DVN Shanghai Workshop

December 4 & 5, 2024

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Executive Summary

DVN Shanghai event gathered more than 350 participants and 30 OEMs

What a pleasure to meet again the automotive chinese community, exchange and network all together.

My main takeaways from the events in 5 points

- A lot of connections between China, Japan, Europe, India and America, all together at the same place.

- A clear overview about new regulation that is coming in China in 2027 (automatic leveling, ADB field testing, parking mode)

- Interesting discussion how to develop so fast in China with close collaboration between OEM designers and Lighting tier1

- With Democars this year, it was a great experience to really see and feel new trends in China (lighting, interior, UX)

- Main trends in China are Interractive signaling display, projections (including DLP next generation) and Regulation will be updated in 2027 to take into account these new technologies

Main takeaways from Round tables

Leader round table

The third Leaders Round Table in the history of DVN, after Munich and Pune, was again a great success. DVN prepared a question for each of the VIPs at the table. The participants introduced themselves and their companies and answered the questions. After this opening, a discussion started, chaired by DVN's Wolfgang Huhn. Panellists included:

- Mind Optoelectronic's Hossein Nafari (Lighting Vice President)
- Marelli Automotive Lighting's Peter Cao (General Manager APAC)
- Hasco Vision's Ao Jinlong (Deputy General Manager & CTO)
- Xingyu's Lin Shudong (Deputy General Manager, Research Laboratory Director)
- Liaowang's Yang Kai (Deputy General Research Institute Manager)
- Anrui Lighting's Eric Sun (General Manager)

All the executives gave brief and, of course, very positive descriptions of their companies. The Chinese market environment was unanimously seen as extremely challenging but promising for further high-tech solutions. International companies see many opportunities overseas, but also a high political risk due to unpredictable tax strategies.

A particular issue was the different pace of development of Chinese players compared to the rest of the world. Chinese automakers are seen as quick to make decisions and, on the whole, extremely impatient. They are prepared to take risks, such as very short testing times. The Chinese customer accepts that some functions in the car only work properly after several updates, so automakers can act in that way. All of this is the opposite of Europe and other developed markets, where customers expect a flawless car on delivery. Chinese engineers are used to working three shifts, 7 days a week if the project requires it; you rarely find that anywhere else in the world. Also, Chinese automakers' specifications are short, containing only the minimum necessary items. This gives the tier-1s more flexibility.

The provocative question of whether light for safe night driving or light for fun is more important was clearly answered in the direction of safety. Fun functions are important, especially for young customers, and they bring in a lot of revenue. But safety is the basis of everything.

Sustainability is clearly still a minor factor in the Chinese automotive lighting market. European approaches to recycling and energy reduction haven't yet reached China, but it is expected they will in a few years' time. Today, strong cost pressure dominates the RFQs.

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Regulation round table

The second panel discussion focused on regulation. GTB Secretary Davide Puglisi presented the latest information from UN Regulations: acceptance of road projection including predicting trajectory, ongoing activity on signaling road projection and autonomous driving indicator lamps. Regulations allowing predicted-trajectory road marking should enter into force in Q4 2025. For signalling road projections, GTB will provide a new proposal for next GRE in April 2024 to get final confirmation. An AD indicator lamp proposal is under construction for both component and installation requirements. Pugliese also mentioned two other topics: the importance of glare, with a new task force at GRE level, and a discussion to clarify the definition of the apparent surface, under the umbrella of SLR.

Overview of GRE-IWG SLR

- ✓ Established in 2014
- ✓ Chaired by The Netherlands, Co-Chaired by EC
- ✓ Secretariat provided by GTB
- ✓ 69 meetings held so far (hybrid mode)
- ✓ Extension of mandate until end of 2027
- ✓ Main results achieved: UN Regs 148, 149, 150, Mandatory auto levelling

GOAL of "Stage 2 / Step 2"

"Simplify and update the technical requirements of the UN **installation Regulations** (Nos. 48, 53, 74, 86), to become **technology neutral** with **performance-based** and objective test requirements".

Next meetings
- **SLR-70** on 12-13 Dec. 2024, Brussels (BE)
  Note: SLR-70 will be preceded, on 11 Dec, by a special session on "apparent surface"
- **SLR-71** on 5-7 Feb. 2025, Brussels (BE)
- **SLR-72** on 9-11 Apr. 2025, Brussels (BE)

SLR "Stage 2 / Step 2" - Main area of work

- **Improved visibility of the rear Direction Indicators**
  - *Problem only with simultaneous activation of the functions*
  - *Combination of factors such as distance, intensity and luminance may improve the situation*
  - *Goal is to improve the visibility of the DI without being unnecessary restrictive*

- **New Annexes in Reg. 48 (for information only)**
  - *Annex 17 "Summary table of lamps positioning"*
  - *Annex 18 "Summary table of lamps geometric visibility angles"*

- **Baseline document for Reg. 48 series 10**
  - *Thorough editorial review and improvement of latest consolidated text*
  - *Consistency of wording*
  - *Basis document for all SLR proposals to amend Reg. 48 in Stage 2 / Step 2*

SLR "Stage 2 / Step 2" - Main area of work

- **Apparent surface**
  - *Improve and clarify the existing text/examples and consider alternative methods, such as the luminance method*
  - *Work in progress to simplify and improve definitions (and therefore also the determination) of "apparent surface" in Reg. 48*
  - *Special meeting on 11 December 2024 (in conjunction with SLR-70)*

- **Harmonisation among installation Regulations**
  - *Work in progress to align definitions in Reg. 53 (and 74) with those in Reg. 48*
  - *Work in progress to align provisions in Reg. 48 with those in Regs. 53 and 74 on the subject "prohibited if not allowed" to provide clarity and avoid "grey areas" (i.e. different interpretations)*

Requested guidance and feedback from GRE (see GRE-91-02 and GRE-91-22)

UN Regulation No. 53 (similar requirement also in R74)

5.17. The fitting of any lighting and light-signalling devices other than those mentioned in paragraphs 5.14. and 5.15. above is prohibited for the purposes of type approval.

Glare issue

- Much incorrect and misleading information on internet and social media.
- CPs regularly report to GRE that they receive complaints from citizens about glare generated by modern headlamps.
- Mandatory auto-levelling in cars from 2027 will help to mitigate glare, but it will not solve the glare problem completely.
- FIA European survey presented at GRE-90 in April 2024 highlighted a widespread issue of glare in road traffic. This led to the launch, in October 2024, of a new **GRE TF on "Glare Prevention"** co-chaired by Germany, Canada and Netherlands. GTB will provide Secretariat.

Screenshot: Vision Vibes/YouTube

GTB in June 2024 created a new **Task Force on "Glare Control"** to:
- investigate the spectrum of factors contributing to a driver's perception of glare in road traffic.
- develop recommendations to regulatory and enforcement officials to improve the situation.

The objective outcome resulting from this work may be used as the basis for amendments to regulations.

GTB
The International Automotive Lighting and Light Signalling Expert Group

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FAW asked regulators to make more space for innovation, at least in some specific areas, especially about interactive light scenarios—and also faster regulation updates.

市面上各种创新灯光/Various Innovative Lights on the Market

挡位切换提示 Gear Shift Indication
星环灯 Halo Light
投影转向 Projection TI
用户自定义。。。 Customized...
自动驾驶 Autonomous Driving
售后改装 Aftermarket Modifications

FAW-VW Lili Yang

Xingyu discussed the latest update in the Chinese GB 5920 standard covering all light signalling device,

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applicable from July 2025 for new vehicle type (position, turn signal, width marker, daytime running, licence plate, rear fog, and slow-vehicle lamps, as well as light signal projections), July 2027 (stop and reversing lamps) and mandatory for all vehicle types starting July 2028. A small delay has been accepted for stop and reverse lamp application due to new requirements: minimum 15 cm^2 lit area for stop lamps, and an enlarged photometric grid for reversing lamps.

CATARC's He Yuntang described the latest update of GB 4599 (road illumination devices), applicable from July 2025 for new vehicle type (fog and cornering lamps), July 2027 (low and high beam) and mandatory for all vehicle types in July 2028. Similar to LSD, A small delay has been accepted for stop and reverse lamp application due to the same new requirements.

SMVIC's Bu Weili gave some news about the update of installation requirements for vehicles (GB 4785, equivalent to UN R48). The first meeting will be in December 2024, first draft in 2025, and final draft in 2027. Topics to be addressed will include:

- ADB testing (similar to FMVSS 108)
- Clarification about light from parked vehicles and a new definition for a 'non-running' vehicle
- Clarification of the definition of apparent surface, including apparent surface symmetry and the 60-per-cent rule with quadrilateral shapes
- Integration of new AFS mode from GB 4599 into GB 4785
- Certification of the lit grille part of position lamp
- Sequential turn indicator sequence

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- Automatic levelling as in UN R48-09
- Autonomous Driving Signaling lamp (need or no need)

Designer round table

The third panel talk gathered designers from Dongfeng, IM Motors, Lynk & Co, and Zeekr.

Importance of function development was highlighted especially for new EV brands. Lighting function development expresses the otherwise hidden 'intelligence' and capabilities of the car. Examples include welcome and farewell sequences, show room modes, and selectable lighting signatures. The more fun you have from your lamp, the more intelligent the car seems to be. That is why ISD, road projection, signalling projection, and videos from lamps are so important in China. Interaction between driver and its vehicle has number one importance.

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To shorten the development schedule and integrate innovation and functions into the lamp, a close relationship between design studio, R&D and set maker is needed, that was clearly explained by IM Motors' exterior designer.

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Keynote speeches

"Lighting interaction & DIY leads customer needs to improve user experience"
Lin Shudong, Deputy General Manager & Director of Xingyu Research Laboratory, XINGYU

The first keynote speech starts with the presentation of industry trend insights: upgrade of electronic architecture and increasing demand of vehicle software, smart cockpit, autonomous driving penetration of L2/L2+ increase and design of user-centered human-computer interaction systems. Intelligent lighting is part of these industry trends with integration of sensors for perception enhancement, digital lighting, personalization of displays and projection interactions.

Product differentiation is explored with integration of perception modules (cameras, lidar sensors and radars) for situation detection, use of software upgrades and AI to take decisions, to allow programmable lighting

effects and to communicate information. To achieve these objectives, development of SOC (System On Chip) controller based on multi-core architecture and camera-based AI real time image recognition calculations are key factors.

The intelligent perception integration of lights is an important part of the intelligent development of automobiles, which mainly relies on sensor technology, radar technology, visual recognition technology and

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advanced control computing. The intelligent light adjustment system can automatically adjust the brightness and high and low light according to the ambient light, vehicle speed and traffic conditions, improving the lighting effect at night or in bad weather. Simplify driving operations, significantly reduce the risk of accidents caused by blurred vision or glare, and enhance driving safety. Within the product differentiation is possible to move from a normal scenario (ADB and path illumination) to a sensor-based scenario with scene creation (lane narrowing prompt or vehicle distance warning) to a DIY scenario for fun (instant hand-drawing or somatosensory games, also supported by remote control and software upgrades). Differentiation of light sources technologies is also explored with LED, OLED and Mini-LED as needed to achieve the different scenarios both in front and rear applications.

User experience is then analyzed to identify how to enhance value through creation emotional and entertainment experiences, while building on safety and functionality. In this contest the value delivered by scenarios far exceeds the meaning of price alone: consumers consider the value of a car light more based on the features and experiences it can provide in each scenario (normal driving, special road conditions, emergency rescue, social & entertainment). How to reduce in the future development bottlenecks of achieving comprehensive upgrades in time, cost, and experience is analyzed. In the conclusive part of the presentation, a scheme for a jointly creation of a win-win situation is explored: key points are proactive services (deeply understanding needs, enhancing technology promotion, innovating development models) and collaboration with OEMs and supply chain in research and development for integration of multi-party resources.

"IFAL summary & status about lighting research in China"
Professor Yandan Lin, Fudan University

The second keynote speech traces the history of the IFAL (International Forum of Automotive Lighting, China) from 2013 to 2025 and explores the latest hot topics, in particular the interactions around vehicle-mounted light environment in era of AI: multi-modal & multi-feature, human factors & human-vehicle interactions, optical & sensor technology.
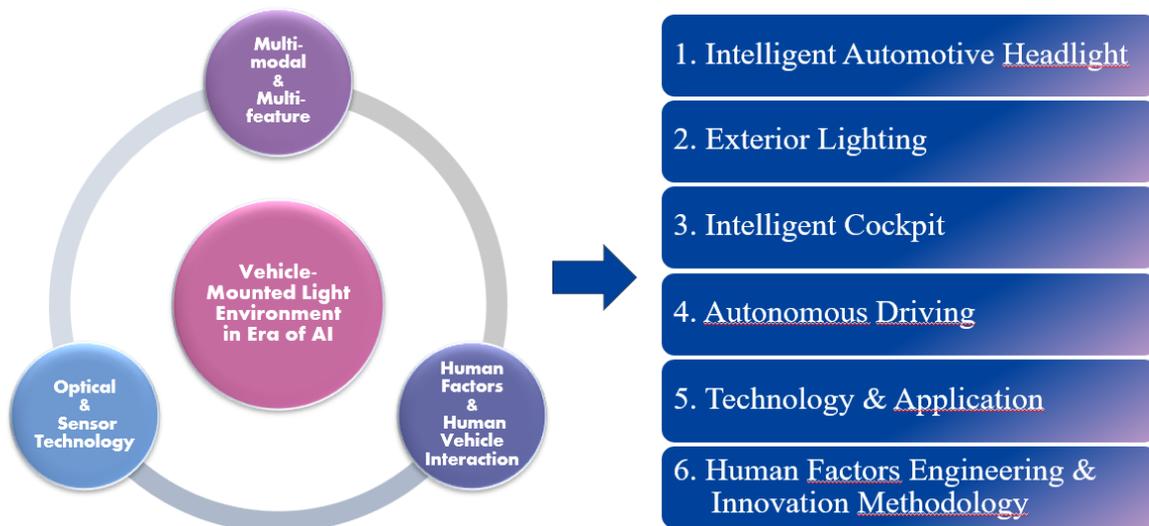
Each of the 6 themes generated by the interactions is then detailed. In particular Intelligent Automotive Headlight considers projector modules, technologies from micro-LED ADB to laser digital headlight and visible light communication. In the area of exterior lighting, external human-machine interactions are considered including car body lighting & attention mechanism, dynamic light and aesthetics/design. Intelligent cockpit includes multi-sensory interactions, human factors engineering, human-vehicle interactions, aesthetic economy and emotional value. Autonomous driving Includes autopilot takeover, graded alerts, emotional interaction and multi-modal takeover interaction. Among the technology & application, micro-LEDs and

precision optical components are considered for digital light and projection modules. In the research and innovation emotional interactions, visual ergonomics, visual safety and detection/assessment methods are considered.

The final part of the presentation is dedicated to completed and in-progress investigations about CBL (Contour Body Lighting) with the objective to identify limits of recognition and distraction in terms of brightness limits, color and locations to define appropriate settings for traffic safety improvement.

- Single line
Source: UXiang

- Double line
Source: Audi

- Area
Source: HongQi

- Front Light, Grille
• Source: OSRAM

How to prevent a driving Xmas-Tree?
Source: motoringmatters.ie

- Long tail lamp, racks, A-C pillar
• Source: OSRAM

Car Body Lighting (CBL): Lights which outline the outer vehicle frame to **decorate** cars as **a "near zero candela lamp"** to make them **more attractive and unique** without another signaling function.

"Automotive lighting in Europe, trend, stakes & status"
Paul Henri Matha, CEO & Lighting Editor, DVN

The third keynote speech starts with the analysis of the 3 main trends in China, North America and Europe-Japan-Korea, being these 3 the group of Countries adopting ECE regulations. For China the major trend is to keep focus on mega-cities, signaling and interactions, Interactive Social Displays and more in general V2X communication. In North America lighting is considered a design element, auxiliary lamps are allowed, providing in this way a lot of flexibility in the applicable standards and some "cool" features can be implemented, but today intelligence in lighting is still not permitted by legislation; SUV and trucks have here a large share of the market. Indian market was similar to Europe and Japan, but now demonstrate a growing interest in technology, safety and design, including lit logos, ISDs and interior lighting. European market is dominated by importance of safety (lighting performances) and design, sustainability plays a key role, whilst regulation is more conservative and today doesn't allow ISD, signaling projection and V2X communication. In spite of these restrictions, V2X communication is coming with small steps as front and rear lamps configurable by user from Audi and EV charge status display from Renault can demonstrate.

Real passion for light

SIA VISION October 16th 2024

The presentation is rich of photos and videos illustrating the best European cars and the passion for light and safety of OEMs and Darmstadt University with studies on glare reduction in different weather conditions for other vehicles and pedestrians and on statistics on the accidents for vehicles with and without ADB. The last point touched by this keynote speech is about sustainability
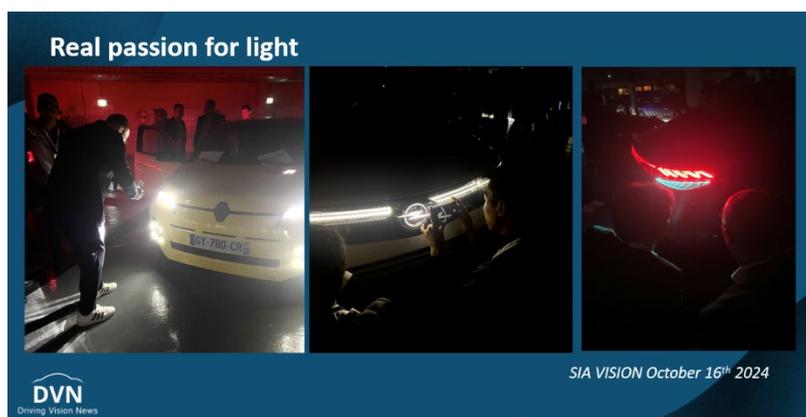
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DVN Next Event Europe

- **Next challenges : Sustainability | Development speed acceleration | Software**

- Sustainability (including new sustainable material, repair, reuse, circular economy and power consumption reduction)

- Development new way of working (including simulation, supply chain footprint, vertical integration, innovation)

- EE Hardware development and Software integration

19 / 20
FEB. 2025
MUNICH

DVN Lighting

DVN MUNICH WORKSHOP
SOCIAL COCKTAIL • MEET & GREET DINNER • CONFERENCE • EXPO

34TH DVN WORKSHOP | NEXT CHALLENGES : SUSTAINABILITY, DEVELOPMENT SPEED ACCELERATION AND SW

where new concepts to repair / change / reuse / recycle lamps are a clear request waiting for smart answers. With sustainability, more driven by European Parliament willingness to reduce CO_2 emissions, reduce power consumption and recyclability of materials, other common challenges between Europe, Asia and America are the transition to Electrical Vehicles, the software defined vehicles (software transferred from lamp to car's ECU with more intelligent features) and the identification of processes to develop faster and cheaper components and upgrades. Some of these topics will be explored and discussed in the next DVN Munich Workshop on February 19th and 20th, 2025.

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SESSION 1 Part 1: MiniLED & alternative for displays & V2X communication: User experience (UX), light source & EE architecture to support

Zeekr : "How stargate has revolutionized front lighting design"

Markus Quarta, Head of Technology & Innovation, Zeekr Design

Zeekr presented the various expressions allowed by the ISD in the Zeekr007, an ISD that incorporates 1.831 led chips at each side.

There is a rich interface to set signatures and play various contents.
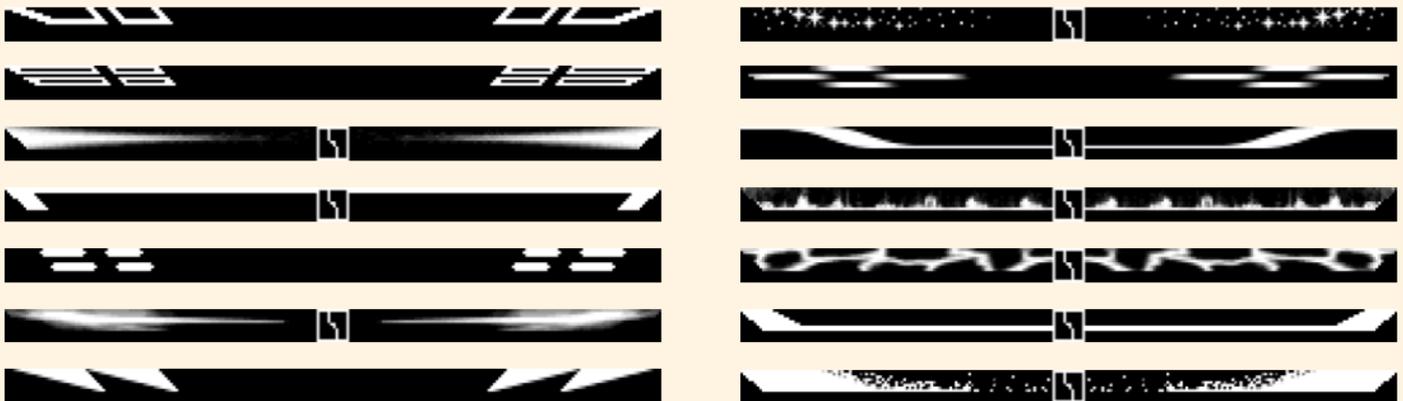
Above, the many faces of the 7X with a growing library of signatures & content

This is allowing Dynamic Signatures: when vehicle comes to a stop, signatures come to life.
Similarly, there are many welcome and goodbye scenarios:

Emojis, texts can also be written, enabling a rich communication with other road users.

This is preparing the future, with more communication, more safety and more design in an automated future

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Forvia Hella: "Shining Bright: how innovations in automotive lighting are transforming mobility experiences"

Fang Min, Director of Technical Center, HELLA Nanjing Technical Center

First, it was reminded that Forvia is a very large group, the 7th worldwide automotive supplier, with sales of €27,2bn and 150,000 employees in 260 locations. The group is involved in seats, interiors, clean mobility, electronics, lighting and life cycling solutions.

They presented their concept "Horizon", first introduced in CES 2024, integrating future solutions for front, rear and interior light like road projection and displays.

CO2 neutrality is a priority for Forvia group, and so they have developed a sustainable headlamp that compared to a traditional headlamp, is allowing 60% weight saving, 60% energy saving, with 90% recyclability.
This is mainly due to the adaptation of the light to the situation, with adaptive DRL, adaptive low-beam and glare free high beam.

Forvia presented also new products corresponding to the new trends:

. Front display for V2 X communication, upgradable, customizable, and modular. Pixels size and shape can be customized, with a black panel effect.

. Similarly, the rear displays can be customized, tailored for V2X communication, and modular.

After these future possibilities, it was presented a real current innovative product installed on Z10 Lynk and Co rearlamp, the first RGB rearlamp having so the possibility to adapt the color to the need, for instance red for tail lamp, and other colors like blue for welcome-goodbye scenario. As other displays, besides the 256 available colors, dynamic multicolored animations are possible.

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Lumissil: "New Generation of Intelligent Interactive Light Driver Solution"

Eben Qiu, Application Senior Manager

Lumissil have developed different electronic drivers for the control of exterior displays, already in production as for the L7 with 24 channels of 75 LEDs, or for the M9 with 48 channels. They are proposing for this LED control the IS32FL3761, able to control 396 LEDs in 12 channels of 33 LEDs,

They are also proposing the IS32FL3248 controlling 48 LEDs or the IS LT3138.
One advantage is their ability to reach a high PWM frequency till 25kHz avoiding the flickering effect.
Or the IS32FL3776 controlling 36 channels of 6 LEDs.

Hereafter is their sheet summarizing the main characteristics of these drivers:
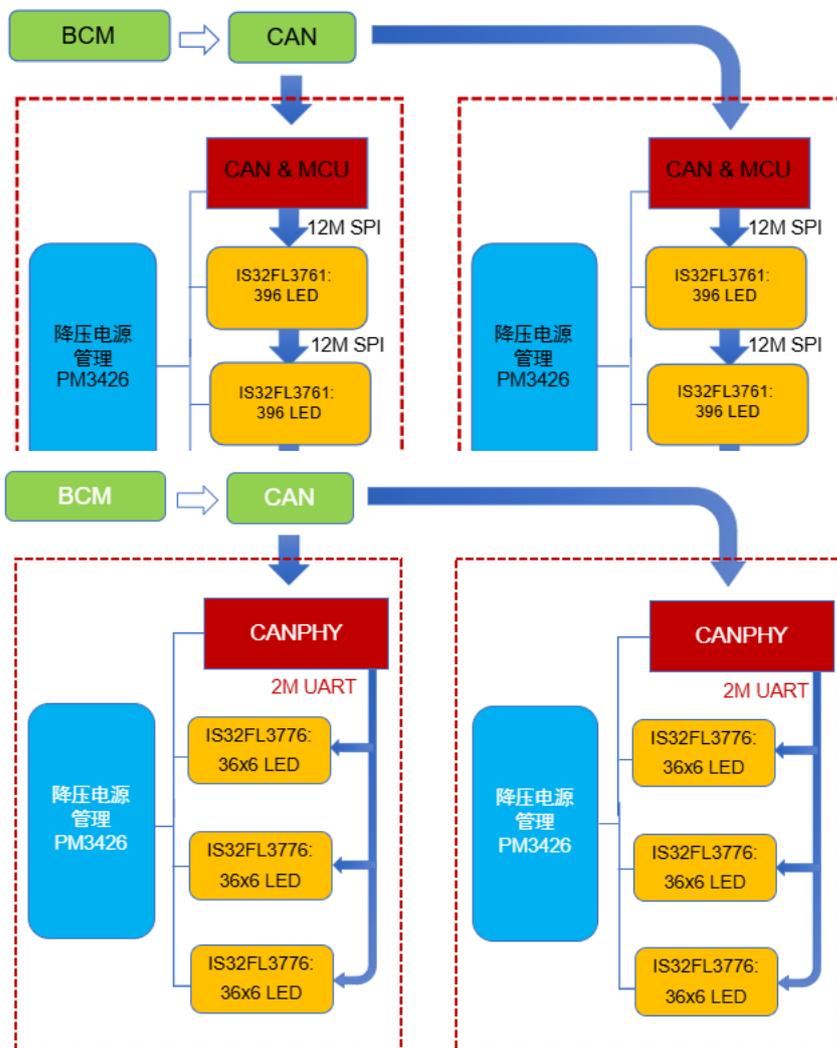
Application Example: 576LED, 10mA each					
驱动芯片Driver IC	**IS32FL3761**	**IS32FL3248**	**IS32LT3138**	**IS32LT3136**	**IS32FL3776 (Sample 25Q1)**
通信方式Interface	SPI 12MHz	SPI 25MHz	UART/LUMIBUS 1MHz	UART/LUMIBUS 2MHz	UART/LUMIBUS 2MHz
峰值Peak current	40mA	10mA	10mA	10mA	40mA
平均Avr current	10mA	10mA	10mA	10mA	10mA
Scan/no scan	Yes, 4 扫	No	No	No	Yes, 4 扫
Max. PWM Fre(multi-ch) Scan Fre(matrix)	PWM: 312kHz@6+2-bit Scan: 26kHz	PWM: 62kHz@8+8-bit	PWM: 24kHz@7+5-bit	PWM: 25.6kHz@7+5-bit	PWM: 250kHz@7+7-bit Scan: 41.6kHz
BOM Table	FL3761 x 5 MCU x 1 CANPHY x 1	FL3248 x 12 MCU x 1 CANPHY x 1	LT3138 x 32 CANPHY x 1	LT3136 x 18 CANPHY x 1	FL3776 x 4 CANPHY x 1
BOM Cost	驱动芯片数量少, BOM成本较低	驱动芯片数量多, 成本较高			驱动芯片数量少, BOM成本较低
通信方式Interface	SPI 跨版需额外单片机控制	UART/LUMIBUS+CANPHY, 无需额外单片机, 方便跨板			

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Refond: "Application & Innovation of Mini LED Technology in the Automotive Field"

Han Tingting, Director of MINI Display Product Line

Mini LED backlight screens have been previously released on the interior displays as on the Ideal, NIO, SAIC Feifan, Cadillac, Lincoln, and Roewe car models. In 2024, the Mini Led market has further grown with applications on Xiaomi's 16.1-inch 3K ultra-clear central control screen mini LED backlight, Changan Automobile Qiyuan E07, and the Asian Games-specific Geely Yinglun LEVCTX5, which are equipped with different designs of miniLED.

In the interior, many kinds of applications of miniLEDs displays are prepared not only for central display, but also rearview display, roof displays, etc.

In the future, the design of smart surfaces and displays will gradually be applied to the front face to display different interactive information. For example, a Hyundai Mobis' display can interact with vehicles and pedestrians.

For car applications, miniLED can be put on flexible support, with a pitch of 0,5mm, with RGB possibilities, offering for instance the ability to dance to a music.

These flexible miniLEDs support have a size of 408,6mmX10mm, a total thickness of 1mm including a 0,5mm silicone protective layer, LEDs and drivers being on the FPC.

A more "traditional" use of miniLEDs is for the LCD backlighting allowing 1500 nits, offering high brightness, wide color gamut and high contrast and better energy efficiency. Its high brightness makes the screen clearly visible in bright light environments and is suitable for various driving conditions. A wide color gamut means that the screen is able to display more colors and more delicate color transitions, making the image more realistic and vivid. The high contrast ratio enhances the depth and depth of the image, especially when displaying a black scene, which can show deeper blacks and provide a better visual experience.
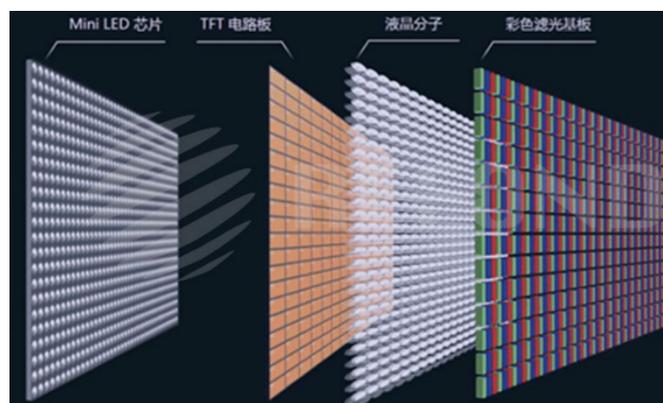
However, currently prices are high due to the high precision required, and heat dissipation is another challenge.

So, with the development of intelligent and electrified vehicles, Mini LED backlight technology can no longer meet consumer demand for display effect and performance, and in the future, the direct Mini LED direct display technology in the automotive field will be able to display various driving information, navigation information, entertainment content and human-vehicle interaction lights with higher quality.

New cars as the full range of Li Auto models or Geely Yinglun LEVC TX5 car project will all use Mini LED direct display technology, which brings new display effects and performance improvements to automotive displays.

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Ansys: "Ansys optical solution for intelligent display in Automotive"

Tong Xing, Manager Application Engineering

Ansys presented their simulation solution for many of the current and future trends including transparent displays, MLA, DLP, LCD; etc., using their main simulation tools Ansys lumerical for Photonics design and analysis, Ansys Zemax for optical design and modeling, Ansys Speos for system level-optical simulation.

They presented first the challenges and also the interests of transparent displays, that could be realized with DLP or with LCD, MiniLED or Micro LED, and that can be used on lateral, front, rear windows or sunroof. The requirements are severe including high transparent, high contrast, high transmittance and no color difference, and could be simulated with Ansys tools.
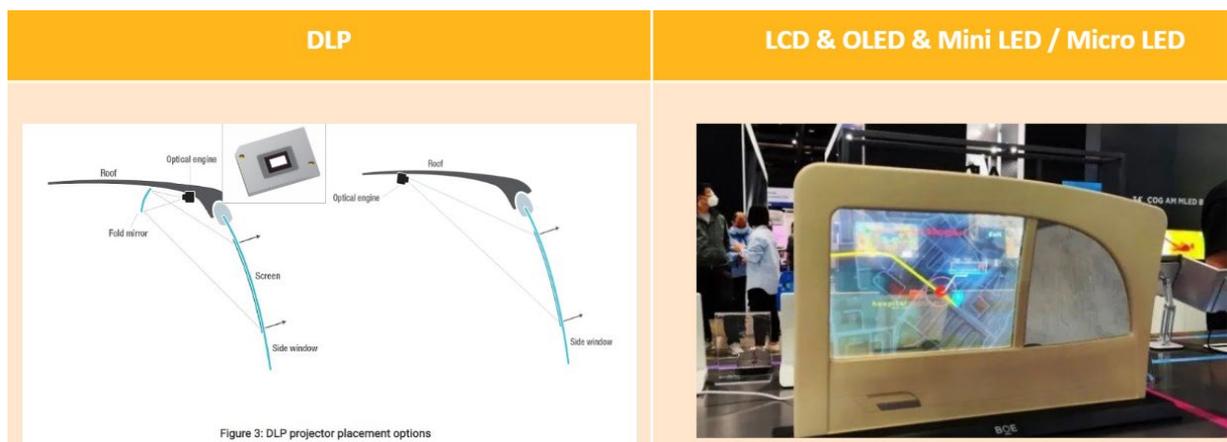
Floating display could be an interesting direction, still with many challenges, but could be simulated with Ansys tools, according to the main principle of this kind floating display.

Light decorative panel with display is direction for new interior appearance, with possibility for instance to simulate the aspects according to the diameter of the
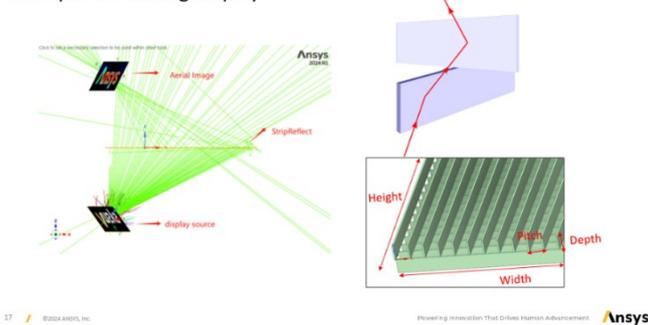
future that of another the different texture.
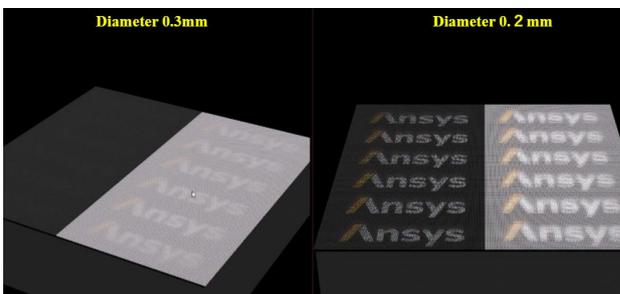
Similarly, other examples of simulations were presented for displays, road projection, MLA, MicroLED, demonstrating the large variety and strong efficiency of Ansys tools to prepare the new lighting trends.

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APT Electronics: "Auto LED & Module for Intelligent Vehicle Interactive Display"

Wan Chuiming, Director of Operations, Automotive Division

Compared to the traditional face up architecture, vertical or flip chip architecture gives better heat dissipation, better light emission, better reliability, are adapted to high power, with nevertheless higher costs. APT is now giving priority to flip chip structure, being the first in 2012 to launch this technology for streets lamps, after for TV backlighting, and since 2018 for high power LEDs.

APT 3W LEDs are now used by more than 500,000 vehicles in China. APT ceramic high-power LED have an overall ppm level below 0,5%.
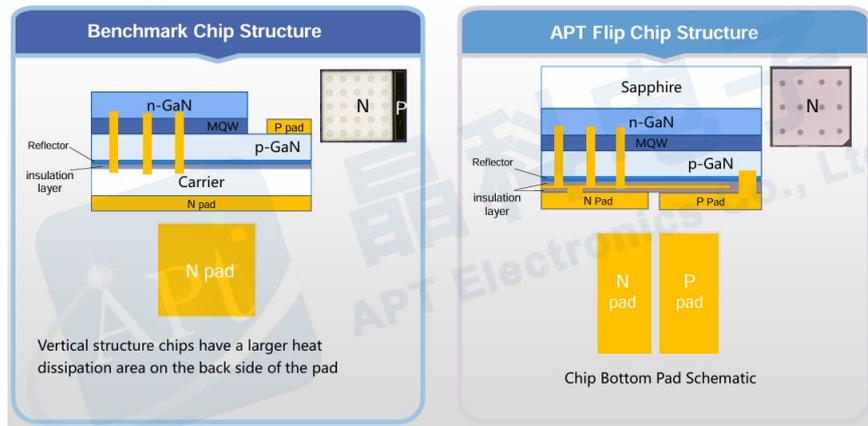
APT is proposing many kinds of power LEDs with one, two, or three chips, and with an evolution of the ratio lumen per Watt improving roughly by 4% per year.
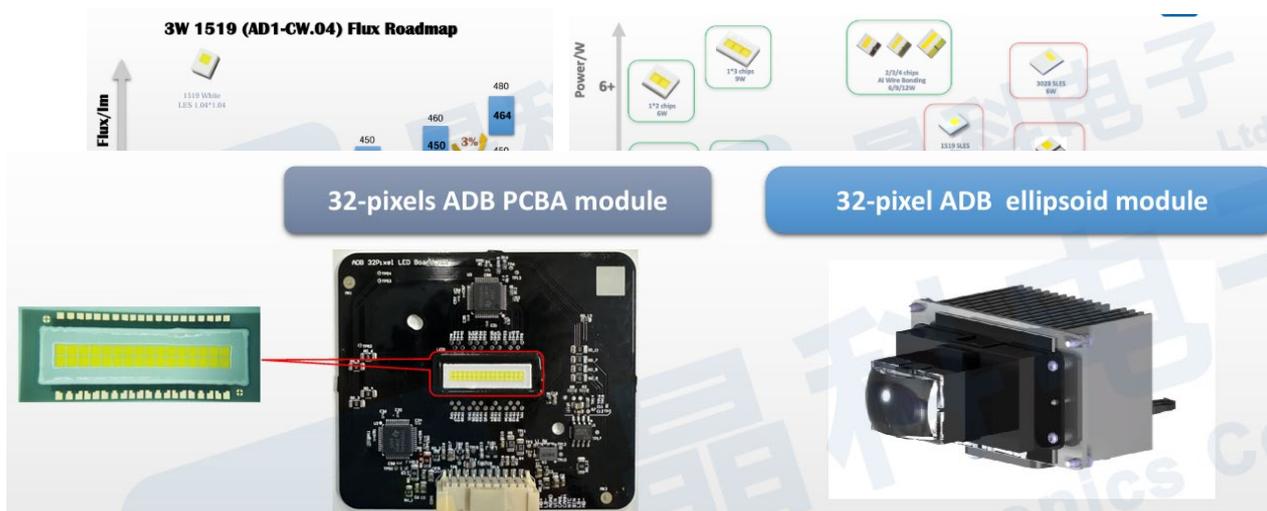
APT company have also developed ADB solution with a 32-pixels system in two rows.

Lynk&Co Design: "Z10, new design language & interaction with environment"

Alsed Briscoe, Exterior Chief Designer & Louise Kivi, HMI Project Manager & Chief Designer

Lynk&Co dare to be Lynk&Co, and has the ambition to be the next premium company, with a proud tech and a rich experience.

The company recently launched 07 sedan, the 08 hybrid SUV, and the crossover with a unique tech spoiler rearlamp.

mild hybrid small BEV Z20 integrating the

And in September 2024, they launched the Z10 BEV.

They wanted to express emotion with the front face, because that creates connection to human being, and here, the intent is a smiling car. Lynk&Co realized many tests including with VR, and most of the emotions of the car were perceived and understood well.

For Lynk&Co, everything comes back to their users, that are quite young and are a demanding target group that was born digital.

For motor show events, they are using a specific blue colour for the lighting functions, color of the brand, to better attract customers.

During the welcome scenario, the car comes alive and gives the perception that it is happy to see the driver again. Research & user study show that blue and green are a suitable combination cross cultures.

The green colour is also giving the indication of the charging status.

The Car with Emotions concept includes a security feature called suspicious mode. If there's a security breach, the light activates to signal the car is on its guard. This animation gives the car a protective quality, making it feel aware of its surroundings.

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Great Wall Motor Company: "With the trend of intelligent vehicles: lighting integrated with innovative technologies in the intelligent era"

Li Luxiang, Optoelectronics Chief Engineer

GreatWall presented the assumptions of autonomous vehicles with L1 to L3 levels in the coming years.
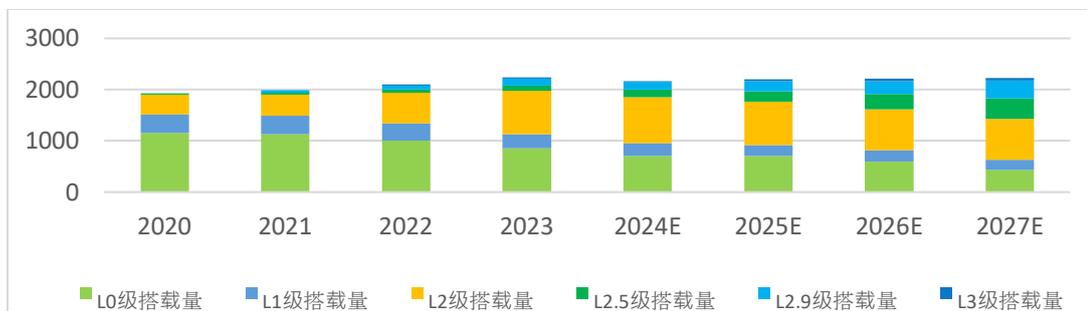
The following graph is showing the China's Passenger Car L2.5 Autonomous Driving (Including Hardware Embedded) Price Segment Distribution (Full Year 2023)
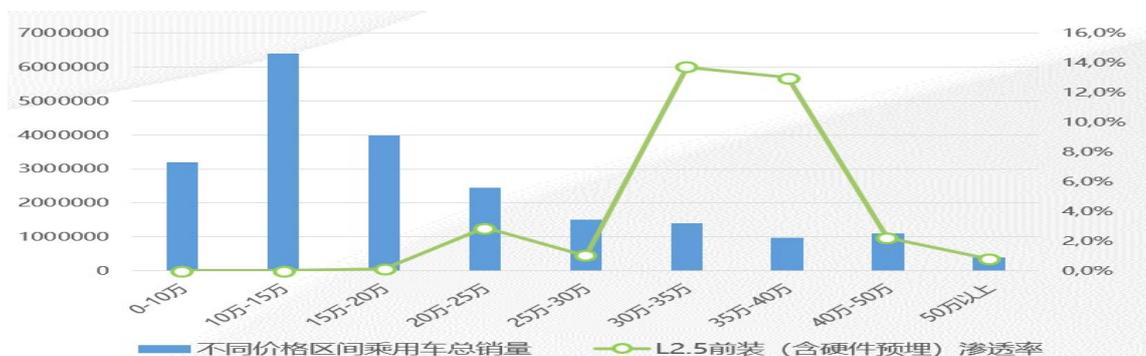
More and more sensors are equipping cars for more safety, with an electronic architecture more and more centralized.

The exterior display screen is used to realize interactive display while illuminating, with also integration of light in grilles.

A new styling possibility is the "volcano aspect" of headlamp: when the vehicle is locked, the kinematics remain closed, giving the impression that Volcano Bromo is asleep, and when the vehicle is unlocked, the kinematics "wake up" like an eruption with "modules that break through the sky".

New Lighting functions are a way to answer the younger generation requests for more innovation and intelligence in the car.

DVN Report: Shanghai Report

SESSION 2 − PART MiniLED & alternative for displays & V2X communication: User experience (UX), light source & EE architecture to support - Chairman Harry Zhao, Jidu

OPmobility: "Digitalization & Customization of Signaling Functions"
Li Jiangong, Lighting APAC Innovation Manager

OPmobility is a group with sales of €11,4bn, 40,300 employees in 152 plants and 40 RD centers. They have 6,500 employees for lighting.

SDV (Software Defined Vehicles) are now transforming automotive technology with informational and safety alerts, lighting customization, regulatory compliance and remote diagnostics.
And digital exterior technologies are driving new applications and use cases like these following ones:

For displays, the legibility is in relation to the pitch, being good with less than 1mm.

Sample dimension	LED Pitch	LEDs (Pixel)	LED quantity	Viewable*	Qualitative feeling*
252 cm² (150mm x 168 mm)	1.5 mm	100 x 112 = 12.320	Factor 0.4	2.5 - 6.0 m	Visible
	1.25 mm	120 x 135 = 16.200	Factor 0.6	1.5 - 4.0 m	Suitable
	0.93 mm	160 x 180 = 28.800	Factor 1.0	0.9 - 3.0 m	Good
	0.68 mm	220 x 247 = 54.340	Factor 1.9	0.5 - 2.0 m	Excellent

But with more pixels to control, the electronic architecture needs to be adapted.
For instance, today with OLEDs display of 1024 pixels, CAN 2.0 is possible, while with 8,192 pixels tomorrow, CAN FD could be necessary.
But for miniLEDs applications, for today's applications with 24,576 pixels, Ethernet 10-T1S is already necessary, and in the future for 120,960 pixels, Ethernet 100-T1 will likely be necessary.
This is due to the quantity of information to control, from 1,5 Mbyte for 1,024 pixels to 181,4 Mbyte for 120,960 pixels for a video of 30s.

This can be managed by a zonal electronic architecture in the next future. However, with very high resolutions higher than 25,000 pixels, dedicated display controllers will be necessary.

DVN Report: Shanghai Report

Macroblock: "LED Driver IC for Automotive Pixelated Applications"

Kerry Huang, Deputy Director of Technical & Marketing Division

Macroblock is a company founded in 1999 in Taiwan and with 2250 employees.
They are currently the market leader for microLEDs controllers.

They have developed specific processes for manufacturing and tests to ensure a good Cpk for their production, with the possibility to identify good dies in bad clusters.

One of their important markets is interior displays, with the evolution towards smart cockpit, that are forecast to reach a market share of 75% in China in the next years.

For displays, FALD (Full Array Local Dimming) have interests for contrast, brightness and power saving.
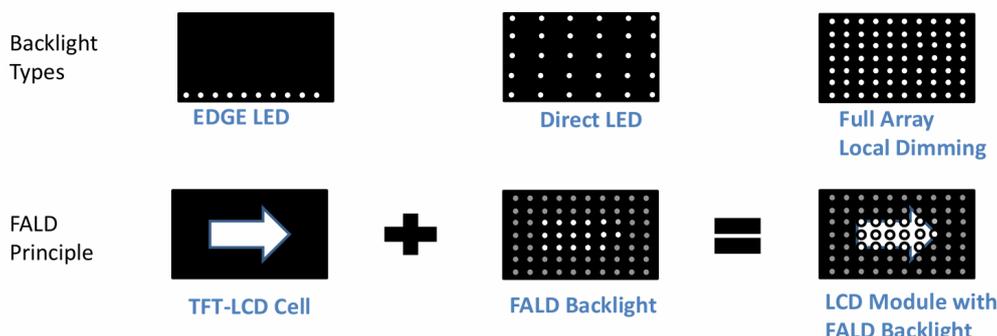
To drive these displays, two kinds of architecture are possible, the first one with LEDs and drivers placed separately, and the other one with LED and driver on the same package. The first technology is more compact, but the frame rate is limited as well as the power dissipation, limiting them to low power applications.

high pixel numbers, they proposing two drivers, MBI5989Q till 2A, 16 channels 7VLED, and the MBI5353Q with 48 channels at 20mA and 17VLED.

For are the
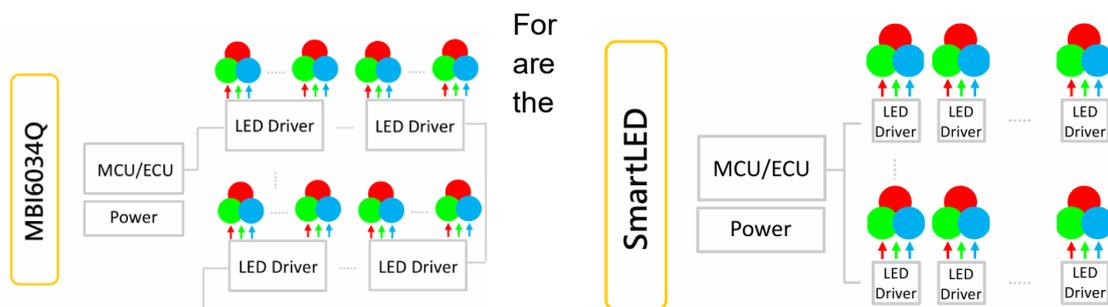
Headlamps are now also using MicroLEDs for ADB HD and are so needing specific control.

Macroblock had delivered drivers for many cars in recent years, for instance for the halo of the AVATR using MBI5353Q+5989Q controlling 12,000 pixels. They include 48ch Driver + 16ch Mosfet, and they support Scan Design Max. 32-Scan and 16-bit PWM.

DVN Report: Shanghai Report

Jidu Auto: "The Smart Light for ROBOCAR"
Li Zhuo, Front Light Expert

Jidu is an AI technology company founded in March 2021. Based on Geely SEA's vast architecture, Jidu focuses on the definition of intelligent vehicle products and AI intelligent technology innovation and creates a complete solution for high-end intelligent vehicles. In this strategy, Jidu is responsible for the engineering of Baidu's AI capabilities to build an automotive AI brain; In parallel, Jiyue is responsible for the operation and management of the automotive robot brand, market layout. Baidu and Geely are supporting the rapid development of Jidu and Jiyue.

The Jiyue brand has two production models, the Jiyue 01 and the Jiyue 07. . Jiyue 01 is positioned as an AI intelligent pure electric SUV and the first automotive robot under the Jiyue brand. It is equipped with the 8295 Qualcomm Snapdragon super flagship chip and the Apollo high-end autonomous driving system for the first time, and has AI intelligent driving technology that is fully empowered and applicable to all scenarios. Jiyue 07, as the face of the Jiyue automobile robot family, is an intelligent driving car equipped with Baidu Apollo high-end intelligent driving system, Geely SEA vast architecture, and CATL Kirin battery, with minimalist avant-garde design, space technology sense cockpit, 5C flash charging.

Pixel-J is the core language that runs through Jiyue's design. J is the initials of Jiyue Pinyin, the CEO, Pixel-J symbolizes a new connection between humans and machines.
The front smart eye-catching intelligent interactive headlights have 15mm ultra-thin high and low beam headlight module, and there are also dynamic interactive ISD screen to create a minimalist visual effect and sharp eyes.

At the rear, the rearlamp has the shape of a unique dynamic piano keyboard design, and the interactive ISD screen is echoing the front, and represents the family language of the Jiyue lighting system. The side of the car is also equipped with pixel wheel eyebrow lights and dynamic pulsating intelligent interactive lights, which make the vehicle very sideways recognizable and show its personality

For lighting, AI will change deeply the safety functions soon, for instance putting on automatically the turn indicator, and at the interior with intelligent interactive light with prediction of user's needs, with ISD screens interacting with user's emotion and environmental guidance interaction.
For Jidu, an intelligent lighting revolution is taking place now with AI.

DVN Report: Shanghai Report

ConvenientPower: "Intelligent Automotive LED Lighting Solutions & the Evolution"

Wang Zhihao, General Manager of Automotive Chip Product Line

Founded in 2016, Yichong Semiconductor is headquartered in Chengdu, Sichuan, with branches in Shanghai, Xi'an, Shenzhen, Hong Kong, Seoul, Seoul, Silicon Valley and other places.
The company is a leading enterprise of wireless charging chips in China; It is the first enterprise in China to enter the field of vehicle-grade digital-analog hybrid chips.

For lighting applications, they are proposing different boost converters, buck LED drivers, LED matrix drivers for the different LED controls.
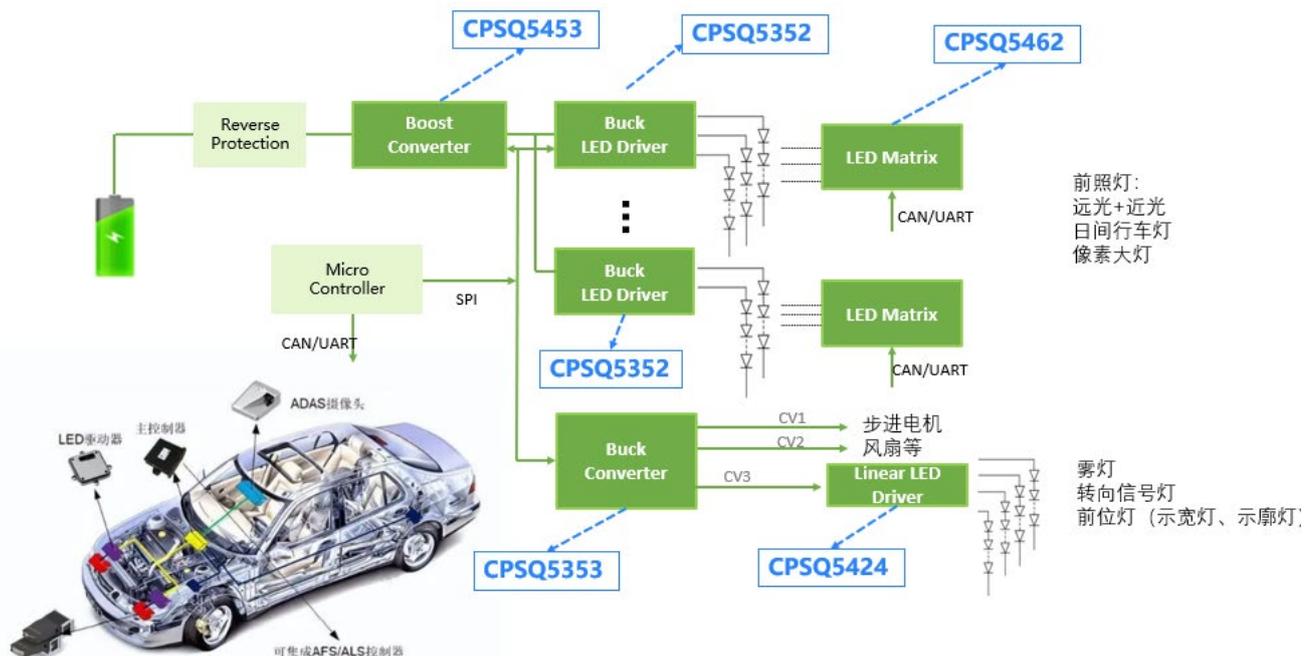
They have also drivers for low power applications, for instance tail lamps, with linear constant current drive at 24 channels with their CPSQ5424

Changan: "Enpower future automotive lighting via connectivity, digitalism & smart technologies"

Yu Zhixiao, Deepal Senior Deputy Chief Engineer

AI will change deeply vehicles and particularly lighting in the coming years.

In the future, lighting will integrate physiotherapy, and lamps will not only have lighting functions, but also express emotions and car interaction. In parallel, cars will have a high degree of self-learning functions with continuous innovation functions, and the lights will support this trend with cloud interconnection.
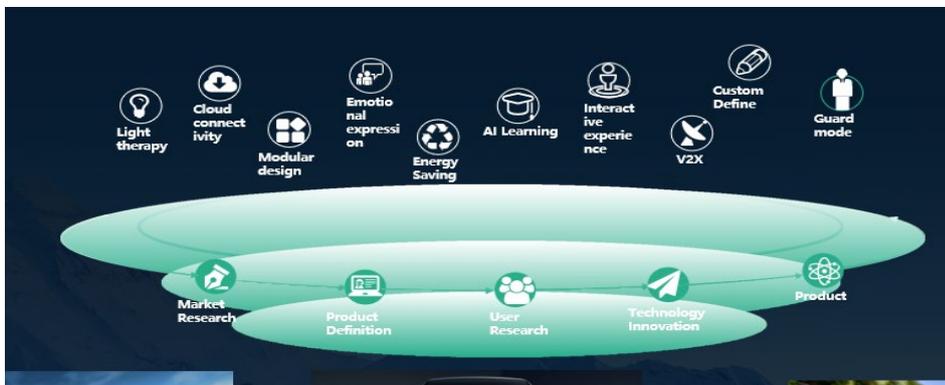
The innovations are driven by three enablers: sensory experience, technical experience, and user experience.

. Sensory experience: are various new trends design of lamps, more flat particularly necessary for electric allowing more inspiration for lamp and creation.

There for and more vehicles, design

. Technical Experience: In parallel, the continuous progress of technology has allowed new functions more diverse, more attractive, and more digital like, AFS-ADB-Pixel-OLED-HD ADB-DLP-ISD-MiniLED.

. Driven by user experience: with emotional experience and entertainment experience for safety and functionality.

DVN Report: Shanghai Report

Hascovision: "Digital Interaction Technology for Practical Use"

Wang Liangliang, Senior Manager of Integrated Optics

Intelligent vehicles will have massive perception and decision-making data, but they will have to coexist with non-intelligent vehicles, and with the human visual perception in complex situations.

So the massive perception data of the intelligent vehicles will have to take into account also the visual perception of the driver, of the pedestrians or cyclists, and of the other drivers, and this is particularly important for lighting systems for instance front road projection systems, defining their main requirements.

This analysis is necessary to define for instance the emax, in relation to the illumination by streetlamps for the different new functions possible by road projection including pedestrians warning, blind zone warning, forward distance warning, forward collision warning, lane departure of vehicle ahead warning, welcome mode and car finding function.

The FOV (Field of View) is another important requirement for road projection systems, having to take into account the regulation and most of the practical scenarios.

This approach was used to define the current Hascovision projector module having the main following characteristics.

- **Pixel:** 960*960
- **Emax:** 125 lx @25m
- **FOV:** 14°×7°
- **Contrast:** 260:1
- **Power:** ~66 W
- **Cooling:** Air cooling
- **Weight:** 900 g

DVN Report: Shanghai Report

Anrui: "An introduction to Mini LED screen control technology"

Liang Jin, Director of Electronic Technology

Mini LED, also known as "sub-millimeter light-emitting diode", are the technology between small pitch LED and micro-LEDs with less than 200μm, and are, for Anrui, the new "blue ocean for display applications".

They will be used for central displays, for interior mirrors, for steering wheel gauges, for seat control panel, and for front interactive front display.

For the control of these many miniLEDs, many electronics devices are necessary.

There are different architectures for that with traditionally a FDP Link3 and a RGB888 interface. The FPD LINK III interface is stable and reliable, but the RGB888 interface is affected by the number of BASE data lines and TTL level transmission stability, resulting in a surge in the number of PINs in the actual data line, and low production efficiency, scalability, and reliability!
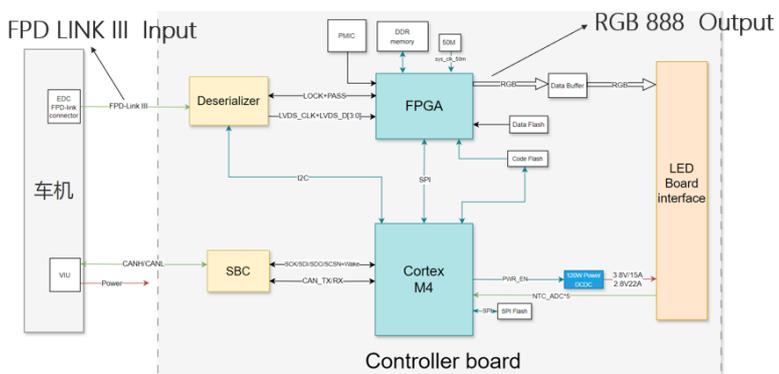
Another electronic architecture is using LVDS output. In that architecture, the FPD LINK III interface is still stable and reliable, and the LVDS interface is highly producible, anti-interference, and expandable.
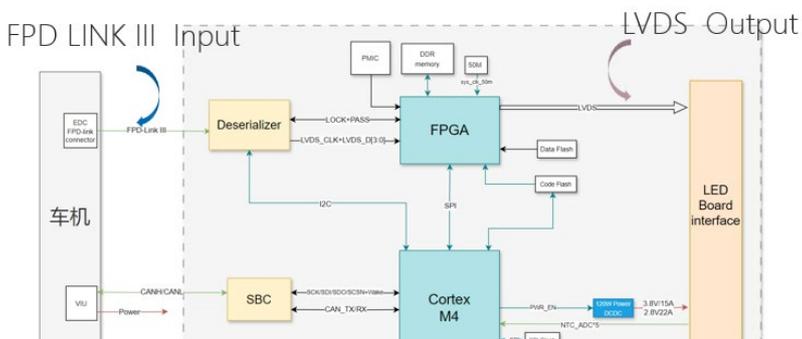
A third solution is the use of ethernet input and SPI output.
This solution is both scalable, with a lower cost, with a better protection for EMC, and with high producibility. This solution will likely be preferred for miniLEDs application as soon as the number of pixels will increase.

DVN Report: Shanghai Report
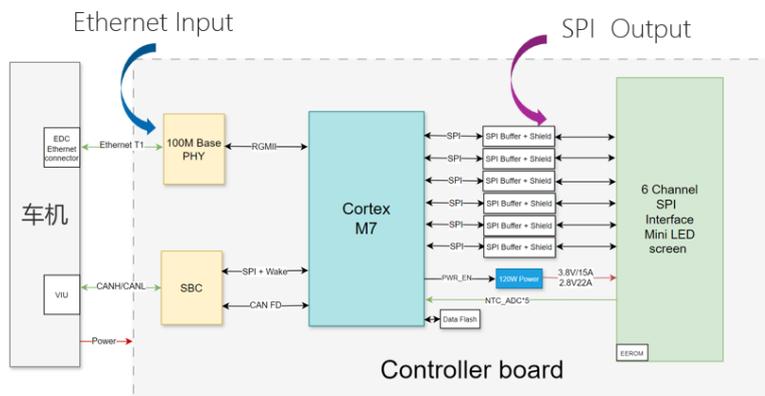
SESSION 2 Part 1: ADB, Rating, road projection & signaling projection technology

ZKW : "Fully Dynamic Ground Projection - Technical Introduction and Future Outlook"

Henry Song

The presentation discusses the technological advancements, requirements, and applications of dynamic ground projection (DGP) systems in automotive lighting.

DGP systems enable vehicles to project dynamic symbols or images onto the ground, enhancing communication with pedestrians and other road users. The ideal projection area is 2x2 meters with a large field of view (FoV) of 38° x 136°, requiring ultra-short-throw projectors. Practical FoVs, however, are closer to 15° x 28°. Brightness expectations vary: ideal projections demand more than 120k lumens, while real conditions can only deliver under 200 lumens. Resolution studies show that on rough surfaces like asphalt, a resolution of 588x330 pixels is sufficient for visibility. Symbols must be large enough for human perception, with contrast playing a critical role in legibility under varying conditions.
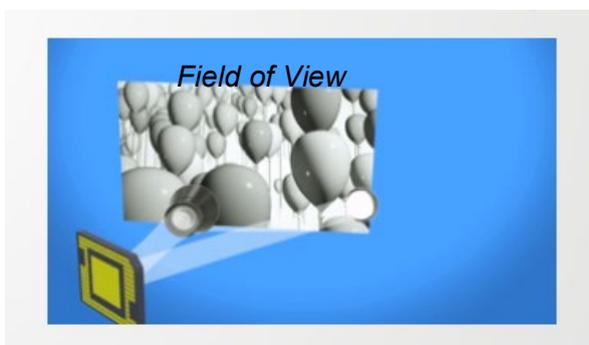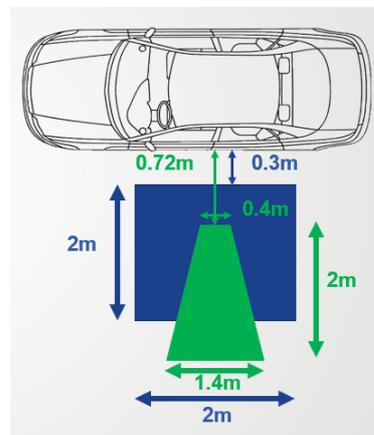
DMD-Based Modules with DLP2021-Q1 (0.2", 588x330) or DLP3021-Q1 (0.3", 864x480)

The presentation highlights two technologies: DMD (Digital Micromirror Device)-based modules and MEMS (Micro-Electro-Mechanical Systems)-based modules. DMD systems offer higher brightness but are more complex, while MEMS systems are simpler and more energy-efficient but limited in laser output power.

Future outlook emphasizes laser safety, particularly ensuring compliance with Class 1 standards for automotive use. Both technologies have potential depending on specific use cases, offering innovative solutions for vehicle-to-environment communication and paving the way for safer, smarter transportation systems.

Comparison between DMD and MEMS

Synopsys : "Synopsys Optical Solutions portfolio for developing complex illumination systems for exterior and interior automotive lighting applications"

Dr. Tobias Schmid

The Synopsys Optical Solutions presentation outlines a comprehensive portfolio for developing advanced automotive lighting systems for both exterior and interior applications. The focus lies on combining innovative design capabilities, precise simulation tools, and physics-based visualization to streamline workflows and enable cutting-edge designs. A key feature is functional geometry, which uses algorithms to automatically generate optical geometries based on user-defined light intensity and illumination distributions. This allows designers to focus on strategic concepts rather than mathematical complexities. Synopsys also integrates CATIA-based modeling tools for creating highly sophisticated optics, combining features like MacroFocal lenses and LED collimator lenses while maintaining fully parametric designs for quick iterations.
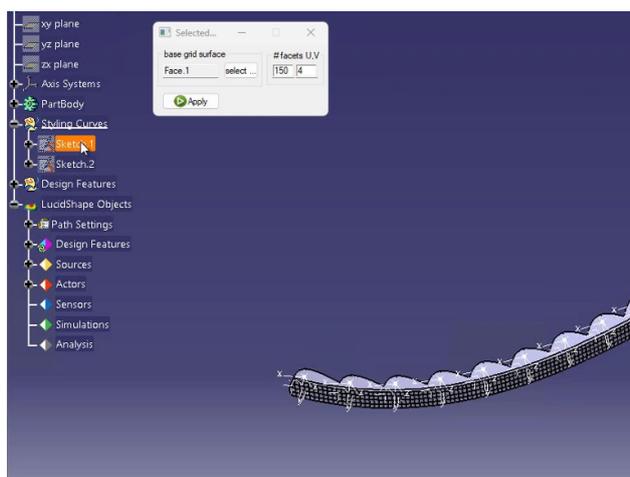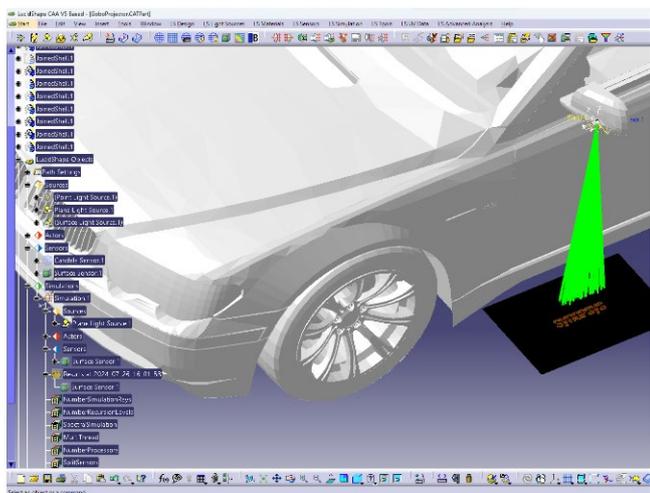
Synopsys Design Tools Catia based

The presentation highlights solutions for Micro Lens Arrays (MLAs), ideal for shallow projection tasks such as light carpets or animated lighting effects. Synopsys' light guide design tools automate the creation and optimization of light guides, enhancing spatial uniformity and directional control. Similarly, backlit display optimization focuses on creating homogenous illumination across thin light guides, applicable to automotive displays.

The physics-based photorealistic visualization tools allow designers to virtually preview products with accurate visual feedback and quantitative photometric data.
Finally, Synopsys offers measurement solutions for material characterization, custom measurements, and ready-to-use libraries, supporting an efficient and collaborative design process. Overall, Synopsys delivers powerful tools for simulation, optimization, and analysis, driving innovation in automotive lighting systems.
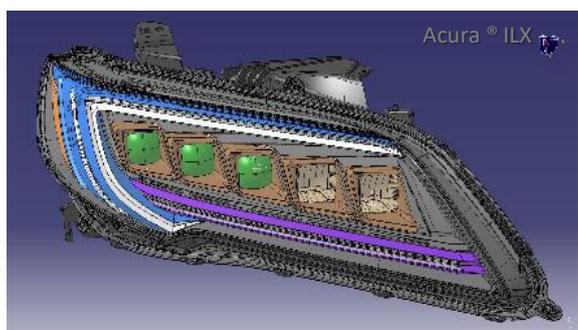
Physics-Based Photorealistic Visualization

DVN Report: Shanghai Report

Technoteam and LMT : "High-Resolution and High-Contrast Analysis of ADB Systems and Symbol Projection"

Bob Liu

The presentation focuses on the advancements and challenges of Adaptive Driving Beam (ADB) systems, emphasizing high-resolution and high-contrast technologies. High-resolution systems aim to minimize dark gaps compared to traditional LED Matrix systems, with resolutions between 0.02° and 0.05° for close-range projections.
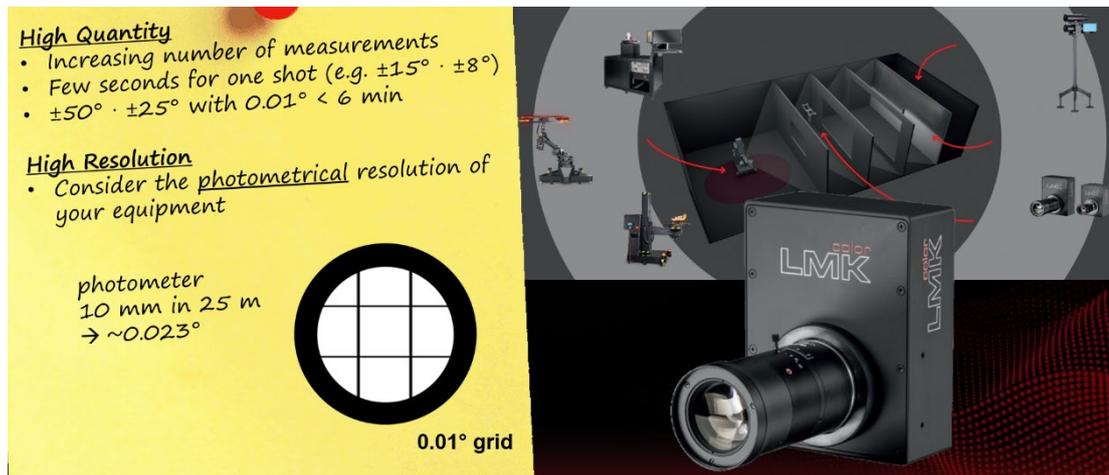
LMK 6 Color camera enable high-contrast measurements with a resolution of 0,01°

High contrast is another key area, with systems requiring contrasts as high as 1:200, particularly under worst-case scenarios. Challenges include achieving black spots on white screens, managing camera contrast limits, and addressing lab influences. For this, high-contrast cameras with features like Sequential Light Control (SLC) and Refined Sequential Light Control (RSLC) are used to ensure accurate measurements, particularly under complex luminous flux segmentations. Measurement challenges arise from increasing data quantities and the need for high-resolution grids. Capturing results within seconds while achieving angular precision (e.g., 0.01°) requires photometric and camera systems with resolutions down to 0.005°. Devices like the LMK 6 Color camera enable high-contrast measurements, offering resolutions up to 30M and superior color accuracy. This eliminates frequent recalibrations and reduces costs for end-of-line processes.
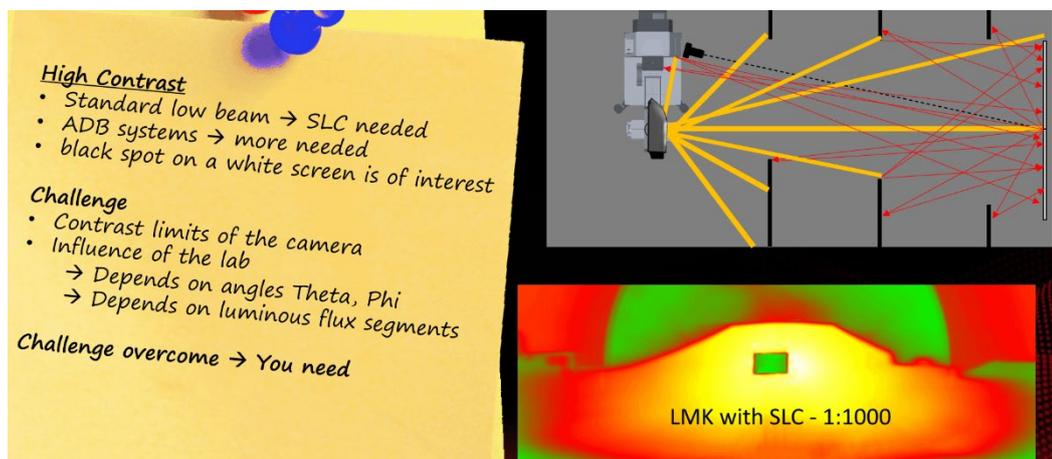
LMT Camera Measurement with Sequential Light Control (SLC)

Future developments may include measuring emerging lighting technologies, such as carpet light systems. The core focus remains on achieving precision, speed, and accuracy in high-resolution and high-contrast ADB systems, ensuring advancements align with evolving automotive lighting demands.

DVN Report: Shanghai Report

NXP : "Latest Electronics Developments in Advanced Exterior LED Lighting"

Dr. Prem Sharma – NXP

The presentation highlights key trends, challenges, and solutions in advanced automotive LED lighting systems. A significant trend is the increasing demand for edge-to-edge lighting in both front and rear applications, aimed at enhancing safety and improving the driver experience. However, this innovation presents new challenges for current LED driver electronic architectures, particularly in managing long LED strings, which require multiple power channels and add cost and complexity.

Increasing the requirements and challenges on the LED Driver Electronic Architectures

To address these challenges, NXP introduces the ASL6xxx Matrix LED Controller (MLC), a solution that enables synchronization of PWM duty cycles and phase shifting across multiple controllers without the need for MCU intervention. This innovation significantly reduces costs by allowing all LEDs to be powered from a single channel while maintaining system efficiency and safety. The ASL6xxx series features up to 16 switches, programmable PWM resolution (12-bit), and advanced diagnostics for detecting single LED failures, open/short circuits, and voltage anomalies.

The ASL6xxx controllers support large LED counts in strings, enabling seamless edge-to-edge lighting while avoiding high peak currents and excessive string voltage. Furthermore, the controllers are scalable, flexible, and compliant with emerging requirements, including compatibility with 48V low-voltage battery architectures. These advanced features make NXP's solution a robust and cost-efficient answer to the challenges posed by new automotive lighting use cases.

In conclusion, the ASL6xxx Matrix LED Controller family offers an innovative approach to addressing the increasing demands of automotive LED lighting, ensuring safer and more cost-effective designs while enhancing the driver experience.
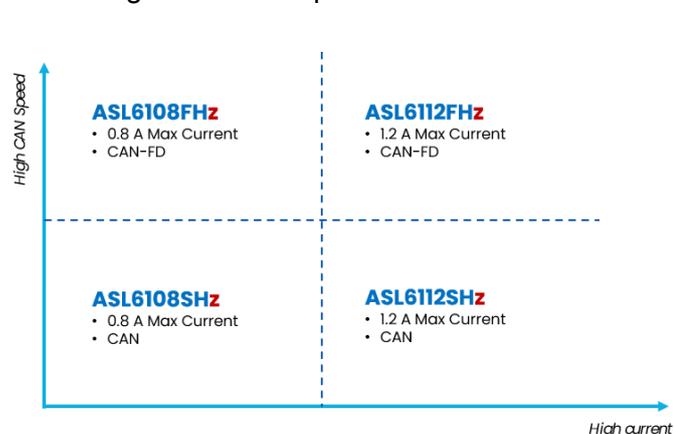
NXP ASL6xxx Product Family: Solutions for advanced matrix Applications
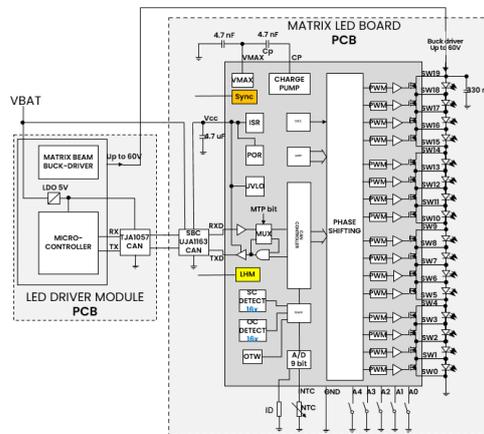
NXP Matrix LED Controller (MLC): ASL6112 / ASL6108

DVN Report: Shanghai Report

MIND : "eHMI The key to unlock the Potential of Autonomous Driving, or the Obstacle to Negotiate Road Rights - Technological Upgrade of the Living Lighting Series "

Allen Zhu – MIND

The presentation explores how external Human-Machine Interfaces (eHMI) can bridge communication gaps between autonomous vehicles (AVs) and human road users. With the rise of intelligent driving technologies, challenges arise, particularly in the interaction between AVs and pedestrians or drivers of traditional vehicles. The presentation highlights that autonomous vehicles must communicate their intentions to build trust and ensure road safety. eHMI systems, such as visual signals on car grilles or lights, allow AVs to indicate actions like yielding, braking, or accelerating. Findings from static and dynamic experiments reveal that design factors like color, size, and placement (e.g., front grilles vs. headlights) significantly impact users' perception and trust.

The research underscores the psychological and physiological impact of eHMI on pedestrians, showing that dynamic signals (e.g., moving arrows or text) and clear, universally understand-dable designs enhance willingness to cross. However, ethical dilemmas remain, such as liability in accidents involving AVs.

Experiment: Psychological and Physiological Measurement of e-HMI-Willingness to Pass

In conclusion, eHMI systems represent a critical solution for fostering interaction between AVs and vulnerable road users while addressing societal expectations and technical complexities. By balancing trust, clarity, and efficiency, eHMI can help integrate autonomous vehicles seamlessly into shared spaces, paving the way for safer and smarter transportation systems.

Living Lighting, Optical Empowerment for an "Interactive World

DVN Report: Shanghai Report

ams OSRAM : "Next level of Application for µLED LEDs in Headlamp Systems"

Joachim Reill – ams OSRAM

The presentation outlines advancements in automotive lighting through high-resolution and adaptive solutions. EVIYOS technology represents a significant step forward in dynamic forward lighting, offering features that enhance automotive safety and efficiency. Modern trends emphasize slim headlamp designs, high brightness (170 lm/W), and contrast ratios exceeding 1:200. EVIYOS systems range from mid-resolution (100–4k pixels) to high-resolution solutions exceeding 25k pixels, such as the EVIYOS HD25 with 25.6k pixels.
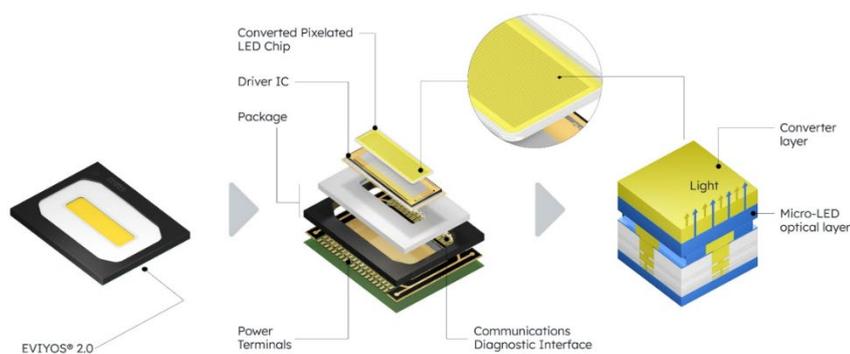
EVIYOS 2.0 Chip with 25.6k pixels

Current applications include pedestrian protection, lane detection, blind-spot monitoring, and adaptive high-beam systems, all of which rely on camera-controlled sensors for real-time adjustments. The dynamic flexibility of EVIYOS enables adaptive light distributions tailored to varying nighttime traffic scenarios, enhancing Advanced Driver Assistance Systems (ADAS) capabilities.
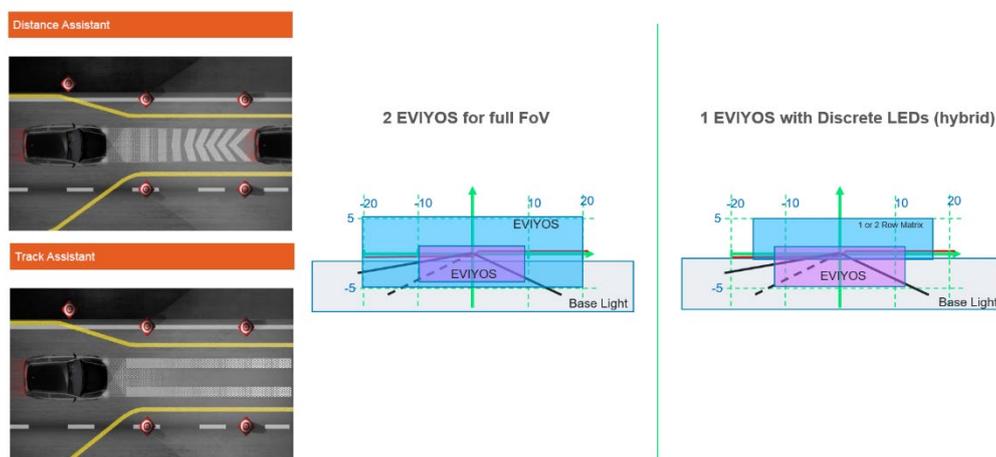
General Implementation of EVIYOS in Front Lighting

Resolution and contrast are critical factors for recognizing obstacles, pedestrians, and road details. Simulations demonstrate that higher pixel counts (e.g., 80x320 pixels) produce sharper illumination and improved contrast, enabling better object masking and separation. This results in clearer visibility, especially at lower light levels, compared to low-resolution systems (e.g., 20x80 pixels), which yield diffused and less effective light output.

Looking to the future, EVIYOS will continue to drive innovation in high-resolution Adaptive Driving Beam (ADB) systems and symbol projections. Its flexibility, precision, and efficiency ensure it remains pivotal in optimizing safety and visibility for drivers, paving the way for enhanced lighting solutions in next-generation vehicles.

DVN Report: Shanghai Report

Sunny : "Ultra-Bright Semi-Dynamic Ground Projection Solutions: New GOBO Technology Applications"

Jia Yang – Sunny Automotive Optech

The presentation discusses advancements in near-field vehicle projection lighting. The focus is on overcoming challenges in current systems, including limited installation compatibility, single static patterns, and high costs for dynamic solutions. Static projection lamps offer limited visual appeal, while dynamic systems require complex and costly components, raising development challenges.
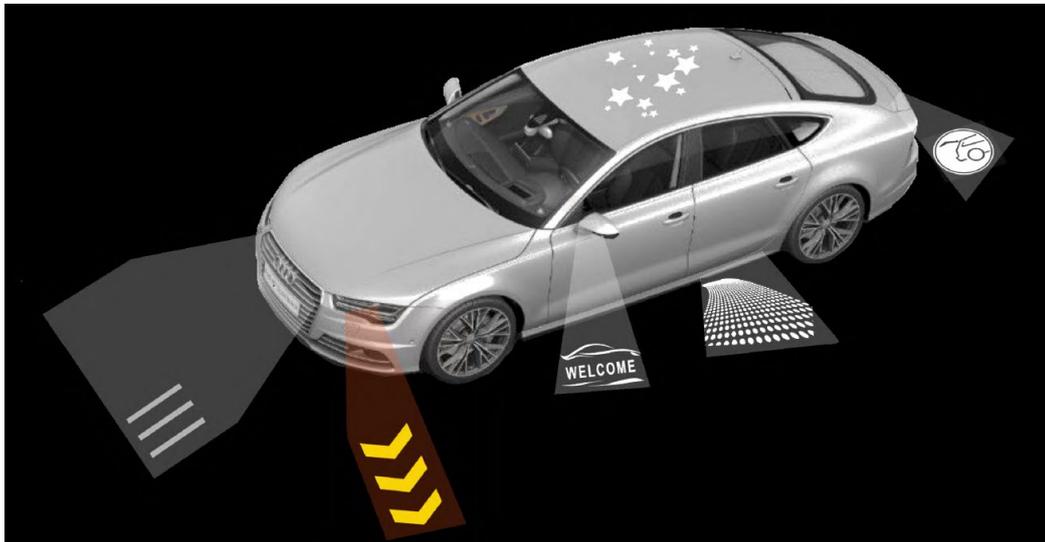
SUNNY's Ultra Bright Semi-Dynamic Projection Solution

SUNNY's solution addresses these issues with a compact and platform-based design for ultra-bright semi-dynamic projection lamps. By implementing multi-channel LED arrays and efficient control systems, SUNNY achieves high-definition and dynamic projection effects. The modular system allows for quick customization to meet various installation positions, such as bumpers, mirrors, or doors, reducing costs and development time while ensuring stability and quality.

Performance testing shows significant improvements in brightness and clarity under different conditions. At a projection distance of 300 mm, the system achieves 850 lx with sharp, uniform illumination. Even at 1,000 mm, the solution maintains 95 lx with 90% illumination uniformity. This flexibility enables clear projections in low-light environments, such as parking areas, where ambient illumination can range between 30 lx and 300 lx.
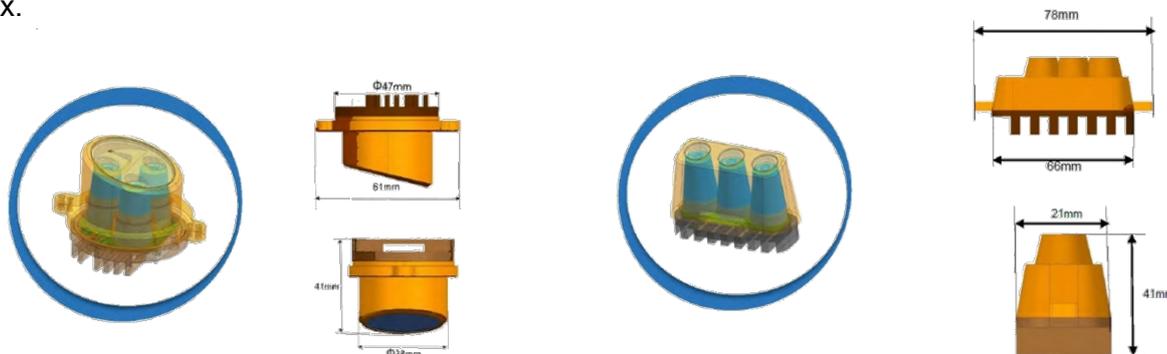
Ultra Bright Semi-Dynamic Projection Small Light Units

SUNNY's semi-dynamic projection solution improves user experience with dynamic, customizable patterns while balancing cost and performance. The technology's adaptability and superior illumination quality position it as a future-proof solution for vehicle projection applications, enhancing safety, functionality, and user interaction.

DVN Report: Shanghai Report

ONSEMI : "Ethernet-Connected Headlamp - Revolutionizing Software-Defined Vehicles (SDV)"

Qing Zhang – ONSEMI

The presentation explores the integration of Ethernet-connected, software-free headlamps into SDVs, a major innovation for the automotive lighting industry. The core aim for OEMs is to enhance flexibility, upgradability, and customer experience while reducing costs and complexity. SDVs allow software updates to introduce new features without hardware changes, ensuring continuous improvements, faster market readiness, and new revenue streams, such as on-demand features and subscriptions.

To address the requirements of SDVs, zonal architecture is proposed as a solution. Traditional headlamp systems with multiple MCUs are costly, rigid, and non-scalable. By transitioning to MCU-less, software-free headlamps utilizing 10BASE-T1S Ethernet, manufacturers achieve reduced time-to-market, lower bill of materials (BOM) costs, and greater flexibility. This layered software architecture separates hardware from software, enabling scalable solutions.
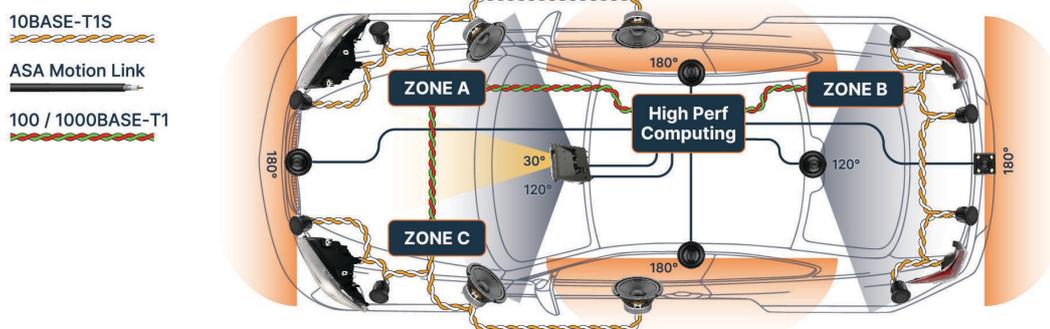
Zonal Architecture as a solution for SDV

The ONSEMI Gen4+ LED drivers are highlighted as a key innovation. These drivers feature single-chip solutions for boost and buck channels, optimized for minimal external components and low BOM cost. With integrated current sensors eliminating shunt resistors, the design achieves superior cost, efficiency, and footprint performance. These features make ONSEMI's LED drivers ideal for software-defined vehicles, supporting applications such as low beam, high beam, daytime running lights, and dynamic turn indicators.

In conclusion, Ethernet-connected headlamps showcase the future capabilities of SDVs, delivering scalability, bandwidth, and security. By leveraging ONSEMI's Ethernet solutions and advanced LED drivers, OEMs and suppliers can revolutionize vehicle lighting systems while driving innovation, improving efficiency, and enhancing the customer experience.
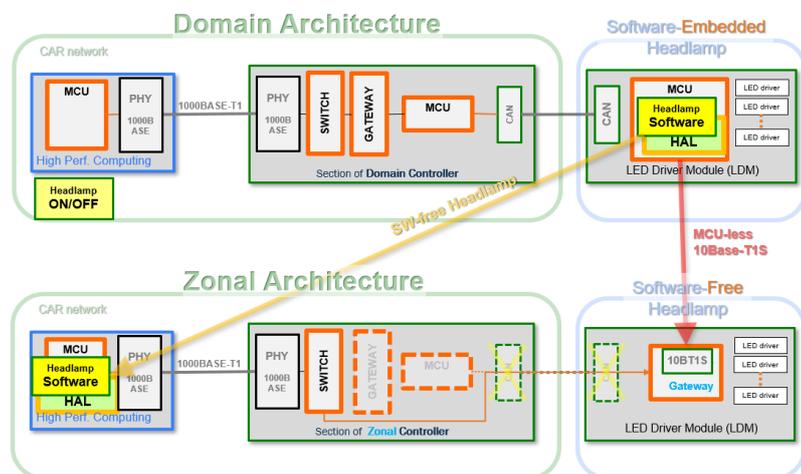
Transition to SW-free Headlamp

DVN Report: Shanghai Report

SESSION 2 Part 2: ADB and Projections

CATARC : "Status about C-NCAP 2024"

Zhao Zhun, Senior Manager of Lighting Safety, CATARC,

The presentation discusses the statistics on the implementation of C-NCAP lighting safety regulations and describe next steps in the development of evaluation methods for assessment of headlamps. At the end of 2021, C-NCAP officially included lighting safety in the evaluation procedures to assess the lighting and safety performance of basic high and low beams. In July 2024, the C-NCAP lighting safety evaluation regulations were updated to include the assessment of the ADB performance of smart headlights with static and dynamic tests. In the first part of the presentation the significant improvements of each indicator show that the implementation of the regulations has played an important role in improving the performance of headlamp products and ensuring driving safety. In particular scores of vehicles equipped with ADB are generally better than the ones of vehicles without ADB : average 1.882 points versus 7.573 points
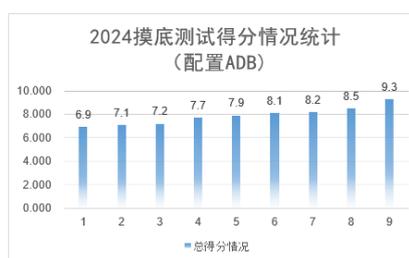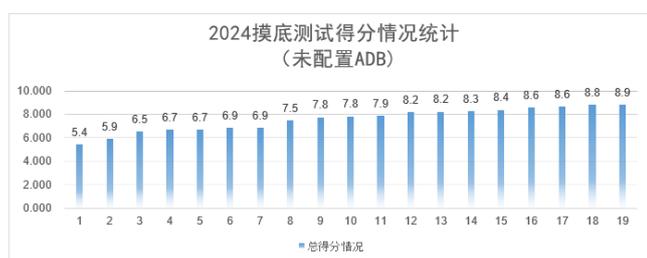
In the second part of the presentation the C-NCAP 2027 and future roadmap planning are described, in particular with researches on the development of methods for glare evaluation and optimization of headlamps, for driving assistance signs and optical signal projection signs (figure 1), for the assessment of uniformity of headlamp road lighting and for high precision ADB evaluation in dynamic complex road conditions (figure 2).

Figure 2: evaluation of driving assistance signs and optical signal projection signs
Figure 1 : Dynamic evaluation in complex road conditions

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■ **High-precision ADB performance test and evaluation research**

> **Occlusion Width:** the occlusion width of the glare area when interacting with vehicles in the same and opposite directions

> **Masking accuracy and error:** the alignment of the ADAS camera and ADB masking recognition range

> **Illumination Loss:** the luminous flux lost by the occlusion target/the base luminous flux of the high beam

> **Dynamic evaluation in complex road conditions:** effectiveness and timeliness of multi-vehicle interaction

FORD : "Concern & proposals on lighting use in adverse weather"

Henry Shi, Automotive Lighting Senior Engineer, FORD

The presentation is focused on the use of LED headlamps in bad weather conditions (fog, rain snow etc.). The use of LED car headlights, generally in normal weather and traffic conditions, can provide better lighting, but in fog, rain, snow and other bad weather conditions, LED headlamps provide some defects in road lighting and bad weather sometimes even becomes a key factor that endangers the safety of drivers and other road participants. Statistics of traffic accidents in daylight and in the night, with or without street lighting and in different road configuration scenarios, are analyzed in dry, wet or icy conditions. Reflectance of the road and back scattering generated by water droplets of fog and rain affect the driver's line of sight, increasing the driving risk. In adverse weather conditions, also the color of the light plays an important role: warm light with longer wavelengths has strong penetration on rainy/foggy days respect cool light. The presentation indicates that the glare level of a LED headlamp can be reduced to a value comparable to that of a dry road surface by adaptively reducing the near-light brightness to 50% in the range of -2° to -7° (figure 3). The results showed that dimming the headlights on slippery roads did not result in reduced visibility and increased the average detection distance by 20%.
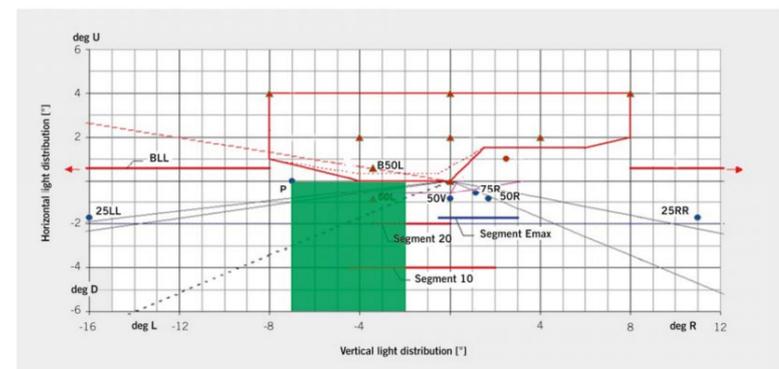
Figure 3: Recommended light distribution for wet road surface (green area shows the glare-critical area, which should be partially and dynamically darkened)   (©Technical University of Darmstadt)

Also tunable white (CCT from 3000K to 6000K) headlamp lights can support visibility in bad weather conditions. The addition of steering projection, road guidance, reversing projection, etc., can correspondingly enhance the attention of other road participants such as two-wheeled vehicles/pedestrians, and identify the steering and lane change intentions of vehicles at a longer distance, and can also effectively reduce the risk of traffic accidents.

BYD : "Development and planning of ADB headlamp"

Zeng Rong, Technical Director of Automotive Lighting, BYD
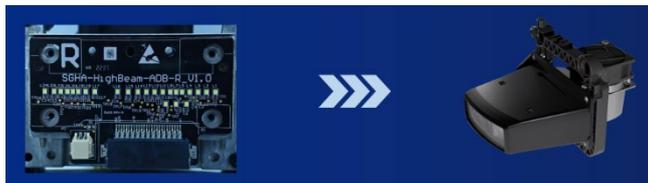
Figure 4: 24-pixels module (LEDs in one row)

Figure 5: 108-pixels module (LEDs on 5 rows)

The presentation introduces the development of an ADB headlamp, with evolution from Matrix ADB composed by 10 to 100 LEDs to Pixel-based ADB with finer lighting partitions, including Micro LEDs with 10.000 pixels for intelligent interactive projection and more.

The first step of the evolution presented is the ADB module with 24 pixels on a single row (E_{max} 135lx, figure 4) and the ADB module with 108 pixels on 5 rows (E_{max} 140lx, figure 5) which significantly improved imaging quality.

A further step in the evolution is the 10.000-level pixels module (E_{max} 110lx) where the light source is a single chip

containing 25.600 micro-LEDs that can be independently and enabling a first step of projection (figure 6). The last step in the of the definition in the megapixel headlight 1.28 million of LEDs (figure 7), minimizing the area of ADB illumination while reducing glare, supporting intelligent interactive projection to complex welcome scenes, vehicle brand promotion, personalized projection and wall BYD also present a planning for continuous improvements in FOV of new modules and for development of an RGB mega-pixel range

Figure 6: 25.600-pixels module (micro-LEDs)

Figure 7: 1.28 mega-pixels module (DLP)

controlled signs evolution DLP with effective but also achieve viewing. the module.
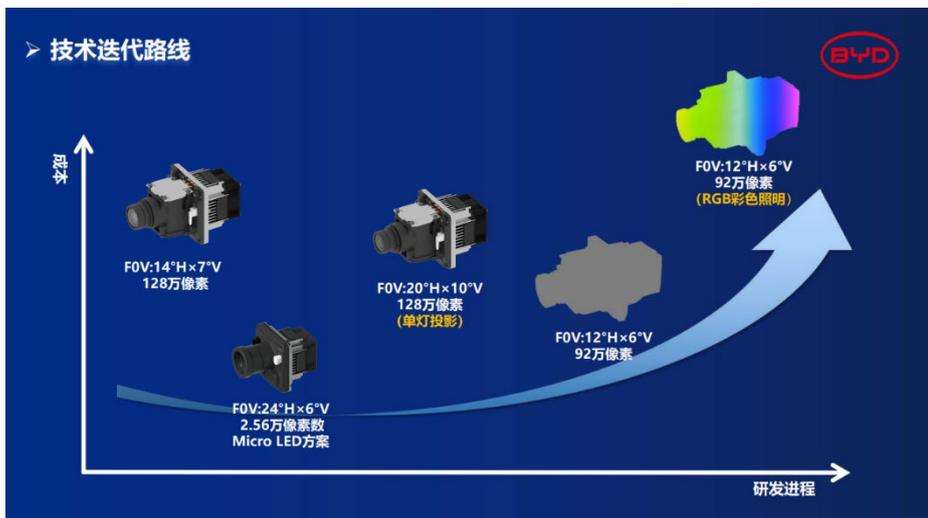
The roadmap considers intelligent lighting as the inevitable development trend of traditional driving and automatic driving, and it is the guarantee of night travel safety. ADB headlights enhance driving pleasure and personalized experience, and this special way provides people with emotional support and healing. As a product of intelligent lighting technology, ADB headlights promote the development of intelligent driving, and with the continuous improvement of autonomous driving level, better ADB headlights will welcome and help the arrival of a higher level of autonomous driving.

S&P : "China automotive lighting market & projection lighting overview"

Laura Dong, Sr. Research Analyst, S&P Global

The presentation in the first part provides an automotive lighting market overview with current and forecasted volumes by region: Greater China and Europe continue to exhibit growth expectations, minor production volume increase is expected from North America but Japan/Korea regions see decline over 2023 levels of output.
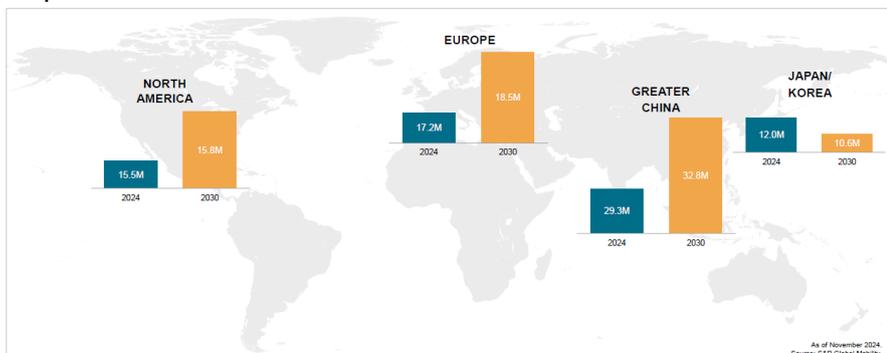
The focus of the analysis is on Mainland China headlamp demand overview where the top 10 automotive manufacturers consistently represent over 60% of the total market demand. In the ADB market, demand for ADB systems with medium and high pixel resolutions is expected to gradually increase.
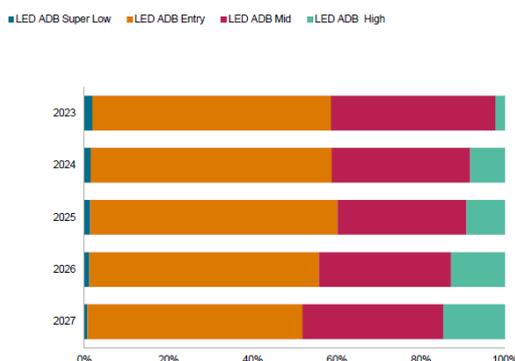
The second part of the presentation analyze the projection lighting market and technology trend:

1. dynamic and semi-dynamic side projection (logo, welcome, and signaling projections) is expected to have a significant increase in both China and other areas;

2. Europe is poised to lead the market for ADB-related projections, while China is expected to dominate the multi-function projection. This growth is driven by the increasing development of mid-to-high pixel products and heightened consumer interest in driver assistance features, leading to a significant anticipated rise in HD matrix plans in the coming years.

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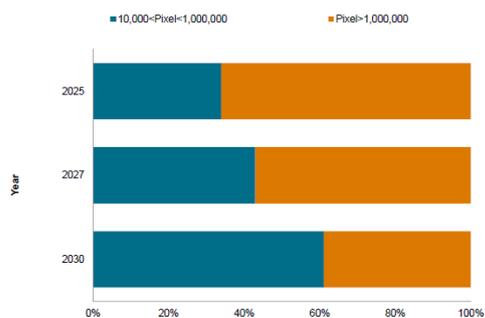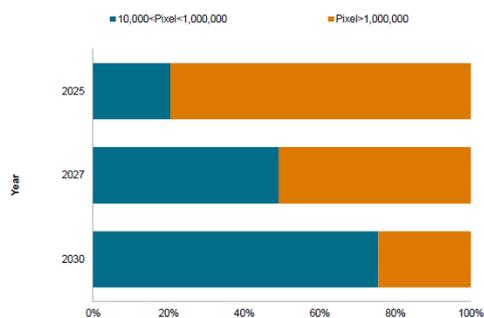
SESSION 3 PART 1 : Lighting as a design element: trend & innovation

PATAC : "Optical Simulation of animation"
ZHU Zixiang, Senior Advanced Lighting System Engineer

Patac showcased how modern automotive lighting blends aesthetic appeal with emotional value, elevating brand expression. This innovation extends to exterior lamps, including illuminated grilles, pushing boundaries with thousands of individually lit components that enable intricate animations. The pursuit of differentiation leverages advanced techniques like laser abrasion and varied finishes to introduce groundbreaking lamp designs.

Dynamic lighting animation brings challenges such as cycle coordination, where mismatched animation tempos and dual-feature synchronization can disrupt visual harmony. Addressing these requires adjustments to align headlamp (2.18s) and taillamp (1.09s) animations. Optimized swiping turn signal designs are achieved through optical design and simulation, resolving timing inconsistencies and enhancing performance.

Advancements in LED selection and light curtain design support unique lighting effects. Simulations of these designs under diverse ambient conditions—ranging from no light to sunny or cloudy environments—ensure consistent performance. This simulation phase reduces development costs and time by refining targets before the mockup stage.

Precision testing of components is made possible through tools like integrating spheres and goniophotometers in optical labs. Meanwhile, innovative technologies such as laser textures transform lamp styling with added depth and detail. Fiber optic technology further enhances lighting possibilities, enabling both interior and exterior applications, including impactful RGB laser fibers.

Dynamic lighting case studies reveal the value of iterative animation reviews, progressing from concept design to static and dynamic simulations, culminating in refined optical performance. Video analyses demonstrate smoother transitions and improved flow effects, surpassing benchmark models and enhancing overall visual perception.

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L.E.S.S : "Enabling Ultra-Thin Exterior Lighting Functions with High-Intensity Nano-Active Laser Fiber Technology"

Yann Tissot, CEO

Lesse introduced their groundbreaking LuxiBright™, a revolutionary advancement in automotive lighting that combines enhanced performance with innovative design. LuxiBright™ enables brighter, lighter, and distinctive lighting solutions that are highly customizable. It offers adjustable light dispersion angles ranging from 15 to 80 degrees, segmented light extraction customizable from 20 cm to 2.3 m, and a thin light profile of 1.5 to 1.9 mm, all while meeting SAE and ECE color standards and delivering up to 1000 cd from a single light source.

These innovations were prominently showcased in the Pura Vision by Pininfarina and the BMW M Hybrid V8 Daytona, which utilize L.E.S.S. nanofiber lighting technology. This cutting-edge design features concealed headlights and ultra-thin lighting structures, creating a striking daytime running light (DRL) signature. The seamless integration of this luminous technology not only enhances the functionality of turn indicators and taillights but also elevates the overall aesthetic. The result is a masterpiece of elegance and innovation, ensuring the Pura Vision makes an unforgettable impression on the road.

Less's technology allow an integration of grill illumination across the side to meet Daytime Running Light functions or stop light functions in the rear.
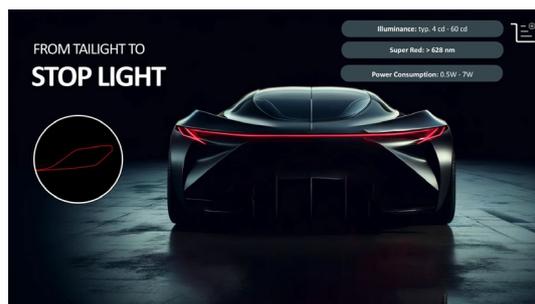
With minimal changes can also include different colors to achieve other functions like yellow for turn signal or Turquoise for autonomous mode.

Focuslight : Full MLA Headlight with ADB

Dr. Olga Fryčková - Automotive Product Line Manager

Focuslight is a company dedicated to advancing technology. Among their innovations, they have developed optical lighting components such as micro optics that enable cutting-edge designs. Notably, they have created Micro Lens Arrays (MLA) for both low and high beam solutions. Their Miraluz 1.0 offers static low and high beam capabilities, while Miraluz 2.0 includes Adaptive Driving Beam (ADB) technology for high beams. Looking ahead, Focuslight plans to introduce dynamic projection with Miraluz 3.0, which integrates Micro LED and MLA solutions.

Miraluz 1.1 provides smooth road illumination with a wide and homogeneous maximum area, allowing the cutoff line to be customized for specific markets—sharp for ECE or smooth for SAE. The Micro Lens Array (MLA) is designed with a robust optical architecture that can be scaled in size and number of modules, while also allowing customization of the light sources.

This reference system design utilizes a 350-lumen per LED light source with 3 LED dies per Micro Lens Array (MLA), achieving a system efficiency above 40% while meeting all legal low beam (LB) requirements with just one module. This translates to a basic setup of only two MLAs (one for low beam and one for high beam), making it an excellent option for city cars or two-wheelers.
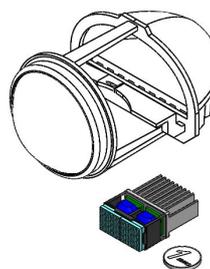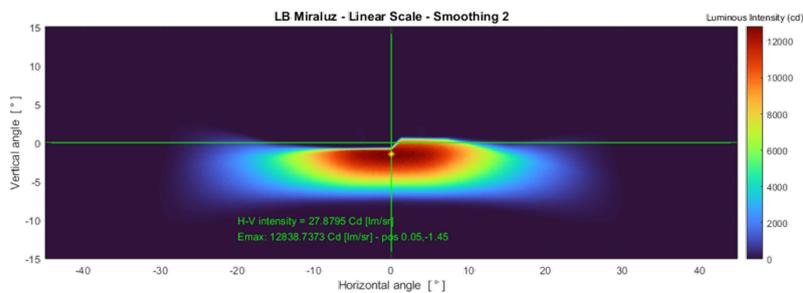
Component	Optical efficiency
Collimator	70%
MLA (without shield)	95%
MLA (with shield)	65%
Full system	**Above 40%**
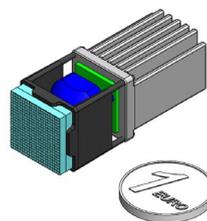
The upgraded Miraluz 2.0 headlamp features ADB functionality, reducing the MLA footprint while maintaining the same modules for consistent aesthetics in both Low and High Beam. It offers a cost-effective base version with fewer MLAs, scalable for premium performance. Compliant with UNECE R149, it uses standard LED components for robust optical design and good DFM. The compact design meets Emax market requirements, with narrow segments and high contrast, featuring one row of 10 segments, including 8 overlapping center segments with a 2° spread and outer channels covering a total of ±12°.

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LB Miraluz - Linear Scale - Smoothing 2
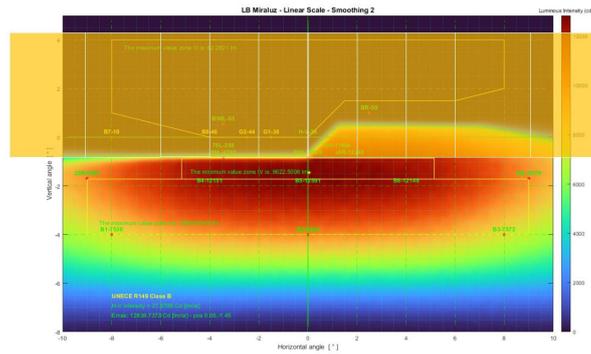
- 17 mm x 70 mm x 22 mm
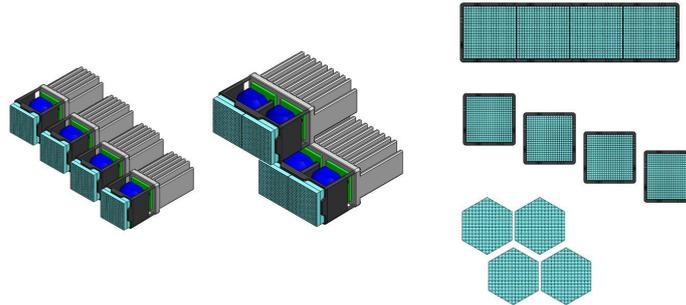
The Miraluz 2.0 reference design uses a succession and overlap of channels for a full ECE ADB HB design, with each MLA having the same mask but different lens positions. The system employs 4 MLAs (2 per headlamp) and achieves 33% efficiency with 10 segments of 2°, using 9 LEDs and a total system input of 500 lm. Each MLA is 18 mm², with an Emax of 60 Kcd.

ADB - 25 mt view – position space
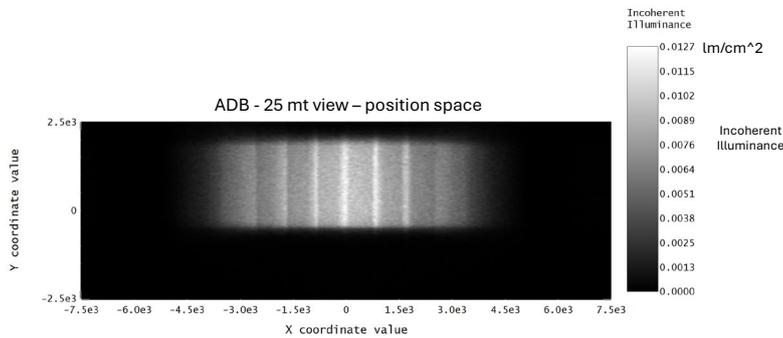
Conclusion:

Focuslight's Miralux solutions utilize MLAs to provide versatile baseline designs that are modular and scalable for premium performance. These solutions meet ECE requirements while minimizing packaging space, thus offering significant design freedom.

DELO : "Innovating Headlamp Manufacturing: Adhesives for Precision Optics and Active Alignment"
Christoph Appel - Product Manager LED

DELO, a family-owned company, develops specialty adhesives tailored for the automotive industry, addressing issues like temperature resistance, strength, flowability, flexibility, and resistance. They employ dual curing methods (heat, light, humidity, anaerobic, and multi-component combinations) for higher production rates. For lighting, their adhesives offer low outgassing, good optical, thermal, and electrical conductivity, and low permeation, solving many current headlamp design challenges.

Matrix-LED Headlight	Projection systems	MLA	DLP-Headlight
Pin-Pot-Alignment	AA Collimator lens & MLA	Optical imprint material	AA & lens to barrel bonding
✓ No screws / clips	✓ Yellowing resistance @ HT	✓ Lens imprint material	✓ Yellowing resistance @ HT
✓ High automatization grade	✓ High HTHH resistance	✓ High transmission @ VIS	✓ High HTHH resistance
✓ Fast UV curing	✓ High aspect ratio	✓ High optical stability	✓ High transparency, low haze
✓ High UPH process	✓ Low outgassing	✓ Mechanical stability	✓ Black version for dual curing
DELO PHOTOBOND OB4116	DELO PHOTOBOND OB4116	DELO KATIOBOND OM6113	DELO PHOTOBOND OB4210
DELO KATIOBOND OB6669	DELO PHOTOBOND OB4189	DELO KATIOBOND OM6115	DELO DUALBOND LT2221
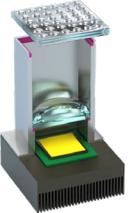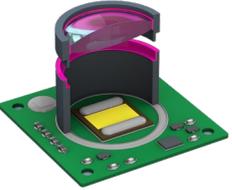
DELO's value proposition includes solutions for Matrix headlamp alignment that eliminate the need for screws, allowing precise focusing fixation before curing, and enabling high automation with UV curing. Their adhesives also bond Micro Lens Arrays with low yellowing, high HTHH resistance, and low outgassing. Additionally, DELO's materials serve as optical alternatives, providing micro optics with high optical and mechanical stability.
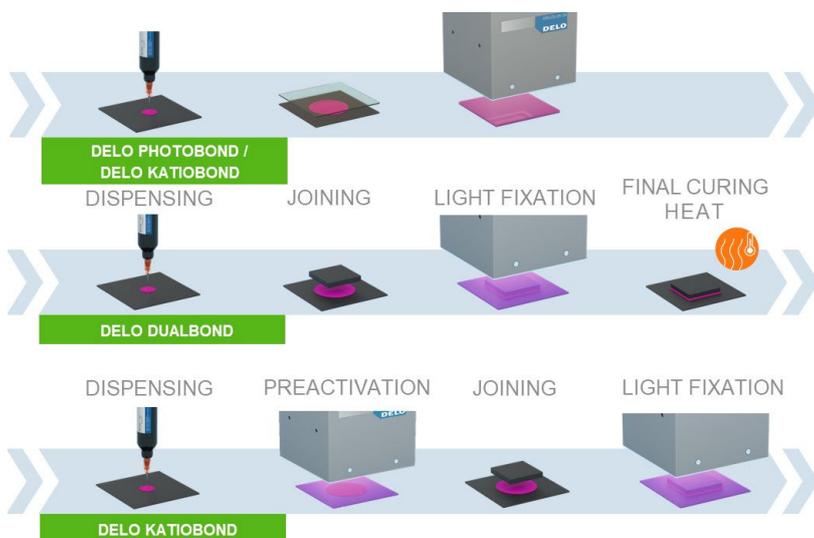
DELO's expertise in efficient process solutions allows tailor solutions for almost any lighting application by combining processes with material properties to offer solutions for multiple challenges in the automotive industry.

Brightview Technologies : "Computational Optics for Automotive Lighting and Other Applications"

Michael Murphy - Managing Director

In a rapidly evolving automotive landscape, lighting has emerged as a critical element of both functionality and design. BrightView, a leader in computational optics technology, is pioneering innovations that redefine the role of light in modern vehicles. Their solutions promise to transform how vehicles illuminate the road and communicate their presence.

"Light is the new chrome," said a Volkswagen design chief, signaling the shift towards lighting as a symbol of energy, safety, and the future of mobility. BrightView's computational optics films support this transformation with a suite of advanced features that enable lightweight, energy-efficient, and cost-effective lighting designs. These films, crafted with micron-scale microstructures, offer unparalleled versatility, allowing automakers to create thinner lighting structures that consume less electrical power.

Their solutions span the full spectrum of automotive lighting needs. For exterior lighting, these films enable seamless rear light profiles, distinct daytime running lights, and custom-shaped light patterns that differentiate vehicle designs. On the interior, the films efficiently transmit light to ensure bright and uniform cabin illumination with fewer LEDs, reducing hotspots and creating a modern aesthetic.
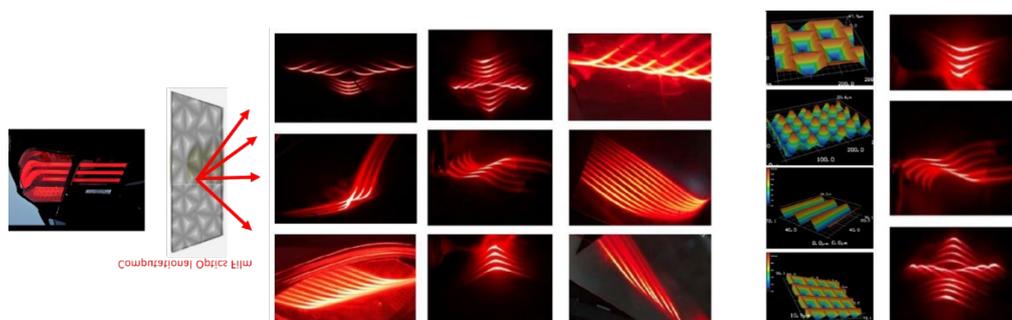
Beyond lighting, computational optics films are instrumental in advanced automotive systems. They enhance Head-Up Displays (HUDs) with precise beam shaping, optimize LiDAR sensing capabilities, and elevate infotainment displays. These versatile applications underscore the films' importance in the next generation of connected and autonomous vehicles.

BrightView's manufacturing process uses grayscale photolithography and roll-to-roll production in cleanroom environments, ensuring high precision and quality. The films can be die or laser-cut and thermoformed into intricate shapes, maintaining optical performance even with complex designs. This adaptability has already been showcased in vehicles like the Ford Mustang and Explorer.

With computational optics, BrightView is not just illuminating vehicles; they're driving an industry-wide shift. Their innovative films lower costs, reduce weight and increase energy efficiency, all while offering unique design possibilities. From lighting clusters to advanced sensor systems, these technologies represent the cutting edge of automotive design and functionality.

As lighting becomes a defining element of vehicle identity, BrightView's solutions ensure automakers can create distinctive, efficient, and futuristic designs. The future of automotive lighting has never been brighter.

SAIC Volkswagen : "Research on fog test method of automobile headlamp based on vehicle test condition"
Fan Dayong - Lighting Development Engineer

China's rapidly evolving automotive industry faces challenges with headlamp fogging, which affects aesthetics and driving safety. To address this, a robust fog test methodology is critical for effective product validation during development.

The Double-Chamber Test Method simulates real-world environmental conditions using two adjustable chambers: 1) Lens Side Chamber - Mimics external conditions, and 2) Housing Side Chamber - Reflects the lamp's internal environment.
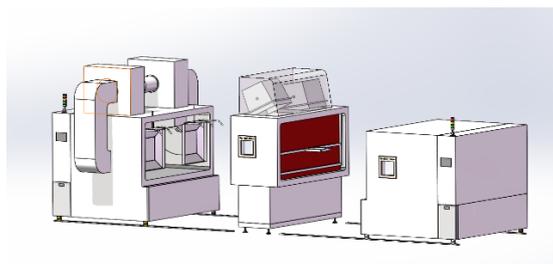
Conditions are designed based on actual vehicle data to enhance test-to-field performance correlation.

The Key Environmental Factor, Humidity Ratio (d), is the fogging process is analyzed using the humidity ratio (g/kg), derived from temperature and relative humidity.

Test Design of the chamber is done in three stages simulate operational conditions: Initial Stage - Stable conditions; Fogging Stage - Simulates car washing/rain and Dispersing Stage - Fog dissipation.

The validation is done through a comparison of double-chamber and whole-vehicle tests shows consistent results in fogging risks and dissipation.

阶段 Phase	样品A Sample A		样品B Sample B	
	整车试验情况 Vehicle test record	双腔试验情况 Double chamber test record	整车试验情况 Vehicle test record	双腔试验情况 Double chamber test record
初始阶段 Initial stage				
起雾阶段 Fogging stage				
消散阶段 Defogging stage				

Conclusions

The Test conditions must reflect real-world scenarios to avoid irrelevant parameters, the use humidity ratio to define temperature and relative humidity in test design.

Common summer washing scenarios indicate Stable humidity ratio during regular operation and Near-saturated humidity during washing/rain.

Fogging involves interconnected factors, necessitating broader research for optimal test methodologies.

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FAW Group : "Solution to headlight fog based on Bernouli Equation"

Xinxing Kong - Director of Lighting Product Development of Hongqi Brand

Headlamp fogging is the top consumer complaint in the automotive industry. The issue arises due to water vapor condensing when humid air inside the lamp cools. Addressing fogging is vital for brand quality and cost reduction. Research highlights a 44% complaint rate for headlamp fogging issues.

FAW researched existing Industry Solutions and found six common solutions including **Anti-fog coating:** Forms a water film, masking fog; **Desiccant capsules:** Absorb moisture but require periodic replacement; **Active airflow:** Fans or vents improve air circulation to reduce fog; **Recyclable desiccant:** Reusable through air exchange cycles; **Sealing methods:** Limits air exchange to control internal conditions and **Cold zone design:** Directs condensation to less visible areas.

Through their market research they found that Complaints are regionally concentrated in Eastern China (Shandong, Hebei, Jiangsu); Seasonal peaks occur in humid summer months (July-August) and a study of 28,500 units with desiccant solutions showed desiccants degrade within ~8.57 months, aligning with complaint peaks.

The challenge for consumers is that Headlamp fogging is not a premium feature but a basic expectation. Frequent or long-term fogging with visible streaks leads to dissatisfaction. Fog issues are prominent in prolonged parking in high humidity, quick environmental temperature changes (e.g., indoor heating to outdoor cold) and rain or car washes after exposure to sunlight or heat.

The proposed Solution is to use the Bernoulli Equation Application. This new approach uses differential air pressure created by driving speeds to enhance internal air exchange without external contamination. This system ensures effective defogging at speeds as low as 20 km/h, achieving 18.9 L/min air exchange.

Simulation confirmed severe fogging in conventional systems where active airflow designs eliminated fogging during trials. Controlled experiments highlighted improved defogging and lower dew points with active airflow (29.1°C compared to 50.1°C for conventional designs).

PREPRO CESSING	COMPONENT SOLUTION	PHASE ONE ENDS	END OF PHASE TWO	END OF PHASE THREE	END OF STAGE FOUR	TEST RESULTS
ORIGINAL PLAN	20*40 GORE BREATHABLE MEMBRANE*3					Water droplets appeared on the inside of the lampshade in stage 3, and the phenomenon worsened after stage 4. The water droplets did not dissipate at room temperature. Basically consistent with the CAE results
CMD PLAN	PAN ASIA CMD					No abnormalities during the whole test
VENTILATION DUCT PLAN	AIR VENT + VENTILATION PIPE * 1					There were no abnormalities during the entire test Basically consistent with the CAE results

Conclusions

Utilizing airflow for rapid defogging is feasible and cost-effective, current solutions like desiccants are temporary fixes, with increased maintenance burdens post-warranty. Materials and simulation methods need refinement to address fogging more holistically while redesigning headlamps with advanced air circulation could revolutionize fogging management.

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Brightek : "Machine-Learning Optimized Tuning Solution for IC-LED based Ambient Lighting Applications"

Kerwin Cheng - R&D Product Manager

Brightek Technologies tackles the challenge of calibration of multiple RGB LEDs through different illumination intensities. Typical applications yield a color shift at dimming intensities in comparison to brighter ones. Additionally 8 bit PWM normally used for this application is insufficient in color depth for achieving accurate color and brightness.
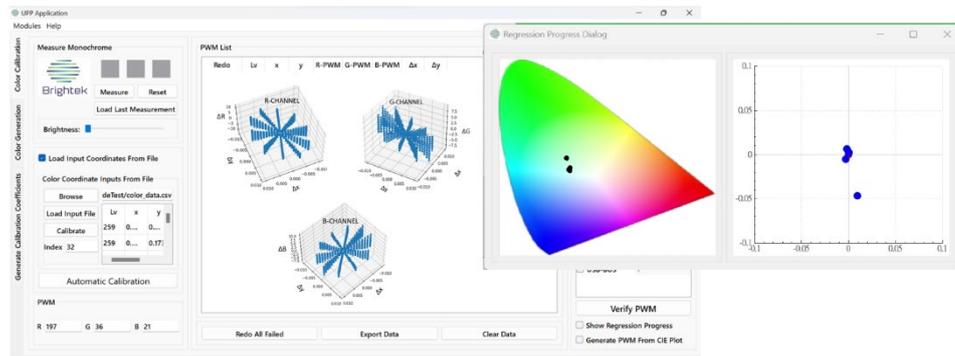
Evo smart iCLED is their New LED that offers better performance with multiple superior features like automatic temperature sensing, 256 levels of adjustable current settings, 16 million times color gradient and up to 7000 mcd. This latest LED version upgrades from their previous 8-bits PWM to 16-bits and color calibration of 2 SDCM from their previous generation of 3 SDCM while keeping temperature detection as previously offered. The largest upgrade is the more than 3X light output to an outstanding 7000mcd from their previous 2000mcd offering.

The current variation tolerance in existing smart LEDs is around ±5%, which leads to inaccurate colors during color adjustment. When adjusting colors, the current supply errors make it difficult to accurately set the required RGB brightness ratios through current scaling calculations, resulting in difficulty hitting the target color.
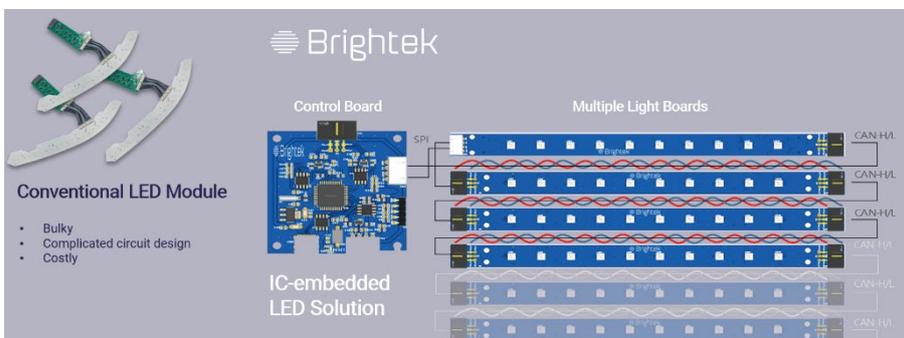
The New Smart LED narrows down the current variation to only ±2% and their new technology allows a large matrix LED calibration to be achieved from typically 14 days to just 2 hours with a CIE variation of <0.002 allowing a quicker time to market.

Furthermore their iCLED allows scalable topologies that are scalable, not only reducing implementation time, but also offering cost savings while driving simplification of technology.

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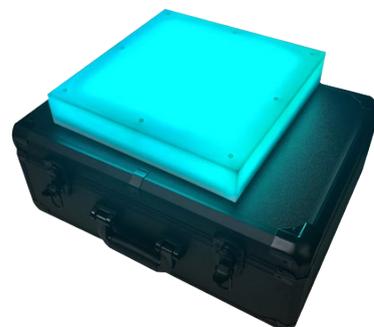
SESSION 3 PART 2 : Lighting as a design element: trend & innovation

MIND : "International Style, Chinese Design,   Affordable innovation – Cost reduction of Headlamp from a styling perspective"

Dai Jie – Styling Director

Mind presented a comprehensive analysis of cost reduction in headlamp design from a styling perspective, emphasizing innovation in both aesthetics and functionality. Their study began with a benchmark comparison of current lamp designs, focusing on the "Gray Wall" style and traditional off-road pickup trucks. This initial analysis highlighted areas for improvement, noting that the light band of the Gray Wall design appeared slightly weaker compared to its competitors.

Mind's styling exploration introduced a strategic approach where the signal light became the centerpiece of the design. This approach emphasized the robust character of pickup trucks by modifying the width and narrowness of the light pattern to create a sense of momentum and strength. To reinforce the theme, they simplified the design by removing unnecessary decorations, using color separation in the decorative ring to add visual depth, and applying diverse material surface treatments to enhance texture.

Their design strategy not only reflected the aggressive and dynamic identity of off-road vehicles but also introduced an industry-first transition lighting effect, which shifts from uniform light transmission to a granular, dappled appearance for enhanced visual appeal. By reconfiguring elements, remodeling designs, and optimizing materials, Mind proposed significant opportunities for cost reduction while maintaining a bold and sophisticated lighting design. After several rounds of styling, optics, and structural adjustments, they finalized an innovative approach that skillfully combined frosted and transparent optical areas, leveraging grain gradient effects to balance aesthetic appeal, functional performance, and cost efficiency.

Mind concluded showing the results for different proposals to reduce quantity, propose higher and lower performance with a small reduction in c-ncap while reducing cost based on their estimations.

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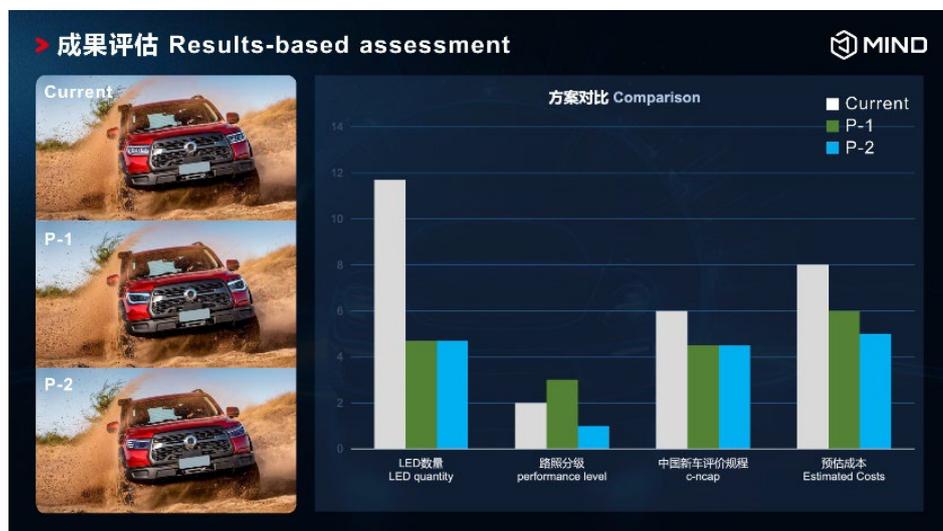
HASCO Vision Technology "Slim Module Pioneer – H Line New Optical System"

Dong Shikun - Technical Manager

Hasco presented their proposal for Slim module - 10-20mm upper and lower openings with full functions for Low Beam, High Beam, ADB High beam and Cornering Light that are efficient development and excellent optical performance.

The H-line optical system represents a groundbreaking innovation in automotive lighting, offering significant advantages over traditional ellipsoid and reflection systems. Designed for slim, narrow openings, it excels in uniformity, efficiency, and compactness, positioning itself as a trailblazer in the field. With a 40% shorter length and reduced openings to just 10-20 mm, the H-line's core design minimizes the distance between the primary optics and the focal point, making it ideal for applications requiring a compact system. The combination of Lambertian LED light sources and a paraboloid-like reflector ensures a highly uniform and seamless light distribution, enhancing pavement illumination and setting the H-line apart from other optical models. The system leverages real image imaging, which simplifies the design process by allowing precise manipulation of the light pattern. The individual LED modules are designed separately and then combined into a cohesive light pattern, streamlining development and replication. Additionally, the H-line features a sharply defined low-beam cut-off line with minimal dispersion, improving light quality over traditional systems.
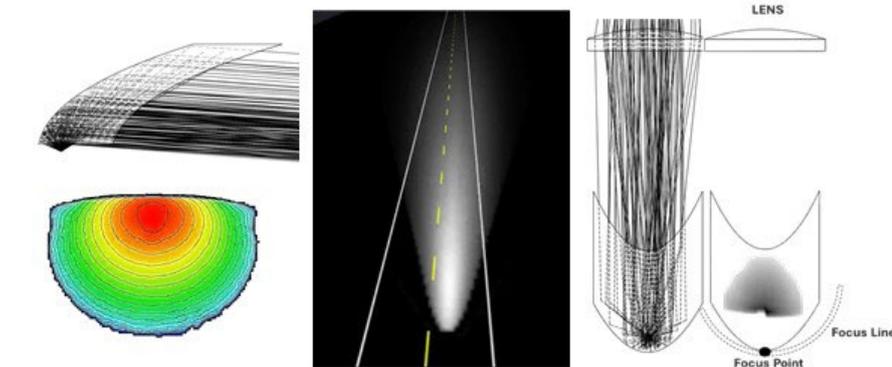
The H-line supports a full range of lighting functions, including low beam, high beam, bi-function, ADB, and steering-following systems, maintaining high performance even with narrow openings. It is built on innovative patents such as the root cut-off line design and bidirectional collimating lenses, which enable more efficient light distribution and enhance overall system performance.

With a robust patent portfolio, the H-line boasts 92 applications and 43 granted patents globally, covering invention, utility model, and design patents. Despite these advancements, there are areas for improvement. The system continues to aim for further miniaturization, optimizing module size and shape, and enhancing its visual appearance in both lit and unlit states. Additionally, efforts to reduce costs through miniaturization and weight reduction are essential to improve market adoption and affordability. The H-line system, pioneered by HASCO Vision, stands as a testament to automotive lighting innovation, driving the industry toward more compact, efficient, and functional solutions.

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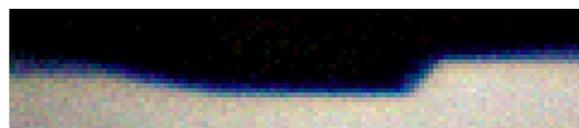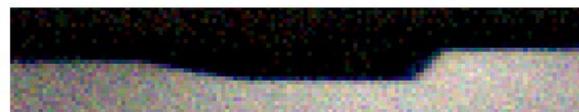
Infineon – "Innovative uLED light source for advanced automotive system: Technological Innovations"

Xing Su, Technical Marketing for LED lighting solutions

Infineon, in collaboration with Nichia, is advancing digital automotive lighting with innovative solutions for pixel resolutions ranging from 3,000 to 70,000 pixels. At the core of their strategy is the micro PLS engine, featuring 10-bit PWM control, with plans for a 70,000-pixel solution by 2026.

The 3,000-pixel solution bridges the gap between high-definition (HD) and standard adaptive driving beam (ADB) systems, delivering higher performance at reduced costs. Its simplified design reduces component count, enabling smaller PCBs, optics, and housings, which translate into lower weight and cost while enhancing resolution and performance. A low-cost HD alternative is achieved by eliminating the need for a dedicated GPU, with video rendering facilitated via UART over CAN or SPI. This architecture makes the system more affordable compared to traditional HD setups.
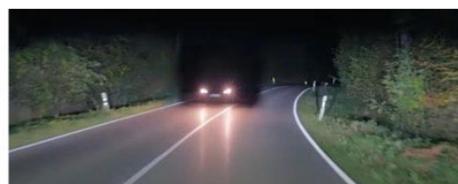
For HD ADB systems, the 3,000-pixel design simplifies operation by utilizing a standard light function ECU with a single buck supply in voltage mode, reducing cabling and complexity compared to legacy systems with 84–100 pixels. The micro LED technology supports this by enabling system miniaturization for control units and light source modules.
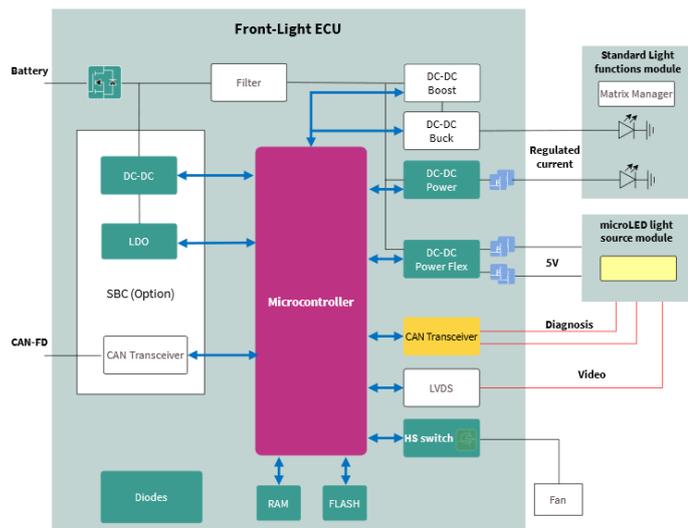
Infineon's comprehensive HD pixel lighting solution integrates the LITIX™ and OPTIREG™ power optimization systems, TRAVEO™ Cluster for image processing, and OptiMOS™ 5 for cost-effective ECU power management. It supports versatile communication interfaces, single-pixel diagnostics for 3,000–16,000 micro LEDs, and robust pattern storage via RAM and Flash memory. The accompanying software includes reference code for μPLS communication, streamlining integration and deployment.

This technology offers automakers a pathway to enhanced lighting performance, reduced costs, and simplified system architecture, paving the way for the next generation of automotive lighting solutions.

Pixel Lighting
Application Page

DVN Report: Shanghai Report

Sabic : "Material innovations for exterior panels and lightings"
Paul He - Sr. Business Manager

The automotive industry is undergoing a transformation driven by key trends in safety, sustainability, electrification, and aesthetics, with a focus on innovative materials and smart integration.

Sustainability remains a priority, with a strong emphasis on reducing carbon footprints and adopting circular economy solutions to improve resource efficiency. These efforts are complemented by advancements in electrification, where weight reduction plays a pivotal role in extending range and minimizing greenhouse gas emissions. Autonomous driving technologies are also accelerating innovation, with advanced lighting systems, LIDAR/RADAR sensors, and pedestrian communication solutions requiring high-performance, transparent materials.

Diffusive when lit-on Creates a scattering effect when lit

Design freedom and aesthetics are reshaping the look and feel of vehicles. New materials and applications enable brand differentiation, while transparent and semi-transparent surfaces with gloss finishes redefine visual appeal. Functional integration is at the forefront, combining features such as capacitive switches, LED lighting, and durable structures to enhance performance and cost efficiency.

Smart panel design trends are emerging, driven by the transition to Battery Electric Vehicles (BEVs) and Autonomous Vehicles (AVs). Traditional grilles are being replaced with body-colored or transparent panels, and innovative designs incorporate information displays and messaging capabilities. Interior displays are evolving with curved panels and integrated lighting effects enhancing dashboards, consoles, and door interiors.

Materials like LEXAN™ are revolutionizing automotive applications. The LEXAN™ LS and AT series offer advanced solutions for sensor integration, defrosting, and light communication, along with high-impact resistance and optical styling. Coatings enhance durability and thermal stability, while low-haze diffusion resins enable edge LED designs that mimic OLED lighting effects. High-reflectivity LED brackets eliminate the need for metallization, maintaining consistency after processing.

Meeting new demands in lighting design, materials like LEXAN™ LUX2289 provide superior light shielding, balancing color and reflectiveness to achieve both functional and aesthetic goals. These innovations reflect a future where sustainability, intelligent features, and advanced materials converge to redefine vehicle performance, safety, and design.

DVN Report: Shanghai Report

Lumileds : "Car Body Lighting: new trends and solution proposals"

Keanu Ma - Director APAC Technical Competence Center, Lumileds China

The evolution of car body lighting reflects a growing demand for innovative and diverse designs, creating both aesthetic and functional advancements in automotive lighting technology. Here are key trends and solutions shaping the industry:

Diverse Lighting Concepts

Singular Optical Elements: Point-based lighting with individually addressable low-power LEDs allows precise control and flexibility in creating unique lighting signatures.

Elongated Light Lines: Slim, homogeneous light sources provide a continuous lighting effect, extending from taillights to front signals for a seamless, modern look.

Key Applications and Technical Specifications

Dynamic pixel lighting for applications such as Daytime Running Lights (DRL) and position lights demonstrates the potential for tailored designs:

Dynamic Signature Light
192 individual addressable pixels

- Brightness: 1,000–3,000 cd/m².
- Dimensions: Width (40–160 cm), Height (5–40 cm).
- Addressable elements: 10–1,000 points.
- Efficiency and power: 10–30 W, optimized for appearance and performance.

PCB 3: 72 LEDs
PCB 2: 36 LEDs
PCB 1: 84 LEDs
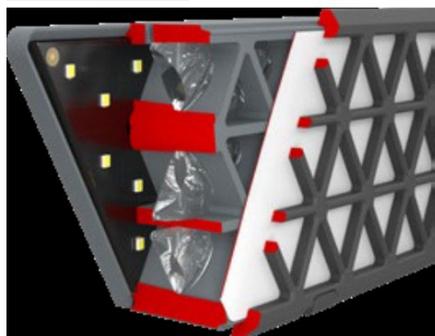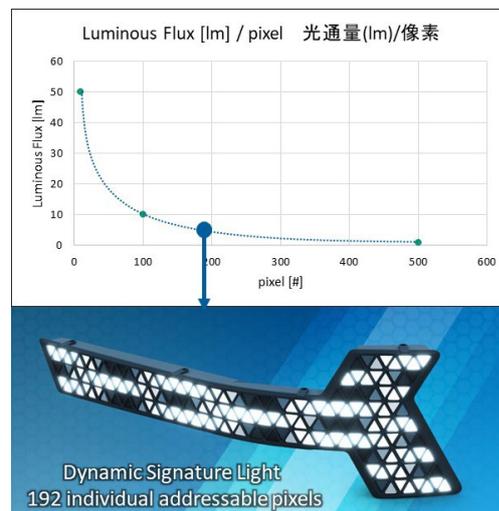
Innovative Light Source Solutions

LUXEON Versat 2016: A new family of low-power LEDs offering miniaturized packaging and spectral tuning to enhance design freedom. Available in Ultra White (6500 K), Warm White 1 (3500 K), and Warm White 2 (2700 K), they meet the increasing material and color demands of car body lighting.

LUXEON 3D LED Series: Flexible, ultra-slim lighting solutions tailored for elongated, homogeneous applications.

3D LED Lite (2024): An economical version with optimized performance.

3D LED Max (2025): A bold design offering extended flexibility, larger size options (up to 1500 mm), and competitive performance.

Benefits and Design Innovations

Customizability: Solutions like the 3D LED Max enable bending along the Z-axis, making them ideal for intricate automotive designs, including signal lights, interior lighting, and decorative elements.

Ease of Integration: Integrated optical, thermal, and mechanical designs simplify handling and reduce system complexity.

DVN Report: Shanghai Report

Geely : "Shining Forward: Refined Innovation of Automotive Lighting Systems"
Zhang Xiting

Automotive lighting has become a focal point of innovation, integrating advanced technology with aesthetics and functionality. Driven by global initiatives like carbon neutrality, environmental sustainability, and smart mobility, lighting systems are adapting to meet emerging demands from policies, markets, and consumers.

National strategies supporting carbon neutrality and the development of new energy vehicles (NEVs) have accelerated industry progress. Subsidies and stricter regulations promote sustainable and intelligent lighting solutions. At the same time, younger consumers, especially those born after 1990, are reshaping market expectations by prioritizing interactive, intelligent, and visually appealing designs.

Modern car lights are no longer merely functional components; they are now pivotal in achieving energy efficiency, safety, and design differentiation. The evolution includes advanced technologies like intelligent projection lamps, ADS (Autonomous Driving System) lighting, and pedestrian safety features. These systems emphasize user experience and regulatory compliance while enhancing the vehicle's overall appeal.

Domestically, the Chinese automotive industry faces fierce competition, marked by rapid technological advancements and cost pressures. This environment has spurred unprecedented innovation, attracting international attention at events like the Beijing and Guangzhou auto shows. These platforms highlight China's growing influence in the global automotive market, as well as the dual challenges and opportunities presented by this leadership position.

Automotive lights are increasingly viewed as commodities, requiring careful balancing of functional utility, design aesthetics, and technological value. Companies like Geely illustrate this shift with their Galaxy E8 and E5 models, which feature groundbreaking micro-laser carving techniques and integrated illuminated front-end designs. These innovations align with Geely's distinctive "ripple aesthetics," inspired by natural patterns, and have garnered patents and recognition for blending style with advanced technology.
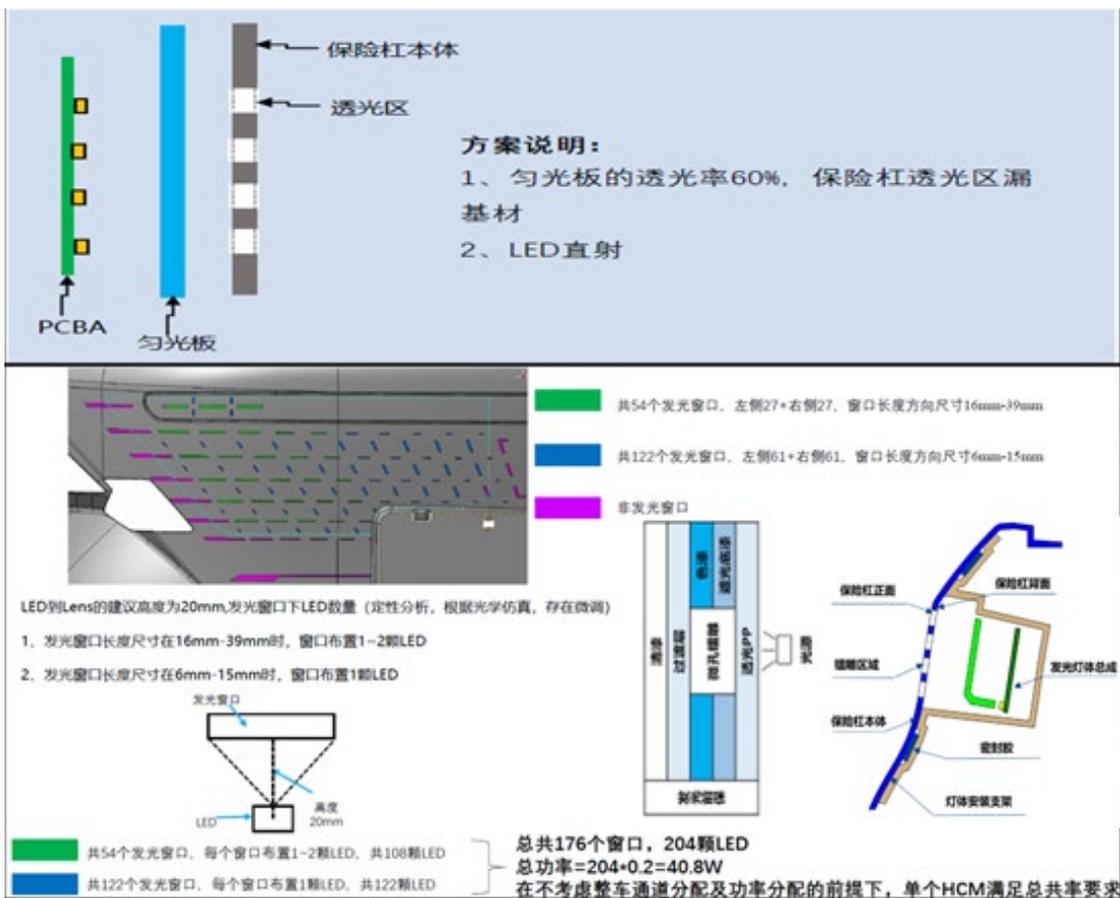
The future of automotive lighting lies in its transition from a simple light source to an intelligent system. Lights will incorporate sensors for environmental perception, enable communication through visible light technologies, and offer interactive features such as projections and gesture controls. This transformation is poised to redefine safety, convenience, and user engagement in intelligent mobility.

As the automotive industry embraces intelligent lighting systems, continuous innovation is essential to meet the evolving demands of sustainability and smart transportation. The path forward requires collaboration and creativity to deliver advanced optoelectronic solutions that enhance both user experience and global competitiveness.
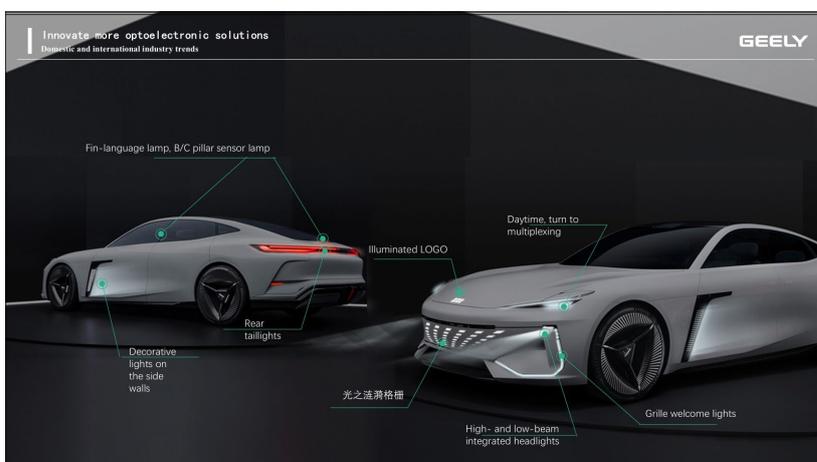
Dongfeng Motor "Unique light signature to convey Brand values"
Henning Knoepfle - Design Director

The interplay of emotion and reason has always defined car purchases, blending freedom, flexibility, and control with personal expression. While the rise of autonomous vehicles (AVs) and battery electric vehicles (BEVs) challenges traditional ownership concepts, Dongfeng Motor embraces this shift, crafting distinct identities across its NEV brands—Nammi, Epai, and M Hero.

The Emotional Connection to Cars. Despite technological advances, the emotional context remains central to automotive design. A vehicle's aesthetics, heritage, and functionality communicate meaning, resonating with its audience. Dongfeng capitalizes on this by tailoring brand identities to specific lifestyles and preferences.

Dongfeng's NEV Portfolio: Diverse Appeals

Nammi. Targeting young families and busy urban dreamers, Nammi blends chic, playful designs with practicality. Its friendly styling—like the round "sleepy eyes" headlights and floating roof—makes the Nammi 01 approachable. Compact, city-friendly, and efficient, it emphasizes ease of use and individuality, appealing especially to young women and mothers.

Epai. Positioned in the upper mainstream market, Epai serves affluent, active customers with a dynamic, premium look. Vehicles like the Epai 007 and 008 balance sleek, muscular designs with practical functionality. Inspired by "crystal energy," their refined surfaces and advanced lighting systems—like the "digital diamond" daytime running lights (DRL)—reflect a modern, technology-driven aesthetic.

M Hero. Evoking adventure and luxury, the M Hero caters to assertive explorers seeking rugged, off-road vehicles with bold styling. Drawing on its military roots, M Hero's angular, sculptural designs break conventional norms, featuring triangular surfaces and distinctive lighting like the "crossed swords" taillights. These elements embody power and resilience, appealing to thrill-seekers and luxury enthusiasts.

Bridging Heritage and Innovation. Dongfeng blends cultural heritage with cutting-edge design. For example, M Hero's headlamps reference ancient Chinese weaponry, symbolizing strength and peace. Similarly, the "skyward sword" taillights reflect a daring spirit. Across all brands, Dongfeng emphasizes humanized technology—balancing innovation with simplicity and intuitive functionality.

Lighting the Way Forward. Distinct lighting signatures play a pivotal role in brand differentiation. Nammi's curved light bands offer softness and charm, while Epai's geometric patterns exude sophistication. M Hero's bold "crossed swords" DRL signify toughness, ensuring each brand's identity is instantly recognizable.

DVN Report: Shanghai Report

A Future Defined by Purpose. As AVs and BEVs redefine mobility, Dongfeng's design philosophy centers on simplicity, beauty, and relevance. By aligning brand stories with customer lifestyles, it ensures its vehicles remain meaningful in an increasingly digital world—whether they evoke adventure, elegance, or urban chic.

Through Nammi, Epai, and M Hero, Dongfeng demonstrates that the future of automotive design lies in balancing emotional resonance with rational purpose.

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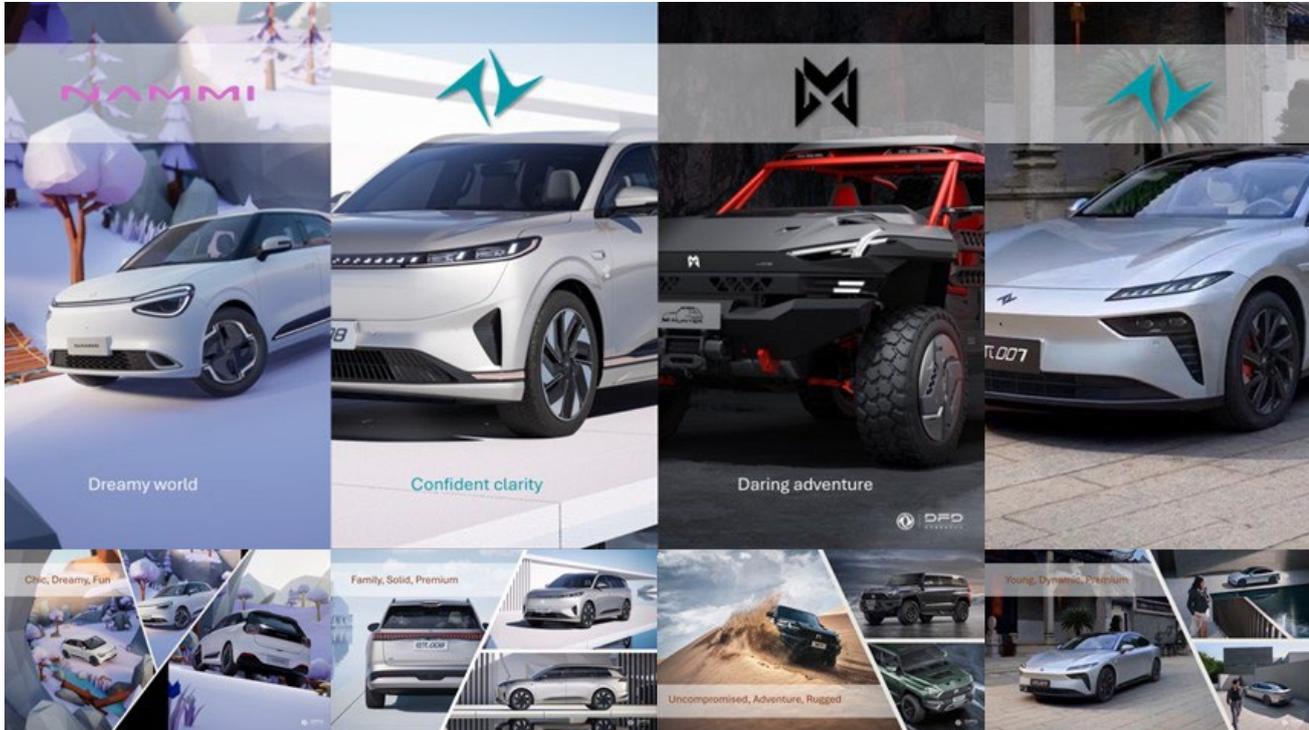
Doctor Optics : "Efficiency improvement for Slim Lens Designs"
Markus Winkler, Docter Optics - CTO

Slim design challenge is optical efficiency, and especially disctance between lightsouyrce and primary optics. Solutions are existing to imrpove efficiency :

- ✓ min. space between light source and primary optic by using glass

- ✓ anti-reflex coating on glass and polymer optics

- ✓ Usage of aspherical lenses

- ✓ hybrid lenses / diffractive elements to reduce amount of optical surfaces

SLIM LENS DESIGN VS EFFICENCY
New Technologies to overcome restrictions

DOCTER®OPTICS

Docter Optics primary glass optics

Glass Injection molding

Width / Height

>2:1

DOC3D   DOCµTEC

2:1

100µm   Precision   10µm

Today collimator   *Modular design primary optics*

Docter Optics AR nano structure on Polymer

Relative light intensity

110%

+10 %

105%

100%

95%

PMMA /PC Lens Application

■ Untreated
■ DO Treatment

Hochsp. = 5.00 kV
Arbeitsabstand = 7.4 mm
PMMA Probe 4
Signal A = InLens
Vergrößerung = 22.97 K X
Datum :6 Nov 2024

200 nm

IMPACT ON SINGLE LENS

✓ Single lens double-sided coated optical performance increase 6 % Beam performance increase by 10 %
✓ Energy and CO_2 saving up to 8 %

Transmission — Benchmark
— Docter
Angle dependence   Adhesion
(Scratch resistance)   Microstructure coating perf.
Cost effectiveness   Part complexity

IMPACT ON SYSTEMS

✓ Reduced glass components 66 %
✓ System performance increase 10 %
✓ Reduced system length 24 % (90 mm to 68 mm)
✓ Weight reduction up to 27 %
✓ Cost reduction up to 30 %

DVN Report: Shanghai Report

Exhibitors innovations
AML

AML as the leader of headlamp actuator supplier globally , we bring many innovation devices except traditional levelers to this DVN, Like CMD (Condensation Management Device)and Digital Aiming ;

CMD1 was in mass production for BMW since 2019 with no issue. And we have developed second generation -CMD2 already which is better performance with lower price, we have tested on a Local OEM lamp with very good results and will do the testing with other OEMs soon .CMD2 will be mass production for BMW 3 series in the middle of 2025 ;

Digital Aiming was applied with Tesla lamps, with two stepper motors, one for horizontal and one for vertical adjustments, to achieve High precision of aiming and Lower R&D and project costs as less tooling.

ams OSRAM
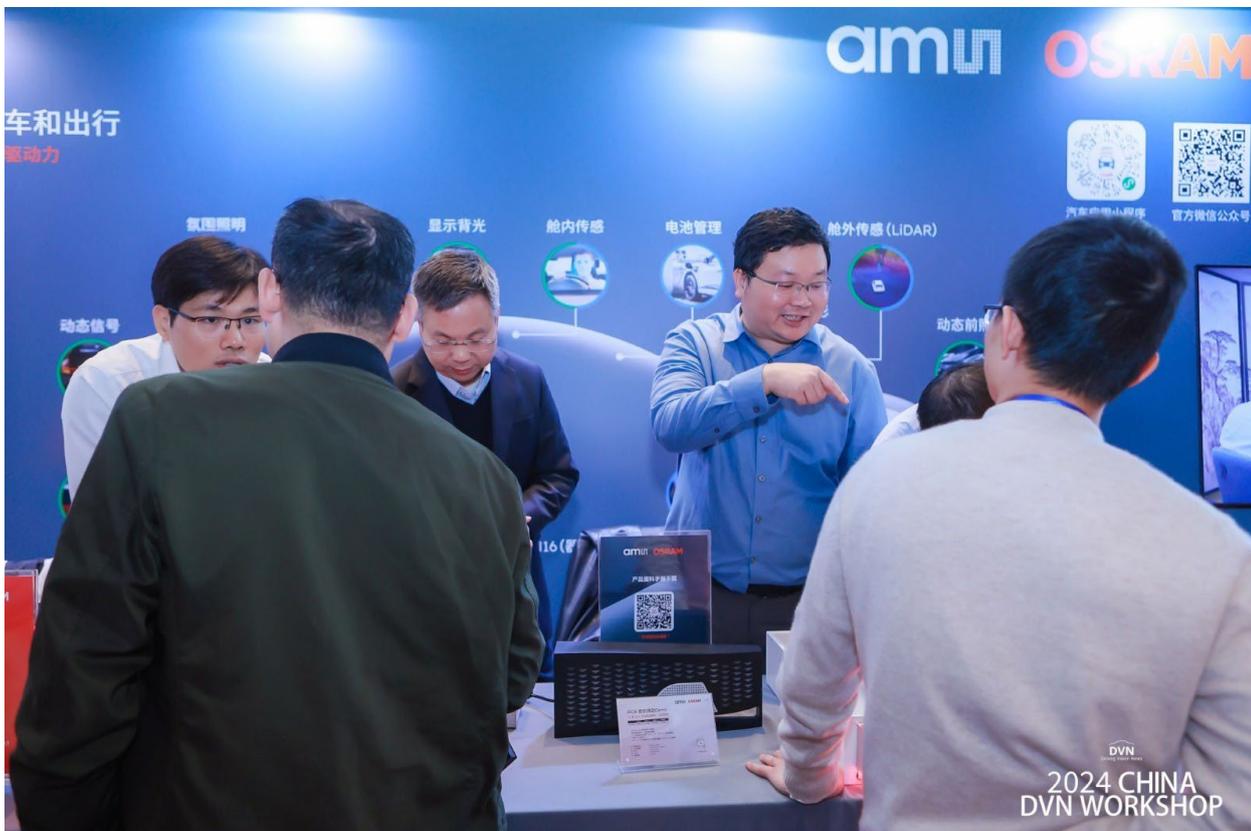
ams Osram showcased a variety of cutting-edge products of auto lighting. Among them, the most eye-catching is the Eviyos 2.0® Headlight LED. With its excellent high-resolution light distribution and energy efficiency, the product brings innovative possibilities to automotive lighting design. Eviyos 2.0® has won the German Future Award (Deutscher Zukunftspreis 2024).

At the same time, ams Osram also brought the ALIYOS™ LED-on-foil technology, marking the first public display of this technology in the Chinese region. With the ultra-thin structure (<1mm) of the transparent ALIYOS™ LED film, LED light sources can be applied to any substrate almost invisibly, bringing a whole new field of application and engineering methods for interior and exterior applications.

ANRUI

Anrui and its subsidiary WIPAC jointly demonstrated the capability of innovative design, mold design & manufacturing, process engineering and innovation application:

CD701 sample (from Anrui Chongqing factory): MiniLED mass application, mold manufacturing for end to end headlamp, drive control, and injection molding assembly of oversized products.

ISD (from Anrui Chongqing factory): The application of large LED display, relying on the LED chips of Anrui's parent company Sanan Group, and the large-scale production and adoption of Anrui's self-packaged automotive-grade LEDs

Ferrari rear lamp(Anrui UK R&D and manufacturing), the design of the ultra-thin model integrates the various functions of the taillights, and the design of power aesthetics has a simple temperament beauty

Rolls-Royc taillight （from Anrui UK R&D and manufacturing): streamlined design, functional integration, have a graceful and luxurious beauty.

ASYST

ASYST Technologies showcased its automotive lighting technologies and products this December at the Shanghai, China DVN event. ASYST presented multiple product lines for a variety of lighting applications including aiming adjusters, flexible aiming cables, ball sockets and tracks, pivot studs, micro adjustment systems, and plastic molded heat sinks. There was significant interest in the injection molded "TC" thermally conductive heat sinks which are designed and manufactured to provide optimal thermal management for LED lighting applications. The use of "TC" molded heat sinks can provide significant weight and cost advantages over the use of Aluminum heat sinks in LED lighting applications. ASYST continues to work towards a localization strategy aimed to grow the Chinese market and build new relationships through a local production approach.

BrightView Technologies

BrightView Technologies showcased its computational optics solutions at the recent DVN Shanghai event, presenting a forward-thinking approach to automotive lighting design. Leveraging a fast, iterative design process, BrightView demonstrated how its customizable thin-film optics can be adapted to optimize for specific lighting specifications, delivering precision and performance tailored to each application.

Highlighted innovations included ultra-thin optical films for taillight modules and dynamic interior/exterior lighting systems, designed to meet the demands of modern automotive styling. These solutions not only enhance aesthetics but also align with the industry's growing focus on energy-efficiency.

Through discussions and a presentation by VP of Sales & Marketing, Dr. Michael Murphy, BrightView highlighted its ability to support automakers with rapid prototyping and custom optical designs, enabling faster development of innovative lighting solutions.

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ConvenientPower

CPS was founded in 2016 Chengdu, Sichuan, and has branch offices in Shanghai, Xi'an, Shenzhen, Hong Kong, Seoul, South Korea, and Silicon Valley, USA. It is a rapidly growing high-performance analog and mixed-signal integrated circuit IC design company with a high-quality management and R&D team. The core members are all experts. In recent years, the company has begun to focus more on the automotive sector.

CPS has the top market occupation in China new energy vehicle (NEV) onboard wireless charging market. In the automotive field, it has established four product lines: charging management, smart protection, automotive lighting drive, and general-purpose power supply.

DELO

Materials and adhesives for MLA modules

Microlens arrays (MLA) in headlamps and projection system modules enable accurate light control and compact designs. DELO develops high-tech materials for the imprint of lenses in MLA as well as optical adhesives for MLA and lens bonding. All products fulfill the high optical and mechanical requirements, especially regarding yellowing stability.

ELMOS
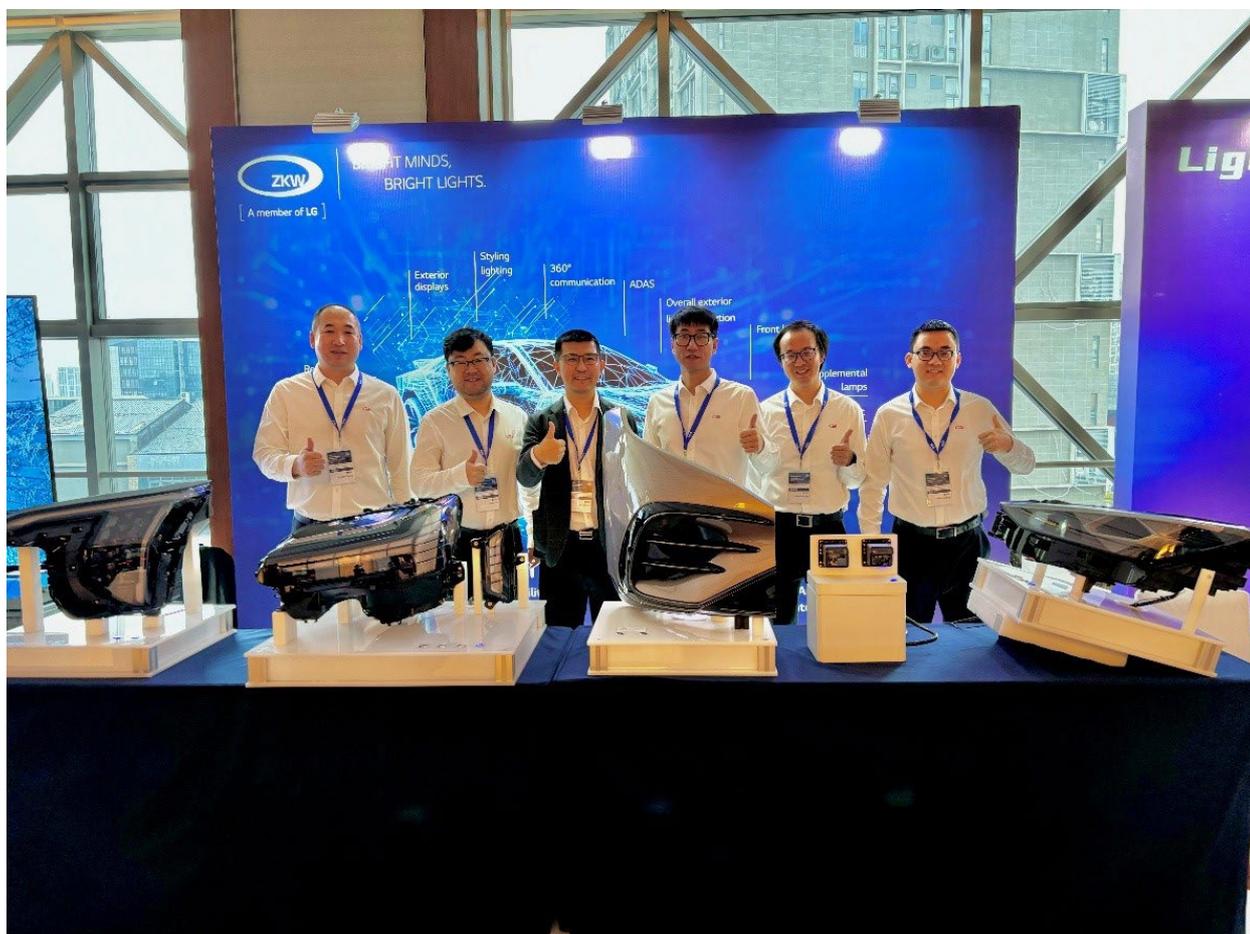
Elmos presented numerous demos with new products at the DVN Workshop Lighting in Shanghai/China. Above all, our new multi-channel (O)LED driver E522.96 with high speed CAN/FD interface combined with OLED modules provided a very positive response.

Another highlight was our Dynamic LIN demonstrator based on our static LIN/RGB LED-driver E521.39. DynamicLIN redefines lighting control, seamlessly bridging static and dynamic ambient light functions for OEMs at lower costs. With 10ms RGB refresh across multiple LIN modules, it enables real-time, fluid animations updated over the air (OTA) — no flashing required. Its intuitive interface lets users craft intricate lighting effects using specialized commands for color, intensity, and dynamic modulation. The built-in synchronization ensures flawless coordination across devices, creating cohesive, stunning visuals, all powered by Patent applied DynamicLIN control.

Discover how Elmos technology can transform your automotive lighting with efficient, flexible, and high-quality solutions. Illuminate your path to innovation with Elmos – where advanced technology meets sustainable design. Explore our offerings today and light up your automotive future.

DVN Report: Shanghai Report

FOCUSLIGHT

Founded in 2007 and headquartered in Xi'an, China, Focuslight Technologies Inc. is a fast-growing public company (Shanghai: 688167) that specializes in developing and manufacturing high-power diode laser components and materials, laser optics, as well as photonics module and system solutions focusing on optical communication, automotive, pan-semiconductor, and medical and health applications. Focuslight has expanded its global footprint through strategic acquisitions including LIMO GmbH in 2017 and SUSS MicroOptics SA in 2024 (now as Focuslight Switzerland SA). With the acquisition of assets from ams OSRAM in 2024, Focuslight extends its business to be a global photonics foundry by providing global photonics industry process development and manufacturing service under the brand of Heptagon. Learn more at www.focuslight.com and www.hptg.com.

HASCO Vision

At the exhibition, HASCO Vision brought a variety of representative products, including Xiaomi SU7 head and rear lamps, Passat Pro matrix headlamp, IM LS6 rear lamp and IM million-pixel DLP projection headlamp. Also shown were HASCO Vision's intelligent interactive projection technology, ISD interactive signal display lamp, Mini LED signal lamp technology, etc.

L.E.S.S.

Our innovative approach involves generating light directly from a (proprietary) nano-active fiber approximately 1mm in diameter, which can be distributed over any defined length or 3D shape. This technology allows for delivering a maximum of light intensity in minimal space, providing exceptional visibility for the driver and significantly enhancing the car's visibility to other road users. Uniformly bright lightings are consistently effective across various application around the exterior of the car while fullfiling the strict automotive regulations.

The use of our laser nano-active fiber technology eliminates the need for additional optics and reflectors, drastically reducing the use of plastic parts to a minimum. This innovative approach, combined with the high efficiency of our light generation process, significantly reduces the overall weight of the lighting system by several kilograms.

Our advanced nano-fiber lighting technology significantly enhances exterior visibility, optimizing the driver's vision and improving safety for passengers.

This technology delivers intense, uniform illumination, reducing risks in poorly lit conditions and adverse weather, especially beneficial for night time driving.

Additionally, it offers greater design flexibility. It can be seamlessly integrated in front or rearlightings.

Liaowang

SAIC IM L6 Tail Lamp

Liaowang Automotive Lamp latest mass-produced red light MDL technology also achieved a global debut, significantly improving the fineness of the rear red interactive display. This technology makes the rear interactive display more diverse in terms of interactive content and application scenarios, aligning with the development of automotive intelligence and interactivity. The successful mass production of this technology indicates that Liaowang Automotive Lamp can provide corresponding fine-tuning solutions for the entire vehicle's interactive display, making it possible to achieve full-vehicle high-definition interactive display.

DeepalG318 Tail Lamp

Typical small-sized multi-faceted uniform lighting fixtures have a high level of difficulty in optical design. Liaowang Automotive Lamp have achieved uniform lighting characteristics in all directions while ensuring the optimal cost-effectiveness, demonstrating Liaowang's excellent Automotive Lamp design capabilities and quality assurance capabilities.

SAIC MAXUS eTerron 9 Headlights & through grille Lamp

The iconic large-area luminous position light and daily running light reuse, and the upper and lower two full-penetration position lights. In the overall luminous matching, as well as luminous uniformity, are in the industry leading level. Flat and long shape lens modules are used for both near and far light, and the road performance has reached excellent levels, and the vehicle modeling integration is also very satisfactory to customers.

MIND

MIND Opto is the specialist of lighting, modules and electrics systems for the global automotive industry. Since 2024, integrated ADAS Camera and 4D imaging Radar into our business. We have around 7000 employees globally connected and reached turnover over 4 Bill RMB in 2023. At 2024 Shanghai DVN, we showcase our several mass production products including BMW Mini Headlight, Rear Light, it features a stylish and dynamic design, inheriting the design language of the Mini family. and also Great Wall SOUO Headlight and rear light, with its three-dimensional strip design, complements the lion-head lamp and ensures the continuity of the design. We also showed a Rear light designed for HAVAL brand, it utilizes an ink-patterned inner lampshade technology to create tunnel effect and make structure compact, cost effective.

Those demonstrators are just a small example where we launched in the market in different applications. We are continuing to invest on innovation technology in automotive lighting, ADAS camera and sensors, and we are looking forward to discussing innovative ideas together with all of you.

OLEDWorks

OLEDWorks attended the Driving Vision News (DVN) Workshop in Shanghai, displaying its robust and automotive qualified Atala organic light emitting diode (OLED) lighting technology.

Attendees could experience both bendable and rigid Atala panels at the OLEDWorks booth. Bendable panels can wrap around a vehicle, allowing light to follow curves for greater visibility and design freedom. This functionality increases viewing angles, enhances communication capabilities, and improves safety for any vehicle, whether two-, three-, or four-wheeled.

Automotive red Atala panels on display featured custom OLEDWorks animation software. They demonstrated the functionality of individually addressable, high-contrast segments for V2X communication and styling. The latest technology shown included rigid panels with 224 segments each and bendable panels with 192 segments, capable of a maximum brightness of 10,000 cd/m^2.

Cutting-edge Atala panels at DVN Shanghai expressed form, function, and safety in an elegant package. They are the thinnest, brightest, and longest-lifetime OLED lights on the road—customizable for the segmentation and luminance that each location and function of the vehicle requires.

DVN Report: Shanghai Report

SESO
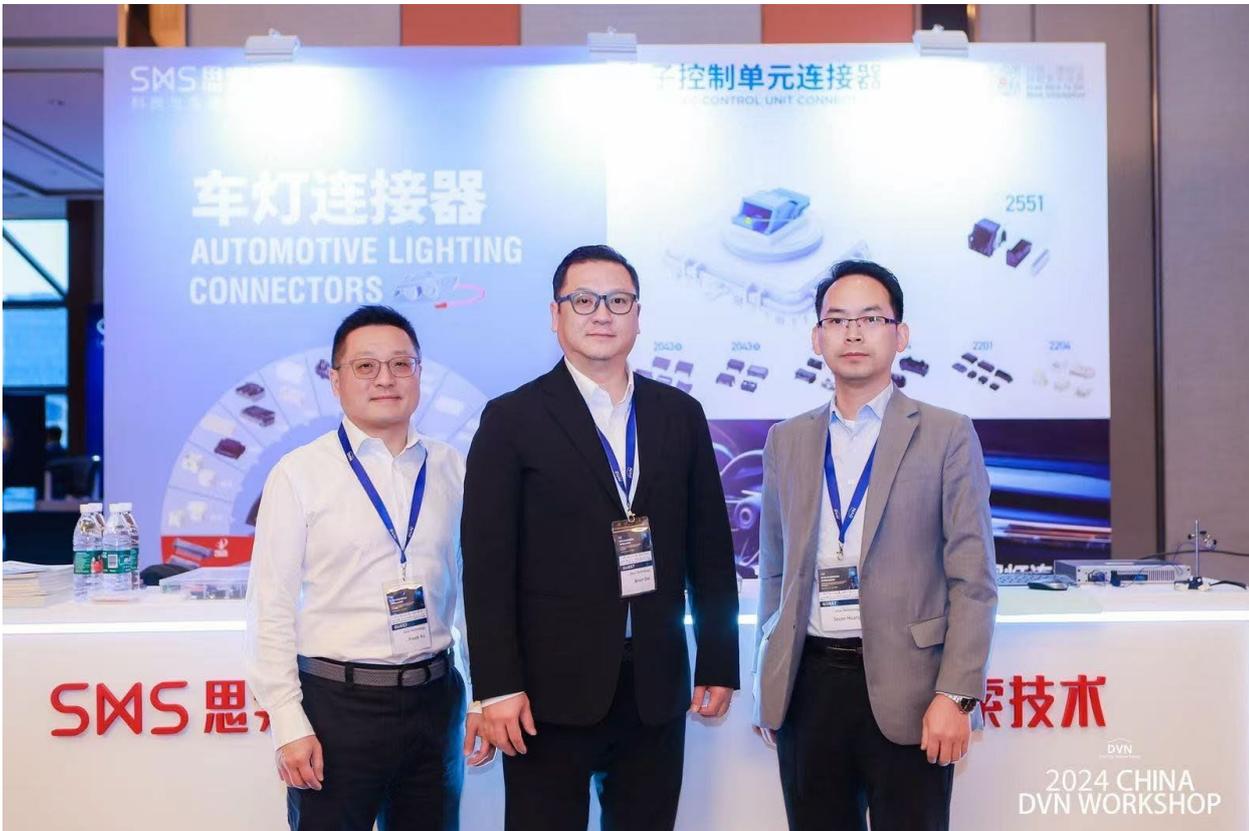
SESO Technology is a privately-owned domestic enterprise founded in 2008. In 2014, the company successfully transitioned into the automotive sector, establishing itself as the market leader in China's automotive lighting segment for several consecutive years. Building on this success, SESO has continually expanded its product portfolio by developing a diverse range of connector solutions, serving applications such as new energy vehicle powertrains, body control systems, and intelligent cockpit control systems. SESO's products are renowned for their compact design, exceptional vibration resistance, low contact resistance, and reliable performance across wide temperature ranges. Each product meets rigorous automotive-grade standards, including LV214, USCAR-2, and the specifications of both domestic and international OEMs, making them highly trusted and widely used in the market. With a steadfast commitment to innovation and quality, SESO is dedicated to advancing the global automotive lighting industry and driving its future development.

Synopsys

Synopsys Optical Solutions Group participated in DVN Shanghai Workshop during Dec 4 to 5. Synopsys provide a wide range of world-leading optical software for AR/VR, lighting, automotive lighting, stray light analysis and metalens design with intelligent, easy-to-use solutions and an expert support team anchored by optical engineers, Synopsys helps organizations deliver superior optics to market faster. In 2024, we release ImSym (Imaging System Simulator) an imaging system including lenses, sensors, and ISPs before it is sent to manufacturing. Apart from ImSym we showcase classic innovative software packages include CODE V imaging design software, LightTools illumination design software, the LucidShape products for automotive lighting, and the RSoft Photonic Device Tools for passive and active photonic and optoelectronic devices. We offer optical design services, with more than 5,500 completed projects in imaging, illumination, and optical systems engineering. And our optical measurement solutions give customers access to precision light scattering data for materials and media used in optical systems.

TechnoTeam and LMT

TechnoTeam and LMT are German companies with extensive experience in light metrology. As partners, we market advanced measurement techniques for automotive lighting, including Adaptive Driving Beam (ADB) headlamps. TechnoTeam specializes in imaging luminance and color measurement cameras with V(λ) adaptation, while LMT focuses on goniophotometry. Together, we provide specialized rapid camera-based screen goniophotometry measurement systems. This technology combines the speed of digital imaging systems with the accuracy of traditional goniophotometers.

This technology is 100 times faster than standard goniophotometry and has been patented in Europe, the USA, China, and Japan.

We invite you to contact us, to learn more about our patented technology and how we can help you get better and faster measurements of your complex automotive lighting devices.

At this workshop in Shanghai, TechnoTeam's chinese distributor, Mr. Bob Lui, held a presentation on "Advanced Analysis of ADB Systems & Symbol Projection".

Toshiba

Toshiba Lighting & Technology Corporation has proposed socket-type LED light sources that maintain the ease of use of incandescent bulbs while accommodating a variety of designs. This product simplifies lamp design and shortens the time required for evaluation and mass production. Installation is as easy as that of incandescent bulbs, and in case of malfunction, only the light source part needs to be replaced. The lineup includes UNECE standard products, and the more powerful 6 series is compatible with long lamps and wide-area lighting fixtures. Additionally, customized solutions for individual customers are available. For example, it is possible to combine light sources that were previously needed for different functions, such as position and turn signals, into a single light source, reducing the number of parts and lowering costs for customers.

VALEO

Valeo headlight technology: bringing more safety and design to the road.

The aerodynamic design of the Lynk & Co Z10 is highlighted by its first RGB through-light on the front face, which is continued by the application of a dual-function lighting module with a height of 15mm. LED strip Integrating 224 pcs LEDs, which can display 256 colors. This is the first time that Valeo has applied RGB LEDs to exterior lighting, bringing technology and aesthetics together.

XINGYU

1. Aito M9 Headlight: The industry-leading DLP projection module, combined with ISD pixelated display, achieves diverse scene expression.

2. Chery STERRA Position Light: ISD pixelated display, the first front lighting with ground projection steering lights.

3. Perception Fusion Projection Headlight: 25600 pixels, integrated with high-definition cameras, perception fusion in a self-closed loop.

4. Laser Fiber Projection Module: RGB, OTA upgrade, compact size, supports installation at any vehicle position, full scenario user customization.

5. MLA Projection Module: High brightness, 4 zones, 3D dynamic effects, supports customization.

YEOLIGHT

Yeolight is the company which focus on the OLED Automotive lighting source. Please see our products introduction.

The NISSAN N7 was unveiled at the Guangzhou Auto Show (Nov. 15th 2024), and is expected to officially go on sale in 2025. OLED is using for rear lamp. There is total 882 segments in the N7 rear lamp, and so many segments could display rich and cool animations.

The second is the Dongfeng VOYAH Zhiyin. Each OLED panel has 11 segments, there are 131 segments in total, It realizes VOYAH's familial taillight design. OLED overall cost close to LED thick-walled parts.

The third is the new Hongqi H9, each panel has 64 segments, there are 512 segments in H9 rear lamp. There are 5 signatures on the center dash console, You can change it easily.
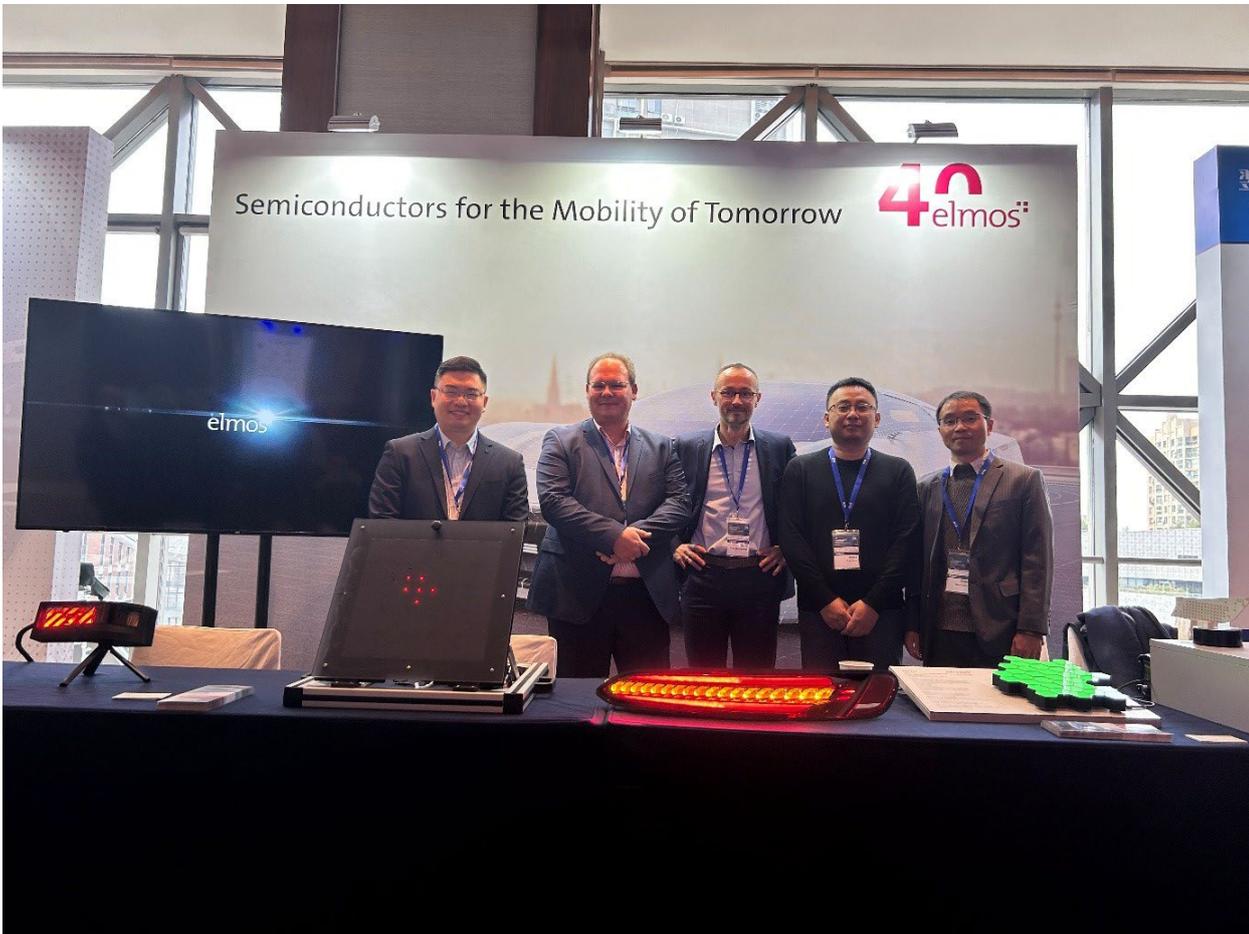

红旗H9尾灯OLED光型模式

模式一　　模式二　　模式三

模式四　　模式五

OLED has the beautiful appearance, lighting uniformity, thin form, the OLED panel power is lower, so don't need Consider heat dissipation.
In the future, more OEMs communicate the demand for OLED mass production.

ZKW

Five colleagues from ZKW China, led by R&D Director Mr. Zhang Ziyi, attended the DVN 2024 Shanghai workshop with numerous innovative products, including Volvo EX90 "blink" headlights with hidden dynamic mechanism inside, Cupra Terramar 25K microLED headlights, Kia EV3 ultra-small module headlights (15x15), and the "all-in-one" pixel modules. In addition, we also publicly showcased for the first time in China the illuminated grille product jointly developed by ZKW and Rehau.
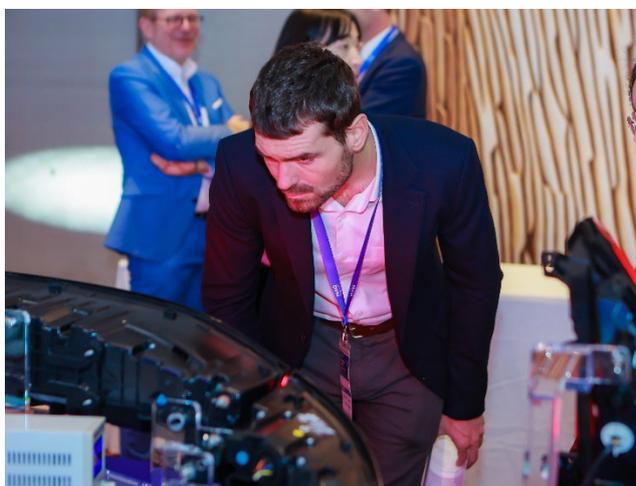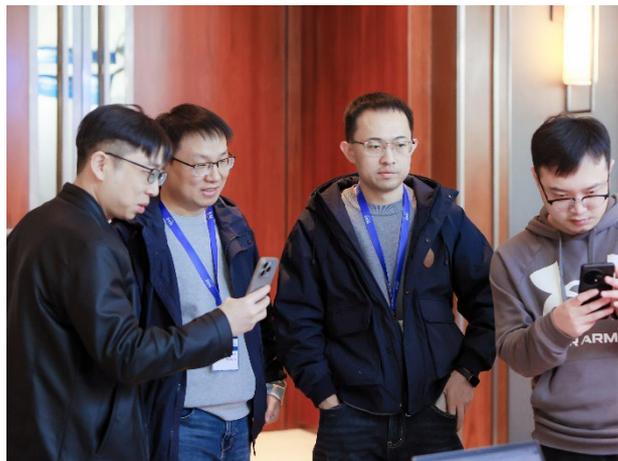
Demo Vehicules

DVN Report: Shanghai Report

Networking

DVN ecosystem and scientific community

DVN is a reference in the world of Lighting, Interior comfort and Lidar

Car Makers

Audi
Bentley
BMW
Ferrari
Ford
General Motors
Genesis
Honda
Hyundai
Jaguar-Land Rover
Kia
Lotus cars
Lucid Motors
Mazda
Mercedes-Benz
Mitsubishi Motors
Nio
Nissan
Renault
Rivian
Seat
Stellantis
Subaru
Toyota
SAIC Volkswagen
Volvo Cars
Zoox (Amazon subsidiary)

System Suppliers and Tier 1s

Adient
Anrui
Appotronics
Aspöck Systems
Chongqing Rebo
Creat
Diode Dynamics
Elba
F2J Industry
Feka
Fiem Industry
Flex-N-gate
Forvia
GHSP
Grupo Antolin
Hascovision
Ichikoh
J.W. Speaker
Keboda
Koito
Lightworks
Lumax
Luxit
Magna
Marelli AL
Mind
Mobileye
Mobis
Nordic Lights
Odelo
OPmobility
Panasonic
Prettl

SL Corporation
SMR Automotive
Stanley
The Lighting Consultants
Toyota Boshoku
Uno Minda
Valeo
Varroc
Xingyu
Zanini
ZKW
Zodiac

Light Source Suppliers

ams OSRAM
APT Electronics
Dominant Opto Tech.
Everlight Electr.
HC Semitek
Kyocera SLD Laser
LG Innotek
Liteon Technology
Lumileds
Nichia
OLEDWorks
Samsung LED
Seoul Semiconductor

Univ., labs, Consultants

Bluebinaries
Capgemini
CEA Leti
Darmstadt university
DEKRA laboratory
Endego
FEP, Franhaufer
Fudan university
Fraunhofer IMS
Hannover Leibniz .(HOT)
Institut d'Optique
Karlsruhe Lighting Institute LAB
Nuremberg university
Pacific Insight
Parma university
Pforzheim
Rensselaer university
Sapphire
S&P Global Mobility
UMTRI
University of California
YoungNam University

Tier 2s

A2Mac1
Ascorium
AML Systems
Ansys
ASAP
ASYST Technologies
Auer Lighting
BASF
Braslux
Brightek
Brightview Technologies

Cepton
Ceres Holographics
CLM Search
Coindu
Continental
Covestro
Dajac
DBM Reflex
Delo
Die haptiker GmbH
Docter Optics
Dow
EcoGlass
Edag
Elmos
Ennostar
Euro Moulders
EV Group
Focuslight
Grewus
Hitachi
HJ Optics
Huawei
Idemitsu
Infineon
Inova Semiconductors
Instrument Systems
Integrity
Joysonquin
Leonhard Kurz
Less
LMT
Luminus
Marquardt
Mektec
Microvision
Maxell Frontier
MD Group
Melexis
Microchip
Microrelleus
Mitsui Chemicals
Mocom
Muth Mirror Systems
Nalux
Novem
NBHX Trim
Oerlikon
ON Semiconductor
Polycontact
Polyrise
Preh
Ray Group
Rehau
Sabic
Seaborough
Seoyoneh-Ewha
Shihu
SP3
Sunny Automotive Optech
Synopsys
TechnoTeam
Toshiba lighting
TQ Technology
Uni Tooling
Vangest SA
Ventura
Weidplas CH
W.L. Gore & Associates
WLOPT
X2F
Xunchi
Zollner