Tue, 20 May 2025
Weekly Newsletter

DVN Lighting

NEWSLETTER #905

Editorial

Universally Legal LED Bulbs For Halogen Headlamps — Finally!

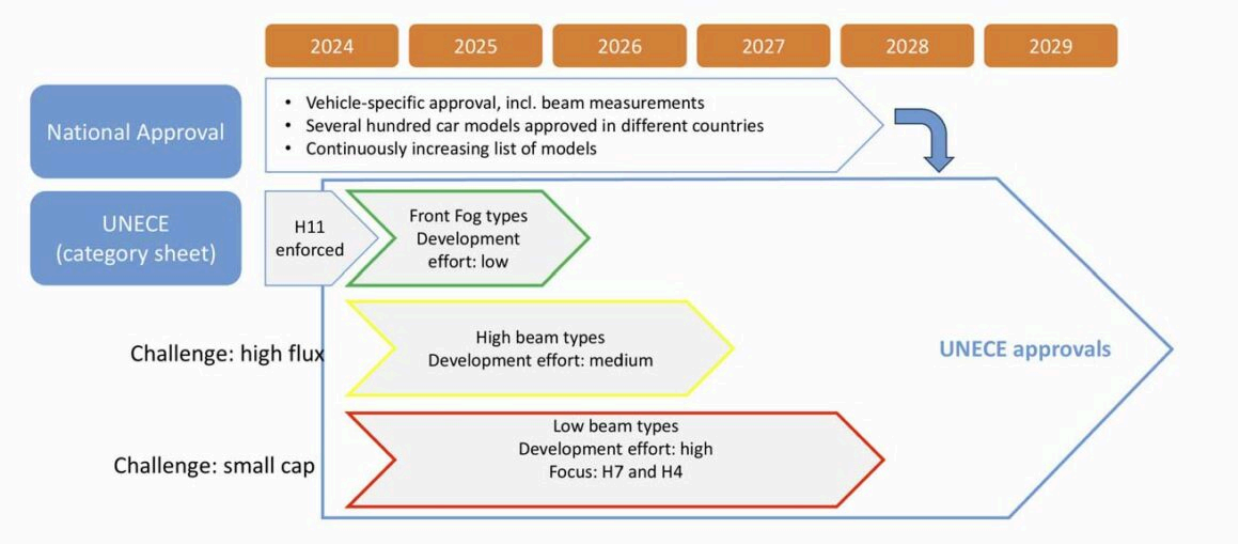
LED replacement bulbs for halogen headlamps have been on the market for years, but always with strings attached. For a long time, it was a nudge-and-wink disclaimer, "for off-road use only". Then a few years ago, a few bulbs from legitimate makers started getting approved for use in certain headlamps on certain cars in certain countries. Now — at last! — the world's first ECE-approved LED replacement bulbs have been announced.

This story started about 15 years ago in the Fall of 2011, and only very recently came to a conclusion with amendments to UN Regulation 37. Replaceable halogen and filament (incandescent) bulbs must comply with R37 requirements to be used in a vehicle's safety lamps — all regulated lamps, which means most every lamp on the outside of a vehicle. Unapproved LED bulbs have long been offered in the aftermarket, enabling consumers to degrade traffic safety with glare, improper light distributions and colours, RF and EM interference, and other problems.

GTB and GRE started to work on an evolution of R37 to provide for the approval of safe, effective LED bulbs to replace filament ones — called LED retrofit light sources, or LEDr for short. In October 2017, GRE established a task force on substitute and retrofit light sources (TFSR). In June 2022, R37 was officially updated to provide for LED replacement bulbs that would be safe and effective in any lamp designed to take the corresponding filament bulb. And now, in May 2025, ams OSRAM have announced the world's first such bulbs.

This means owners of vehicles not factory-equipped with LED lamps can now to benefit from real advantages of LED technology, such as the increased lifetime (up to 6× longer), reduced power consumption (down to ⅕ that of a filament bulb), and perceived advantages such as cool white 'daylight' 6000K colour from headlamps.

The new OSRAM LED bulbs are designed and type-approved to replace H11 halogen bulbs in headlamps and fog lamps. It's a big leap over the last big announcement in this field, which was LED bulbs approved at the individual-country level (Germany, France, Austria) on a specific-lamp, specific-vehicle basis. That started with H7 bulbs, then came H4 and others.



Graphic from GRE-91-14

This homologated H11 LED bulb is primarily aimed at the aftermarket. Plans are for the product range to be expanded to include fog lamp bulbs (H8, H16, and HB4) in 2026; high beam bulbs such as H9 and HB3 in 2027, and additional types (H1, H4, H7) in 2028 and beyond. This aftermarket product range will complement OSRAM's OE vehicle LED light sources type-approved under UN Regulation 128, the eXchangeable Light Sources (XLS) such as LR5, LW5, and LY5. Both product families will be showcased at DVN Japan workshop next month. **Registration is open**, so hurry and sign up — you won't want to miss this!

Sincerely yours,

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

In Depth Lighting Technology

DVN Field Trip: Yejia Dongguan

Yejia R&D Director Dr She (L), DVN's Paul-Henri Matha (R)

By Paul-Henri Matha

I took time to visit YEJIA in Dongguan with Anne. Yeija is an optical component provider for illumination optics, image optics and silicone optics. They started Silicone products in 2009 (Dongguan TronshinSilicone Products Co., Ltd.) and plastic optics in 2014 (Dongguan Yejia Electronic Technology Co.,Ltd), and then later merged into a unique company in 2015, Yejia Optical Technology.

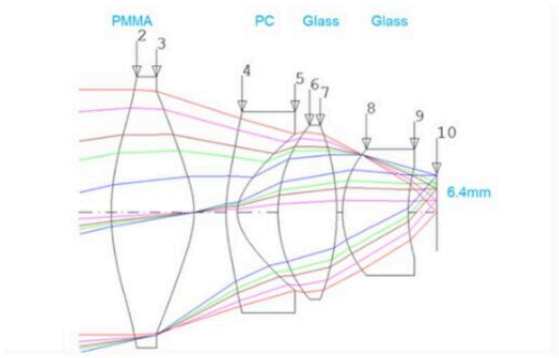
Yeija is producing in 2 different factories. In Guangdong province, 20,000 square meters (600 people) and Zheijang (200 people), 12,000 square meters.

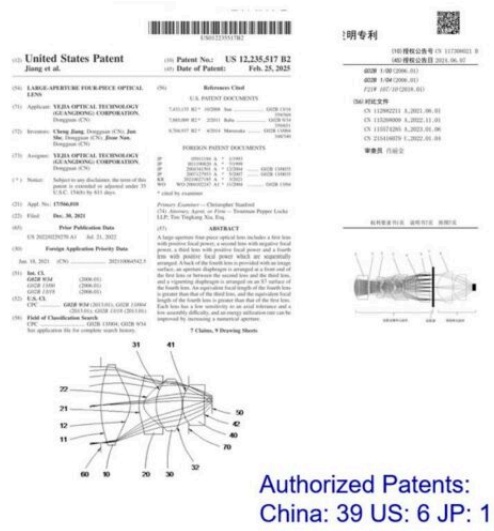
Revenue is around RMB 400 million, with main focus automotive-related business (70%). Yejia is one of the leading manufacturers in China for Headlamp plastic module lens and silicone. Main customers are all lighting tier1, including also camera and HUD players

Main components are thick lens optics, lens module, HUD primary optics and silicone optics

Yejia is not only a component injector and manufacturer. Yejia is realising all the optical inserts (250 insert tool per year capacity) for plastic (2 months lead time) and silicone (50 days lead time). They have around 100 injection machin in Dongguan and 100 in Zheijang, plus 50 silicon sets, 14 coating machines set and more than 10 assembly lines, all in clean room.

Yejia is also able to do the optical design of complete illumination and imaging optics thanks to IP rights.





About injection and optical capabilities, they are able to produce mono-shot (for 28mm thickness 70x45mm lens, cycle time around 1,000 seconds) and 2 shot plastic lens (for 28mm thickness 70x45mm lens, cycle time around 300 seconds). They can design and produce lenses with Microstructure and free form surface, including compression tool to keep optical properties and low tolerances

They are developing complete optical lenses system for pixel and HD modules including PMMA and PC-coated lenses (Glass lens are bought).

Optical control is done at 100% by different precision measurement equipment to guarantee optical and image properties: Mitakalarge 3D and Zeiss GOM, Trioptics HR, Panasonic UA3P, Luceo StrainEye.. After final check of the optical lens assembly, possibility to rework the module if needed

Yejia is also developing Gobo lens modules for projection systems, including high-illuminance silicone lens modules (no additional sealing rings required) and light carpet lamps (without MLA). These products are already in mass production and supplied to multiple automotive OEMs, such as General Motors (GM) and Volkswagen (VW).

FVW Magotan

SVW Passat

In preparation of DVN Tokyo workshop, I took time to exchange with Nan Jixue, Chairman of Yejia Optical Technology, who will do a lecture in our event. From the bio of Mr Nan, he has obtained multiple degrees, including Northeast Heavy Machinery College, Computer Applications degree from Harbin Institute of Technology, an EMBA from Sun Yat-sen University, an AMP from Yonsei University in South Korea, and Changjiang Business School EMBA. He also serves in various positions such as the President of the Overseas Trade Committee of the China Asia Economic Development Association and a Visiting Professor at the Chinese Academy of Management

Sciences, among others. He also attends the World Korean Business Conference LEADING CEO Forum.

PHM: Mr Nan, Yejia have the plan to exhibit and do a lecture in DVN Tokyo. Can you explain your relationship with Japan?

NJ: Yejia is already a supplier to Koito and Stanley. Through DVN, we aim to expand our influence in the Japanese automotive lighting industry.

PHM: Your team explained me 2 difficulties you are facing in China: Silicone raw material supply chain and High temperature PMMA. Where does the material come from currently and do you have plan to find local supplier?

NJ: Silicone materials are primarily sourced from Dow, while high-temperature PMMA is supplied mainly by Trinseo. Material adoption in automotive lighting requires extensive validation and is ultimately determined through collaboration between OEMs, Tier 1 suppliers, and material providers.

PHM: Do you plan to open plants in Europe and North America?

NJ: The plan remains undefined at this stage.

PHM: What do you think about Silicone about automotive lighting business? Optical designer like it for optical accuracy for ADB system, but manufacturing does not really like it, same for purchasing (price). What is future for silicon according to you? why nobody produces it in Europe and is there a room for production in Europe?

NJ: Silicone-based solutions have become the preferred choice for cost-sensitive, low-pixel ADB designs, offering an effective balance between technical feasibility and affordability. Their use in automotive lighting continues to grow in parallel with the expanding adoption of ADB technology. As far as I know, there are some silicone component suppliers in Europe. Yejia distinguishes itself by leveraging its established capabilities in high-volume optical component production and testing to support its silicone manufacturing — a unique integration that enhances both efficiency and quality.

PHM: European glass and plastic optical tier2 are struggling in Europe. What is your secret in China? I see you are extending your capacities.

NJ: We are undoubtedly facing tough times. In response, we need to proactively leverage technology to enhance efficiency and rapidly scale automation — ensuring we stay competitive and aligned with evolving customer demands.

PHM: What is the next innovation in optical design? is it direct imaging? free form optics? which technology will disappear, and which one will emerge?

NJ: Freeform optics—especially discrete freeform optical design—has emerged as a highly promising technological frontier. Over the past two decades, rapid advancements in plastic optics manufacturing have enabled the large-scale production of freeform-based components, while parallel progress in theoretical research has driven continuous innovation. In collaboration with Prof. Rengmao Wu at Zhejiang University, we have conducted extensive experimentation in this domain. We

look forward to applying these cutting-edge technologies to market through real-world product applications in the near future.

PHM: You are presenting design of optical systems for HD lamps with both PC, glass and PMMA: what are your criteria for these choices? Are you totally designing this group combination or is it the responsibility of the tier 1 supplier?

NJ: First, cost constraints prevent the use of molded aspheric glass lenses in our designs. Meanwhile, we are capable of producing high-quality plastic aspheric lenses with a PV value of less than 5 μm for lenses with a 50mm diameter. Next, to effectively control chromatic dispersion, materials with specific dispersion properties must be used. Finally, due to the limited material options approved by most OEMs, we rely on the most widely available polymers—PMMA and PC—for optical design. Our patents have been granted in China, Japan, and the United States. In most cases, we deliver fully assembled optical lens modules directly to Tier 1 suppliers.

PHM: For silicone, what are your limits for the shape?

NJ: The main issue with silicone is its relatively high thermal expansion, making it more suitable for use in collimator rather than lens. In this case, the precision of the product is closely related to its structure. The main challenge is controlling roughness and burrs, which are influenced not only by tooling but also by the injection process.

PHM: What do you think about MLA and could they replace traditional lenses for the future? Are you targeting to develop in the future MLA systems?

NJ: We have conducted extensive research on MLA and applied for several patents. At the same time, we have identified numerous technical challenges that need to be addressed, which significantly limit the application of MLA. The most key issues are dispersion and stray light.

PHM: In your revenues, what is the share of automotive parts compared to non automotive markets? And in the automotive revenues, the share for silicone parts?

NJ: The ratio between automotive parts and non-automotive markets is approximately 7:3. Silicone parts currently account for about 5%, and in the near future, this is expected to reach around 15%.

PHM: Thank you

Lighting News

World-First: OSRAM's ECE-Approved LED H11 Bulbs

LIGHTING NEWS

With ams OSRAM having announced the world's first LED replacement bulbs ("LEDr") type-approved under UN Regulation 37, vehicle owners will be able to remove halogen H11 bulbs, install the new LEDs, and drive off — no matter what kind of vehicle they have.

Up to now, the closest thing possible was for the vehicle owner to consult a list to see if a particular LED bulb was approved for their particular lamps in their particular vehicle in their particular country — since 2020, ams OSRAM have sold more than four million LED bulbs with specific-country, specific-lamp, specific-vehicle approval — so the universal approval under R37 of OSRAM's new H11 Night Breaker Smart ECE is quite a breakthrough.

Yes-lists like this can grow quite cumbersome, and getting a bulb approved at the national level requires tests including validation of photometry, mechanical and electrical compatibility, including EMC, and solutions to address possible false triggering of bulb-outage indicators.

Now, with the R37-approved bulbs, a list of vehicles also exists, but it's an easier one to manage and maintain, for it contains only those vehicles whereon specific installation instructions are necessary. Buyers of the R37-approved H11 LED bulbs will find the link on the package to a website with this information; if their vehicle is not on the list, it means no additional action is necessary — just drop them in, check the aim, and drive off.

The obligation to make this kind of information available on the internet is presented in R37 §.2.2.1:

Providing (a) website address(es) where the applicant shall publish up-to-date listing(s), for which the approval holder is responsible, of lighting and light signalling functions installed on vehicle models, specified by at least brand, type, model, and manufacturing period of the vehicle.

The H11 LEDr category specification in R37 allows for a slightly larger light source base and optional connector on a harness, which could affect mechanical compatibility. On OSRAM's new H11 LEDr bulb, the bulb base is larger in diameter than that of a halogen H11, and the connector is at the end of a cable, not directly on the bulb. The purpose of looking at the installation-caveat list on the website is to check compatibility to make sure that the LED bulb will fit in the lamp and on the vehicle.

To avoid RFI-EMI, LED replacement bulbs must also fulfil UN Regulation 10 requirements incorporated by reference in §3.4.7.3 of R37:

The LED replacement light source shall comply with the technical requirements to an electrical/electronic sub-assembly (ESA) as specified by Regulation № 10 and its series of amendments in force at the time of application for type approval.

Dajac Upgrade IntelliAim, Lamp Inspector, Lamp Controller for H-Aim

LIGHTING NEWS

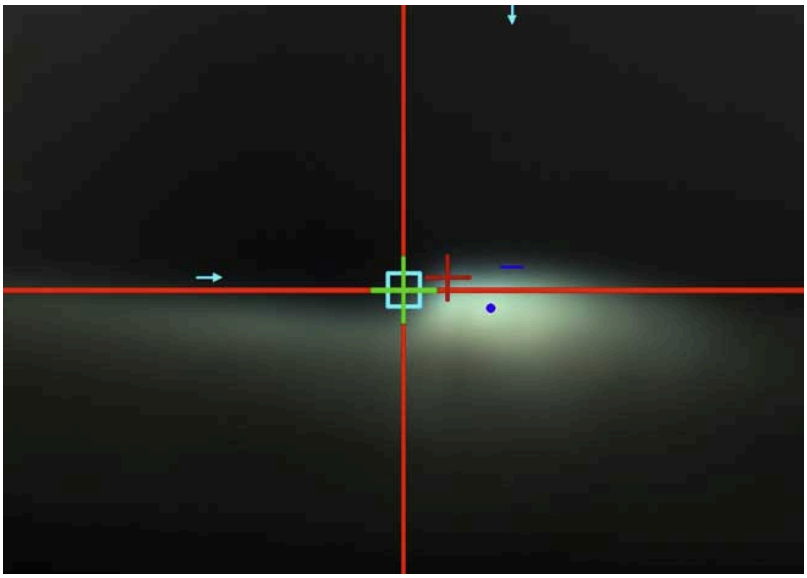
Horizontal headlamp aiming in North America, with SAE beams, is one of the most nuanced challenges vehicle lighting engineers face. In the latest update to their IntelliAim platform, Dajac have introduced a feature that tackles the complexity of horizontal aiming, bringing new levels of precision, flexibility, and traceability to the manufacturing process.

Unlike vertical aim, wherein the beam pattern offers a defined, predictable visual cue — the cutoff — there are no such indicia for horizontal aim defined in the U.S. SAE lower beams often lack a defined reference point suitable for use as a horizontal aiming cue, and if they exist, their position is not consistent across all beams.

Simulation work by NHTSA has shown that as little as 0.5 degrees of horizontal misaim can reduce pedestrian detection distance by about 25 per cent. Automakers' own **research has shown** that horizontal aim can make the difference between a "good" headlight rating and a "poor" one on the IIHS tests. And IIHS, for their part, have found that the horizontal aim on new cars is not necessarily where it should be. For automakers and tier-1 suppliers, achieving accurate aim isn't just about regulatory compliance—it's a matter of safety, IIHS ratings, and user experience.

The push to improve horizontal aim stemmed from limitations encountered in real-world lamps. Dajac's existing V/O+ software already excelled at locating the cutoff elbow, if it exists, but beam patterns with a flat-across cutoff or a dip in light just before the elbow posed issues. The fix comes in the form of several key software upgrades:

- Customizable Scan Start: Operators can now choose where the horizontal scan begins. This is critical for lamps with cutoffs or notches that can serve as reliable aim points, while avoiding oddities in the beam pattern or slight tilt that might otherwise mislead the system.
- Scan Thresholds: Horizontal and vertical scans now use separate thresholds. Previously, only vertical threshold existed.
- Visual Feedback: The software now displays scan lines and markers—including the hot zone, cutoff, and start position—using clear visual on-screen 'decorations' to support easy verification and adjustment. These changes were built as an extension of Dajac's existing V/O+ logic, maintaining continuity while adding major improvements



With these enhancements, Dajac's Osprey systems with IntelliAim — especially those paired with the Expert I/O 1000 — are delivering better precision and repeatability than ever before. That translates directly into less rework, fewer misaimed lamps, and greater compliance confidence. Dajac's EU-compliant traceability database ensures that every aim is recorded and auditable, making it easy for manufacturers to meet strict international regulations.

While the technology behind the update is sophisticated, its impact on the production floor is intentionally simple. Operators can easily configure and fine-tune it to the needs of each lamp. Whether the system is working with sharp cutoffs, softer beam patterns, or lamps designed specifically to meet IIHS criteria, the new horizontal aiming feature adapts. Importantly, it also supports relative aiming of multi-beam configurations—critical for today's complex lighting systems. And if a lamp introduces a third adjuster, IntelliAim handles it seamlessly through Dajac's robust hardware integration

The algorithms powering horizontal aiming will also help identify ADB shadows and support edge detection in digital lighting systems.

Lumax To Complete IAC Buy

LIGHTING NEWS

Indian tier-1 supplier Lumax Auto Technologies have signed an agreement to acquire the remaining 25-per-cent stake in IAC International Automotive India (IAC India) from the International Automotive Components Group.

In March 2023, Lumax had acquired a 75-per-cent stake in IAC India; the plan now is to merge it with Lumax operations. IAC India are a key components supplier to automakers including Mahindra & Mahindra, Maruti Suzuki India, Volkswagen, and Volvo Eicher Commercial Vehicles. IAC India are the sole supplier of integrated cockpits and door panels for Mahindra's BE6 and XEV 9e, for example.

IAC India have five manufacturing plants across the country including two in Chakan, Pune and one each in Manesar, Nashik, and Bengaluru. The company also have an in-house engineering centre in Pune with key capabilities in product designing and engineering, dimensional engineering, product development, program management, and tooling development. The engineering centre has a team of 330 engineers and designers with Global experience catering to all tool development requirements from customers as well as from the company's global sister concerns.

Lumax Group chair Deepak Jain says, "The consolidation will strengthen our strategic vision and enable future growth, building on the strong foundation to drive continuity, performance and scalability. This development marks a significant milestone in our journey towards long-term value creation and providing comprehensive solutions across lighting, plastics and interiors. It also reinforces its strategic position within IAC

India and expands our footprint on major electric vehicle platforms of leading OEMs such as Mahindra & Mahindra, emphasising our commitment to the future of sustainable mobility".

And Lumax Auto Technologies Managing Director Anmol Jain says, "This strategic move will further strengthen Lumax Auto Technologies' foothold in four-wheeler automotive plastics. This further integration will allow for better cost optimisation and rationalisation of resources, potentially creating financial flexibility at the parent level to pursue future strategic, inorganic opportunities that align with our long-term vision. In addition, it will accelerate innovation and enhance our value proposition per vehicle that is seeing a shift towards improved interiors in passenger vehicles".

IAC Group will continue to support IAC India through a technology support agreement.

Changan Nevo C390 Has Full-Width Lamps

LIGHTING NEWS

Changan Design recently unveiled their new Nevo A06. They've put a lot of efforts into lamps, including a feature-loaded front fascia including low and high beams, a lit logo centred above a full-width light stripe, and an interactive signalling display (ISD).

At the rear, a full-width red light strip also contains a lit logo.

The car will be launched in the second half of this year, equipped with lidar on the roof.

DS 4 Becomes № 4, With Well-Lit Front Fascia

LIGHTING NEWS

The DS 4 is being renamed as the № 4. It has a totally new front end, though the headlamps bring continuity of design themes (compare the DS 4 below). The DRLs, lit grille, and front lit logo on the № 4 hew to the design cues seen on the DS № 8.

Serma Buy Piséo For Optical, Photonic Tech Boost

LIGHTING NEWS

Serma Group — through their subsidiary Serma Ingénierie — have bought Piséo, a company specializing in the engineering and testing of optical and photonic systems.

Serma have been a minority shareholder since Piséo's creation in 2011, so are well acquainted with the company and its teams. This integration is the result of a longstanding collaboration, and a shared vision focused on innovation, technical expertise, and tailored customer solutions.

The acquisition expands Serma Ingénierie's range of expertise in photonic technologies and their integration into illumination, detection, and imaging systems. These technological building blocks further enhance the group’s engineering capabilities, particularly in the medical, aerospace, defence, and industrial sectors.

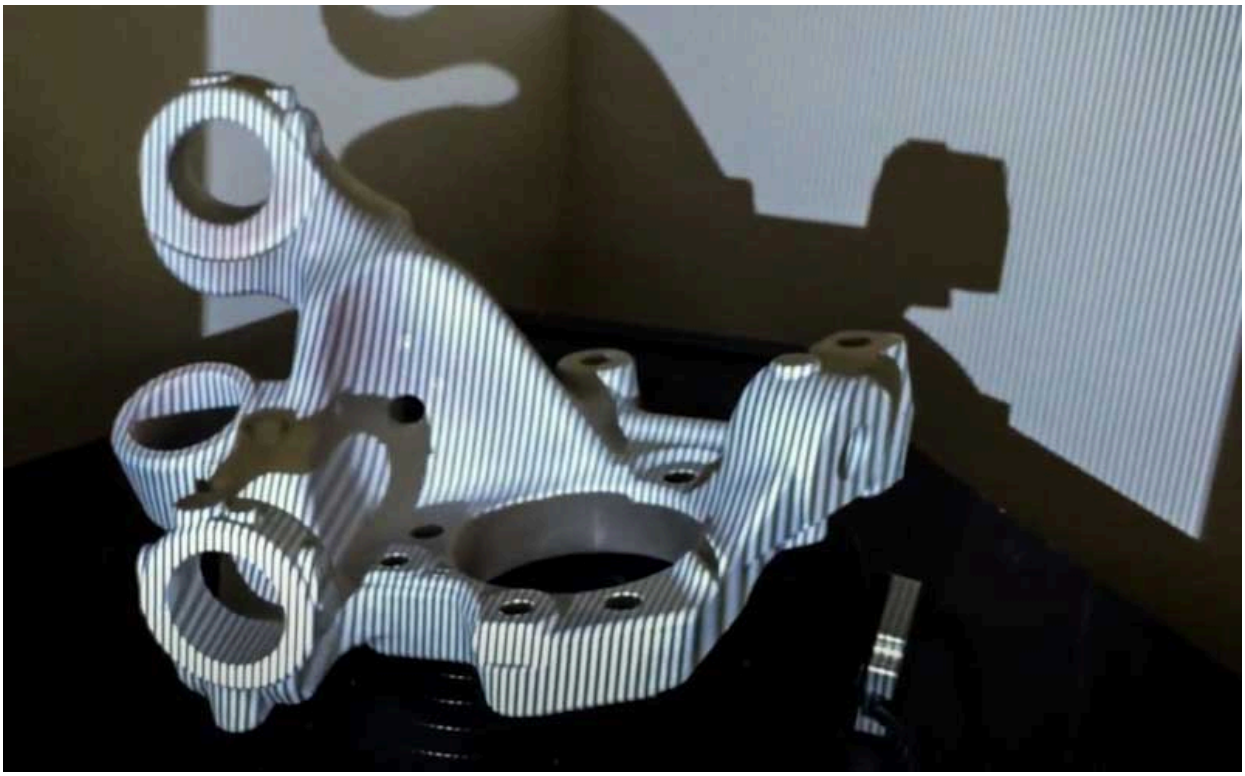
Piséo will continue to bring high-level expertise to the design and testing of complex optical systems, as demonstrated through numerous projects in medical and dental applications, automotive, defence, and through ongoing collaboration with Serma Microelectronics. By joining Serma Ingénierie, the company will benefit from a multidisciplinary ecosystem and a solid structure to accelerate development.

Piséo are joining a group recognized for expertise in embedded systems, electronics, and critical technologies. The company will maintain their base in Lyon and retain technical autonomy, while embracing the growth and innovation dynamic driven by the Serma Group.

The move aligns with Serma Ingénierie’s strategy to provide clients with a comprehensive, agile, and expert offering, by integrating new key competencies to meet the demands of the most ambitious projects.

New SAE Papers Shed Light on Lighting, Vision

LIGHTING NEWS



Four recently-published SAE technical papers are worth a look. Paper 2025-01-8663, by Honda's Kazuyuki Kawamura and Kei Oshida, is entitled "Study on the Improvement of Pedestrian and Vehicle Visibility by Geometric Patterns Projection Lighting". The authors examine a novel application of the projection of light from vehicle-mounted projectors.

The idea is to shine not just generalized light but geometric patterns of light on pedestrians, to make them more visible to humans and vehicle-based electric eyes (cameras). It's similar in concept to white-line 3D scanning — shown in the image here — a technique used to create digital representations of physical objects so they can be studied or reproduced. The paper presents great detail about the Honda research, and the conclusion is intriguing: the authors found that geometric pattern projection is better than low beams for pedestrian visibility distance and the distance at which an approaching vehicle is detected, and geometric pattern projection offers an attractive combination of improved seeing without increased glare.

Paper 2025-01-8662 is by vehicle lighting and human-factors research rockstar John Bullough, who heads the Lighting and Health Research Center at the Icahn School of Medicine at Mount Sinai. The paper is called, "A Survey of Vehicle Forward Lighting System Mounting Height and Driver Eye Height", and it is a much-needed update to older such surveys. Vehicles have changed quite a bit since the last major study of lamp and eye height; bigger and taller vehicles and evolving design trends and pedestrian-protection regulations (outside the U.S. regulatory island) have changed where the headlamps and the driver's eyes are located. Given the present interest in headlight glare, this new information is quite timely.

Paper 2025-01-8667 is by IIHS researchers Becky Mueller, Haden Bragg, and Teddy Bird. It is called "Developing a Camera-Based Perspective Transformation Method for Quantifying Driver Direct Visibility for Passenger Vehicles". Once readers have caught their breath after reciting that sizable title, they can learn that the method for

producing a 360°-viewmap of the nearest visible ground points proposed by the authors is portable and compact, making it well suited for in-field data collection. In tests, the proposed method was found to be highly accurate for points near the camera, such as the view through all parts of the windshield. Points viewed through the vehicle's backglass were somewhat less accurately handled by the new method, on account of their greater distance from the camera. The authors describe a parametric study examining seat position and eye height, and discuss the implications of those findings. In all, the researchers say the visibility maps created by their method can facilitate the assessment of blind zones and their contribution to various kinds of collisions — and could be used to inform consumers about the visibility characteristics of different vehicles.

And paper 2025-02-8664, by Oak Ridge National Laboratory's Adam Siekmann, Vitaly Prikhodko, and Vivek Sujan, is called "Assessing the Impact of Mirror Technology on Driver Perception and Safety: Traditional vs. Camera-Based Systems". It starts from the premise that while camera-based side- and rearview vision systems are beginning to replace traditional mirrors, particularly in large heavy-duty vehicles, both will be commonplace in vehicles on the road for quite a long time, so drivers will have to be able to cope. The paper looks at the differences and how they affect driver behaviour. Things like driver head and eye movement, reaction time, and distance perception are measured and discussed. It is proposed that the findings from the study behind this paper will inform further research into edge cases involved with the use of camera-based mirror replacements.