Tue, 1 April 2025
Weekly Newsletter

DVN Lighting

NEWSLETTER #898

Editorial

Car Lights Cost More Now

Some weeks ago, The SRA (Sécurité et Réparation Automobiles, a French association of car insurance companies) published a report about the huge, 70 per cent upward price evolution of replacement car lamps over the last four years. This is certainly not unique to France, and it's largely on account of technological evolution; LED lamps cost more than halogen ones, whether they're new or used. The average price for a replacement headlamp in France is €810. For an older vehicle, around 15 years old, the average headlamp price is €465; for a vehicle under 2 years old it's €1,094.

At the same time, SRA mentioned that 91 per cent of damaged lamps cannot be repaired; they must be replaced. For damaged vehicles that cannot be repaired—end of life vehicles—headlamps have the lowest level of reuse—only 4.9 per cent, compared to hoods (9.4), tailgates (18.1) or even front bumpers (5.6 per cent). They are just too complex to package, transport, or reuse due to complex lamp ECU management.

There are other reasons, too. There are a lot of ways for headlamps to deteriate with age and usage, and most lamps cannot be repaired, except for lens polishing (which raises its own durability-of-repair issues) and bracket replacement if suitable parts are available and the lamp's brackets happen to have broken in a repairable way.

The SRA want industry to make lamps more readily repairable and reusable. Every year in France alone, 300,000 headlamps cannot be repaired. With an estimated average CO_2 footprint of 45 kg CO_2 per headlamp, that means 13,500 tonnes CO_2 equivalent, similar to 62 millions kilometres driven by ICE vehicles.

We in the vehicle lighting community—as discussed in our sustainability session at the DVN Munich event—can and should pick up and run with this challenge. We must initiate the action. As said by Valeo Keynote Mino Yamamoto in Munich, 80 per cent of the job is done during design phase, after which it is too late to change the reusability or repairability of a lamp. Read all about it in our coverage of the SRA report in your DVNewsletter this week.

Sincerely yours,

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

In Depth Lighting Technology

Euro NCAP's 10 Best '24 Cars, With DVN Analysis

Euro NCAP have revealed the safest models they tested in 2024. Best-in-class winners included the Škoda Superb and Volkswagen Passat (twins winning jointly), the Mazda CX-80, and the Zeekr X. The overall best score was garnered by the Mercedes-Benz E-Class, which achieved the best weighted average of the four safety categories in the protocol: adult occupant protection, child occupant protection, vulnerable road user protection, and safety assist technologies.

Euro NCAP Secretary General Dr. Michiel van Ratigen says, "The automotive industry had a challenging year in 2024 marked by weak consumer confidence and difficult economic conditions. Given these difficulties, Euro NCAP finds it especially encouraging that car makers continue to place significant emphasis on safety innovation and equipping cars with the newest safety systems. This firmly places consumer safety at the forefront of automobile design, as it ought to be".

20 of the 44 tested cars were small SUVs. The Chinese Zeekr X outperformed competitors including Deepal's S07, the Porsche Macan, the Cupra Tavascan, the MG HS, the Toyota C-HR, the Volvo EX30, and the Xpeng G6. The Zeekr X also won the best-in-class award for the safest EV of 2024.

In the large SUV class, Euro NCAP tested six seven-seater vehicles. The Mazda CX-80 won best-in-class for 2024, edging out the Audi Q6 e-tron.

The winning large family car was the Volkswagen Passat and Škoda Superb—twin vehicles built on the same platform, which delivered the same class-leading safety performance.

There were no contenders in 2024 for the small family car class, as the top-scoring vehicles were ineligible because they had a 'red' body part score in their safety testing.

EURO NCAP | Best in Class 2024 ★★★★★

	Adult Occupant	Child Occupant	Vulnerable Road User	Safety Assist
Mercedes-Benz E-Class Best Performer	92%	90%	84%	87%
ZEEKR X Best in Class Small SUV Best in Class Pure Electric	91%	90%	84%	83%
Škoda Superb **VW Passat** Best in Class Large Family Car	93%	87%	82%	80%
MAZDA CX-80 Best in Class Large SUV	92%	88%	84%	79%

To define the best in class, a calculation is made of the weighted sum of the scores in the four areas of active and passive safety assessment. This is used as the basis for comparison of the vehicles. Cars qualify for best-in-class based on their rating with safety equipment and functions fitted as standard.

Analysis by DVN's Paul-Henri Matha

I took time to check the lighting performance of the winning cars, to see if they are also best-in-class.

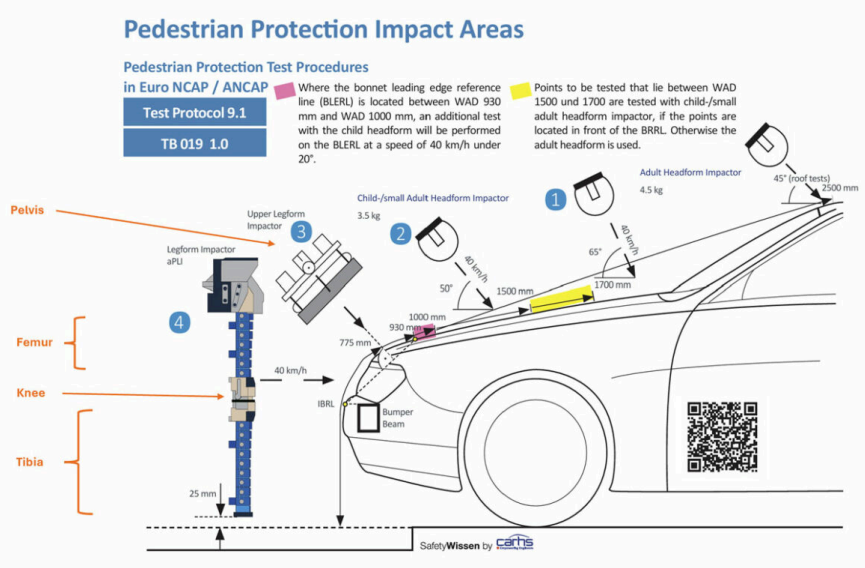
Balance limits for years 2023 and 2024

2023-2024	Box 1: Adult Occupant	Box 2: Child Occupant	Box 3: Pedestrian	Box 4: Safety Assist
5 stars	80%	80%	70%	70%
4 stars	70%	70%	60%	60%
3 stars	60%	60%	50%	50%
2 stars	50%	50%	40%	40%
1 star	40%	40%	30%	30%

You get the 5-star rating if the boxes 1 and 2 are above 80 per cent and the boxes 3 and 4 are above 70%. Impact mitigation is mainly focused on ADAS. Headlight performance—low and high beam—can help to detect pedestrians and bicyclists by night.

Impact protection is focused on energy absorption when a car contacts a VRU in four areas:

- Headform test zone (18 points; cyclist, adult, and child/small adult). Especially hood, A-pillar, and windshield
- Pelvis and femur (4.5 points each). Especially headlamp area (tests at same height)
- Knee/tibia (9 points). Especially the bumper area



To reach the 5-star rating, the main effort for a lighting team is pedestrian impact performance.

Head impact performance is limited to the area between WAD (wraparound distance): 1, 000 mm and 2,500 mm.

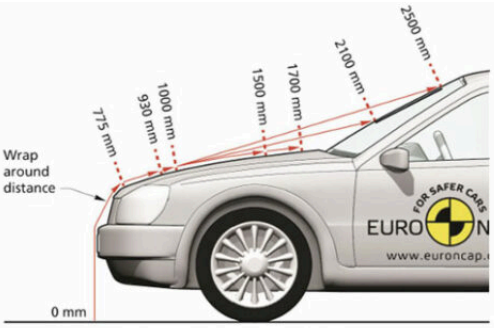


Figure 9: Marking wrap around lines

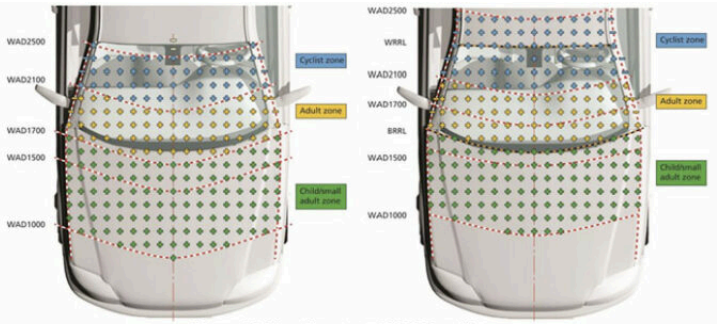


Figure 20 Identification of VRU headform zones

The child/small adult zone is defined as all grid points on WAD 1,000 to 1,500 mm. The adult zone is defined as all grid points rearward of WAD 1,700 mm, up to and including 2,100 mm. The cyclist zone is defined as all grid points rearward of WAD 2,100 mm, up to and including 2,500 mm.

This adult zone is usually not a concern for lighting but may be, depending on exterior designer willingness to put a lamp there, as on the Avatr models or the Li Mega.

Usually, headlamps are mounted at between 500 and 1,000 mm above the road surface (minimum and maximum legal heights in UN R48). SUV headlamp height is usually above 850 mm; sedans are usually around 650 mm. These heights put the headlamps in the impact zone, so they must safely interface with a pedestrian's head.

The pelvis (upper leg) test is done at WAD 775 mm, a common height for headlamps. To fulfil the test, common practice is to use breakable headlamp bracketry and to keep free space between headlamp and platform components behind it.

The taller the car is, the more severe the energy impact is (see formula below). This adds challenge to the task of headlamp energy absorption management.

10.3 Determination of Impact Angle, Impact Energy and Impact Velocity

10.3.1 The impact angle α in relation to the ground at each grid point is perpendicular to a straight line passing through the internal bumper reference line and WAD930mm at the same lateral position from the vehicle centreline. Measure and record the angle α at each grid point to be tested.

10.3.2 The nominal impactor energy to be used in the test shall be calculated using the following formula:

$$En = 0.5 \times m_n \times v_c^2$$

Where:

$$m_n = 7.4kg$$
$$v_c = v_o \cos(1.2\alpha)$$
$$v_o = 11.11 \frac{m}{s}$$

10.3.3 The test velocity v_t shall then be adjusted to meet the nominal energy by using the following

Femur, knee, and tibia tests are done in the lower area on the bumper. More and more vehicles have lamps in this area.

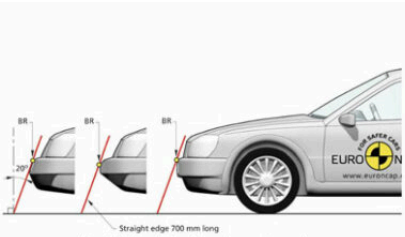


Figure 12: Determination of upper bumper reference line

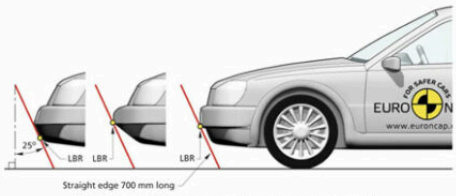


Figure 13: Determination of the Lower Bumper Reference Line

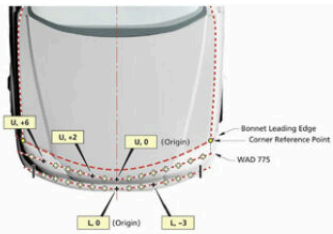


Figure 23: Labelling the Upper Legform and Legform grid points

Now, in that context, let's look at the NCAP best-in-class results:

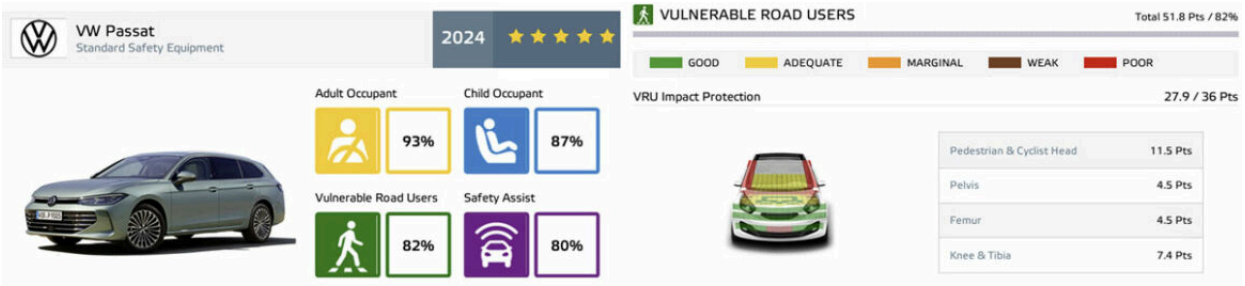
Mercedes E Class

For VRU impact protection it got 28.1 points out of a possible 36. It lost points in the upper leg test, achieving 0.7 points out of a possible 4.5. This is understandable because the headlamp is in this area.

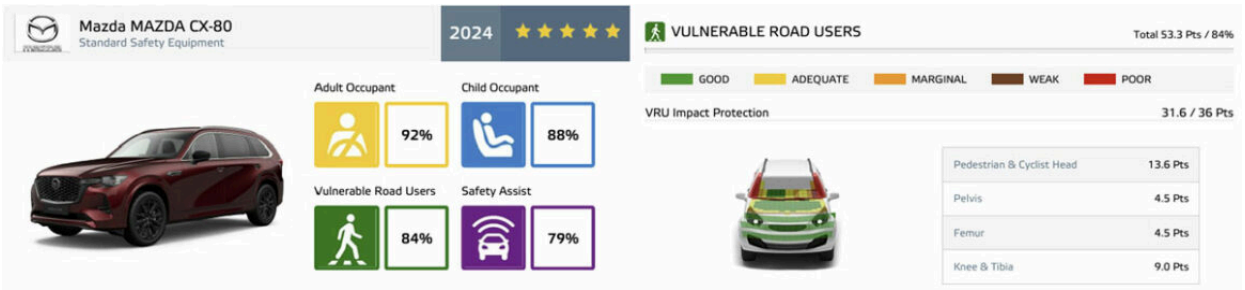
Škoda Superb

For VRU impact protection it got 27.9 out of 36 points. It got a perfect 4.5 in the pelvis test, but not as well as the Mercedes in head impact, especially in the hood area. The Passat, on same platform, has exactly the same results. This can be explained because Mercedes E Class has an active hood) that improve pedestrian performance.

VW Passat

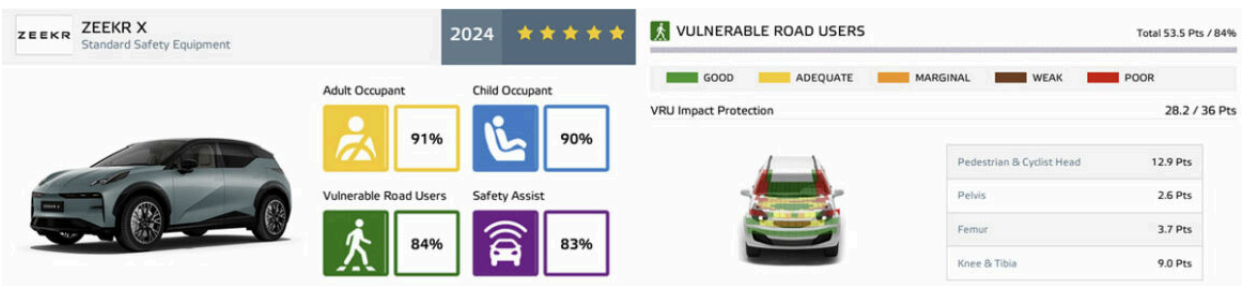


Mazda CX-80



About Mazda, For VRU impact protection it got 31.6 out of 36 points. It got full points for the pelvis, femur, knee, and tibia tests. The headlamps are mounted higher, certainly around 900 mm, above the pelvis test area but right in the child head impact zone, which explains the red line on the hood around WAD 1,000 mm.

Zeekr X



For VRU impact protection it got 28.2 out of 36 points. It didn't do so well in the pelvis area especially (bumper headlamp location) and in child head impact around WAD 1,000 mm (DRL area).

So, nobody got maximum points for all impact criteria. Energy absorption is not simple; it requires a lot of R&D loops to find a good compromise between design, energy absorption, and robustness.

The Mercedes E-class has the best head impact results (certainly helped by active hood), the Zeekr X has the best knee and tibia scores, and the VW-Škoda twins and Mazda the top score in pelvis and femur.

Overview:

Pedestrian safety has mainly been a topic in Europe and some parts of Asia but in the near future, it will also come to the US market, as NHTSA have recently finalized their NCAP testing protocol that is planned to start in model year 2026. There is also a protocol for pedestrian protection, the first such effort in the U.S. market. Since that market is dominated by very large vehicles, it will be a big challenge for the domestic brands and models. Lamp design will surely be influenced a lot by this, one would assume.

Test methods are taken from Euro NCAP, except for the lower leg impact where the U.S. test will use the old Flex PLI legform instead of the newer aPLI. Scoring is also a bit different than Euro NCAP.

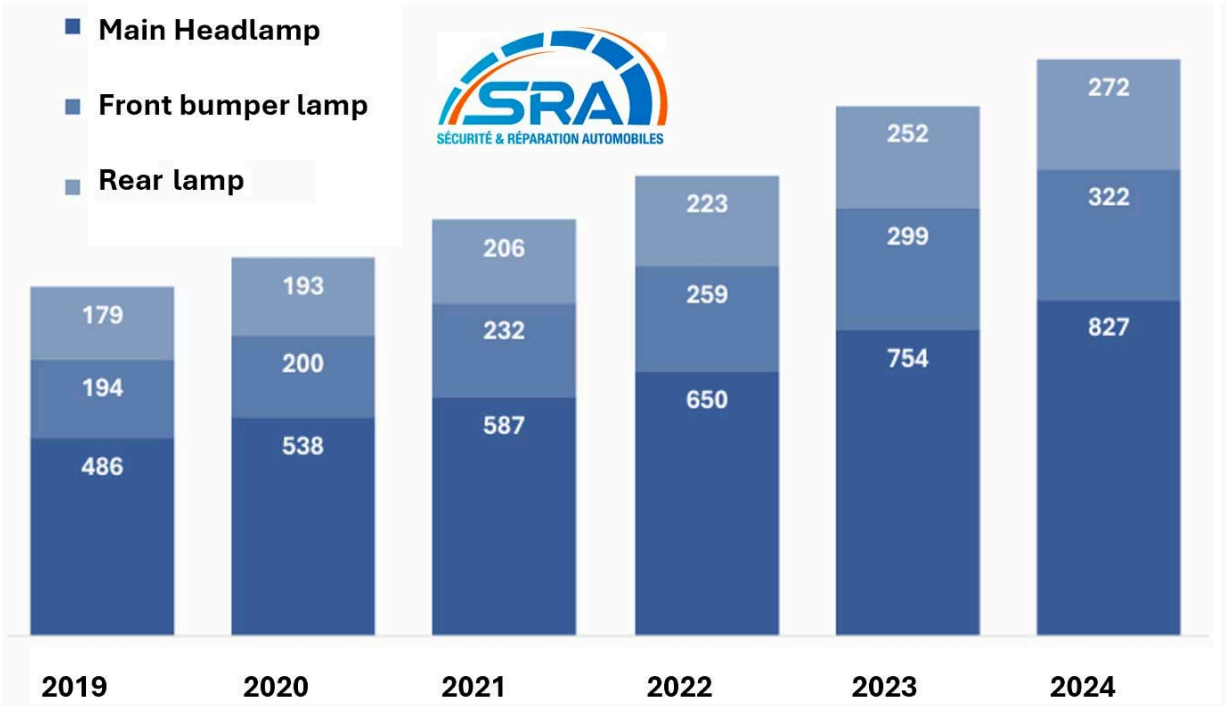
Table 4. Scoring Apportionment Summary

Body Region	Apportionment	Maximum Possible Points
Head	50%	18.000
Upper Leg	25%	9.000
Lower Leg	25%	9.000

Lighting News

Car Lights are Costly, Not Repairable: SRA Study

LIGHTING NEWS



By Paul-Henri Matha

The SRA (Sécurité et Réparation Automobiles) is a French association of car insurance companies. Created in 1977, it aims to help limit the cost of car claims for policyholders. The SRA have a database of French vehicles available to members—cars, yes, and also two-wheelers and all motor vehicles weighing less than 3.5 tonnes.

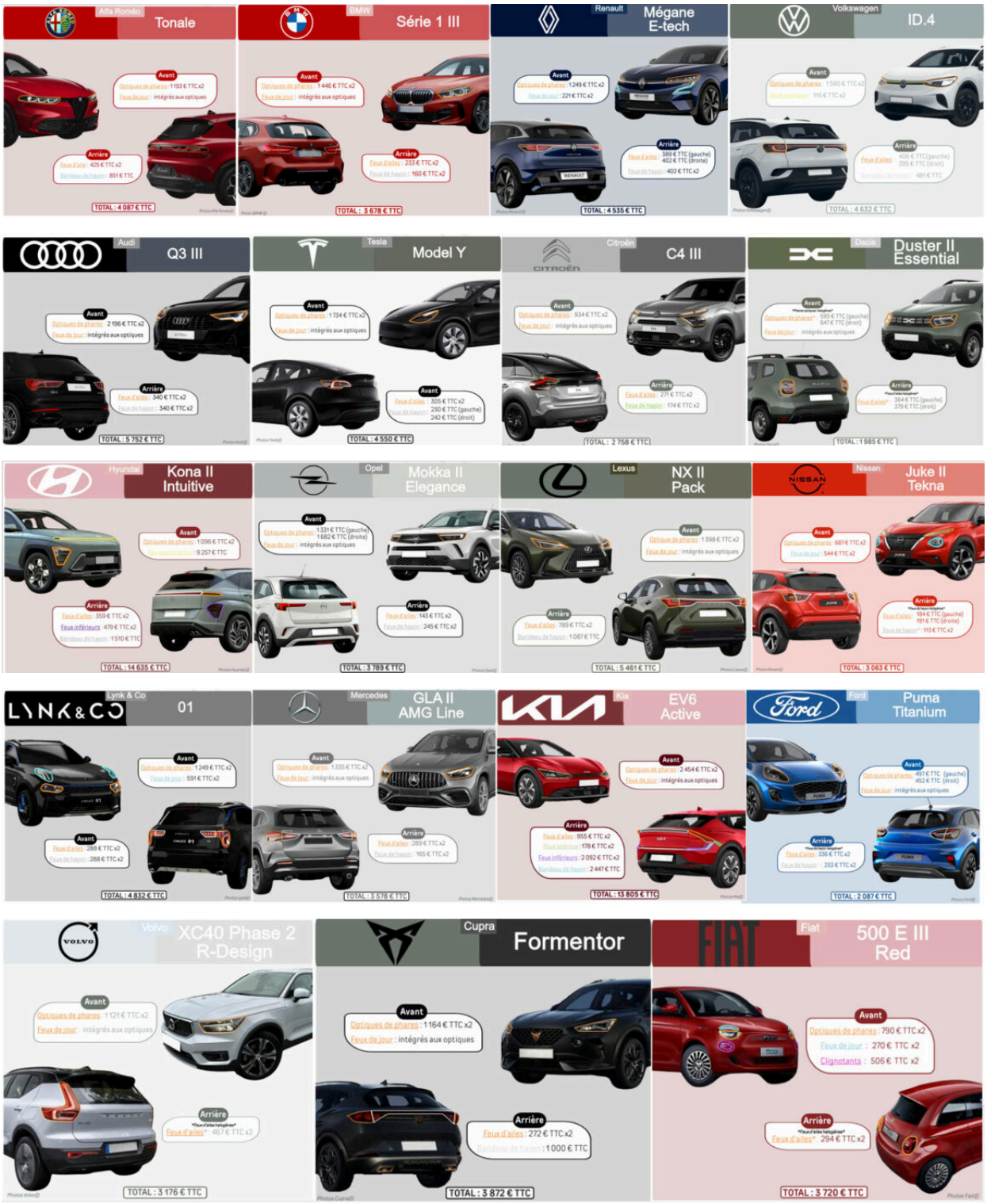
Each time one of these vehicles is manufactured or imported in France, it is assigned an SRA identification code, specific to each vehicle model. It appears on their registration document. This ranking takes into account:

- The risk associated with the vehicle, based on its components
- A replacement price index
- An index of the vehicle's vulnerability to impact, as well as its repairability
- A clue to its anti-theft protection

Insurers can use these indicators as inputs when determining the cost of a policy covering that vehicle. In November 2023, SRA made a comparison of prices of exterior lighting systems. All prices are based on information from Sidexa Qapter© database registered as of 15 March 2024.

The lighting kit (front and rear lamps; parts only, without labour costs) varies from around €2,000 (Dacia Duster) to €14,000 (Hyundai Kona); on the Kona, lamps represent 40 per cent of the vehicle selling price—driven in substantial part by the 2-metre-wide front light strip, which costs more than €9,200. That might be an outlier, but for many models sold in France, the lighting kit price costs between €3,500 and €5,500—lower, but still considered expensive by the insurance companies and vehicle owners. This

goes for most all brands; here are some examples ("TTC" seen at the bottom of each box here is french for 'all taxes included').



Get more information about this study on DVN website.

We find similar articles in China, where some car owners think lamp replacement prices are too expensive. As an example, a Porsche Cayenne microLED headlamp for C¥27,900 (€3,557) or an Aito M9 Xpixel lamp for C¥30,000 (€3,825).

Lit Logos On Stage at April GRE Meeting

LIGHTING NEWS

Germany will propose new text to clarify lit logo provisions in UN R48 during the 92nd GRE meeting, to occur later this month.
The goal of the proposal is to clarify that logos may be lit only for signalling functions; lit logos as part of AFS will not be allowed any longer in the new text. This possibility was a bit more flexible to avoid the 75-mm rule to go to the 400-mm AFS maximum distance between two lit areas, and was also a possibility to avoid the limitation of three housing units for a given signaling unit.
In the proposal, Germany proposes also to disregard lit logos which are not identifiable at a 10-metre distance. In case of doubt, the character height shall be not more than 12 mm, which would serve to allow the example in the picture above—it would not need to be certified as a lit logo. That, in turn, would mean this vehicle could also have a central rear lit logo, despite the limit of 1 centered or 2 lateral logos at rear and at front.

However, Germany's proposal does not resolve the requirement in UN R148 about how to calculate the size of the logo with respect to the 100-cm^2 lit area size, as defined in paragraph 4.5.5:
Size: the enclosed light emitting surface of the logo (incorporating transparent and non-transparent components of the logo) of such a lamp in the direction of the reference axis shall not exceed 100 cm^2
This question is relevant for a lot of automakers who want to light their logos. Shall we consider only the letters, a quadrilateral shape for each letter, or the rectangle shape of all the letters together? Different interpretations exist today—just like in America with the EPLLA requirement but no defined test for it—and that makes life complicated.

AI and Laser hot topics at 2025 ALE Conference

LIGHTING NEWS

By Wolfgang Huhn, DVN senior advisor

This year's "20th Auto Lamp Industry Development Technology Forum and Shanghai International Auto Lamp Exhibition" (ALE) was held at the Huaqiao International Expo Center from 26 to 28 March. Around 200 exhibitors showcased their products and services in 3 huge exhibition halls with 3 parallel conferences covering Lighting, Vehicle display and Cockpit. The aisles were a little less crowded this year than last year (2024: over 40,000 visitors) due to travel restrictions imposed by companies around the world to cut costs.

As usual, the 3-day event began with a VIP reception in a luxurious setting close to the venue. Key industry, government and regulatory figures were invited to an enjoyable program of speeches, food and drink, entertainment and networking. The two hosts, Ms. Chen Qiong and He Yutang, lead through the program like TV entertainers.

Left : The two ALE hosts Mr. He Yutang from CATARC and Ms. Chen Qiong from Audi China
Right : In the center the famous Sally Zhou, President of Xingyu, with DVN's Wolfgang Huhn (wearing a beanie because his right ear was injured in an accident)

The conference began, as always in China, with many greetings from board members and officials. After the traditional photo, the sessions began with presentations on adaptive and intelligent lighting concepts. Besides the usual product introductions, it was clear that lasers are coming back with several new applications such as RGB

lasers, scanning laser systems and blue lasers to color by color-wheel technology. The regulatory session, chaired by Davide Puglisi, Secretary General of the GTB, dealt with harmonization, regulatory developments and the importance of lighting electronics in regulations.

Another big and important part of the conference was the application of AI technology to lighting systems. Especially the car manufacturers like BYD, Huawei and especially Zeekr: "The Future of Automotive Lighting in the AI Era", Dongfeng: "Research of Emotional Design of Auto Lamp in the Background of AI" and Geely Research: "Automotive Lighting in the AI Era" highlighted this new field with great potential. But most of the speeches from Tier 1 suppliers also dealt with AI. The real hot topic of this year's ALE conference.

The Exhibition is huge. Around 20 Tier 1 automotive lighting companies displayed their headlights, taillights, ISD displays of all sizes, ground projectors and many other products. I give you some examples below. The mechanical solutions of last year's ALE have almost completely disappeared this year.

- The large LED ISD screens are shown with smaller and smaller pitches (1.4 mm and less) and in RGB. The trend is towards better technology at lower cost.
- In Europe, uLED technology is completely replacing DMD, but not in China. New DMD concepts with lower resolution, higher luminance and lower cost and volume were shown.
- ams Osram showed its Allyos LED-on-Foil technology for the first time in China and attracted a lot of interest.
- The number of international Tier 2 booths is growing (semiconductors, materials) while the number of international Tier 1 booths is shrinking. However, the importance of non-Chinese companies is low at the ALE.

Left : At the Anrui booth: Wolfgang Huhn, Ian Haughton and Carl Smith from Bentley, Anrui General Manager Eric Sun, Audi's Chen Qiong and Anrui's Stephan Hellmann
Right : The Team of the new Chinese Elmos company named Ji Wei Cheng

Left : Wolfgang Huhn with Module Maker Enor's CEO Mr. Cheng
Right : Hasco booth Mr. Zhu with Xiaomi SU7 components


Left : Wolfgang Huhn, Maggie Wang, Lynk & Co, Phil Gush, Bentley R&D director
Right : Interesting concept of a rear lamp cluster with combined OLEDs and Mini LED display seen at the Xingyu booth

LEFT : Mini Aceman rear lamp from Mind
RIGHT : Secretary and GTB President during evening dinner

LEFT : Valeo – Mercedes Rearlamp
RIGHT : Forvia Hella Lynk&Co Z10 Rearlamp

Nissan and INFINITI outline bold new products and next-generation technologies to excite customers around the world

LIGHTING NEWS

Nissan just presented new Micra (based on Renault 5) and New Leaf, 2 full BEV and their plan for fiscal year 2025 and 2026, including a new generation of Nissan‘s top-selling Sentra compact sedan, a refreshed midsize Pathfinder SUV, a refreshed three-row luxury QX60 SUV, fourth-generation Rogue, all-new QX65 crossover coupe, evolved design on Frontier/Navara midsize pick-up truck, all-new Patrol and the all-new, all-electric Juke

Ivan Espinosa, chief planning officer, said “Over the next two years, we are excited to roll out an impressive lineup that will redefine the road! This includes the reimagined Nissan LEAF, and a daring new Micra EV. But that's not all – we're refreshing our range of SUVs to elevate the driving experience, and our next-generation e-POWER promises new levels of refinement and efficiency. We are committed to investing in products that embody the very best of Nissan. To our passionate fans and loyal owners around the world, I can assure you, this is just the beginning of an exciting journey ahead.”

RGB DLP on Changan Qiyuan Q07

LIGHTING NEWS

The Changan Qiyuan Q07 is a new mid-to-large SUV built on the all-new SDA electric platform. According to media, the front is equipped with full-color DLP projection headlights, supporting a maximum projection size of 150 inches.

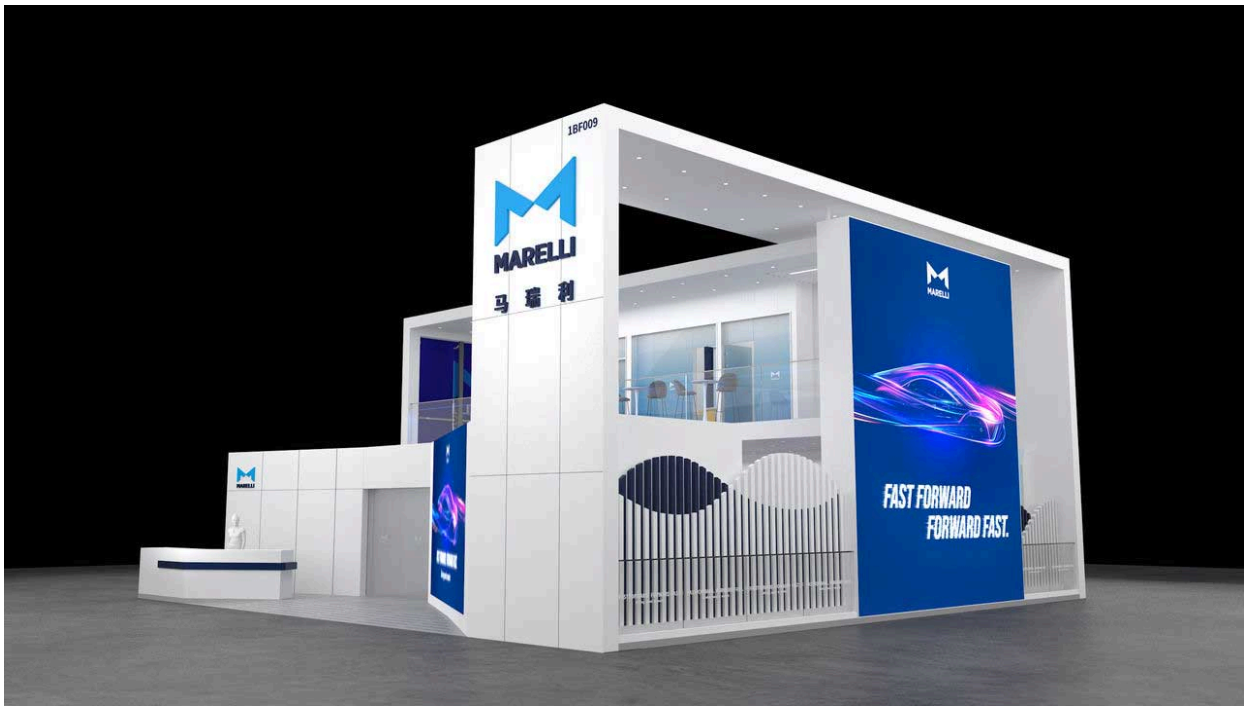
Zeekr 7X official launch in Europe

LIGHTING NEWS

Zeekr 7X has officially been launched in Europe in Stokholm. Due to technical constraints (EuroNCAP?), Stargate is not proposed in Europe and replaced by a light band that is replacing classical ICE grill.

Marelli @ Shanghai Autoshow

LIGHTING NEWS



Marelli will showcase their latest speed-to-market innovations at Auto Shanghai 2025, from 23 April to 2 May. They will present the 'Fast Forward, Forward Fast' theme, highlighting their commitment to accelerating product development to help carmakers get to market faster. Marelli will offer a curated journey through four distinct areas: a 'Momentum Lab' will focus on Marelli's agile approach to innovation through minimum viable products (MVPs), a 'Velocity Zone' will be dedicated to software-defined vehicle (SDV) enablement tools, an 'Acceleration Lane' will highlight modular solutions through the supplier's tiered hardware development platform approach, and the 'Instant Impact' area will display ready-to-offer technologies, for immediate deployment.

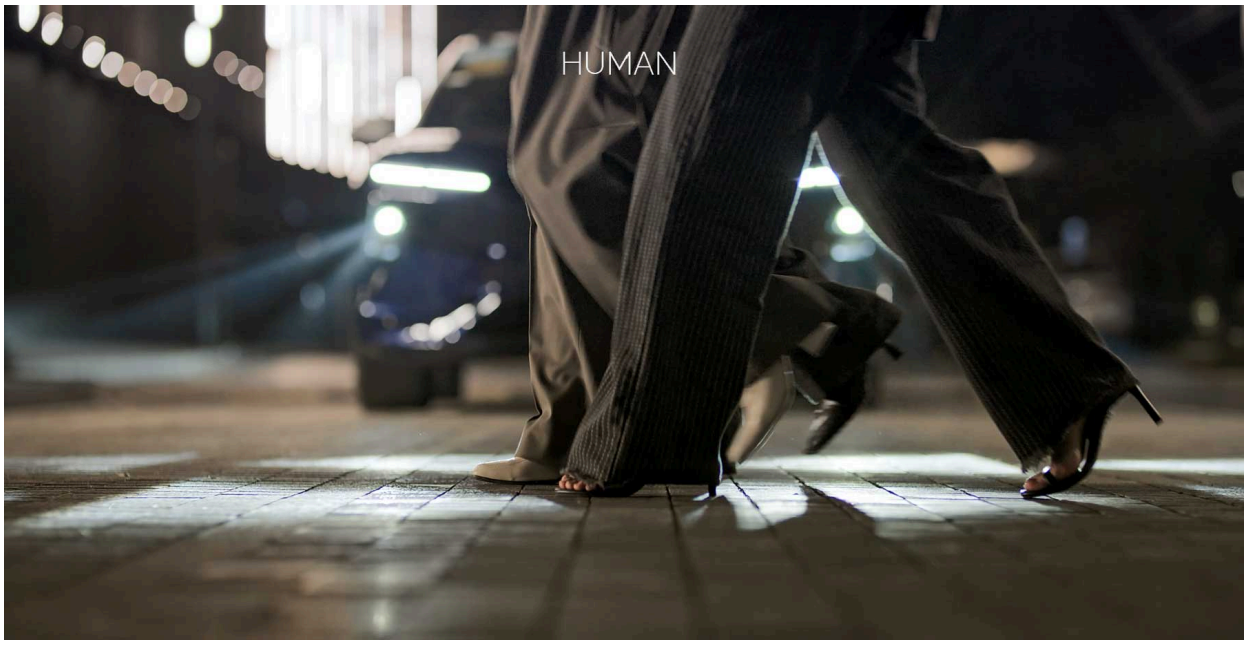
Lighting will be part of the show with two really promising innovations. First will be the Micro Laser Projector, co-created with Infineon. This display concept decouples the projection function from the surface that shows the information—increasing flexibility and performance while reducing cost. The projection unit is made of three RGB laser sources and a MEMS mirror to form an image by scanning. It will reflect light only when it is needed, reducing energy consumption. It offers flexibility in projection surfaces, accommodating customer preferences such as windshields, console, large information panel, dashboards, and even curved surfaces of various shapes and sizes. It provides outstanding brightness, colour, contrast, and extreme flexibility of applications while always maintaining focus. Subtle ambient lighting and detailed information displays are ensured, resulting in versatility for both day and night use and user convenience through intuitive operation.

Second is the Pixel Rear Lamp demo, which uses TFT-OLED technology to deliver high-resolution displays integrated in rear lamps, aligning with market trends in dynamic communication and personalization.

To go further ...

Nio ET9 Interior, Exterior Lighting UX

TO GO FURTHER ...



Nio have put up an interesting video showing how they can interact and communicate with dynamic interior and exterior lighting, front and rear—especially with their high-definition projection lights (HDPL) providing light carpets, Nio logo signatures, and welcome lighting. Take a look: