in Germany alone. Even beyond Germany, the company have built up a

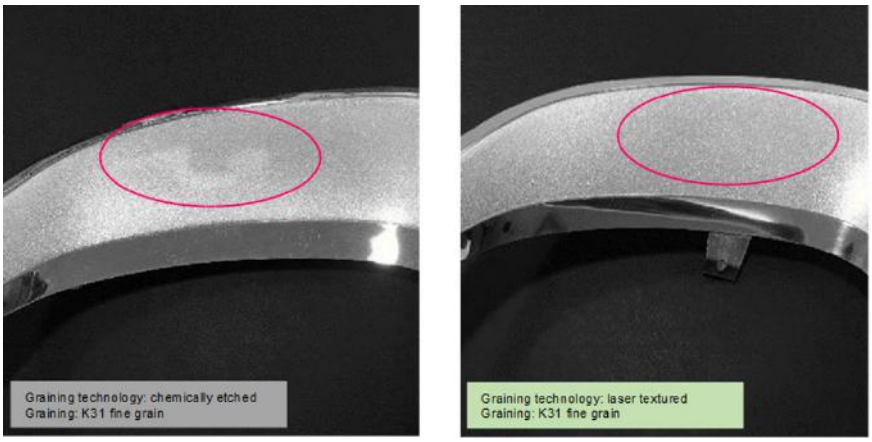
global network with cooperation partners in Portugal, North America, and China, bringing the total number of laser processing machines to more than 45. Project management, R&D, design, consulting, mapping, and programming are done in Germany, ensuring the highest quality even far away from headquarters.



Reichle's global network of cooperation partners

State-of-the-art laser technology allows the realisation of conventional blasting, etching, and eroding structures as well as modern 3D design structures, and the Reichle team strive for innovation and progress. From geometric textures, functional structures, fade-outs and morphings to textile and leather grains in complex geometries, the development of fascinating surfaces is always a welcome challenge for their Advanced Design and R&D Centre.

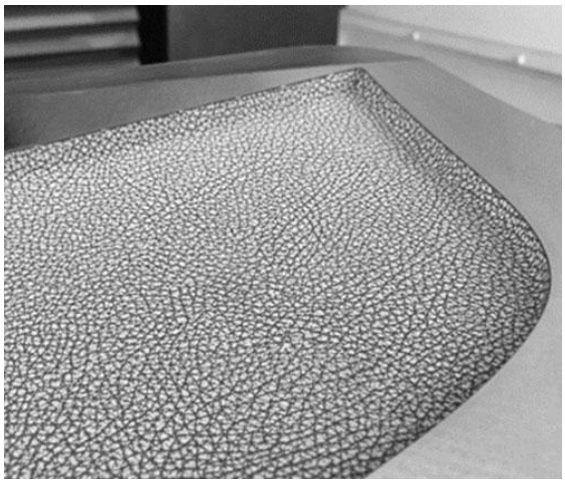
In comparison to other technologies like etching, blasting or EDM, laser texturing offers advantages including very short lead times; highest precision; sharp edges between high-gloss and grained areas with no blasting needed; 100-per-cent digital process for reproducible results with no manual work; matte gloss levels in all plastics; no differences between moulds and different plastics, and the list goes on. It is a sustainable process, too, with no harmful acids.



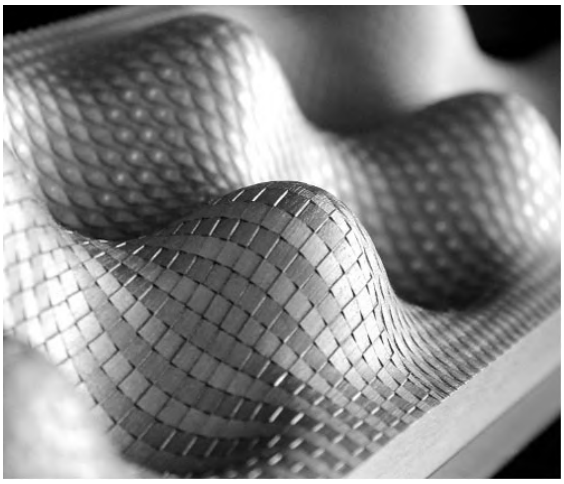
Existing etched graining was polished out by Reichle and re-textured by modern laser technology. Surface defects, shrink marks, and shiny areas are no longer visible

Different tools on the world's largest laser texturing machine (axis movement 4 × 3 × 1.5 m)

Laser textured headlamp



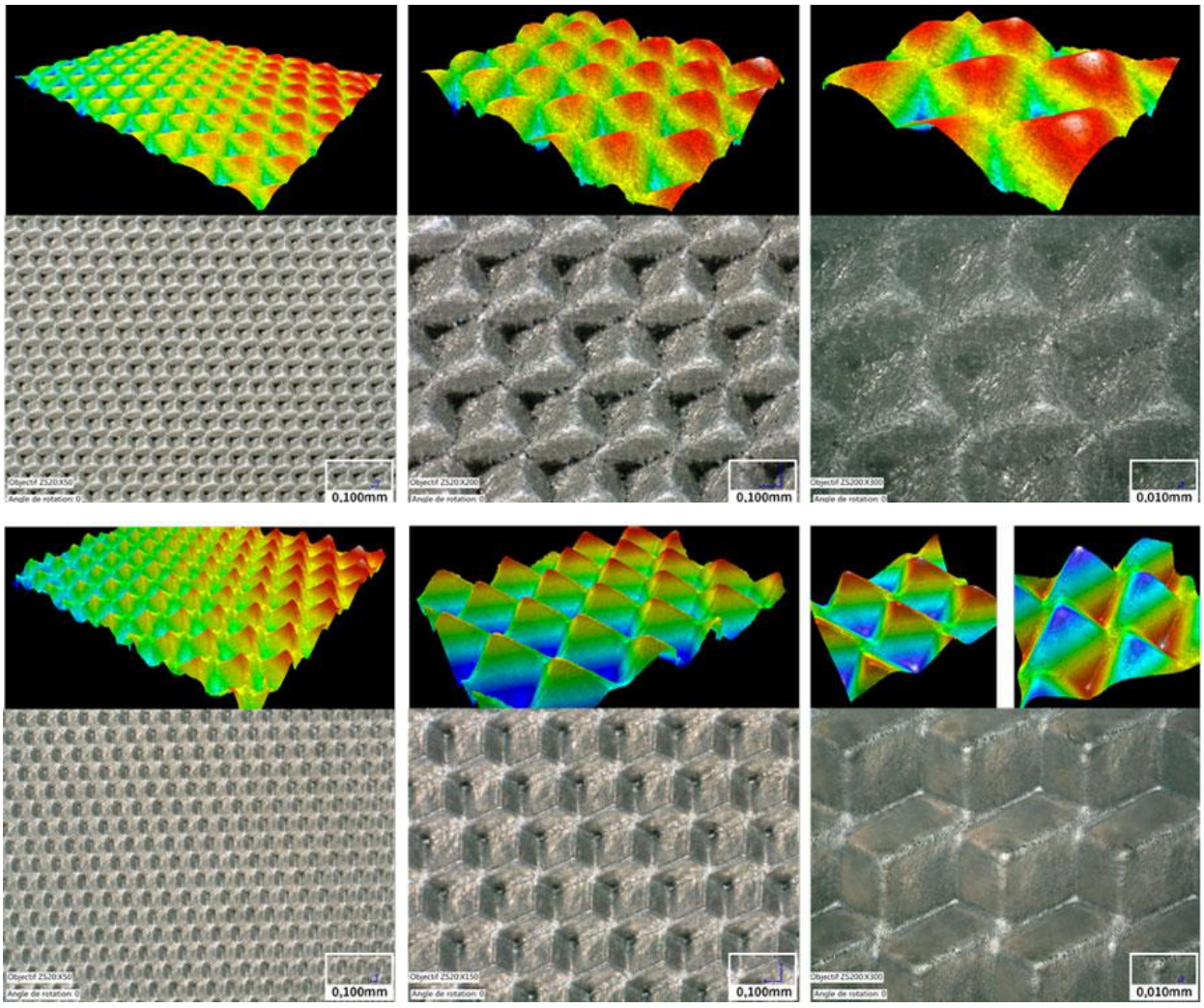
Laser textured leather grain



Laser textured geometric structure

Geometric structure with fade-out

In 2021, the company entered the field of lighting development and femto laser technology, the most precise laser technology in the world. Such a laser emits pulses on the order of one femtosecond (10^{-15} second, that is one quadrillionth of a second, or 0.000,000,000,000,001 second). The main advantage compared to conventional laser texturing is cold ablation. This prevents burr throw-up and thus allows the introduction of fine and detailed geometries, holograms, colour effects in metals and plastics, engravings without depth, high surface finishes and much more. See the difference between conventional laser texturing (upper row) and femto (lower row):



Due to the special features of femto-laser technology, materials such as ceramics, plastics or even challenging materials such as sapphire, nickel, titanium and many more can be processed in addition to metals. Depending on the application and customer requirements, this opens up possibilities for prototyping or working directly in plastic, in addition to the sharp-edged and vertical geometries.

Femto laser sample plaque with holograms, 3D structures, engravings without depth, etc.

This technology is a groundbreaking innovation in devising microöptics for the likes of daytime running lights, diffusers, light incoupling and outcoupling structures, light guide structures and more, which the femto laser can realise with unprecedented precision and homogeneity. In addition to the manufacturing advantages such as maximum precision and process reliability, it can also reduce deviations between a light simulation, prototype light guides, and series components to a minimum. That significantly shortens a customer's development time, and also improves efficiency.

With their lighting partner network, Reichle are also continuously working on innovative technologies to elevate the combination of laser texture and lighting systems. Two of their most recent projects in this area include partial transillumination of surfaces and a one-of-a-kind transparent lighting technology.

Partial transillumination of 3D-textured surfaces is the focus of the Day-Night Design 2.0. It can completely conceal structures when the lighting is switched off, and emphasise them when the lighting is on:

Femto laser sample plaque with holograms, 3D structures, engravings without depth, etc.

Their Hyperion transparent lighting technology is based on light outcoupling optics so precise that they are almost invisible on transparent plastic when the light is switched off, but form a homogenous surface light guide when illuminated.

Hidden designs and logos are revealed with the light switched on.

Reichle Technologiezentrum have accumulated an extensive client base with well-known automakers and tier-1 suppliers—over 1,000 companies worldwide. The company history of Reichle shows that Marco Reichle's team is full of ideas and innovative drive to attract attention and custom in the automotive industry. As an example, Reichle got in 2021 the SPE Central Europe Automotive Award for innovative plastic parts and components.

*Extract from **news piece** about the award:*

Together with the US automotive company Lucid Motors, which specializes in electric vehicles, the Reichle Technology Centre and lighting technology specialist Hella have developed this award-winning rearlight for the Lucid Air.

With its dimensions of approx. 1.80 × 0.5 m and a two-metre-long cover lens, the vehicle's pioneering one-piece rearlight is characterized by its enormously narrow and efficient design. Due to its unusual shape and thus highly sophisticated design, the Reichle Technology Centre developed special light outcoupling optics together with Hella, which could be lasertextured into the injection moulds of the lights thanks to the latest laser technology. A special micro-optics system ensures light outcoupling, while the light guide optics enable extremely slim light surfaces and a 3D depth effect. The high level of homogeneity created in the light imaging not only ensures a very aesthetic experience, but is also extremely efficient in terms of energy consumption.

ZKW is also working with Reichle to develop the laser graining structure for optical elements on Volvo Thor’s Hammer xc40 and xc60 headlamp

Lighting News

EU's Horizon Funding

LIGHTING NEWS

Jan-Erik Källhammer, Chair of the Photonics21 Mobility working group, informs the lighting community of an opportunity for defining a project call with EU funding under EU's Horizon Europe framework. The Photonics21 partnership budget has tentatively reserved €15m EU funding for such a project. A suggested topic could be energy savings of ADAS and advanced lighting. One means of achieving energy savings could be through collaboration among road users.

There is a restriction in the call definition, requiring a joint call with other partnerships. The CCAM partnership—Cooperative, Connected and Automated Mobility—could be a suitable partner for such a joint call. Interested corporations or research entities should contact their respective national and industry **partners within CCAM** to promote such a call proposal.

Support from Photonics21, CCAM, and the EU lighting industry should have a decisive influence when EU will finalize the project call topics. That could be in the 2025-'27 timeframe.

Further information can be had by **emailing Jan-Erik Källhammer**.

Knowledge Through Experience: Small VIP Lighting Conference

LIGHTING NEWS

Probably the final vehicle lighting event of 2023 took place in Berlin on 12 December, initiated—as every second year— by Rainer Neumann. The well-known German Haus der Technik—Wissen durch Erfahrung (House of Technology— Knowledge through Experience) provides the umbrella for this small, 20-person German-language conference as a technical training event. Despite (or perhaps because of) its small size, Neumann brings together top speakers from Germany to talk about the latest developments in vehicle lighting.

Here is a condensed list of selected speakers and their main messages.

Claus Allgeier (PO lighting systems) showed new integrated front and rear end systems and talked about the influence of regulations.

Anette Sawonski (Ford) talked about the specifics of truck lighting. An extensive data collection showed that only 11 per cent (30 hours per year) are spent driving at night with the headlights on.

Wolfgang Huhn (Driving Vision News) analyzed the opportunities and risks of the new 360° lighting and gave an overview of what China has to offer in this field.

Ernst-Olaf Rosenhahn (Marelli AL) showed the GOBO (graphical optical blackout) technology as an alternative to MLAs (Microöptic arrays) and mentioned the visual noise that could obscure the real information.

Michael Hamm (TU Darmstadt) explained the evaluation of headlamp systems and the importance and fundamental weaknesses of the IIHS Top Safety Pick.

Jörg Kälble (BMW) explained what crystal effects BMW uses for their 'Iconic Glow' and welcome and interior applications.

Christian Schmidt (Hella) showed their Digital Flat Light for communication and announced an amazing smart glass application. He also showed a sustainable headlamp concept. Both innovations will be on display at CES in January.

Ralf Schäfer (Schäfer Consulting) talked about the synergies between automotive lighting and ADAS sensing. He showed some new approaches and possibilities.

Dirk Meyer (University of Applied Science Mittelhessen) showed some results of driver simulator experiments with optical warning projections his students carried out this year.

Stephan Berlitz (Audi) explained how road projections and dynamic OLED rear lamps are used to create an exterior user experience. Even a gaming application using headlamp projection was mentioned.

Neumann summarized and closed the event with an invitation to dinner on a boat on the Spree River in a warm, family atmosphere.

ZKW, ÖAMTC Show Future Light Tech—Live!

LIGHTING NEWS

ZKW and ÖAMTC Fahrtechnik presented their vision of future vehicle lighting at an event on 14 November at the Melk/Wachauring Driving Technology Centre. Both companies demonstrated the latest technologies in automotive lighting technology, including high-resolution glare-free high beam, light projections for greater road safety, and person-, vehicle-, and obstacle detection using modern sensor technology and artificial intelligence. ZKW CEO Wilhelm Steger said, "With the onset of the dark season, the topic of ‘safety and light’ is increasingly in focus. ZKW is constantly researching the development of digital lighting systems that can interact with other road users and increase driving safety".

During specialist presentations on the latest developments in lighting technology and with the help of demonstrators, participants were able to see for themselves how the latest premium headlamps and illuminated vehicle fronts of the future will work. In during demo drives on the Wachauring, experts from both companies showed how glare-free high beam, modern light assistance systems, and sensor technology in the headlights can increase driving safety.

As an example of intelligent LED lighting systems from ZKW, the high-resolution glare-free high beam could be experienced live while driving the Opel Insignia. The 25,600 high-performance LEDs of the microZ high beam module are specifically switched on and off via a linked front camera. This enables the system to automatically adapt the high beam to the traffic situation and avoid dangerous glare. Digitally controlled light can not only precisely shadow out oncoming traffic, but also enables numerous information and communication functions. These functions are based on high-resolution projection technologies. A semiconductor component comprising 25,600 micro-LEDs on a small surface area of 40 mm^2 provides the basis for this. In addition, light projections (such as directional arrows on the ground to indicate the direction of travel) were shown during the demo drive to improve road safety.

Chinese Innovation Award for Hella's Smart Light System

LIGHTING NEWS

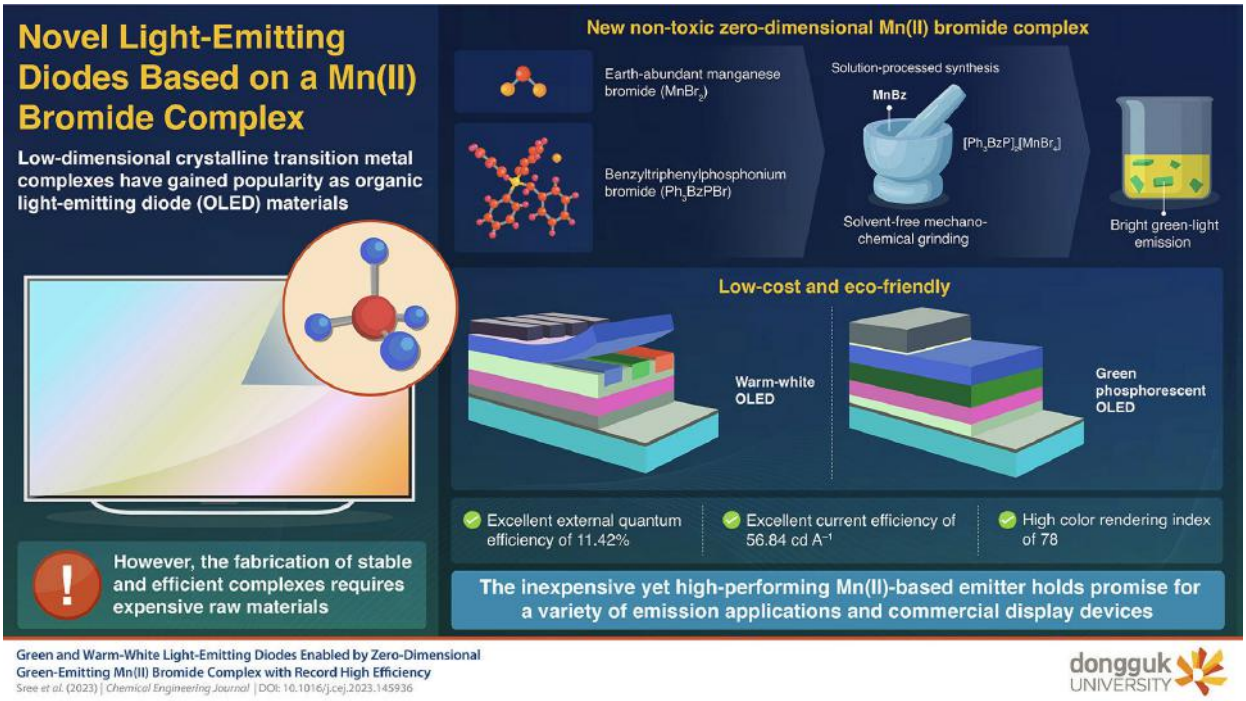
Hella have received a prestigious innovation award in China for their Smart Light system. The award is presented by the trade journal Automobil Industrie in China and the Institute for Automotive Engineering (ika) at RWTH Aachen University. Above all, it focuses on the innovative strength of the Hella lighting solution and its influence in the automotive industry.

Hella's Asia Pacific regional interior lighting business manager Fang Min says, "Lighting plays an important role in the automotive industry, not only enhancing driver safety but also providing passengers with aesthetic & emotional experiences. With cutting-edge lighting technology, Hella offers dynamic and customized interior lighting solutions. We prioritize not only the visual impact of lighting but also its energy efficiency and functionality".

The Smart Light system offers an innovative approach to traditional surface decoration and ambient lighting. It incorporates Hella's New Generation Dynamic Lighting, enabling the assembly's thickness to be within 8mm, thus providing greater flexibility in the interior space layout of automobiles. Additionally, Hella have put high-power modules in the system that offer approximately ten times the luminous flux compared to current RGB LED modules, with only a marginal increase in overall size. This enables high brightness, large-area interior ambient lighting at lower cost. The solution meets customer requirements for daytime ambient lighting. By integrating customer-provided data with self-developed simulation software, Hella can provide real-time simulations and animations demonstrating dynamic lighting, enabling a WYSIWYG (what-you-see-is-what-you-get) concept during the early stages of the project. along with traditional static lighting, Hella's smart lighting system also enables new functions such as distance reminders, direction indicators, and gradient surface light sources through flashing, flow, and colour mixing of multiple light sources.

Manganese Complex Leads the Way to Bright White OLEDs

LIGHTING NEWS



Scientists at Dongguk University, Seoul, Korea, have developed a new environmentally friendly and cost-effective bright green light-emitting manganese complex called MnBz for OLEDs. The material was used to fabricate a first-of-its-kind Mn-based white OLED device and a green OLED device with record high efficiency.

However, while the fabrication process of such LEDs itself is low-cost and simple, the raw materials used during solution process often include precious and expensive metals such as rare earth metals, driving up the fabrication costs.

Studies have shown that low-dimensional complexes of earth-abundant transition metals could be the key to solving this problem. To develop a promising solution using this approach, a team of researchers led by Assistant Professor Vijaya Gopalan Sree from Dongguk University recently attempted to synthesize zero-dimensional manganese (Mn)-based complexes for OLEDs via solution processing. In their recent breakthrough published in Volume 474 of the Chemical Engineering Journal, the team has laid out the strategy for fabricating a bright green-light-emitting Mn (II) complex MnBz, which was further utilized to design a first-of-its-kind warm-white OLED device.

"*Replacing expensive rare earth metals like gold and platinum with crystalline earth-abundant transition metal complexes can help achieve lightning solutions or displays that are cheaper yet bright and vibrant*," says Dr. Sree, talking about their motivation to explore new materials for OLEDs.

Driver Assistance News

Startup CorrActions to Prevent accidents through AI

DRIVER ASSISTANCE NEWS

CorrActions, an AI-based driver safety startup, has successfully closed its oversubscribed Series A round, raising $7 million. The funding round was led by Volvo Cars Fund, which was joined by BlackBerry, alongside prominent venture capital firms Next Gear Ventures, Mobilitech Capital, Regah Ventures, OurCrowd, NextLeap Ventures, and Stone Ventures.
The investment will be used to accelerate the adoption of CorrActions' solution in production vehicles, which is already in process with multiple automakers.

CorrActions has developed AI-based software that detects abnormalities in the cognitive state of drivers and passengers. The software analyzes micro muscle movements that reflect brain activity, using existing human-motion sensors in vehicles such as the steering wheel, in-cabin radars, seats, and other devices. These movements can indicate various cognitive states, including driver intoxication, fatigue and distraction.

Automakers can benefit from CorrActions' privacy-focused approach to driver monitoring. The software can be implemented in consumer vehicles through Over-the-Air (OTA) software updates, including through the BlackBerry IVY™ vehicle platform, and does not require or capture any Personal Identifiable Information (PII) to assess

the driver's cognitive state. This enables automakers to have privacy-focused driver monitoring capabilities without the need for additional sensors or cameras. These capabilities can reduce cost and supply chain complexity, while simplifying integration efforts to support faster deployment."

CorrActions is engaged with multiple automakers to implement its solution in their vehicles, to improve driver and passenger safety and wellbeing. The solution allows fleets and telematics service providers to reduce insurance costs, improve delivery times, and increase driver safety.

General News

China Avatr 12 Deliveries Begin

GENERAL NEWS

The Avatr 12 is officially being delivered in 40 cities around China. The electric sedan has 578 hp, lots of Huawei technology, and no backglass. Since its November launch, it received over 20,000 orders.

Avatr Technology is a former joint venture between Changan and Nio, established in 2018; each party held 50 per cent. Nio withdrew in 2020, due to financial troubles. In 2021, Changan introduced a new partner who replaced Nio: battery giant CATL.

The Avatr 12 (pronounced "one-two") is the brand's second car and sells for C¥300,800 to 400,800 (USD $42,100 to 54,800) in China. It is a large sedan, measuring 5,020L × 1,999W × 1,460H mm with a wheelbase of 3,020 mm. It has two powertrain options: RWD 230 kW and AWD 425 kW. The AWD version can accelerate 0-100 km/h in 3.9 seconds.

Both versions store electricity in a 94.5-kWh battery from CATL, which provides 700 km and 650 km CLTC range, respectively. The car can charge enough to go 200 km in 10 minutes with its 750V ultra-fast charging support.

Inside the car, there's an enormously long 35.4″ CD screen stretched from driver to passenger. It also has a15.6″ central control screen. The vehicle is powered by Huawei's cabin SW HarmomyOS 4.

Three lidar units send input into Huawei's ADS 2.0 ADAS suite, which doesn't need HD maps and covers 90 per cent of urban driving scenarios, according to Huawei. The self-driving capabilities are one of the car's biggest marketing promotional points.

The Avatr12 also has a dimming sunroof, electrically-powered doors, digital rearview mirrors, hidden door handles, frameless windows, and R21 wheels with Brembo brakes. The main remarkable lighting component is the display between the hood and the windshield, shown here displaying birthday wishes.

Avatr have a design centre in Munich, Germany, where the 12 was created. Changan lean heavily on Europe for design; their other EV brand, Deepal, has a design headquarters in Turin, Italy, led by General Motors veteran Bertrand Bach.