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Weekly Newsletter

DVN
Lighting & ADAS

NEWSLETTER #745

Editorial

The Future Of Car Lighting Depends On Us All!

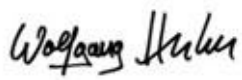
By Wolfgang Huhn, DVN Senior Advisor

ISAL 2021—postponed from last Autumn—started today with my keynote; I am very proud to have been chosen for such an important presentation. Professor Khanh asked me months ago to say what I've always wanted to say. I am freshly retired; my Audi contract ended April 1st, so I can speak freely now. But to be honest, I had a lot of freedom during all my professional years—there were no particular restrictions, so don't expect any big surprise.

In my keynote I talk about the future importance of car lighting. For 20 years its importance has risen continuously, but how about the next years? Many challenges are ahead: the car industry changes to EVs and software-defined cars; the tier-1 lighting business is in a huge structural change; new business opportunities pop up, enabled by technologies like over-the-air updates; new lighting elements, microoptics, and much more. It looks a lot like disruption.

On the safety side of our business, we have to look much more at the system. I mean the whole system, not our usual view to a subsystem like the headlamps. And we need to develop more adaptive systems—adaptive to the *complete* environment. The requirements for car lighting are very different in the colourful and bright ambience of a megacity versus the dim and rainy countryside. One of our future tasks will be providing the best light for the respective situation.

So, all in all the future of the car lighting depends on us all—the whole lighting community.



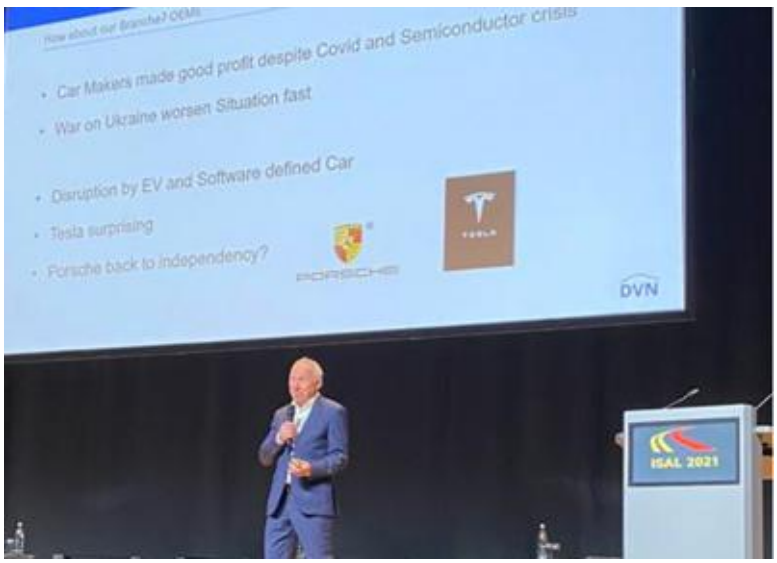
Wolfgang Huhn
DVN Senior Advisor

Last info on ISAL: 613 participants, 491 on site, 122 online, from 26 countries,
2 Keynotes,
75 Presentations

In Depth Lighting Technology

How Will Be the Future of Car Lighting?

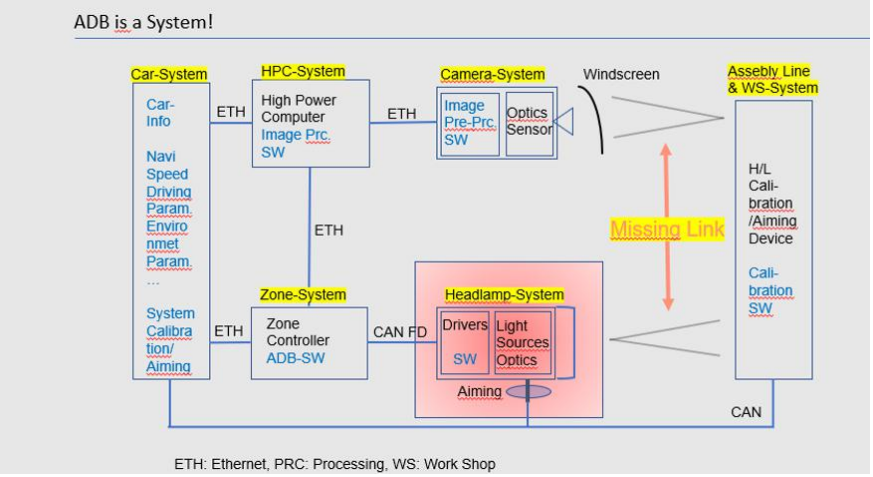
Wolfgang Huhn, formerly Audi's executive director of lighting and vision systems development—and now DVN senior advisor—opened the postponed ISAL 2021 by giving the keynote this morning. His lecture is a thoughtful summary of the vehicle lighting world's activities and challenges, starting with the status of lighting business. Software is becoming more and more important. Automakers are ringing up good profits and investing in EV and AV development and production, despite Covid; the semiconductor shortage, and Russia's war on Ukraine. With the scene set, Huhn went into specifics:



• There are various innovation enablers in a moving situation.
Tier-1 is in the throes of a major realignment, with huge takeovers shifting the topography: Faurecia bought Hella and created Forvia; Calsonic Kansei bought Marelli; LG Electronics bought ZKW;
Magna bought Olsa, and these kinds of mergers and acquisitions will continue. There's also no end in sight to the steadily increasing stream of innovations from suppliers of light sources; electronics and software; lenses and optical components; measuring equipment; semiconductors; plastic materials; simulation tools; sensors, and all the rest of the components, materials, and services that matter to lighting.

With the great change in our industry—the shift towards software-defined cars and lighting—OTA updates create new business. Separation of hardware and software is necessary to make way for new electrical and electronic architecture and car operating systems.

• **ADB is the greatest innovation in car lighting.**
ADB is a great Safety System. It should be mandatory!



ADB consists of several subsystems. Automakers often have no full-system owner, and tier-1 suppliers tend to care only for their own subsystem; at the end, all test methods are weak.

• **New Lighting functions are coming.**

All around the car! Lit roof rails; lit logos on the C-pillar and everywhere else; digital light; edge-to-edge front and rear position lamps; turn signal and reversing lamp projections; digital DRLs; light carpets; welcome/farewell lights,
and soon even more lights. Small projectors for dynamic ground illumination are starting to enter the car. Lit logos are trending, but legislation is still difficult. All Lighting Functions

are dynamic in future**.** We have to be careful with light pollution and the effects on elderly persons.

• **We are going very fast.**
Lighting technologies are getting outdated before becoming mature:- Xenon introduced 1991; last equipped cars were launched before 2020.
- Laser introduced 2014 in a race between Audi and BMW; today very low volume
- OLED was introduced in a similar race; has survived at Audi only
- LED generations last 2 to 3 years until next generation;
- The 'standardised' 84-pixel ADB with silicone optics lived for just 1 car generation
- DMD was introduced in 2020 and now under attack by µLED
- Microoptics approaching the market—the next disruptive thing!

Lighting News

Mind LED + Laser Bifunction Projector on Wey Mocha

LIGHTING NEWS

The Wey Mocha is new high-end car model from Great Wall Motors Group (GWM).
The model Mocha DHT-PHEV was officially presented in March, and this car will be offered in Europe this year.

WEY MOCHA

HEADLAMP WITH LASER MODULE (OUTBOARD)

Its headlamp, devised by Mind Optoelectronics, comprises two modules: a 24-pixel/ 2-row module inboard, and a bifunction LED low beam + laser high beam booster outboard. This combination of LED and laser light sources behind one 40 × 70 mm projection lens is the first such application in mass production in the automotive industry. The bifunction LED/laser module reduces the headlamp size, achieving a fine compromise between extra lighting modes and styling integration.

Mind were spun off from Great Wall Motors in 2018. They have three main activities: lighting; thermal, and electrical systems. They're in Baoding, close to Beijing, and have begun expanding their customers beyond Great Wall. At the 2020 Munich DVN Workshop, Mind presented in their expo booth a full laser headlamp with twin module laser low/high beam headlamp.

Three Questions to Mind VP Hossein Nafari:

DVN: How do you see the future of laser technology in lighting and in sensing?

Hossein Nafari: In sensing, NIR (near infrared) laser has its advantage for eye safety, antiglare feature. It has high potential for object/environment detection and communication. As for lighting, traditional laser lighting modules can provide ultra-high brightness (with a high cost); its application will be limited to high beam or high beam boost. On the other hand, laser fiber has many potential applications for signaling/signature or decorative functions, which will be a future trend.
We are now actively working on some amazing innovative projects of laser as car signature (being seen).

HOSSEIN NAFARI PRESENTING HIS LECTURE

DVN: Yours was one of the finest presentations at the Shanghai DVN Workshop last year. You announced the serial introduction of a 10-kpx ADB system for 2022, and 100kpx µLED module in 2025. Are you on track to meet those forecasts?

Hossein Nafari: As you know we have had recently many high and down in the electronics components supply chain. We massively worked out to ensure our production plan. It has impacted the new models launch and the time to market of our new products. For 10kpx ADB system, by the end of 2022, Mind will be able technologically ready for SOP. However, when this product will be available on the market depends highly on the electronics supply chain. For the same reason, we are in close partnership with suppliers for the 100-kilopixel system, and we will make out a clear roadmap soon.

On the other hand, we will have our 2nd-generation DLP module (> 1 megapixel) in the market for January 2023. I hope in a future DVN review we will have the chance to speak about that.

DVN: How do you see the most important challenges for the automotive lighting industry during the next five years?

Hossein Nafari: We must think about how to continue this level of technology evolution with challenges like:
• The lack and price increase of raw materials, rare earth and their supply chain. Microchips availability is a current example.
• Lack of knowhow and qualified resources, the pace of the companies needs of all the

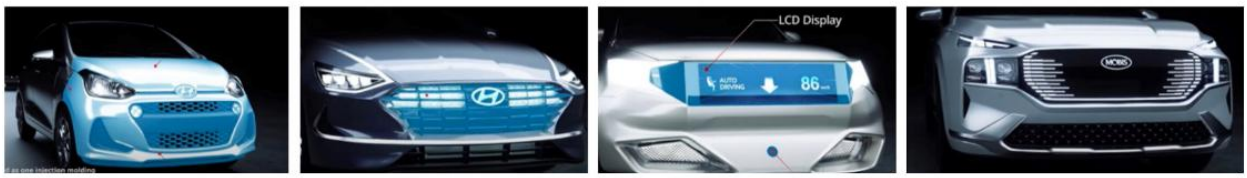
necessary professionals both in required quantity and quality is higher than their availability in the market.
• The world is becoming more isolated; it is necessary to have full-competence and find a new way of international cooperation.
• Remote working mode is becoming more common, It is a challenge to create an efficient team work with people working at distance.

And at the end I can say that as an engineer loving technology, we wait for new source of lights in the lighting technology, it will certainly be the big change in long-term.

Hyundai Mobis' UTILe Bumper Concepts

LIGHTING NEWS

UTILe is a system of bumper concepts from Hyundai Mobis, providing interactive experiences and other benefits. As an integrated bumper system, UTILe increases the range of electric vehicles and enhances visual and audio communication for autonomous vehicles.



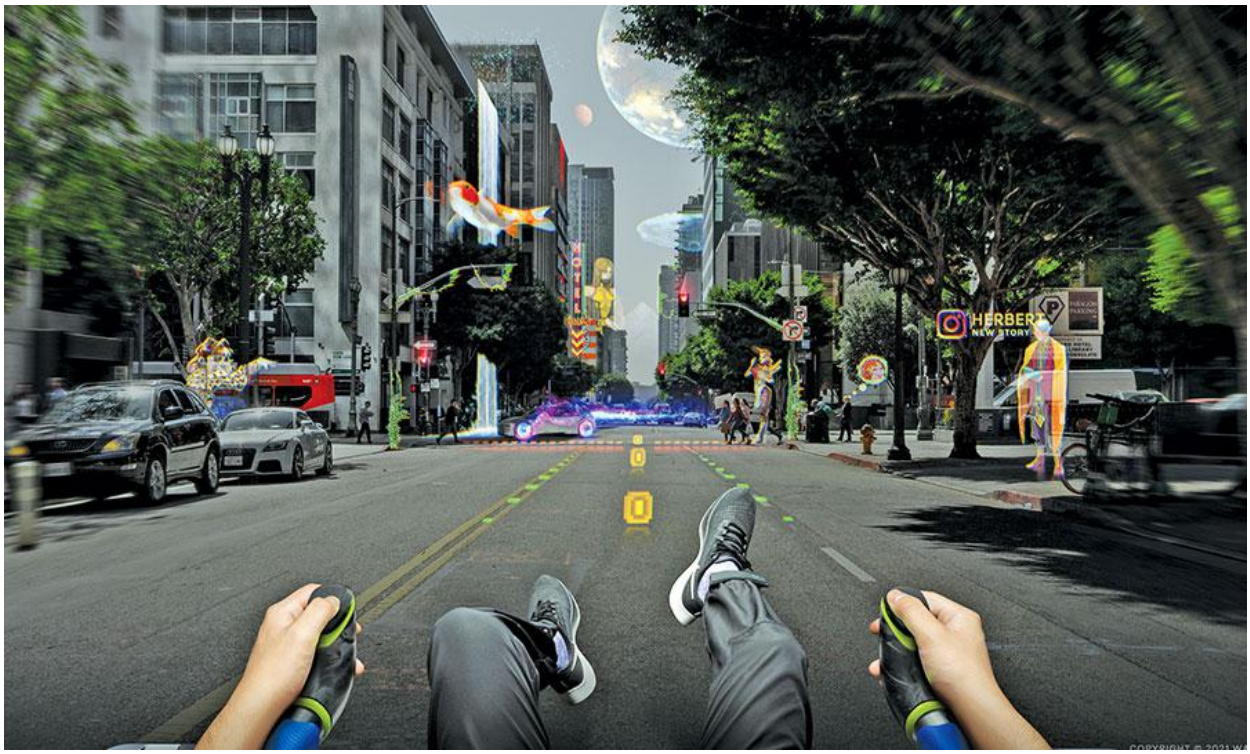
MOBIS UTILE BUMPER CONCEPTS (L-R): UNITED, TRANSFORMED, INTERACTIVE, LIGHTING

The four concepts are:
- **Transformed:** with lighting and new functional structures integrated with active air flap;
- **Interactive:** LCD display and speaker provide visual and audio messaging;
- **United:** Bumper and body are combined as one injection moulding, and
- **Lighting:** Dynamic LCD lighting with chrome appearance when unlit.

an **online video** presents a show-and-tell on the four concepts.

For future vehicles, startup looks into holographic tech

LIGHTING NEWS



The next "screen" for in-vehicle entertainment might be the window or windshield. WayRay, a Swiss startup, uses light created by holograms to give riders an immersive experience.

WayRay, a startup pioneering holographic technology, envisions glass as the surface driving the future of in-vehicle entertainment. For the past decade, the company, headquartered in Zurich, has explored the use of holograms projected on windows as a way to create unique experiences for vehicle occupants.

WayRay has raised $108 million in capital to date, including investments from Porsche Ventures and Hyundai Motor according to the company. It uses true augmented reality and deep-reality display technology to generate virtual images at any distance on multiple depth planes. The virtual images are generated by projecting a red-green-blue laser beam through a picture generating unit onto a holographic optical element, or foil, placed inside a transparent surface — typically a vehicle's windshield or side window.

"Hologram gives you this immersive feeling, so the wavefront, which is basically the light created by the hologram, makes your brain think that the object is real and that it is placed at some distance from where you are" WayRay said.

In December, WayRay announced a partnership with Karma Automotive to integrate a new form of augmented reality head-up display technology in a fleet of the automaker's future vehicles. WayRay said it also is working with several undisclosed automakers to apply its technology specifically for in-vehicle entertainment, content and gaming experiences.

Aschenbroich, chairman of Orange, to be replaced as Valeo chairman

LIGHTING NEWS

Valeo's Board of Directors acknowledges today's announcement of the decision of the Board of Directors of Orange to appoint Jacques Aschenbroich as Chairman of the Board of Orange following its General Shareholders' Meeting to be held on May 19, 2022, subject to his appointment as Director by such General Shareholders' Meeting.

Valeo's Board of Directors, under the guidance of the Governance, Appointments and Corporate Social Responsibility Committee, is continuing the process of selecting a new Chairman of the Board.
If this appointment is confirmed by Orange's shareholders, Jacques Aschenbroich will continue to act as Director and Chairman of the Board of Directors of Valeo until the appointment of the new Chairman and no later than 2022 year's end.

Magna: +11% at $36.2B in sales

LIGHTING NEWS

SWAMY KOTAGIRI, MAGNA CEO

World's 4th; 50+ customers; 158,000+ team members; 343 manufacturing facilities; 28 countries

"Despite the current industry challenges, we anticipate a more favorable production environment extending into 2024. About 90% of our 2024 sales are already booked, and our engineering investments in megatrend areas such as electrified powertrains, are expected to increase. The step-up in our investments for megatrend areas will impact our margins in the short term but will drive growth in the longer term. Today, a large portion of our engineering projects are related to the growing EV market. In addition, we are investing in ADAS and software, areas which will define a large part of the vehicle going forward, and we continue to look at the car of the future from a holistic view." Said Swamy Kotagiri, Magna CEO.

Total sales increased 11% to $36.2 billion, primarily reflecting the launch of new programs, the net business combinations, the higher global light vehicle production and higher assembly volumes.

Driver Assistance News

Elon Musk's Crusade against Lidar and Radar

DRIVER ASSISTANCE NEWS

Notoriously cocksure and capricious Tesla CEO Elon Musk deleted all radar equipment from the Model 3 and Model Y last year, and now he's likewise stripping the radar off the Model S and Model X—for now only on Teslas offered for sale in the U.S. and Canada. As for lidar, Musk has flatly refused to use it at all; he dismisses the technology altogether as "expensive sensors that are unnecessary" and a "fool's errand", and has smugly said "anyone relying on lidar is doomed". Meanwhile, the entire rest of the world—automakers, suppliers, researchers, academics, regulators—everybody who counts agrees lidar is crucial for robustly effective and safe autonomous driving.

Radar works even in foul weather and darkness that hobble cameras, and has a longer range than lidar, but provides a lower-resolution, black-and-white picture. Lidar provides a higher-resolution image at relatively short range, and can function in conditions that render cameras useless. The three types of machine-vision sensors potentiate one another's strengths and compensate for one another's weaknesses. Yet even as Musk claims his camera-only setup is the best system in the world, Tesla have announced that for now, it will operate only up to 130 km/h. Competing makers who put radars and lidars on their cars allow adaptive cruising at Autobahn speeds, which can exceed 200 km/h. Even though most North American speed limits are below 130 km/h, the difference does raise questions about the alleged superiority of Musk's scorn for lidar and removal of radar.

More, NHTSA have opened yet another Tesla investigation, this time on complaints Musk's camera-only Model 3 and Y cars brake—for no valid reason—to a screeching standstill in the middle of fast-moving highway traffic. In the US, there are about 400,000 Teslas on the road made since Musk deleted radar last year. Phantom braking exposes the vehicle to the risk of a severe rear-end collision, and it is one of the scenarios that led all other automakers to build their cars with sensor fusion systems including not just cameras but radars, lidars, or both.

Amnon Shashua is CEO of Mobileye, a global leader in computer vision and machine learning for AD and AVs. He says autonomous vehicles need more than just cameras; Mobileye's AD system is specified to include cameras, radars, *and* lidars, with each providing its own data stream the system will analyse and appropriately prioritise in case of conflicting information.

For Musk and his Tesla fiefdom, none of that reality exists. Perhaps with radar and lidar he could see what he's missing.

Mercedes Want Drive Pilot L3 on American Roads

DRIVER ASSISTANCE NEWS

With Drive Pilot in the Vision EQXX, Mercedes-Benz last December became the first automotive manufacturer in the world to receive the world's first L^3 AD system approved under the UN Regulations recognized by most of the world's countries—except on the American regulatory island. Now, they're pushing to get certain U.S. regulators onside.

In Germany, 13,000 km of motorway are approved for conditionally automated driving—which includes L^3. Mercedes-Benz are working to obtain approval from the authorities for the U.S. states of California and Nevada by the end of this year. Mercedes-Benz Group CTO for development and procurement Markus Schäfer says "In a first step, we are offering this world-leading technology to our customers in Germany, but will be rolling it out in the US as well by the end of this year if the legal and regulatory framework allows".

Drive Pilot uses the car's surround sensors already in place for the Driving Assistance Package, together with additional sensors the Mercedes people consider crucial for safe L^3 automated driving. These include lidar, as well as a camera in the rear window and microphones, especially for detecting flashing lights and other signals from emergency vehicles. There is also a wetness sensor in the wheel well. The S-Class with optional Drive Pilot also has redundant steering and braking systems and a redundant electrical system to ensure it remains manœuvrable even if a primary system fails and enables safe handover to the driver.

General News

VinFast to Build U.S. EV, Battery Plants

GENERAL NEWS

EV startup VinFast will build an electric vehicle assembly plant and a battery manufacturing facility in the U.S. state of North Carolina, with an initial USD $2bn investment. They opened U.S. headquarters in California last year and intend to move rapidly into the North American market with their VF8 and VF9 crossovers currently available for order.

Construction on the factory's first phase will start this year, with vehicle production slated to begin in July of 2024, with initial capacity of 150,000 per year.

VinFast were founded in 2017 to build combustion-engine vehicles in Vietnam. They delivered their first gasoline-powered vehicles in 2019; delivered their first EV there last year, and plan to go all-electric by the end of this year. They are part of the Vingroup conglomerate, which has interests in industry, hotels, technology, and real estate. Vingroup, established in 1993, has a total capitalisation of USD $35bn from three publicly-traded companies as of November 2021.