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Weekly Newsletter

DVN
Lighting & ADAS

NEWSLETTER #809

Editorial

I Drove The World's Best Lighting Simulator

It is always a great pleasure to visit the Mercedes-Benz Technical Centre in Sindelfingen.
This time, I was invited to see their new lighting simulator, developed under the lead of Martin Borowski. I met with him as well as Uwe Kostanzer, Stefan Töpfer, and Bjorn Böke.

I was proud of this invitation, because it was the first time the simulator was presented to external colleagues, and also I was all the more interested as one of my jobs at Valeo was to build a simulator—the first in the world—and show it to automakers during their visits in Bobigny, France.

What amazing progress has been made since that time! I was impressed by the feeling of driving an actual car, with a perfect rendering of not only the light on the road but also the wider environment; it really felt like I was on the road in the normal conditions of driving. This simulator is a great tool to improve the efficiency of the project development. In this week's DVNewsletter we bring you a detailed description of the simulator and its capabilities, including a DVN-exclusive interview with Uwe Kostanzer.

I remind you the **28th DVN Workshop** will be held in person on 29-30 August in San Francisco, California, with the theme *Lighting the Future: Safety, Communication, and Emotions for EVs, AVs & Trucks.*
All the DVN team are working constantly to build a most excellent event; six automaker lectures and 10 tier-1 lectures are already confirmed, as well as a fascinating keynote on a subject (and from a pair of scientists) we've never previously heard of!
250 to 300 attendees are expected, and if you're reading this, you should certainly be one of them. There are **only three days left for the early-registration discount**, so hurry fast and **grab your spot**.

Sincerely yours,

In Depth Lighting Technology

The Amazing New Mercedes-Benz Lighting Simulator

Stefan Töpfer · Bjorn Böke · Hector Fratty · Uwe Kostanzer · Martin Borowski

Uwe Kostanzer invited DVN's Gerd Bahnmueller and Hector Fratty to Sindelfingen, to visit the new crown jewel of Mercedes-Benz's lighting development and innovation facilities, their new simulator. This was the first time the simulator was presented to external colleagues. We warmly thank Uwe and all his team for the time they spent with us and the grand tour.

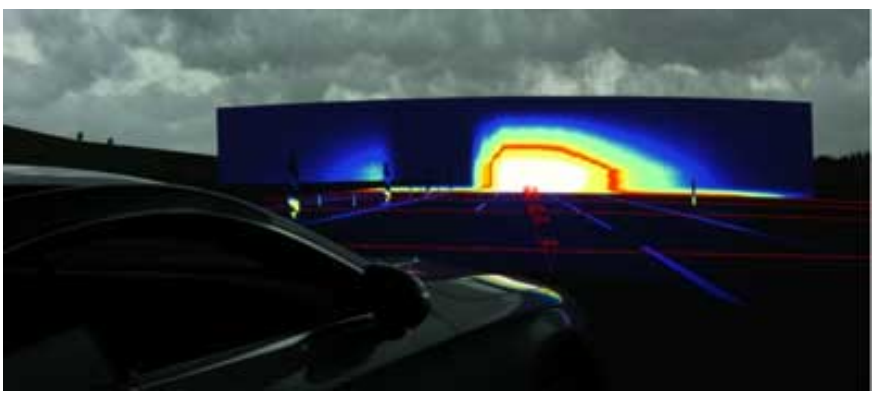
The simulator, located in the Digital Light Lab in a great dark area near a lot of computers, is a front half of a vehicle cut in two parts. The driver and the front passengers are in the normal condition of driving.

The evaluation of headlamp light distributions was—and still is—predominantly carried out in night driving tests. To obtain meaningful results here, good weather conditions with dry roads and good visibility are required in addition to darkness. Often, driving tests have to be postponed due to bad weather. They must take place late at night during the spring and summer months. This requires a lot of time and often flexible planning. And the appropriate hardware must be set up for a drive test, which incurs significant sample costs, especially in early project phases.

Moving the evaluation of headlights to a laboratory environment and using digital data instead of elaborate samples saves a great deal of time and money. And the evaluations can be better planned, independent of weather and ambient-light conditions that cannot be influenced. Moreover, the simulator facilitates testing and optimisation of software algorithms.

Development and construction of the simulator was done at Sindelfingen. Hardware and software were devised in-house, with Martin Borowski in charge. Calculation and simulation of lighting are well-known operations; the difficulties are in faithfully reproducing light performance on the road, and accurately rendering light in the environment. The light on the road is provided by four projectors designed and specified to reproduce the real light. One of Borowski's main jobs was to optimise the number, the function, and location of the projectors to precisely reproduce the total experience of the car's lights.

It was, of course, very big effort to craft an environment as real as possible. A country road is integrated into the simulator; it's one regularly used for night driving tests, and therefore the MB team know it well. There's also a fictitious but realistic highway with six lanes and a construction site section. It is possible to simulate static and dynamic low beam and high beam; added functions like bending light; country light, and high beam with added light in the left part of the road—in all weather conditions including rain and fog, and with wet roads.



The driver 'starts' and 'drives' the car in the usual manner, using the accelerator, brake pedal, and steering wheel. It is not a videogame-type experience; rather, it really

recreates the feeling of driving a car. To see the quality of the light—its homogeneity; spread, and range while doing the normal driving tasks like staying in lane and following the curves; overtaking and being overtaken—it is an impressive rendering! It seems you are on the road in the normal conditions of driving. After few minutes, you forget you are in a simulator. The feeling is augmented by the high-fidelity rendition of not only the light on the road but also by the rendering of the environment: safety rails; lines; trees, and other suchlike. It presents true-to-life highway and country road environments. You drive with a great attention and so you see what you need to see about lighting: does the system need more light at the curb; does it need more homogeneity, more distance reach?

It is a delightful surprise to see such realistic road and environment simulations in daytime and twilight.
There's possibility to have a bird-eye view with the same rendering, too. At the end of the simulated night drive, the ADB was presented, with encouraging results.
To configure the simulation, Mercedes-Benz engineers receive optics calculations from the suppliers; input them to the computer and…that's it! Immediately, they can drive the car at night with the light from calculation. Without slow and costly hardware prototype revisions, systems; components, and software can be validated, or modifications can be requested and tried out.

After this first validation, a mock-up is built, and its light output is input to the computer for a second validation before the production tooling process begins.A few weeks later, the first production-tooled parts' light output is input for a third and final validation. Before each validation, a lot of modifications are made—not outside on the roads, but inside in the simulator. A final validation closes the project concerning lighting quality.

DVN Interview: Uwe Kostanzer

DVN: This is a wonderful simulator! Will you tell us what spurred its development, and how you're using it?

Uwe Kostanzer: Thank you! We decided to develop our HD lighting simulator back in 2015, because we were convinced it would help us to optimise development time, hardware effort, cost, and quality by using advanced digital methods. Over the years, we continuously extended the setting and features to come to today's really impressive simulator. Of course, the simulator has already been used in a lot of series projects to evaluate light distributions and is now even in use for the development of our MB.OS dynamic light system algorithms. I am proud to say, that the simulator is an integral part of lighting development at Mercedes-Benz today. And there is another benefit: By reducing the number of real test drives on the road, the environment is also protected. A benefit for all of us.

DVN: What are the next steps for it? Are there new features you will implement?

U.K.: The current setting of our simulator is already capable of supporting all our daily needs as developers. But of course, we are continuously pushing it to further steps. In future, we will see improvements of simulation quality, and we already integrated the first HD lighting functions like projection of guiding lines, lane-keeping, and wrong-way-alerts. I am sure that we will see many more optimisations and news in the future. this is just the beginning. Let yourself be surprised!

DVN: In the simulator, you focused on the front lighting. Will you also be using it to evaluate the appearance of rear lamps and other signal lights?

U.K.: At the moment, the simulator is mainly used for front lighting and is optimised to show the 'ego' light distribution in the best possible way. The evalution of rear and signal lighting could be another future topic. The setup of the simulator would definitely be a perfect base for that.

DVN: You are one the most experienced experts on lighting, and you have made a wonderful lecture in Paris about the past, present, and future of lighting. Will you share your thoughts on the progress of car lighting?

U.K.: The answer to this question could probably fill a whole evening's discussion with you…! In terms of light sources and lighting performance, we really have great possibilities today. All the boundaries we had with bulbs, halogen, and HiD light sources have been broken by the great flexibility, performance, and variability of today's LED applications—including the innovative Multibeam and Digital Light technologies.
If I look at the the first adaptive functions, e.g., curve lights introduced more than 20 years ago, and compare it to the feature set of our current Mercedes-Benz vehicles, I really have to say that adaptive light functions including AFS, ADB, and assistance projection have become the game changer in lighting. Our intelligent software working hand in hand with great lighting technology really makes the difference in terms of user experience.

Software has become increasingly dominant in lighting development in recent years. That is the right way and it's very important. But keep in mind, software needs powerful hardware and vice versa.

Designwise, I see that headlamps and rear lights still shape the exterieur appearance of a vehicle like nearly nothing else. And every OEM is using lighting to create their own signature look, which I like a lot.

Today, we, lighting developers, have more possibilities than ever, and I think there will be a great future for the lighting business and the lighting community. There will be lots of new applications, use cases and features, for sure. But I want everyone of us still to focus on our core task, which is safety: provide the best illumination for drivers, make vehicles recogniseable in the best possible way, and avoid dazzling other road users.

DVN: And how do you see the future, in the next 10 years?

U.K.: There will definitely be an increasing number of automated driving vehicles over the next years. Mercedes-Benz is the first OEM offering L^3 functionality in the current S-Class and EQS, and we will see higher driving levels and many more driving scenarios that will be handled by our cars.
In our role as lighting developers, we will play a key role for enabling automated driving during nighttime, supporting visual sensors with dedicated light distributions and contributing our knowledge, e.g., in lidar technology. Exterior lighting can also be used for communication with other road users indicating the drive mode, displaying messages and thus increasing trust in automated vehicles.

DVN: Do you think the arrival of EVs will change the evolution of lighting?

U.K.: Electric vehicles have already brought new influences to lighting. Lighting is a perfect topic to differentiate electric vehicles, like for example Mercedes-Benz does it with the lightbars. On the other hand, electric vehicles require more sensitivity in regards of energy consumption, even in the 12V power net, where we have influence of the lighting systems. So the demand for efficient lighting functions and smart operation strategies will become more important in the future.

DVN: About ADB, the greatest innovation in lighting, do you foresee 100 per cent equipment rate in the Mercedes-Benz cars at the end of this decade?

U.K.: At Mercedes-Benz, we already offer Multibeam and Digital Light systems, including ADB, in all vehicle segments. This gives our customers the option of choosing an ADB system in every carline. In the upper segments and in some markets, we have already reached 100 per cent equipment today! Our clear goal is to convince our customers with the great advantages of ADB to achieve this equipment ratio in all segments in the next years.

DVN: What about ADB in US? Are you working to fulfil the specific US requirements?

U.K.: Yes, we are working on the fulfilment of the new US requirements, and are convinced, we will be able to bring ADB to the US in our future carlines.

DVN: How do you see the future of new functions considering lane light and symbols?

U.K.: I clearly see that lane light and driver assistance projections contribute to traffic safety, like several studies have already proven. The implementation of those projections in the UNECE regulations at the beginning of this year was a great milestone for us. For the future it will be our task to not just increase the number of use cases, but identify and standardize those ones, that really prove their safety value-add.

Lighting News

CR Objects to Lazy Brake Lights; Automaker Promises Fix

LIGHTING NEWS

by Daniel Stern, DVN Chief Editor

Legal car lights aren't necessarily safe ones. This isn't exactly a new revelation; DVN Daniel Stern discussed the matter in detail at a DVN Workshop **keynote speech** in 2021. And just last month, we **reported** on a vlogger who squawked about the problematic brake lights on his recent-model EV: they illuminate only when the brake pedal is pushed, not under regenerative braking, which on his model (like many others) can decelerate the car quite aggressively. That's no longer legal in most of the world, because UN Regulations have been adjusted to require that stop lights illuminate whenever a vehicle's deceleration exceeds a threshold, no matter by dint of brakes or regeneration or some other means. But on the North American regulatory, there's no such requirement; MVSS 108 calls for the stop lights to operate when the driver applies the brakes, and is silent on whether anything else should trigger the stop lights. Under the region's general regulatory philosophy—whatever isn't expressly prohibited is allowed, as long as it doesn't impede any required safety device, function, or element—it's legal for an automaker to configure their cars so the stop lights come on under regenerative braking, but they don't have to.

Now, Consumer Reports has spoken up on the matter. In an **article** posted and updated recently, the auto-testing powerhouse reported they first saw this safety hazard in the BMW i3, back in 2014. They checked all the EVs in their present test fleet, and found a variety of Hyundai and Kia models exhibit the same behaviour: no brake

lights under even heavy regenerative braking. They also found a different kind of brake light anomaly on a Mercedes model; the stop lamps light up under regenerative braking, but then they turn off once the vehicle has stopped, unless or until the driver actually steps on the brake pedal.

Hyundai-Kia responded to Consumer Reports: they're working on a software update they'll provide at no cost for the affected vehicles, to make the stop lights illuminate when the vehicle's deceleration exceeds 0.13g; that's the same behaviour required by the apposite ECE Regulation. Mercedes-Benz's response was a bit different: "*The brake lamp control is not a design element. It functions in compliance with regulations. Brake lamps are not required to illuminate while the vehicle is stationary and the brake pedal is not depressed*". All of which is true; Mercedes-Benz aren't doing anything illegal on this, as NHTSA confirmed in their own response to CR's report: "*FMVSS 108…does not require the [stop] lamps to be activated at a specific level of deceleration…NHTSA currently does not have any open rulemakings to establish a new requirement on this topic*".

It's impossible for an observer (such as the driver of a following car) to discern whether a vehicle is being slowed by the brakes or by some other system, but for the foreseeable future in American traffic, stop lamps that might or might not illuminate when a vehicle is being deliberately decelerated are equally legal as stop lights which always do.

If only from a liability standpoint, that's worth a few moments' thought.

New Osram LED is Brighter, More Efficient; Costs Less

LIGHTING NEWS

AMS Osram have launched the third generation of their Oslon® Compact PL family of automotive LEDs. They're 8 per cent brighter than the previous second generation. The new Oslon Compact PL produces 440 lumens in single-chip form, up from 405 before; this gives setmakers the option of providing greater light output with the same number of LEDs as before, or providing the same output as before with fewer LEDs. And the new LEDs' greater output also lets setmakers use optics the previous LEDs might not have been bright enough to support.

The AEC-Q102-qualified new Oslon Compact PL is based on the UX.3 chip. It is certified for corrosion robustness to Class 3A. The single-chip variant produces a typical output of 440 lumens; it is also available in 2-, 3-, and 4-chip variants. Two package options are available. The three-pad version includes one isolated thermal pad for increased heat dissipation. The two-pad version has larger pads to provide a more stable bond with a low-cost aluminium PCB.

The six products in the new 3rd-generation Oslon Compact PL series are

- KW CWLPM3.TK: single 1,150-µm chip, two-pad LED, typical 455-lm output
- KW2 CFLNM3.TK: dual 1,030-µm chip, four-pad LED, typical 880-lm output
- KW3 CGLNM3.TK: triple 1,030-µm chip, four-pad LED, typical 1,320-lm output
- KW4 CHLNM3.TK: quad 1,030-µm chip, four-pad LED, typical 1,760-lm output

VW in Brand-Autonomy Profit Push

LIGHTING NEWS

VW Group CEO Oliver Blume

The Volkswagen Group are giving their brands, including Audi and Škoda, more independence on cost savings and efficiencies to improve returns and make the automaker more nimble in the EV revolution. The group have set 'performance programs' for each brand, allocating capital and setting specific return-on-sales goals, but responsibility is devolving to the brands as to how those goals will be reached.

VW will also focus on speeding up product development at their Cariad software unit, according to Group CEO Oliver Blume.

The group aim to raise returns to 9-11 per cent by the end of the decade while prioritising value over volume; another goal is annual sales growth of 5 to 7 per cent on average until 2027. Chief Financial Officer Arno Antlitz says the group must pivot toward "our value over volume approach, be very disciplined on fixed cost, be very disciplined on investment and rather focus on value".

VW are working through software issues that have delayed key models, and must shore up sliding market share in China and improve their EV offerings. Blume's main target is the VW brand, which hasn't been keeping up with competitors such as Stellantis—that's left the company unhealthily dependent on luxury brands like Audi and Porsche. The VW brand is said to need a sustained boost in earnings of about €10bn in 2026; achieving it could hinge, in part, on the outcome of talks with VW's labour unions, who could veto measures that might save cost at the expense of the labour force.

IM L7 Has 'Intelligent Lamp Language System'

LIGHTING NEWS

Car lamps are no longer limited to providing see-and-be-seen lighting; now they also can provide interaction and display a vehicle's 'personality'. The new high-end EV brand IM Motor has launched what they're calling an 'intelligent lamp language system'. Their L7 model has DLP digital projection headlamps with a projection resolution of 2.6 Mpx. They can project information with high brightness and precision, contributing toward traffic safety and communication between people and vehicles.

The car's 'ISC intelligent interactive lighting' is driven by Texas Instruments 48-channel TLC6C5748-Q1 LED driver, which can drive over 5,000 LEDs in the front and rear of the vehicle through highly-integrated independent pixel control, displaying rich graphics and animation effects.

In addition to hardware support, the L7 also provides a space for car owners to express themselves personally through vehicle lighting, again via the ISC intelligent interaction system.
For example, when the owner walks toward the vehicle, the ISC light cluster can show the vehicle's state of charge. When charging, the ISC light group will also show the charging process with an animation, and show the power status through proportional images, so that users can easily understand the power of the vehicle when they are outside the car. When the owner drives on the road, the ISC light cluster will also allow the owner to communicate efficiently with pedestrians and other traffic users. One of the most distinctive vehicle lighting languages is pedestrian courtesy mode: when

encountering pedestrians during driving, the intelligent vehicle lighting language system can throw two rows of interactive arrows to the ground. The ISC at the front of the car will display a dynamic pedestrian sign to show friendliness, and the ISC at the rear of the car will also display a dynamic little-man-crossing-the-road animation, the idea being to tell the vehicle behind *I am giving way to pedestrians, please wait.*

When a pedestrian is passing, the vehicle's lighting and perception systems cooperate to monitor the oncoming traffic behind in real time. If a vehicle is approaching, a flashing no-go sign appears on both sides of the DLP projection on the ground, and ISC will appear yellow and flash to warn pedestrians. After pedestrians pass, owners can also flash a thumbs-up to the car behind through ISC intelligent interactive taillights, which the IM say they hope will "make the traffic atmosphere becomes more harmonious and friendly".

Cadillac's Escalade IQ De Luxe Electric SUV

LIGHTING NEWS

Cadillac's electric Escalade IQ will be launched on 9 August. In the meantime, GM have dropped a teaser photo of the new SUV's front end.

The image is deliberately shadowy, but shows its lighting signature; we see the familial twin vertical light pillars as bookends to a new wings-of-light grilleboard display, and an illuminated Cadillac crest in the middle.

Driver Assistance News

Denza N7 Has Lidars In Bumper Fascia

DRIVER ASSISTANCE NEWS

BYD's Denza N7 is based on the Inception concept car. It has a no-grille front end, with arrowhead-shaped headlamps reinforcing the arrow theme with triple 'feathers'. A white swingline light below each lamp highlights 'cheekbones' below the headlamp 'eyes'

There's a delta-shaped blackout zone at each side of the bumper fascia. In the past, this might have been where fog lamps would be located. But in this car, each of these areas contains a lidar. They use black crystal material, so the lidar and the front face are perfectly integrated.

The rear lighting system includes the fashionably obligatory full-width red light band, tying together taillights which echo the headlamps' triple-arrow-feathers internal design. The first production N7 officially rolled off the production line days ago on 20 June; deliveries will ramp up in July and August.

General News

Renault's New Rafale

GENERAL NEWS

Renault’s new flagship model will be the Rafale, a midsize coupe-style SUV revealed at the Bourget air show. It takes its name from a record-breaking 1930s airplane built by the aviation company Caudron-Renault, and replaces the Talisman midsize sedan and station wagon as Renault’s top-of-the range car.

Renault say the Rafale is the first car to use the visual language of design chief Gilles Vidal, former head of Peugeot design "Renault is back in the game at the heart of the global market," Renault Group CEO Luca de Meo said.

In designating the Rafale as their top model, Renault are focusing on amenities for passengers as well as the driver. A new panoramic glass roof is 1.5 metres long by 1.2 metres wide and can darken to provide sun protection in seconds.

2024 Buick Envision to Launch with Super Cruise

GENERAL NEWS

Buick released the first images of the 2024 Envision crossover, which includes General Motors' Super Cruise hands-free driver-assist technology and design cues inspired by the brand's Wildcat EV concept.

It will become so in 2024 the first of the brand's vehicles in North America to adopt GM' Super Cruise hands-free driver-assist technology.

The freshened Envision is also favouring more sculptural lines, a wider stance and roomier interior, along with checkmark-style headlamps, a reworked grille and Buick’s updated tri-shield logo.