CES 2024

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Automotive lighting, driver assistance and smart interior

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Contents

About Driving Vision News

DVN is the vehicle lighting; ADAS; lidar, and interior world's journal of record, dedicated to keeping the community informed and communicating about the latest progress and developments. DVN's three pillars are:

• **Technological watch** on new emerging technologies, with weekly electronic newsletters bringing news, analysis, and crucial information on innovation in lighting, ADAS, lidar, and car interiors; there are also monthly technical reports with sharp focus on cutting edge technologies, company profiles, regulatory matters, and other relevant content available only from DVN

• **Networking** of high-level decisionmakers, researchers, innovators, practitioners, academics, and regulators to make new business connections with two workshops per year in rotating locations throughout America; Europe; China; Japan; India, and Korea. DVN Workshops are very popular, and routinely fill to capacity with over 300 participants.

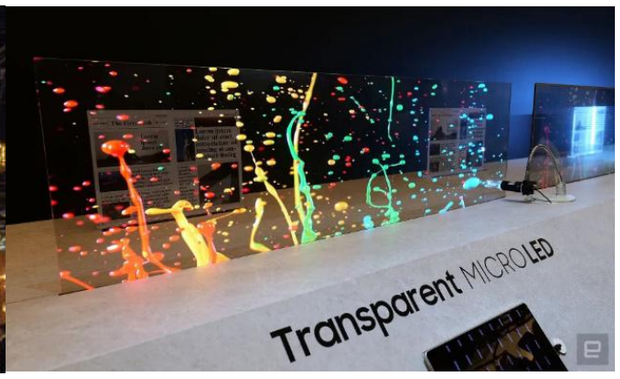
• **Promotion of innovations** from DVN's 240 member companies—we facilitate the promulgation of knowledge of innovation, which in turn paves the way for commercialisation, enabling to build new relationships through DVN Community to forge new business worldwide. The DVN Gold membership roster includes 240 companies including automakers; lighting, interior, lidar and ADAS tier-1 and -2 suppliers, and a wide variety of universities; research outfits, and consultants. DVN Gold members receive all publications and attendance privileges at all DVN Workshops.

Introduction · Key Takeaways

During four days from the 9th to the 12th of January, around 135,000 attendees visited 4,300 companies. Among them, 1,400 startups filled up the packed Eureka Park. These figures are up significantly versus the 2023 show, though still far from the 2019 peak when CES hosted 180,000 attendees.

The major trends this year in the mobility and auto tech space addressed software (essentially software-defined vehicle and components), AI, and user experience including displays, lighting, and AR. Autonomous driving in general—vehicles, lidars, software—has receded somewhat, with the focus shifting to ADAS in recognition that truly self-driving cars are going to remain a thing of the future for a while yet. As to EVs, there was more focus on charging and less on batteries. And the hydrogen ecosystem was more present than in previous years, though still marginal.

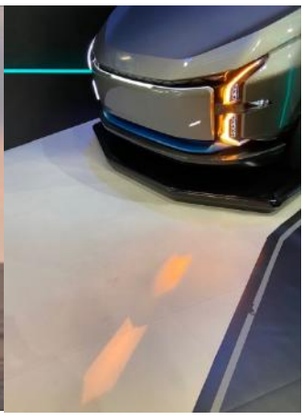
Technology is also flowing from consumer electronics to automotive. That's why it is important to keep an eye on CES with the most exciting tech announcements like TVs from LG and Samsung, computing updates from Nvidia and AMD, and mobile gaming innovations—these things translate more or less directly to automotive display technology. Transparent displays are a new trend. LG presented their new OLED displays, and Samsung their new microLED ones. Seeing this technology in cars is surely just a matter of time.



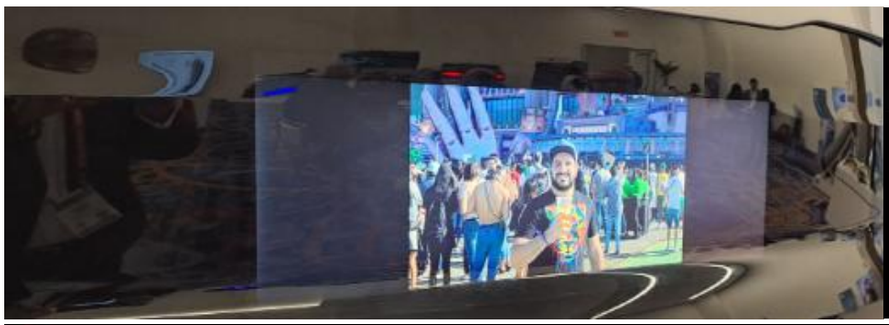
Key takeaways from lighting specialist view:

• Focus is no longer on road illumination functions, but on signalling functions and car lighting for fun.

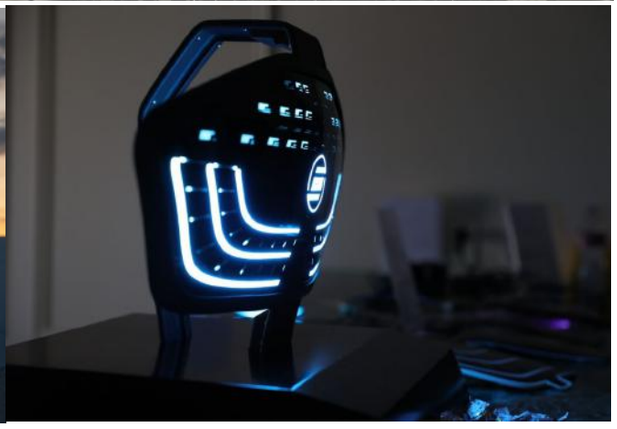
• V2X communication in relation with AD vehicles: Mercedes' turquoise AD status lamp in the US; In more permissive-regulated China, ISDs (social displays) are already on most L^{2+} BEVs. Signal projections and dynamic interaction on displays are new trends, where regulations allow.



• Proposals for ground projection based on LEDs, OLEDs, LED-on-film, silicon-encapsulated LEDs, mini- and microLEDs, TFT display…lot of technologies are available.



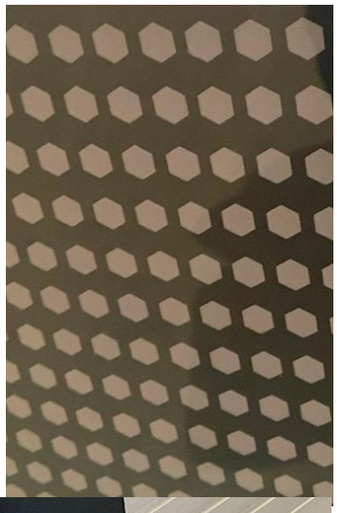

• For integration, a lot of possibilities as well: regular lens with UV coating, PU film, PVD coating, body-colour paint with laser etching, insert-moulding PCB, and more.

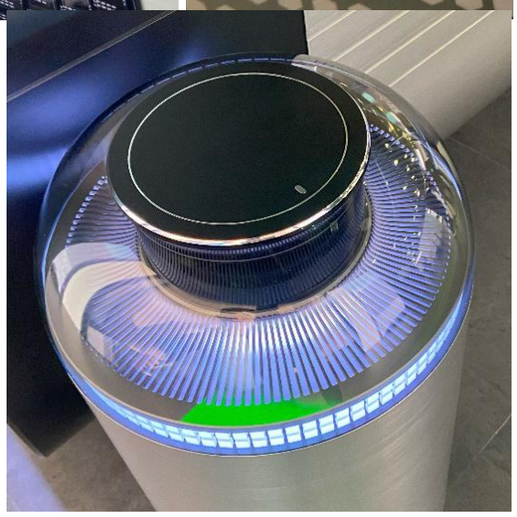



• Numerous concepts to reduce CO_2 footprint. Recycled materials, weight reductions, improved recyclability and refurbish ability, and more.

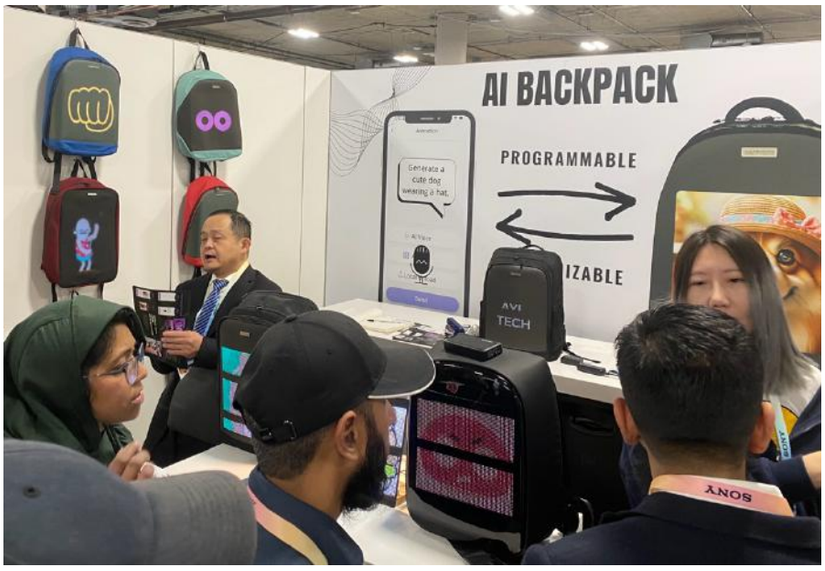
• The styling trend is pixelization. Pixels can display information, and also to advertise the car's sensor and computing technology.







Startups

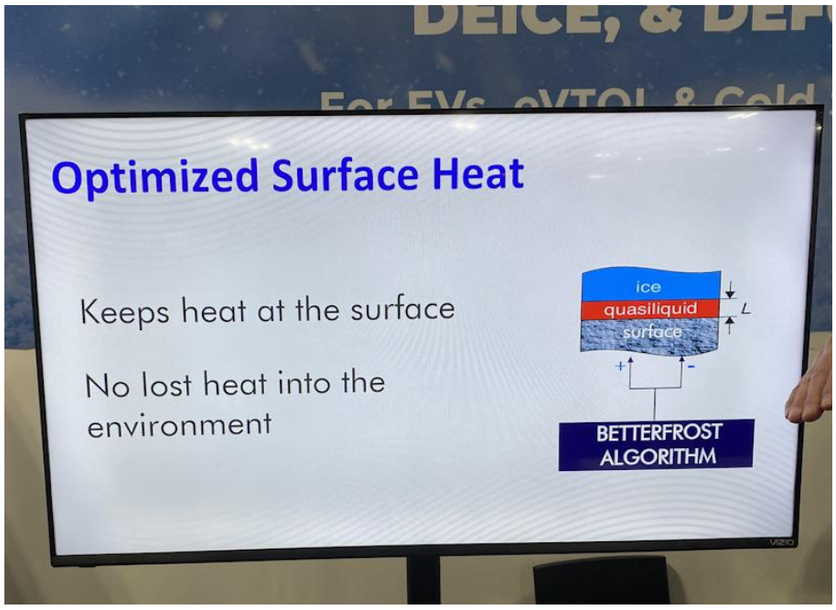


There was a whole hall and stage dedicated to startups at CES this year, and they ran the gamut: medical-health-wellness-wellbeing, home and office automation, materials, sustainability and industrial circularity, entertainment and lifestyle…you name it, there was a startup working on it. Naturally, there was an overcrowd of coattailers trying to wring money from the wave of overheated hype about AI. Who wants a so-called "AI backpack" with a display panel on the back, and you type in something like *cute dog wearing a hat* so the display will show a lame, creepy attempt at a picture of what it 'thinks' you meant? (Yeah, let's not always see the same hands raised…isn't it past your bedtime, kids?).

Fortunately, besides the silly eyerollers and vapid nonsense, there were some interesting, legitimate innovations by and for grownups. How about a pair of automatic spectacles? Put them on, turn a knob on the side to bring something I see into focus, and then—even though I usually must look overtop my glasses and strain to read the fine print up close—whatever I looked at was in focus, whether near or far, just like on a good autofocus camera. The viewing aperture was very small, but the performance was shockingly good; I hope they develop and gain traction enough for me to buy a pair one day. Preferably in time to save me from bifocals (please hurry fast!).

And, winnowing down, a few of the innovations for grownups seemed to show some promise for the automotive and mobility world. Here's a look at some of those.

Betterfrost Technologies



Co-founded by a veteran of the Dartmouth Ice Research Laboratory, Betterfrost specialise in what they call low-energy surface heating. It means finely controlling the penetration depth of heat so as to warm up only what needs warming, without wasting energy heating up other stuff. A particular area of focus for the company is defogging and defrosting of windows and mirrors. Cars have windows and mirrors, and EVs have to be on a perpetual watts-diet to maximise driving range, so this would seem an excellent fit. Betterfrost claim that in an EV, their defog-defrost technology uses just 5 per cent of the energy consumed by a conventional HVAC system, and 60 to 70 per cent less than ordinary heated glass. They say their method uses just 10 per cent of the usual energy to thaw a refrigeration evaporator coil—and with more and more EVs coming with heat pumps, that sounds applicable to the mobility world, too.

Their algorithms are based on close research of how ice forms and sticks to surfaces. They say the most efficient way to remove ice or frost is to melt only a thin 0.1-mm layer right at the substrate surface, creating a thin film of

water so the ice can easily slide right off. This avoids having to melt the whole mass of frost, which is slow and energy-intensive. They do this precision melting by dint of proprietary algorithms—different ones for defogging and defrosting—which pulse power to a conductive material. Heat isn't wasted on propagation beyond the boundary layer. A dramatic video on their website shows a Betterfrost-equipped windshield on a cold-soaked car at -20°C being effectively defrosted *much* faster than with a conventional HVAC system.

InQs

This Japanese company had a nifty magic trick on display: transparent photovoltaic glass. Its transmissivity is over 70 per cent, and generates electricity when photons strike it from any direction, on either side. It also acts as a heat shield, allowing less heat (for example, from the sun) through to the people on the other side of the glass. This glass scooped up two CES Innovation Awards, in the Smart Home and Sustainability/Eco-design/Smart Energy categories, and a Best Of Innovation award in the Smart Cities category. It's said to be able to generate power even from very little light, and pitched as a good power source for IoT applications—the innumerable little sensors and widgets we're busily surrounding ourselves with so we're always watched, monitored, and (so goes the theory) catered-for. Perhaps it will evolve to the point of being able to materially extend EV driving range.

Kaist

This Korean outfit showed a variety of highly effective, eco-friendly amendments for glass and plastic, including antireflective/antiglare surfaces and super-hydrophobic self-cleaning ones. They use what they call 'hierarchically designed nanoparticles', and unlike more conventional methods, the processes don't require dangerous toxic chemicals like hydrofluoric acid. Company scientists have published several scholarly research papers on the subject. Automotive applications seem obvious: camera and sensor lenses, interior and exterior display cover lenses, headlamp cover lenses, maybe even bigger windows. One second-order benefit claimed by the company was notably specific: "reduced need to import anti-glare glass from China".

Morphotonics

This Dutch company describe their speciality as large-area nanoimprint lithography equipment, which allows downstream companies to produce things like naked-eye 3D via diffractive light field backlighting (Leia); smart glass spacers (Elstar Dynamics), and roll-to-plate UV imprint on large substrates and wafer-scale UV replication (Phabulous).

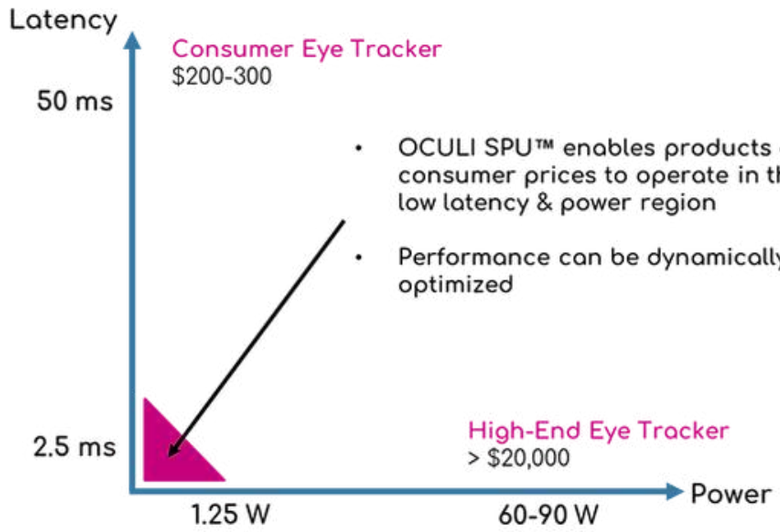
Oculi

Oculi, who describe themselves as a deep-tech, fabless semiconductor company, say their sensing and processing unit is the world's only 'software-defined vision sensor', a single-chip vision sensor faster than the human eye and more efficient than other technologies, which they claim gives 'real-time vision intelligence' by dint of in-pixel sensing and pre-processing.

Founder and CEO Dr. Charbel Rizk says, "The need for machine vision is what has been holding the world back from the next revolution in technology. We have image sensors but not vision sensors in automation. For decades innovators have worked to solve the problems of latency and inaccuracies associated with image sensors. Oculi is solving the problem with the first sensor optimised for machine and computer vision".

The Oculi products are centred round a programmable chip that mimics the human eye in selectivity and parallel processing, with relevant information obtained efficiently in time, energy, and expense and with privacy at the source. The processing occurs in the chip, delivering only the desired data and no need for an additional processor.

Conventional cameras work to reconstruct images for human consumption by measuring the intensity of light on a pixel array at a fixed frame rate, usually 10-60 per second. This results in a stream of full frame images. That makes such cameras inefficient and limits their utility in computer vision, for they continually capture redundant and irrelevant information while causing a combination of latency, blurring, and inaccurate signal information.



That redundant information, Oculi say, is continuously captured even when the scene remains static. Imagine there is only motion in 1 per cent of a total scene. So, 99 per cent of the pixels contain no new information, yet they are continually read off of the camera and processed, creating a lot of needless work.

That needless work drives up latency; with such a large amount of data to be read off the sensor within a frame time. Think of a camera operating at 30 fps. Waiting for the previous frame to be transferred can take up to 33 ms, depending on the exposure time, not including data transfer or processing delays.

Blurring occurs when either an object or the camera is in motion, even when the scene is static—because a point in the scene gets captured by multiple pixels during the exposure time. The exposure time can be shortened to limit motion blur, but that degrades the signal accuracy. For example, with an exposure time of 1 ms and a frame rate of 30 fps, there are now 32 ms between every frame when no data is captured. So the sensor is effectively 'blind' for 97 per cent of the time! The sensor is not measuring light (looking at the scene) so it cannot capture anything happening during that time and the signal fidelity suffers. In machine vision, these limitations result in substantial signal inaccuracies and inefficiencies in processing, power, bandwidth, and latency.

Oculi say their technology solves all of that. Numerous ADAS, AD, and DMS-OMS applications suggest themselves.

Peel Labs

This Japan-based B2B startup are making high-quality, luxurious, ultra-resistant leather out of pineapple leaves, recycled polyurethane, and recycled resin. Since 2022, they've made at least 800 metres of the stuff, and the please-touch samples at their booth were most impressive in look, feel, and touch quality. Peel say their material is better, in ways that matter, than animal leather and ordinary PU artificial leather. Among other favourable comparisons, the Peel pineapple leather is highly and durably scuff proof and waterproof as-made, without need of surface treatment after manufacture or periodically in the field, and that they're in productive talks with airplane seat makers, with an eye on the automotive seats-and-surfaces market as well.

Leather Type	Material	Price per m²	Durability	Environmental Impact
PEEL Lab Pineapple Leather	**Pineapple, Recycled PU, Recycled Resin**	**$20 - $50**	**Water proof Scratch proof Lasts up to 10 years without treatment**	**Emits only 2.75 kg of CO_2 per m² Partially biodegradable**
Animal Leather (Cowhide)	Cow	$40 - $160	Not 100% waterproof Not scratchproof Lasts up to 30 years if oiled regularly	Emits 110 kg of CO_2 per m² Animal cruelty Causes water pollution Increased health risks of tannery workers
Synthetic Leather	PU	$1 - $30	Waterproof Not Scratchproof Lasts 2-4 years	Emits 15.2 kg of CO_2 per m² Takes 500 years to decompose

Peel's appeal extends beyond the functional aspects of the material, to ecological, animal, and human health and wellbeing. They say animal leather is the № 1 most environmentally-damaging of all 'fashion materials'; leather tannery workers have a 35-per-cent elevated risk of getting cancer on account of the toxic chemicals involved, and each kilogram of animal leather's production wastes or pollutes 17 tons of water. They describe Peel pineapple leather, on the other hand, as tackling food-agriculture waste, preventing animal suffering, and helping to address climate change.

Even at the present early stage of commercialisation, their material is cost-competitive with animal leather and PU artificial leather; one imagines the affordability increasing on scale-up, assuming no impediments—the world grows and eats a lot of pineapple, so it would seem the feedstock is probably in good supply.

Lidar and Radar

With machine vision increasingly prevalent—including in, on, and outside of vehicles—lidar and radar are red-hot growth fields right now. At CES this year, major players and new startups jockeyed for position, showing off their latest ideas and innovations. Here are some particular highlights:

Ommatidia Lidar

An ommatidium is one of the optical units that make up an insect's compound eyes. This startup named themselves accordingly, as they explain: "a bee's eye has 5000 ommatidia, so it can fly at driving speed with sufficient accuracy to land on a tiny flower miles away from its hive, while avoiding predators". They say their technology mimics bees' eyes to deliver unusually good lidar performance. Specifically, their 3D Light Field Sensor combines continuous flood illumination with single-photon sensitivity to allow more photons to be emitted and detected, providing what Ommatidia say is an unprecedented combination of simultaneous long range and high resolution.

Their Ant Lidar is a miniature, parallel-FMCW, 2048-channel lidar with 0.05° × 0.05° resolution. It uses solid-state beam-forming and flood illumination for long range and low power consumption. It is said to be immune to interference and adverse illumination, with good performance in what they call 'difficult' weather.

Phasepoint Radar

Phasepoint say the secret sauce in their 4D digital radar is PMCW: phase-modulated continuous-wave radar, which they claim brings big advantages over the widely-used FMCW (frequency-modulated) technology. FMCW radars use the frequency difference between transmitted and received signals as an indirect means of range detection, while PMCW radars use 'digital code correlation' for a direct means. This eliminates the need for strict linearity in frequency-ramping over time, which has been a major challenge in circuit design for FMCW radars. Consequently, PMCW radars exhibit significantly lower error rates in their range detection.

As an example of the practical benefit, Phasepoint say their PMCW radars excel in achieving precise range measurements even with significant variations in reflection levels. For instance, if a child stands near a truck, PMCW radars can accurately detect the smaller object in close proximity to the larger.

Other claimed advantages include reduced interference and a better signal:noise ratio for fewer false images. The Phasepoint PMCW radars use pseudorandom modulation codes to significantly reduce interference caused by other radar systems operating nearby, maintaining reliably accurate detection even in congested environments. The pseudorandom codes allow for efficient signal processing to amplify the desired radar signals while minimising noise, resulting in a ghost-free image with high detection sensitivity and accuracy.

The Phasepoint PAF101 radar boasts a wide ±75° view field and 0.6° resolution, which enables monitoring and detection in situations where broad coverage is warranted, such as at road junctions. Its dimensions are 29H × 180W × 80D mm, it weighs 400 g, and it is operationally happy between -40 and 85 °C and between 0 and 90 per cent humidity. The company class it as an optimal automotive radar solution and, interestingly, position it directly against lidar in their marketing.

Smartmicro

Germany-based Smartmicro, in coöperation with their partner Flex, brought a Ford SUV to CES with three models of their Drvegrd radar: a 4D/HD Drvegrd 169 corner unit, a premium 4D/UHD Drvegrd 171 front radar, and what they call their 'revolutionary' Drvegrd 166 4D imaging radar. Visitors to the Smartmicro booth could sign up for a live-drive demo of the radars' capabilities and performance.

Altos Radar

Altos Radar, a year-old startup in the field, showed their 4D imaging radar—they describe it as an unusually affordable, production-ready, high-performance radar for ADAS and AD systems.

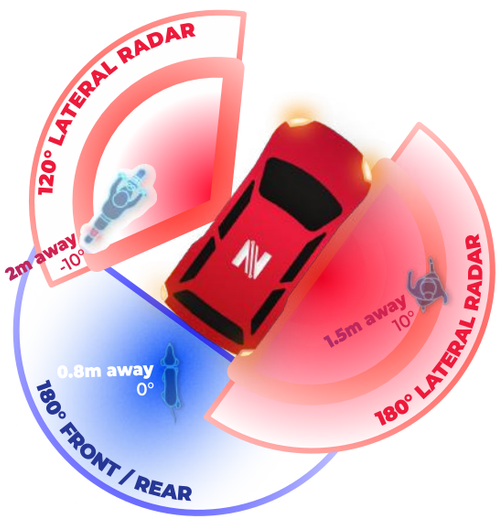
Their radar is built around the Altos V Series, a world-first non-FPGA (field-programmable gate array) 4-chip cascade design based on TI's TDA4. It is said to provide 'highest-quality' point clouds as needed for autonomous vehicles navigating complex environments, with superior detection range.

Aside from what Altos call 'industry-leading' point cloud density, claimed benefits include unusually low point cloud noise; 'unmatched' angular resolution (azimuth and elevation <1.5° at 16dB dynamic range); detection range of 600 m for large cars, 400 m for small cars, and 200 m for pedestrians, and elimination of speed ambiguity in a single frame.

Altos also introduced their RF Series, a non-computing frontal radar module offering an affordable 4D imaging radar solution that seamlessly connects to a common camera interface. At about half the cost of comparable models with onboard processors, it is said to harness untapped ADAS computing resources to yield high-quality point clouds. It provides complete signal processing algorithms and SERDES (serialiser-deserialiser) settings for maximum compatibility.

Altos, too, position their offering directly versus lidars, saying their radars 'enable detection at distances of up to 500m, far surpassing lidar', and that it 'provides lidarlike point clouds with a few hundred meters of detecting range, at a fraction of the cost'. The Altos radar is also said to work well in adverse weather including rain, snow, fog, and sandstorms, and to give precise, instantaneous speed information, addressing traditional automotive radar issues like lack of height information, low angular resolution and noise. Altos Radar's commitment to advancing 4D imaging radar technology has attracted substantial investment, including by the likes of Hesai Technology CEO Yifan Li.

Novelic



Novelic showed off their 360° Short Range Perception solution, a millimetre-wave setup which they call an 'automotive gap-filler radar'. By this, they mean it fills in the gaps of conventional corner radar systems, thus enabling 360° short-range perception in passenger vehicles, trucks, e-bikes, motorcycles, automated guided vehicles, and ATVs. It's available in 180° and 120° configurations for front, side, and rear placement. Application capabilities include:

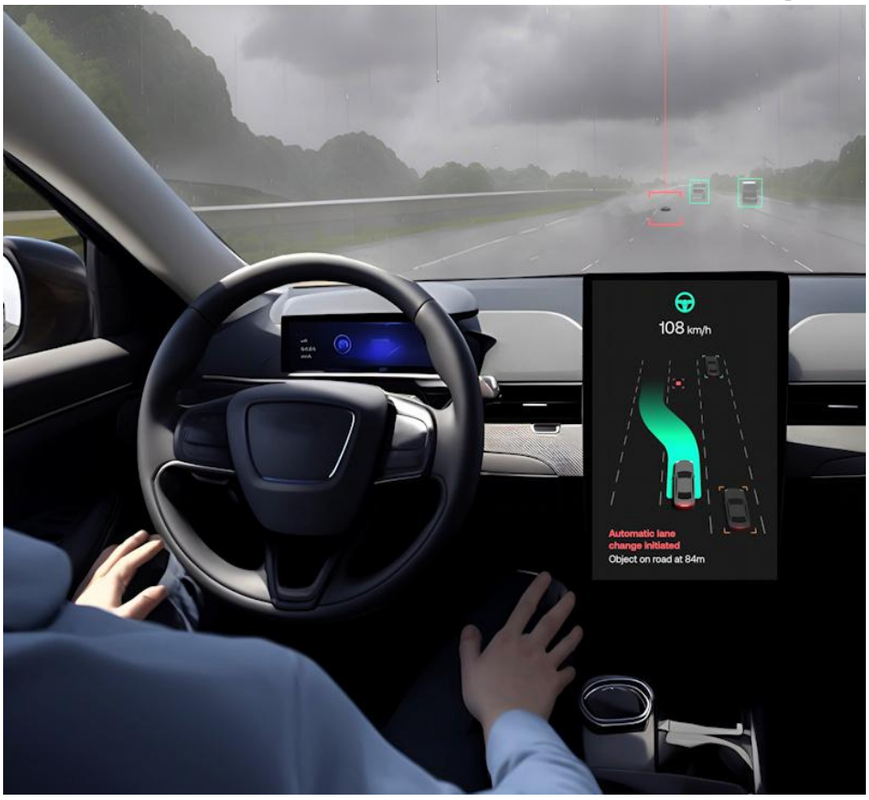
- Autonomous parking
- Curb detection
- Gesture/kick recognition
- Door/tailgate protection
- Lateral collision warning
- Rear cross-traffic alert

• Pedestrian detection and tracking

They also brought their Hypr-Risc, which they call the fastest real-time digital signal processor on the market. It processes radar, lidar, camera, and other sensor signals to enable and improve autonomous driving.
And they showed off their in-cabin monitoring radar for child-presence and seat-occupancy detection as well as intrusion and proximity detection.

Provizio

Provizio unveiled their newest VizioPrime 6K radar at CES. It's a digital imaging radar solution they claim allows automakers to deliver L3+ ADAS and AD without what they deride as 'costly and obtrusive' lidar sensors. The VizioPrime 6K boasts increased ability to distinguish between objects, such as cars and pedestrians, in addition to small object detection such as tires at ultra-long distances; this is achieved with proprietary active antenna technologies, modulation schemes, and sparse array designs to greatly expand the antenna resolution at minimal cost.



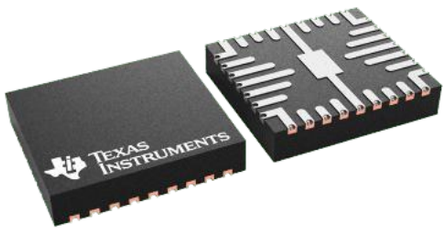
Provizio CEO Barry Lunn said, "Some within the automotive industry have been pushing for autonomy before the tech has been safe to do so; our work at Provizio is reversing this past trend and setting things right with scalable and cost-effective perception. Our belief is that driver safety is paramount, and pioneering innovations centred around this principle will result in impactful transformations in road safety. This goes beyond roads; the technology has already been deployed to make agriculture, industrial machines and mining safer".

Asahi Kasei

Asahi Kasei showed their compact AK5818 radar unit intended for vehicle interior safety systems. It's a new 60-GHz transceiver IC for accurate, high-resolution detection with automotive-level reliability. AK say when it's paired with Pontosense's software, it can wirelessly detect children left behind in cars within seconds, easily meeting vehicle regulations and standards for child presence detection. Show attendees got to experience the system's capabilities firsthand in an equipped vehicle.

The transceiver (photo, in black) is markedly smaller than other existing solutions (photo, green). It features multi-channel architecture—four receivers and four transmitters—and it supports a frequency modulation range 57–64 GHz. This allows for high-range resolution as fine as 2.2 cm. This, in turn, enables the simultaneous detection of multiple persons' respiratory rates and positions, without the need for cameras and microphones.

Texas Instruments



TI introduced new automotive semiconductors including the AWR2544 77-GHz millimetre-wave single-chip radar sensor. It is designed specifically for 'satellite architecture', in which radar sensors use sensor fusion algorithms to output partially-processed data to a central processor for ADAS decisionmaking, and leverage 360-degree sensor coverage to achieve higher levels of vehicle safety.

The AWR2544 uses waveguide interface package ('LOP') technology, which enables mounting of a 3D waveguide antenna on the other side of the printed circuit board, trimming the sensor size by up to 30 per cent. LOP technology also enables extended sensor range to over 200 m with a single chip. In satellite architecture, these features can help automakers increase the level of ADAS intelligence to increase vehicle autonomy, allowing for more informed decisions at greater distances. Applications include corner, front, side, rear, and imaging radar.

Continental

Continental's Radar Vision Parking received a CES Innovation Award. It combines high-resolution surround radars with high-resolution cameras, to enable precise, close-range measurement around the vehicle. Early parking slot detection, for example, lets users park all in one go without driving past the spot. The radars are compact, so they can be mounted behind all painted bumpers. Together with cameras, they provide a redundant, seamless 360° view around the vehicle. So, the system obsoletes the ultrasonic sensors typically used for parking, with better design and performance.

It is a turnkey software + hardware system which provides performant object height detection and can determine object overrideability, such as low curbstones, or underrideability, such as a hanging bicycle in a garage. This means the system can reduce accidents in parkades and provide fast, efficient self-parking operations to minimise wait times. Continental say it is more efficient in using space in existing parking facilities. A variety of videos on Continental's website show how the system works in a variety of scenarios.

Continental's vehicle security tech was in the showcase, namely their Face Authentication Displays. They do what Continental call a 'liveness check' to ensure only an authorised person can use the car. A camera in the B-pillar checks for visual match with a known user, and also discerns real skin from attempts at foolery with e.g. photographs. The double authentication in the exterior and interior adds level of security against theft, and also makes it possible to grant all family members access to the car at any time, yet prevent children from starting the engine.

Also on display was the Full Stack Automated Driving Solution in conjunction with Ambarella. Continental contribute the hardware and large parts of the software to this partnership, while Ambarella provide their SoC platform and additional software functionalities.

Seyond (née Innovusion) + Wideye

Seyond (formerly Innovusion) and Wideye—a corporate scale-up of AGC specialising in cutting-edge glass solutions for optical sensor integration, showed their co-developed in-cabin vehicle lidar solution.

The collaboration focuses on delivering an innovative, practical and visually seamless integration of lidar systems behind vehicle windshields. Proof-of-concept mockups and early development versions have been shown before, but at CES they showed a fully functional prototype featuring a full-size Wideye windshield and Seyond's Robin-E lidar, complemented by additional sensors such as cameras and rain-detection technology.

Wideye CEO Gaetan Friart said, "Our vision has always been to have this in-vehicle lidar integration case as mainstream. However, whereas our previous efforts primarily aimed at demonstrating the feasibility of such a solution, this time we're unveiling a product that's closer than ever to being market-ready. It aligns precisely with industry demands, offering a large field of view while minimizing impact on vehicle design".

Hesai

Hesai Technology won a CES Innovation Award this year for their ultra-thin, long-range ET25 lidar.

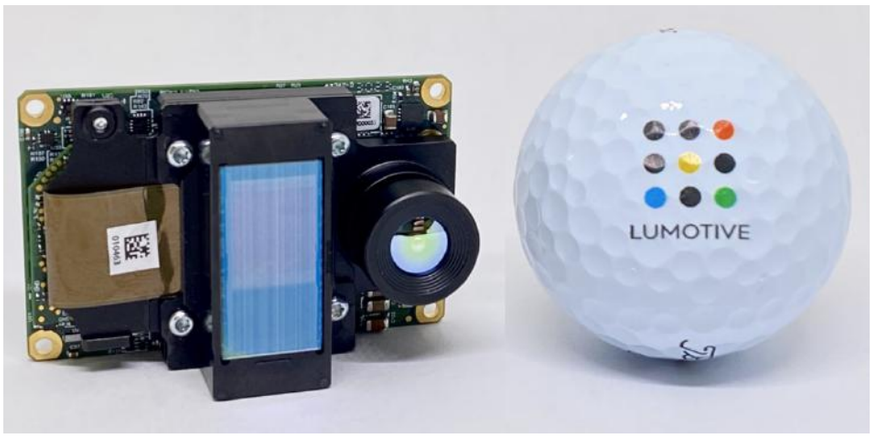
Designed specifically for placement inside the vehicle's cabin behind the windshield, the ET25's ultra-thin form, low noise levels, and high performance are said to be significant advancements.

The size difference from Hesai's popular AT128 is quite striking—its height has been nearly halved. And upgraded laser receivers increase the ET25's sensitivity over the previous unit; its range has been improved to 250 m (with no windshield in front of it; 225 m with), versus the AT128's 200 m. The new lidar has a 120°H × 25°V view field, a point frequency over 3 megapoints per second, and resolution of 0.05° × 0.05°. It's only about 2.5 cm tall, and very quiet at 25 dBa—both figures suiting it well for in-cabin placement—and it uses just 12W. It's a 905-nm unit, and while its 3-megapoints-per-second performance might sound low, it's said to suffice for hands-free systems like GM's Super Cruise and for enhanced automatic emergency braking systems. Rather than a rotating mirror, it uses a proprietary beam steering system which Hesai are keeping quiet about.

And then there's the new AT512, a high-performance item for mounting above the windshield, like the Luminar units on Volvo, Polestar and SAIC vehicles. But unlike the 1,550-nm Luminar lidars, all Hesai sensors use 905-nm lasers; they cost less, but their power output has to be limited to avoid causing eye damage.

Despite the lower power, Hesai claim a detection range of 300 m for a 10-per-cent-reflective target, and resolution of 2,400 × 512 pixels over a 120°H view field. The AT512 has 8 times the resolution of the existing AT128, and is slightly more compact. It can generate 12.3 megapoints per second at 10 fps.

Lumotive



Lumotive won a CES Innovation Award for their LM10 LCM Module, which they call the world's first commercialised optical beam steering semiconductor. They say it offers true solid-state, zero-inertia beam steering, an ultrawide view field of up to 180° (with expansion optics), an 11 × 9 mm active aperture area to fit easily in a variety of system designs, and compatibility with all laser types, including VCSEL and EEL.

The LCM-enabled digital beam steering is said to deliver the performance of a scanning lidar sensor without the associated cost, bulk, and reliability questions of mechanical systems. Lumotive say this is the key to new kinds of lidar to make high-quality 3D sensing more readily accessible. To demonstrate the point, Lumotive presented their M30 Lidar Reference Design, built round the LM10 digital beam steering chip. The photo above, with a standard golf ball next to the M30, shows its remarkably small size.

Zvizion

Chinese lidar provider Zvizion showed off their latest SPAD lidar, the EZ6. It's targeted for long-range ADAS applications. The maker says its 'novel architectural design' (which seems a bit bulky compared to the Lumotive M30 we just finished talking about…!) attains high chip-level integration for lower cost, (about USD $280). With 192 channels, the EZ6 achieves point cloud characteristics with imagelike quality and improves the identification of low-lying obstacles.

It is said to be resistant to dirt accumulation and, in the event, dirt does build up, it has advanced dirt-detection algorithms.

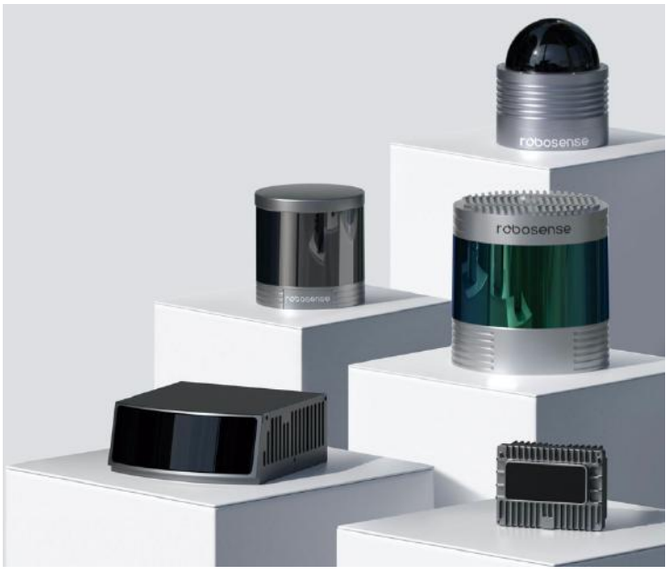
Soslab

Soslab's seventh (and largest-ever) CES booth had a section devoted to autonomous driving, where they showed off their 3D solid-state lidar technology, seamlessly integrated into the front and rear lamps of premium sedans.

Commercialisation is planned in coöperation with an established vehicle lighting supplier. They also showcased their ML-A (for "Mobility Lidar"), a complete 3D solid-state lidar solution which takes modular optics to adapt the view field to the needs of the application.

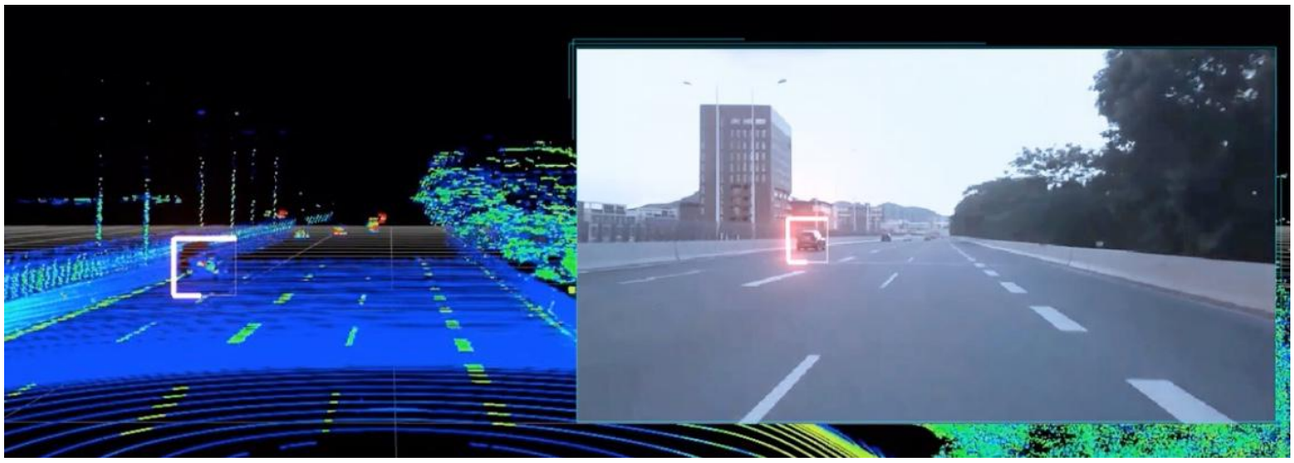
The company are preparing for an initial public offering on the Korean KOSDAQ market in the first half of this year.

Robosense



The Robosense booth bristled with automotive technology, including the M Platform second-generation smart MEMS lidar; the E1 solid-state lidar with Robosense-developed chips; the Helios customised lidar platform including 16- and 32-beam lidars; the Ruby Plus upgraded 128-beam lidar customized for commercial L4 AVs, and the Bpearl 360° × 90° short-range blind spot lidar.

The Helios series is Robosense's new generation of customized multi-beam lidars. They're built with a new modular architecture. Compared to the RS-Lidar-32, a Helios lidar 29 per cent smaller and 60 per cent lower in cost. It supports customisation of beam number distribution; the 32-beam Helios 32 is available in three subtypes to meet the needs of different applications: one with a 26°V FoV, with vertical angular resolution up to 0.5° and long perception distance…one with 31°V FoV offering uniform 1° vertical resolution…and one with 70°V ultra-wide FoV meeting perception and blind spot detection needs, thus simplifying on-board sensor placement. The 16-beam Helios 16 offers 30°V FoV, and has been extensively upgraded in performance and functions versus the previous RS-Lidar-16.



The E1 is billed as a solid-state blind spot lidar with Robosense-developed chips. It boasts a 120°H × 90°V FoV, and is meant for use in forward-looking M-series products to achieve panoramic perception and eliminate blind areas. It's got an ultra-fast frame rate of 10 to 30 Hz, and stronger range detection capability: 30m @ 10%.

The M3 is designed to be used in L^3 vehicles. It uses the 940-nm wavelength, rather than more costly 1,550-nm technology. It is said to be able to detect a 10-per-cent-reflective target at 300 m and work at up to 120 km/h, and Robosense claim it achieves better performance than 1,550-nm lidar despite being as much as 70 per cent less expensive, half the size, and consuming 30 per cent less power. Its modular design will allow customers to upgrade seamlessly to future iterations without vehicle design changes

The M2, for its part, is more or less a lower-cost version of the existing M1 and M1 Plus. Robosense say it can detect a 10-per-cent-reflective target at 200 m.

Asensing

Ten-year-old Chinese supplier Asensing debuted their A2 lidar sensor. It is compact, with customizable features. It's designed specifically for ADAS and AD and is slated for scalable production and shipment this year.

The A2 was showed alongside positioning products and solutions including their "P-Box" integrated navigation system, their IMU inertial measurement unit, and their High-Precision GNSS Positioning Module.

Mobileye

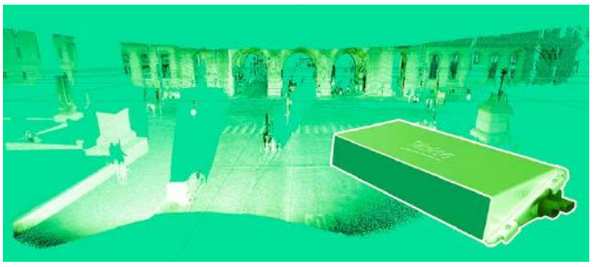
Mobileye's main product launch this year was their DXP (for Driving Experience Platform), designed to allow automakers to provide a customised, brand-specific driving experience without costly, resources-intensive in-house program development. Mobileye say the platform, along with universal general-needs components, provides automakers with "AI tools" to program the vehicle's functionality. This facilitates software-sharing across multiple models, cutting down on the need to develop software for each and every vehicle.

The platform comes preloaded with thousands of adjustable parameters, providing a wide range of options to tailor the self-driving system to their specific requirements and preferences.

Mobileye also proudly announced new supply agreements, including with 'a major Western automaker', particularly for Mobileye's SuperVision, Chauffeur, and Drive products, to be applied in 17 combustion and EV models starting production in 2026. Chauffeur offers hands-off/eyes-off autonomous driving in defined ODDs; it works with input from radar and lidar sensors. Mobileye and the unnamed automaker also will work toward commercialising fully autonomous vehicles incorporating the Mobileye Drive platform, designed to produce purpose-built vehicles for use as robotaxis and mobility-as-a-service operations. Drive integrates computer vision, lidar and Mobileye imaging radar, with initial driverless deployments targeted for 2026.

All systems will use the Mobileye EyeQ6H systems-on-chip designed for powerful but efficient computing to integrate all sensing and REM crowdsourced mapping with safe driving policy. Mobileye also announced an expansion of their existing relationship with India's Mahindra & Mahindra. There, too, it's all about coöperative development of solutions based on Mobileye's EyeQ6 SoC and sensing and mapping software, including an intent to build a full-stack autonomous driving system.

Valeo



Valeo picked up yet another CES Innovation Award for their seemingly unstoppably-popular Scala-3 lidar, the high-density point cloud and perception software of which enables high-speed autonomous driving—including in the only *L*³ passenger cars authorised in Europe.

Other Valeo innovations on display included Predict4Range, a software solution to predict and drive the most efficient EV thermal management strategies, thus extending driving range by up to 24% per cent; and Ineez Air Charging, their wireless charging solution—the first and, so far, only one to use an ultralow ~3-kHz operating frequency; it's conceived as a lighter, simpler, safer charging experience.

The latest Zeekr model was parked outside Valeo's big display hall. It bristled with Valeo technology, including ThinBiLite LED front lighting modules just 1.5 cm tall and two digital panels comprising more than 1,700 LEDs for interactive messaging—look here; it's calling out DVN by name!

Valeo also showed their tele-operation solution in a BMW iX; the car, way over yonder at the BMW booth, could be driven by visitors at the Valeo booth. And there was an Audi Avant with Valeo's creative multimedia interior concepts.

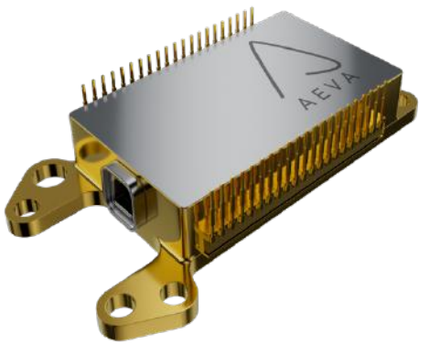
Luminar (+ Webasto)

Luminar put on a slick demonstration in the Convention Center parking lots, where their Iris+ lidar-centred Proactive Safety system, in Luminar's words, provided "higher-confidence detection, faster and farther than today's most advanced camera and radar powered ADAS (and shows) how new automatic emergency steering capabilities can help avoid collisions at high speeds without driver intervention".

It has a single eye-safe 1,550-nm fibre laser and what Luminar call "the most sensitive, highest dynamic range InGaAs detector in the world". It uses 2-axis scanning mirrors with 120° × 28° FoV, and scans only the laser rather than spinning the whole lidar device. Two vehicles lined up side-by-each, one with and one without Luminar's lidar tech. Once they were up to speed, a rigged dummy pedestrian darted out from behind a parked car. The Luminar SUV swerved to avoid the dummy. Then the other vehicle, went. Without inbuilt Luminar tech, it hit and ran over the dummy in its lane.

Luminar's outdoor exhibit also featured Kodiak Robotics and Plus autonomous trucks with Luminar lidar. And another exhibitor, Webasto, tidily integrated a Luminar long-range lidar into their Roof Sensor Module (RSM), where the elevated position is best for ensuring reliable monitoring of the vehicle's surroundings.

Aeva



Aeva gave ride-along demo drives through the trafficky streets of Las Vegas with real-time visualizations from the supplier's Aeries II 4D lidar—including instant velocity measurement, 'Ultra Resolution', long-range object detection, simultaneous velocity and 3D position detection, and immunity to interference.

They also unveiled their new Atlas, which they call the first 4D lidar sensor designed for automotive mass production. It leverages Aeva's innovations in custom silicon technology including their newest CoreVision lidar-on-chip module, and their new X1 SoC lidar processor.

The 4th-generation CoreVision module comprises all main lidar elements including transmitter, detector and a new optical processing interface chip in newly-compacted package. Built on Aeva's proprietary silicon photonics technology, it replaces complex optical-fibre systems in conventional ToF lidar sensors, facilitating affordable mass production.

The X1 processor is Aeva's new FMCW lidar SoC. It integrates data acquisition, point cloud processing, scanning system and application software into a mixed-signal processing chip.

These two innovations allow the Atlas to be over 70 per cent smaller and consume a quarter of the power of Aeva's previous lidar sensor, which means no need for active cooling and easier integration behind the windshield, on the roofline, or in the grille.

Aeva say the Atlas delivers 25 per cent greater detection range for low-reflectivity targets and a maximum detection range of up to 500 metres, and is immune to interference from direct sunlight, signals from other lidar sensors, and retroreflectors like road signs. It works with Aeva's perception software to provide 'Ultra Resolution', a real-time cameralike image that provides, compared to a 3D lidar, up to 20× the resolution; accurate detection at up to twice the distance of small roadway objects; and accurate discrimination, velocity measurement, and tracking of all dynamic objects at up to twice the distance of even a high-performance 3D lidar.

It can estimate vehicle motion in real time with six degrees of freedom for accurate positioning and navigation without the need for additional sensors, like IMU or GPS. It can divide up the scene into drivable and non-drivable regions; classify pedestrians, vehicles, traffic signs, vegetation, road barriers, and other infrastructure elements, and track pedestrians on or near curbs and roadways.

Aeva expect to release Atlas products for production consumer and commercial vehicles starting next year, in 2025.

Cepton

Cepton, for their part, showed their performant 905-nm lidars. They unveiled a new compact 12-watt automotive lidar, the Ultra, with a claimed 300-metre detection distance for 10-per-cent-reflective targets. Other specs include:

- Angular resolution: 0.05° × 0.05° within regions of interest (ROI)
- Field of view: 120°H × 25°V maximum, software-definable

- Data rate: up to 3.8 megapoints per second
- Size: 150W × 24H × 90D mm

It has new beam-steering technology Cepton call MagnoSteer; they say it consumes less than half the power of typical, comparably-performant scanning systems, while taking up as little as one-fourth of the space.

MicroVision

This was MicroVision's first trip to CES since they bought Ibeo just after last year's show. They showed their long-range Mavin sensor for ADAS and AD applications; it is a customizable, low-profile, single-box solution for object detection, classification, and tracking. Also on display was their Movia SRL short-range sensor for automotive and industrial applications.

Their Mosaik sensor validator was shown for the first time; along with validating sensor data, it identifies people and objects, and delineates road boundaries.

Automakers

Many major automakers were noticeably absent—Toyota, VW Group, Stellantis, GM, Ford, Nissan, Volvo. Some were likely not there on account of the multiweek strike and significant salary increase granted to US hourly employees in 2023. But those present showed some really interesting products.

Honda

Honda presented two concepts to preview their EV models. Lighting design is centred on square shapes, as explained by Honda's e-mobility creative director and general manager, Daisuke Tsutamori.

Honda announced plans at CES to launch a new global line of dedicated electric vehicles, starting with a sedan in the U.S. in 2026. The portfolio of EVs from what Honda are calling their '0 Series' will revolve around two concept vehicles unveiled at the show: the Saloon and Space-Hub. They will set the tone for Honda's design and engineering approach for the production vehicles. The first Honda 0 Series vehicle will be based closely on the Saloon concept.

The Saloon is a futuristic, low-slung sedan with a wagon-like silhouette and a front end that resembles an anteater. It is the flagship concept model of the Honda 0 Series. Honda said the human-machine interface will provide intuitive operation as well as superior visibility and a sporty driving position. The Saloon also will have new steer-by-wire technology and motion control systems. A production vehicle based closely on the Saloon concept will debut in the U.S. in 2026. It launches subsequently in Japan, Europe and other markets.



Sony Honda Mobility

The latest prototype of the Afeela electric car, shown at CES 2024, uses a PlayStation 5 controller—yet another warning sign that the future will be nonstop videogames. This year's car is substantially the same as the prototype unveiled at CES 2023, but this time, they're headed towards mass production. It is packed with technological features, with announcements namechecking Epic Games, Microsoft, and Polyphony Digital.

The Afeela will come with ultra-wideband sensors and cameras. As the driver approaches, the car greets them with a light and automatically opens the doors. Once inside, an authentication process makes sure the driver is authorised, and sets up the destination and route map on a panoramic display. As they drive, the sensors and cameras monitor every angle, watching traffic conditions and providing driving assistance based on the external data acquired.

The car uses AI, sensors, and cameras to park itself autonomously when the driver leaves the car. It allows the driver to choose their own theme for cabin lighting, sound, and display.

Outside, an LED strip at the front of the car acts as an external information display. It can flash a warning sign if the vehicle is too close to a rear bumper, show the battery percentage, or play animated sequences to act as an advertising billboard (not only incessant videogames, but also incessant advertising will be put upon us).

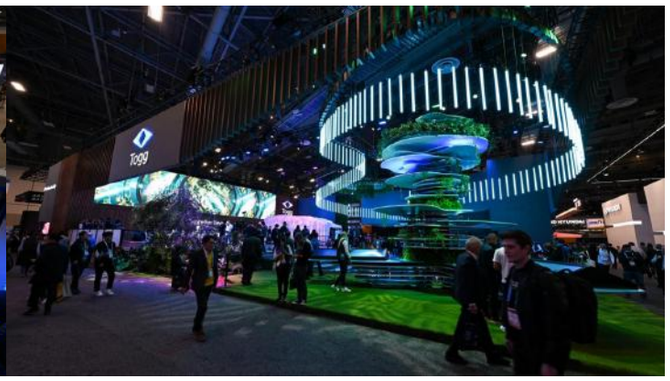
The 2024 concept appeared more production-ready than last year's show car, with actual side view mirrors in place of the cameras (U.S. regulations still prohibit camera mirrors) and headlamps more realistic than the mockups on the earlier car. The Afeela is set to go into production in 2025, with sales beginning in 2026. A starting price of $45,000 has been hinted-at.


VinFast

VinFast presented two vehicles at CES: an electric pickup truck, and their VF 3 microcar that could sell for under USD $20,000. They didn't give details on the pickup, just calling it the company's latest EV concept and releasing a teaser photo that showed an elevated truck body alongside the brand's VF 8 compact crossover.

Also in the teaser photo is a yellow VF 3 with a white roof. The microcar, which VinFast call a 'mini eSUV' for its chunky styling and ample ground clearance, was designed as an inexpensive model for Vietnam. VinFast presented the VF 3 there last year, and said it will launch in the second half of this year.

Togg



Turkish EV startup Togg say they will double the size of their lineup by adding the T10F fastback, which will be sold alongside their first model, the T10X SUV. Starting late this year the company, founded in 2018 and currently selling only in Türkiye, aim to start selling both models in Germany, beginning with the SUV.

The company set a goal of having 1 million vehicles on the road across Europe by 2032. Like the SUV, the fastback is a compact model. Both models are made on Togg's C-segment (compact) platform.

Togg T10F

To get to that level the T10F will offer a suite of ADAS that includes intelligent adaptive cruise control with stop-and-go functionality that works in conjunction with a traffic sign detection system; lane-keeping capability and lane-departure warning; a surround-view camera; blind spot and driver attention warning systems, and automatic parking assist.

Togg said the design of the T10F and T10X are the result of its design studio's collaboration with Italian styling specialist Pininfarina.

Hyundai Kia

Kia exhibited five new commercial EV concepts, with an interesting modular approach. They all have a front display in the bumper (h'mm…commercial vehicle bumpers tend to get, er, bumped).

Outside, on the central plaza, Kia showed their Kia EV3, EV4, and EV9 with a lot of focus on exterior lighting technology.

Take a look at the really interesting front bumper on the EV9: Polycarbonate outer lens with body-colour paint within; laser etching, and LEDs on a PCB behind it.

Hyundai's presentation was centred round hydrogen vehicles and software-defined vehicles.

Mercedes

Mercedes focused on hyper-personalised user experience, with a new MBUX Virtual Assistant that uses generative AI and advanced 3D graphics to make interactions more natural, intuitive and personalised. It runs on the new Mercedes-Benz Operating System that has been developed from scratch in-house.

They also made the North American unveiling of their CLA Class concept, based on the forthcoming Mercedes-Benz Modular Architecture. Further highlights include a new in-car music experience called MBUX Sound Drive, developed in namedrop collaboration with American rapper and singer-songwriter will.i.am. In-car audio storytelling is catered for by means of a collaboration with Audible and Amazon Music. Also making its North American debut was a camouflaged prototype of the new electric G-Class (Geländewagen).

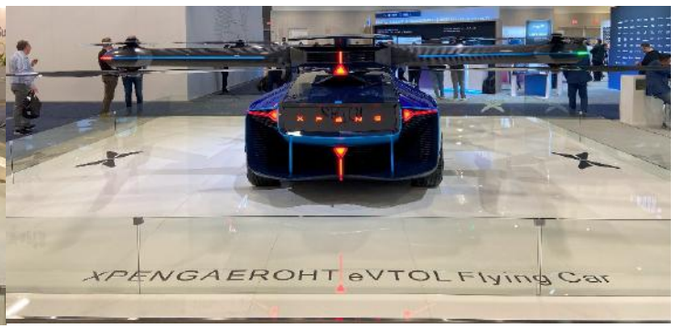
The MBUX Virtual Assistant shown at CES 2024 is the most humanlike interface ever to come in a Mercedes. It presents a new face to the customer with naturalistic interaction. With its four different simulated emotions, it is programmed to act as though in tune with customer needs, and uses generative AI to predictively make life easy, convenient and comfortable. Also on board, and with advanced 3D game-engine graphics, is MBUX Surround Navigation, which seamlessly merges route guidance and assistance. Greater productivity, convenience and personalisation are wrought with the ongoing expansion of the Mercedes app portfolio. These include MBUX Collectibles, Mercedes-Benz's first in-car app to showcase NFTs like the limited-edition Mercedes-Benz NXT Superdackel collection that pays homage to the activity at last year's CES.


Mullen

California EV maker Mullen came to CES with their Five RS, a high-performance version of the Five electric SUV originally shown in L.A. two years ago. Compared to the Five, it has flashier styling and impressive claimed performance numbers.

Xpeng

Xpeng AeroHT—the flying-car subsidiary—will open pre-orders for their modular flying car in China late this year, with mass production and delivery a year later. They showcased their unibody flying car at CES, with really interesting exterior lighting. It's unclear if vehicle lighting rules as we know them will apply to flying cars; if so, the lit logo is too big to comply with current ECE Regulations on the subject.

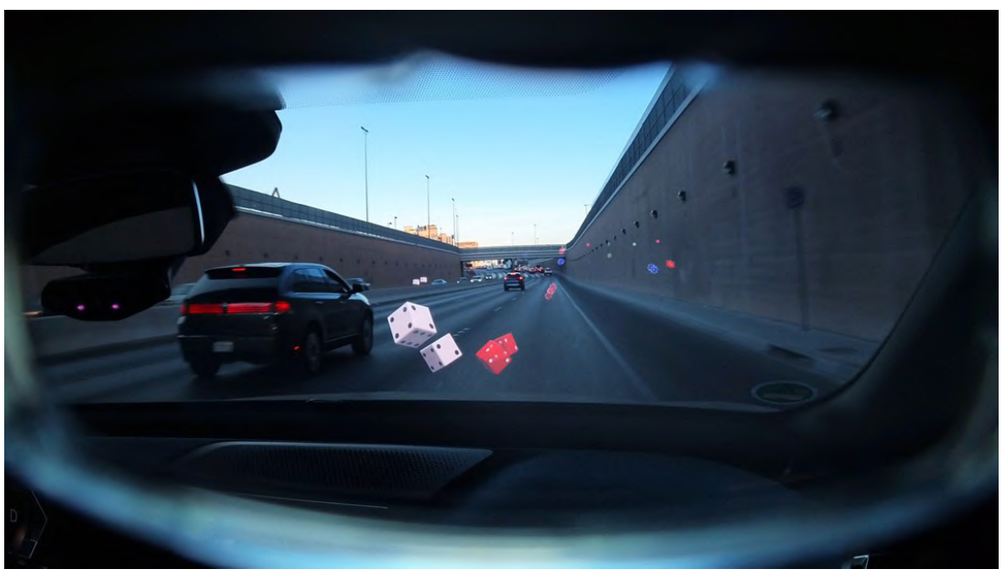


BMW

BMW showcased their newest in-car tech, with the emphasis on video services; augmented and mixed reality, and an updated voice control with (wait for it…) AI. The latest BMW operating system is OS9, which is compatible with BMW Digital Premium, allowing customers to download an ever-growing list of apps and services.

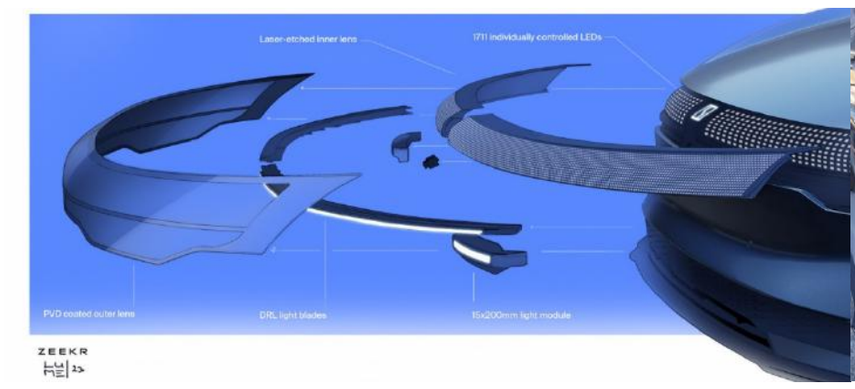
New at CES was the integration of Bluetooth gaming controllers, which means passengers can play games when parked, as demonstrated by a demo of Beach Buggy Racing 2. This feature will be launched later in 2024 and supplements the existing AirConsole app which lets owners use their smartphone as controllers to play numerous games onboard.

BMW also showed new XReal Air 2 AR glasses, which allow users to see navigation instructions, hazard warnings, and infotainment data (…and eventually advertisements?) streamed into their line of sight, wherever they look.

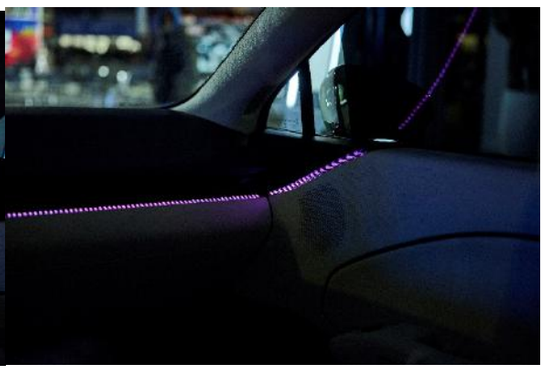


Zeekr

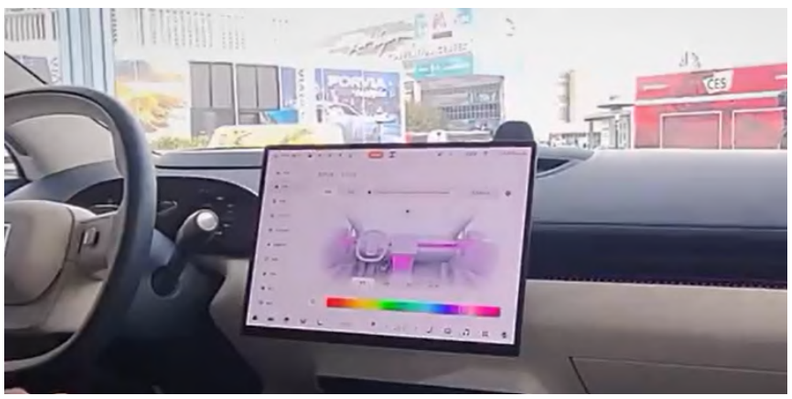
Zeekr's 007 was parked at the Valeo booth.



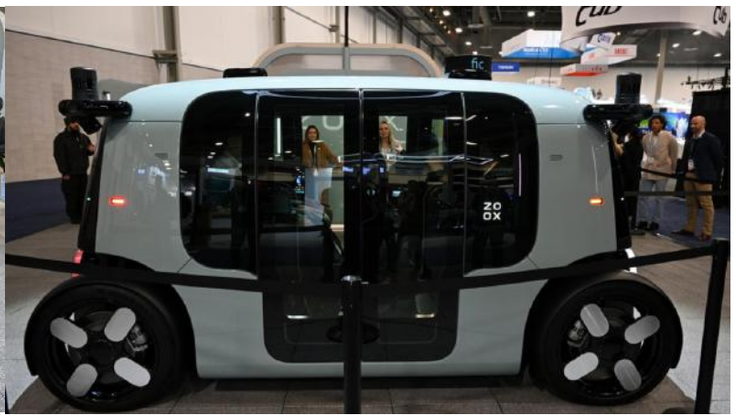
The front signature can be changed from inside the car; just 'write' whatever you want with your finger, and it is displayed on the front grilleboard in white light.



Interior can also be changed from the central display—pick a colour, any colour!



Zoox

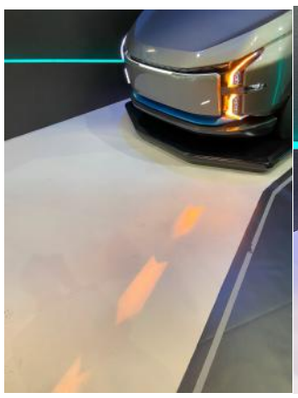


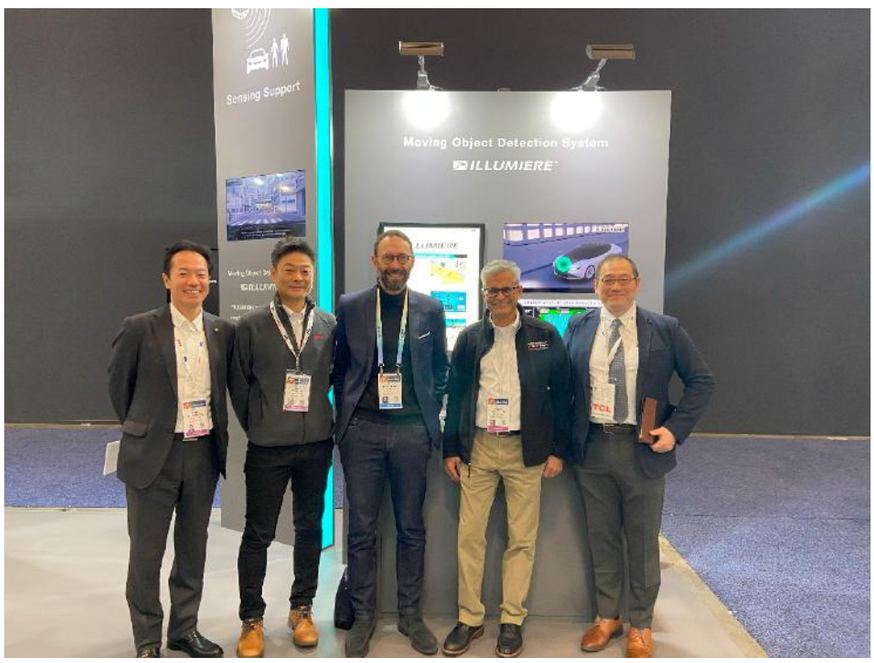
The Zoox MIH ("Mobility in Harmony") platform, powered by BlackBerry IVY, was on display at CES.

Tier-1 Lighting

Koito + NAL

The Koito-NAL booth focused on three lighting topics: ADB with a very compact solution; V2X communication with turquoise AD light and signal projection, and lidar and sensor integration with Cepton (short- and long-range lidar), including cleaning provisions.





Koito team with DVN's Paul-Henri Matha

Marelli

Marelli officialised partnership from the software sphere—Amazon Web Services (AWS), Qualcomm, BlackBerry QNX and DSP—who were also present at the Marelli booth. With a focus on design for affordability, for cost, for performance, for resiliency and for sustainability, the team addressed key needs of vehicle makers worldwide.

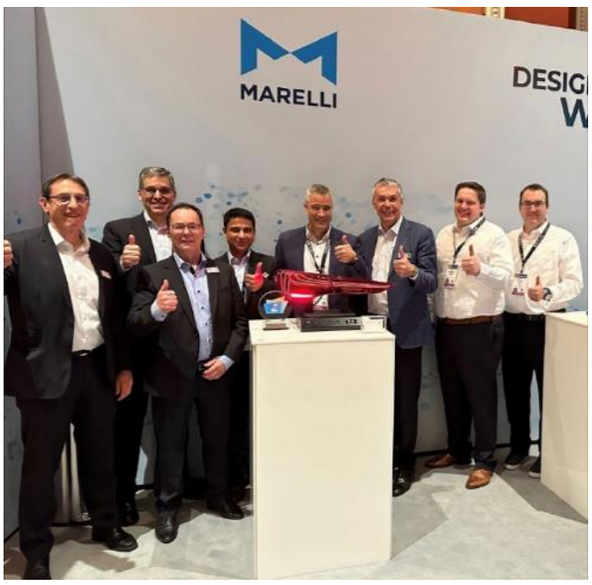
About lighting, the focus was on five items:

• Sustainability with Leanlight front and rear lamps. The headlamp has an optimised CO_2 footprint with one low beam and one high beam module (height 20-24 mm), new outer lens manufacturing process, MCU-free electronics architecture, and low power signaling functions, for a total weight around 2.5 kg per headlamp and 1.6 kg for signal lamp. The rear lamp boasts a 20 per cent weight and component count reduction, slim design, and optimised CO_2 footprint.

• Display integration with miniLED technology for full tail photometry and dynamic communication and near field projection (DMD, MLA, gobo).

• Illuminated front grilleboards and rear panels, including illuminated logo with radar transparency, with innovative surface treatments possible like polyurethane coating, foil overmolding, and laser paint ablation.

Lighting electronics including core computer, zone controller, and light domain controller. One remarkable thing is that Marelli can do the complete embedded software for lighting, from core computer to light domain controller and the lamp itself.



Marelli team with DVN's Paul-Henri Matha

Forvia

Forvia said by 2045, their emissions will be zero and they are approaching two important milestones on that path: by 2025, they pledge to be carbon neutral in terms of their scope-1 and -2 emissions. And by 2030, they pledge to have reduced scope-3 emissions by 45 per cent.

To that end, Hella presented a sustainable headlamp concept using alternative materials and reusable components to increase the recycling rate while maintaining high standards of visibility and illumination. This concept has an optimised (i.e., reduced) component count, and incorporates lightweight, thin, highly efficient Fresnel optics as well as cover optics made from biopolymer. It weighs 2 kg versus 5 kg for a comparable traditional headlamp, without compromising performance.

Hella integrated lighting functions, based on their CLA concepts, in a front fascia with lens height 10 mm.

Signalling functions were based on their FlatLight µMX: a slim design, with maximum energy efficiency and superior homogeneity and performance. The technology is based on an innovative LED light guide concept with microöptics smaller than a grain of salt. This enables a module depth of just 5 millimetres, and completely new design options for the front and rear, as different lighting functions can be realised in just one lighting element. Another plus: it has up to 80 per cent lower energy consumption compared to conventional LED tail lights. in 2024 it will go into series production as a rear combination lamp, and in 2025 front functions will be possible: daytime running light, front direction indicator (brighter than a rear one) and position light in only one light element as well.

ZKW

The LG Concept Car offered visitors an insight into the future of automotive entertainment. The microZ headlamp modules demonstrated how animated projections can be created in the future using intelligent front lighting. The projector function generates a 100-inch image that can be used to display a wide range of entertainment content based on OTT communication via the Internet (e.g. Netflix), transforming the car into a mobile cinema experience.

ZKW also showcased their latest product innovations, including an illuminated multicolour front grilleboard and, for the first time, an illuminated bumper developed in coöperation with Rehau Automotive.

Another new development, ZKW presented innovative rear light modules devised in coöperation with ams OSRAM, in which transparent LEDs are laminated onto a transparent carrier substrate. The result is an animated surface that can display tail lights, indicators, brake lights, and illuminated logos. They also presented also the new Volvo EX90 headlamp with DLP technology and an 'Ultimate Hammer' feature combining the Volvo Thor's-Hammer brandmark with mechatronic pop-up lamp technology.

The new headlamp for GM's Chevrolet Silverado was also on display; it enables an illuminated animation of the charge indicator.

ZKW aim to make their global production CO_2-neutral by 2025, and all products by 2038. This goal is to be achieved by saving energy, avoiding waste, and switching to green electricity. At CES, they demonstrated how sustainable lighting can be achieved through optimised materials and processes. As part of their 'SusMat4CarLight' project, ZKW are working with partners to research recyclable materials for future lighting systems, including polymers based on renewable raw materials.

Valeo

Valeo, too, focussed on five main innovations in their grand showcase:

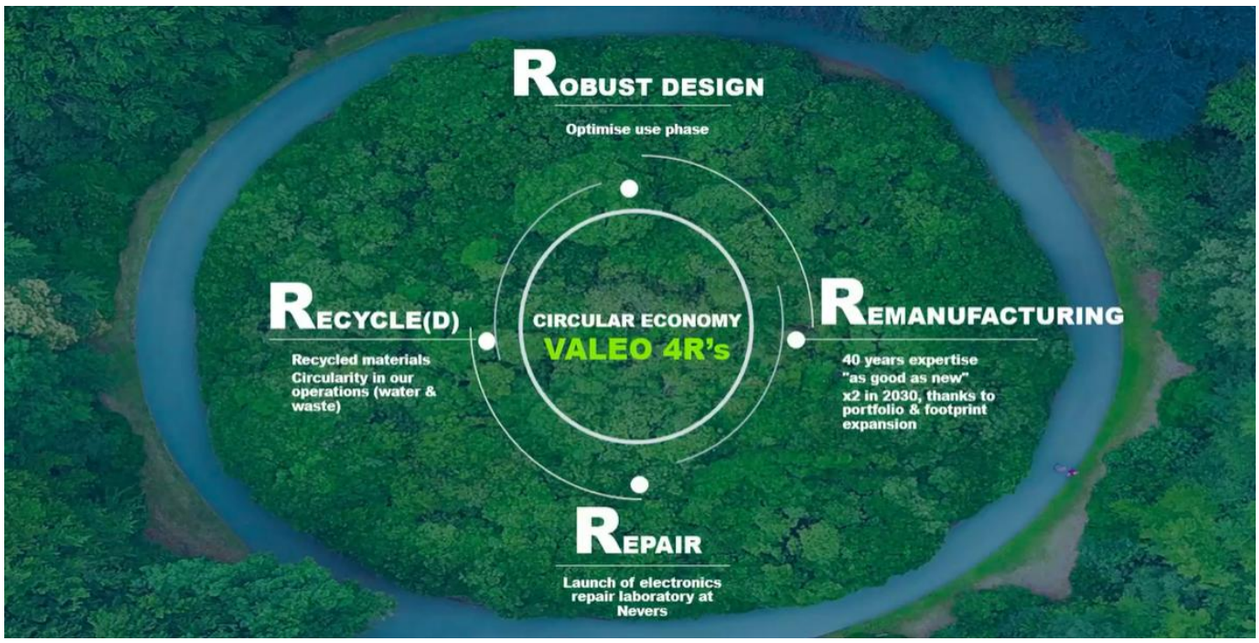
• Their CES Innovation Award winning Scala 3 lidar. Visitors had the opportunity to experience and learn more about Valeo's AI-based perception software and how it helps classify objects identified by the lidar in its point cloud.

• Predict4Range was unveiled: a software solution to predict and drive the most efficient thermal management strategies of EVs for a driving range extended up to 24 per cent, fewer charging stops with faster charging operations, and extended battery life.

• Ineez Air Charging was presented for the first time. It is a wireless charging solution, the first and only one to use an ultra-low operating frequency, around 3 kHz, offering a lighter, simpler and safer charging experience.

• The latest Zeekr model was presented at Valeo's booth. Equipped with a 15-mm-high Valeo ThinBiLite bifunction front lighting module and two digital panels comprising more than 1,700 LEDs, it offers users a unique, personalized and interactive lighting experience.

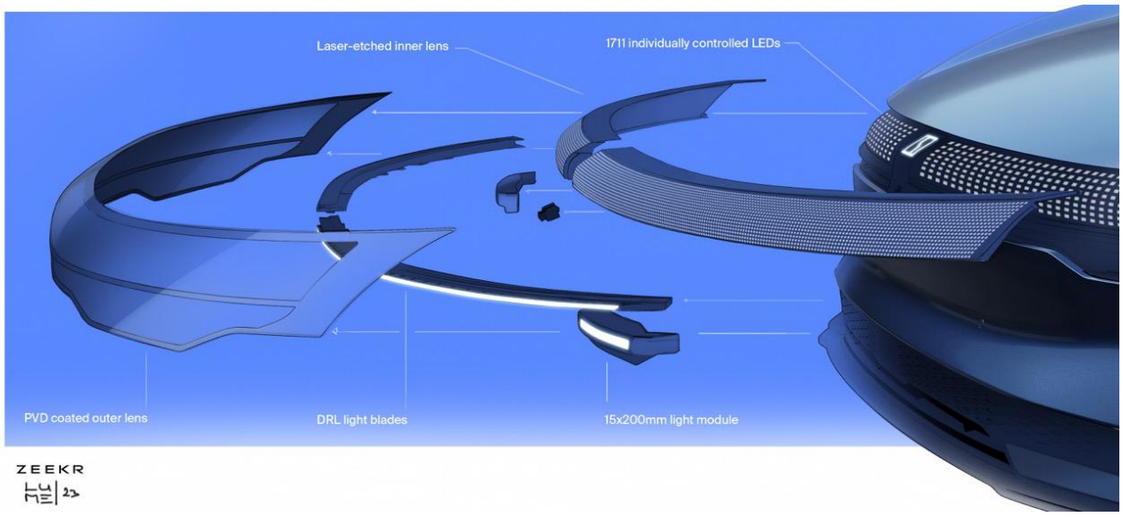
• BMW's Valeo-powered tele-operation was also on display at Valeo's show stand.



During the CEO keynote, Valeo focused also on their '4 Rs' sustainability principles. Valeo are committed to being carbon neutral in 2050 and to preserving natural resources by embracing circular economy principles. This starts at the product conception phase by making the right material, technology and design choices. In this spirit, Valeo presented their latest evolution of Purelight, a new headlamp concept designed with bio-sourced materials and additive manufacturing that allows repair and re-use of materials to minimise its weight and extend its life cycle.

Outside, on the proving ground, Valeo showed the Zeekr 007 headlamp, the Stargate concept. Equipped with a 15-mm-high Valeo ThinBiLite bifunction front lighting module and two digital panels comprising more than 1,700 LEDs, it offers users a unique, personalized and interactive lighting experience.

Valeo's P.E. Strohl, B. Fleury, A. Lafay, R. Mathieu with DVN's P-H. Matha, P. Aumont, D. Stern



Mobis

Mobis' Mobion concept showed off its 4 independent wheels. This concept was equipped with a variety of displays to interact with other road users: signal projections and front grilleboard and rear display.

Inside the booth, Mobis presented five technologies about lighting:

- HD microLED modules with 25 kilopixels
- Lenticular grille lighting
- Prism slim module (combining both low beam and DRL, with lens size height from 12 to 25mm)
- 12mm ADB module with 12 segments
- On-road signal projections.

Plastic Omnium

Plastic Omnium introduced three innovations resulting from partnerships with Sonatus, EyeLights, and Paravision, aimed at breaking down the traditional boundaries of the automotive industry and laying the ground for tomorrow's mobility:

• Intelligent management of rear lights with Sonatus, a major player in the SDV ecosystem. The solution developed with Sonatus enables monitoring and retrieving information from various onboard sensors in the car to interpret situations that may arise on the road. Using Sonatus Automator, vehicle sensors can automatically trigger animated informational or warning messages without driver action on Plastic Omnium mini-LED display in the rear light assembly of the vehicle.

• Plastic Omnium coöperation with the EyeLights startup has yielded high definition, high brightness display capability at the rear of vehicles. The technology aims to better communicate with the vehicle surroundings, over short and long distances and in any weather conditions.

• Facial recognition built with Paravision's facial recognition technology creates a template of vehicle owners' faces, and will only allow registered and authorised persons to access the vehicle.

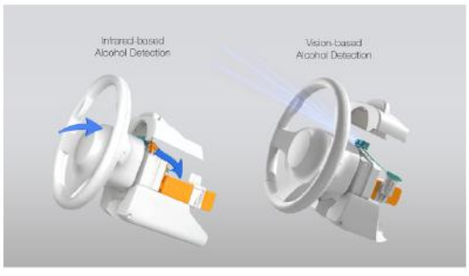
For the second consecutive year, Plastic Omnium won an Innovation Award for their dynamic interior dashboard projection system. It illuminates the entire dashboard with colours and patterns to match the mood chosen by the driver. Already integrated into the interior of the new Mini Cooper Electric, it creates an immersive driving experience including lights, animations and projections.

More precisely, this module comprises several microlens arrays (MLA), integrating different patterns. The light beam is generated by RGB LEDs, and is then sent to the microlenses, which project the desired patterns onto the dashboard.

And the Innovation Award was also bestowed on PO's Smart Tailgate. It integrates lighting elements, decoration, and a screen to communicate with its environment.

Magna

For CES, Magna decided to focus on the three main topics about electrification, ADAS, and connectivity. Nothing was shown about lighting.



HSL

In a private room, HSL, in collaboration with partners Elmann and TactoTek, presented innovations in illuminated grilleboards: fully integrated, illuminated, and animated ones made with IMSE on final production tooling.

AUO

AUO are a Taiwanese company specialising in optoelectronics. It was formed in September 2001 by the merger of Acer Display and Unipac Optoelectronics. AUO showed a range of in-vehicle display HMI solutions and innovations, including microLED applications. Their Smart Cockpit 2024 brings an immersive and engaging visual experience…and garnered the company CES 2024 Innovation and Best of Innovation awards.

The AUO expo booth included:

- Display HMi solutions
- Transparent interactive window
- AmLED large curved display
- Dynamic smart door trim
- Interactive matrix rear light
- A 30-inch transparent microLED display with superior brightness and transparency
- 3D microLED dashboard

LG

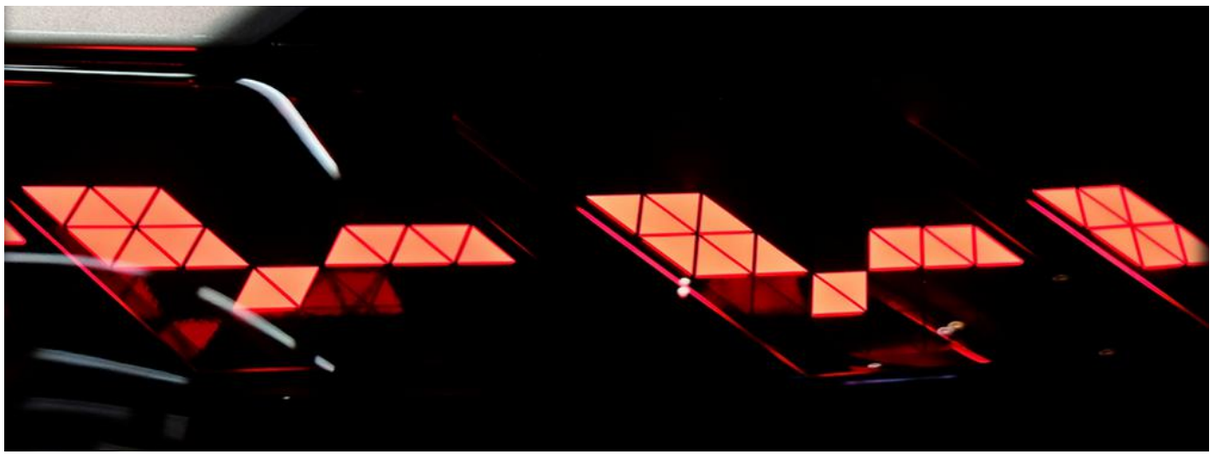
LG were focusing on head-down and head-up displays with a variety of OLED technologies—notably their largest automotive display spanning 57 inches (145 cm).

Zooming in on the LG concept car's headlamps, they are ZKWs with microZ microLED modules inside.

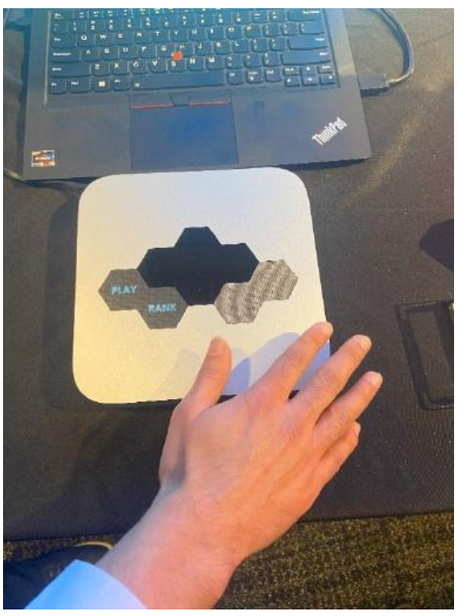
Tier-2 Lighting

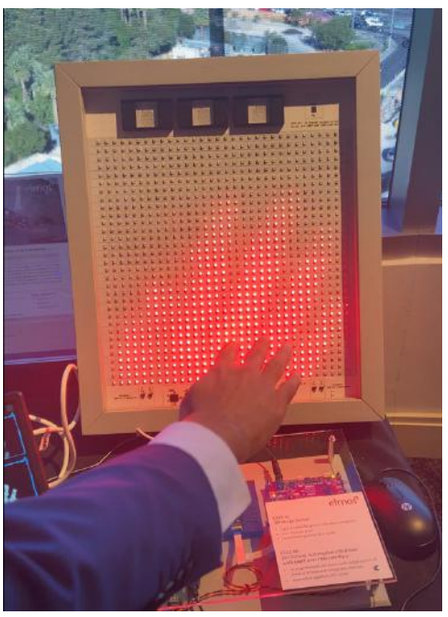
Oledworks

Oledworks revealed their new brand for automotive products: **Atala**, short for Advanced Technology for Automotive Lighting Applications. CEO David DeJoy said the intent was "showcasing the best of OLED technology on the road today, along with technology advancements that are going to be on the road in the very near future". The brand is dedicated to the continuous commercialisation of automotive-qualified OLED lighting technology. Atala products are the thinnest, brightest, and longest-lasting OLED lights on the road, enabled by the technical expertise and precision manufacturing of OLEDWorks.



Elmos





Elmos presented a mix of interesting concepts, including:

- ECU-free headlamp with stepper motor for adjustment
- Gesture detection
- E-Fuse for zone controller architecture
- Pressure sensor for braking system
- Ethernet + CAN FD LED IC
- Ultrasonic sensors

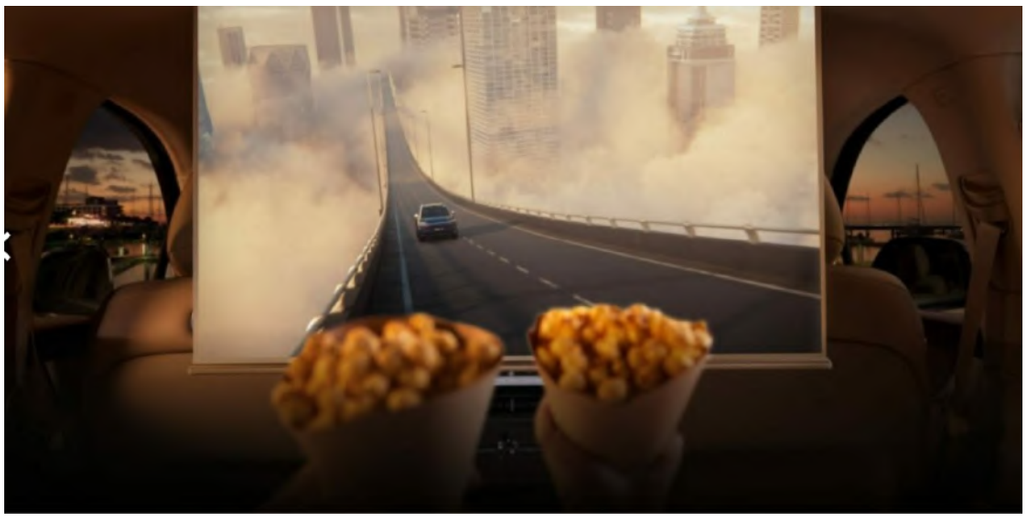
KSLD

Kyocera Soraa Laser Devices (KSLD) showed their laser-based headlamp modules and FiberLight grille assemblies. The LaserLight headlamps offer high brightness white and infrared dual illumination, building on their impressive nighttime demonstration of that dual-light technology at CES '23. It makes for optimal night vision and sensing. The assembly provides low and high beam from compact modules. The white light illumination provides a long-range light beam with a sharp cutoff and precise patterns with minimum glare to maximize visibility. The IR illumination enables camera vision for increased detection of objects such as animals, pedestrians or other hazards that would be otherwise difficult or impossible to see using conventional lighting in foggy or dark conditions. The modules, which are set of four per headlamp (two for low beam and two for high beam), are under 12.7 mm high, enabling flexibility for designers to play with configurations such as horizontal or vertical 2 × 2, offset layouts, and other arrangements.

The FiberLight grille assembly offers ultra-bright white light in a thin emissive fibre only possible with laser light, enabling vehicle manufacturers to offer a strong brand signature. Applications include interior and exterior lighting in white or blue. The demonstrator on display at CES was built into a Jeep grille, and delivers white light with more than 10,000 $^{cd}/_{m^2}$, and is targeted for the likes of grilles, logos, DRLs, and ambient lights. The FiberLight is said to deliver 10 times the brightness of LED solutions, producing brilliant and efficient illumination from thin, low-cost fiber optics and a remote light source.

Appotronics

Appotronics showcased an interior RGB DLP projector and a 32-inch rollable screen as used for watching movies in the Aito M9.



Also at the Appotronics booth:

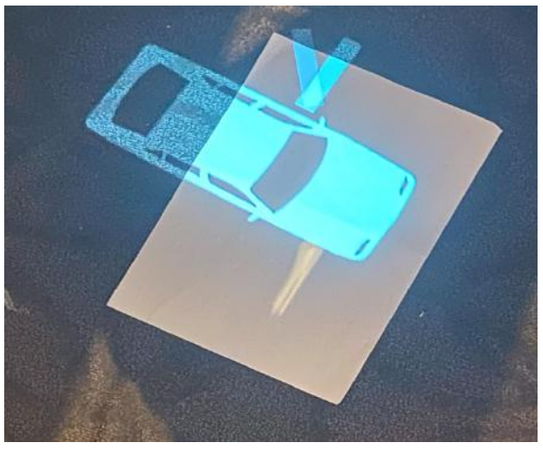
• An exterior DLP solution with RGB light generated by blue laser and a rotating phosphor disk (ALPD Technology)

• ARHUDs with TFT or DLP

• Ultraslim LED and Laser low- and high-beam modules

Coretronic

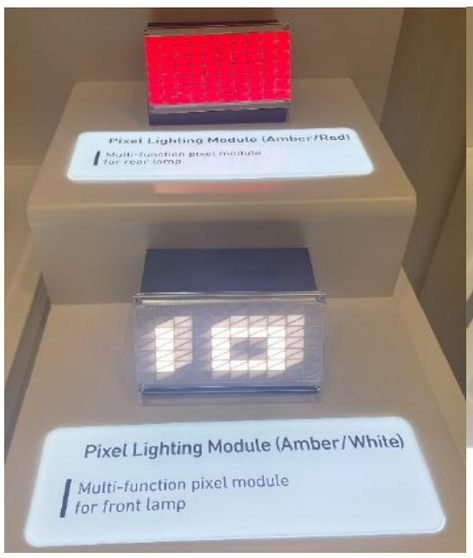
Coretronic Corporation are the first LCD backlight module manufacturer in Taiwan, and have been developing and mass-producing the smallest and lightest VGA single-panel LCD projectors and XGA DLP projectors in the world, so they say. During CES, in partnership with Texas Instruments, Coretronic showcased DLP integrations in mirrors with RGB and laser illumination.



Similar approach for HUD display with DLP and laser technology.

LG Innotek

LG Innotek showed their 4.3-metre vehicle mockup, positioning themselves competitively in the mobility technology sector against the likes of Amazon, Qualcomm, and Mobileye. The front fascia incorporates pixel lighting module technology to make a grilleboard display.



Macroblocs

Macroblocs showed off solutions for front and rear displays, including LED driver ICs for revolutionary and interactive LED matrix displays on front and back of vehicles. The idea is to facilitate tier-1 offerings for premium visual performance with a maximum 16-bit grayscale and 8K refresh rate. They allow real-time interaction between cars and passengers, such as displaying autonomous driving, traffic conditions, warning and reminding messages, charging status, brake lights, and turn signals…animations, emojis, and who knows what-all else.

BOE

BOE's vehicle division showcased cutting-edge vehicle display products and intelligent cockpit solutions, including a 45-inch 9K Oxide Mini LED vehicle screen with a curved design, and a partnership with Geely for their electric sedan featuring an 8K dashboard screen.

The Geely Galaxy E8's unified screen design differentiate itself from the mainstream multi-screen layout. A single 45-inch screen stretches from the driver to the passenger with each section operating independently. It enhances driver safety while catering to passenger desires. With touch integrated into the display, this design reduces the number of components from ten to seven, saving 1 kilogram in weight, and achieving a 9.8-mm thickness with a 7.5mm slim bezel.

They also presented the industry's first rollable OLED notebook screen, offering flexible size adjustment and catering for various scenarios like entertainment, work, and creativity.

AGC

AGC demonstrated numerous innovative products with glass for ADAS sensors and displays. The most interesting thing for lighting may be their super-hydrophobic glass, which efficiently sheds water and therefore lends itself to easy water-spray cleaning. This may be a solution for exterior lighting also to avoid dirt buildup, if the technology can be applied to polycarbonate.

Interiors

CES showcased the innovative trends shaping the mobility appliances and dream cars of tomorrow and addressing the world's most pressing challenges. Tons of tech was on display, a mix of advanced innovation and stuff you can buy today for your next actual car.

The most-sung notes at the show were generative AI (real and imagined) and the many opportunities it's said to promise, and SDV (Software-Defined Vehicles)—smartphones on wheels, basically.

Even though some automakers were not present, other automakers and many suppliers were there with great presence, showing off their innovations and ideas.

Key takeaways

• Cockpit as interior centrepiece, with display size, shape and layout as the base for architecture (and vice versa)

• More and more 'screenification', with pillar-to- pillar display, multiple screens, bigger screens, screen + HUD, smart surfaces, all as extension of HMI real estate

• More and more panoramic displays near the base of the windshield—better positioned in driver's line of sight, and reachable through console-mounted controls

• Interior projection begins to happen, as part of HMI and for decoration

• Display performance is increasing, with developments in OLED, ultra-HD screens, etc.

• Cockpit needs high-performance computing, generating many big-tech partnerships

• From a SDV perspective, AI and Generative AI (such as ChatGPT in the VW Golf) are extending cockpit capabilities

• Rollable displays are getting into automotive, in parallel with their home incursions

• Major consumer/home electronics companies are investing in display and infotainment for automotive interiors. Sony even made provisions to drive a car with a PlayStation controller!

• Pillar-to-pillar displays create immersive experience, and audio is making it even more immersive.

• Interior sensing continues to develop, for DMS and emotion detection. Impaired-driving prevention will develop thanks to upcoming regulations.

• Hyundai/Samsung partnership for Car/Home connectivity, which will most likely become a major topic for forthcoming years' CES.

Hyundai

Hyundai's display was light on actual cars; they were mostly focused on presenting concepts and ambitions around sustainable automotive transport.

A transition to hydrogen power relies on two approaches: plastic-to-hydrogen (P2H) and waste-to-hydrogen (W2H), with a green hydrogen process.

P2H feedstock is unrecyclable waste plastics, such as vinyl and contaminated plastics, and P2H can be achieved by combining liquefaction technology developed by Hyundai Engineering and gasification technology from Shell Oil.

W2H converts biogas from organic waste, such as livestock manure and food waste, into hydrogen.

Hyundai also showcases exhibits and videos introducing core SDV (software-defined vehicle) technologies under development by their global software centre, 42dot, emphasizing the importance of software and AI in becoming a smart mobility solutions provider.

Their DiCE (Digital Curated Experience) infused with AI is a personal mobility platform that provides curated services through software technology customized to individuals. Through a display surrounded on three sides, an immersive mobile experience is possible. It includes a bio-sensing camera to create an optimized environment and an airbag for safety.

And SPACE (Spatial Curated Experience) is about providing customized spatial experiences by incorporating individual lifestyles into mobility to embrace users across a wide spectrum of needs, along with free mobility.

Then there was their City Pod with hydrogen energy technology, a modular system presenting an efficient and systematic middle- and last-mile logistics vision. Each pod is automatically combined or separated as needed, allowing logistics to be delivered directly to customers not only on the road, but also inside buildings.

Hyundai Mobis

Hyundai Mobis, here at car level, presented their Mobion electric SUV concept, which features the Lighting Grille grilleboard and spectacular e-Corner system, enabling all four wheels to turn 90 degrees.

Kia

Kia introduced their modular PBV (Platform Beyond Vehicle) strategy and teased several concept EVs.

Kia introduced their customizable PBV to provide businesses and individuals with modular, fit-for-purpose EVs. The PV5 concept, for example, is meant to capitalize on the commercial vehicle segment. Combined with Hyundai Motor Group's software-defined-everything (SDx) technology, Kia's PBV EVs can provide a new design exercise in modular, customizable space to fit the needs of more people—whether it be a taxi, mobile boutique, cargo van, or recreational vehicle.

Kia shared that the entire area behind the fixed cab can support interchangeable upper bodies they call 'life modules'. These weldless, top-hat structures come in kit form and can be connected to the base vehicle via a hybrid electromagnetic and mechanical coupling technology. This swappability increases versatility greatly. Options include Basic, Van, High Roof, and Chassis Cab variants, with, in the future, a Robotaxi version developed with Motional.

Kia had a second exhibit at CES Central Plaza, where they showed the EV3 and EV4 concepts in addition to the EV6 GT and EV9 production models.

BMW

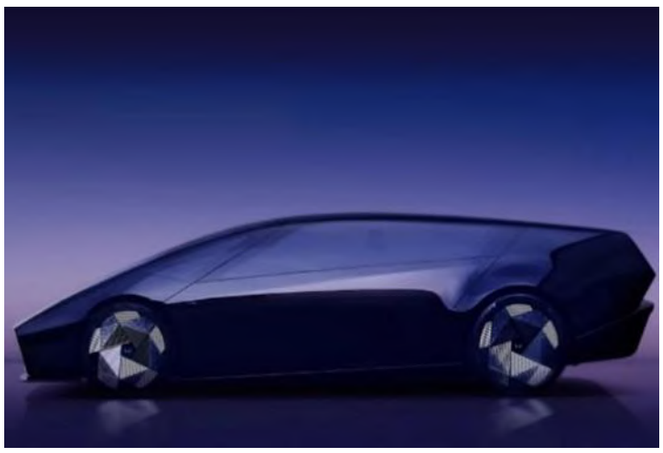
AR Ride: joint development demo with Xreal. Everything shall be a videogame!

BMW's show was dedicated to the digital customer experience, with a new infotainment feature for their current model line, to discover the potential of AR glasses as passengers, and experience the power of BMW's Intelligent Personal Assistant as a vehicle expert enhanced with generative artificial intelligence.

In conjunction with the BMW Digital Premium option, owners of BMWs with Operating System 9 have access to a ConnectedDrive Store extended with third-party apps for music, news, and gaming. With the AirConsole app, BMW and MINI customers can already play single- and multiplayer games in the vehicle today.

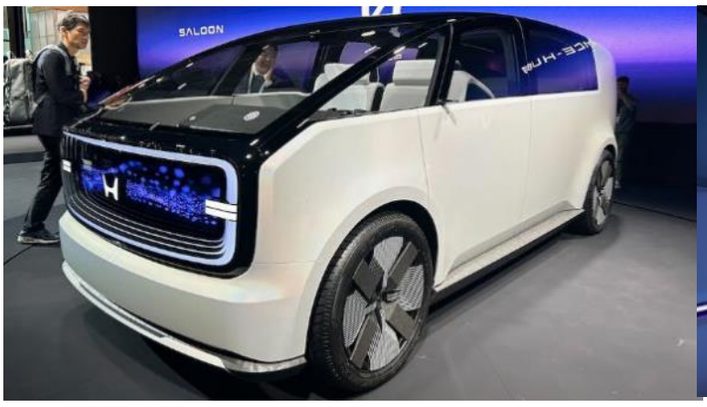
in addition to the BMW Theatre Screen with Amazon Fire TV in the rear compartment of the BMW 7 Series, BMW customers now can watch a variety of video content on the central display. BMW developers worked with XPeri to optimize the TiVo Operating System, which has already been successful in the Smart TV sector, for in-vehicle video streaming, integrating the DTS AutoStage Video Service powered by TiVo. The entertainment offerings include both live channels and on-demand media libraries of news, sports, entertainment for children, movies, and TV series.

Honda



Saloon concept

Honda have decided the future of automotive mobility is electric; they declared their goal is to achieve a 100 per cent global ratio of EVs and fuel cell EVs by 2040. To that end, they revealed the first two '0 Series' EV concepts: a sleek, stylish sedan called the Saloon (the British-English term for 'sedan') and the boxy-chic Space Hub. Both concepts offered a glimpse into Honda's ideas for their cars of tomorrow.



Space Hub concept

Sony Honda Mobility

At a big press conference, Sony and Honda described the next steps for Sony Honda Mobility. Sony CEO Kenichiro Yoshida and Honda President Toshihiro Mibe talked about sensing technology for enhancing mobility safety. The 'Safety Cocoon' is a concept to advance vehicle safety by detecting 360 degrees around the vehicle in various daily driving situations, allowing drivers to take early action to evade risk. At the booth, visitors experienced Sony's diverse sensing technologies that support the realization of this concept. By pursuing resolution and sensitivity better than that of humans and their eyes, Sony's sensing technology aims to enhance safety by serving as the eyes of mobility.

There was a Sony Afeela car being driven by a PlayStation PS5 controller—a spectacle explained this way: "Sony Honda Mobility will provide an additional playground where anyone can create and express their own style using Afeela. To do so, we plan to establish diverse development environments to foster a creative community among users and creators, allowing access to vehicle data, driving data and other related information".

The demonstration showed that cars are becoming more defined by software, rather than hardware. With software having deep control of vehicle functions, over-the-air updates can change several characteristics of the drive experience and can improve vehicles over time.

Sony said the software-defined nature of the car will turn it into a "digital playground" for creators to invent new in-car experiences. They showed an example game that renders a vehicle in a mock world alongside escaped godzilla-like monsters, which you can get points for catching. Why look at boring old, normal old, regular old scenery outside when everything can be turned into a videogame?

Sony Honda Mobility President and COO Izumi Kawanishi announced a collaboration with Microsoft to create a personal agent for mobility. He said SHM aims to revolutionize how people move, making mobility interactive and expressive, redefining the relationship between people and mobility, enhancing "emotional experience".

SHM also will work with Microsoft to develop a conversational personal agent, using Microsoft Azure OpenAI Service. Kawanishi said, "AI plays an essential role in achieving our goal to redefining the relationship between people and mobility, enhancing emotional user experience. Microsoft is a key partner to provide conversational personal agent. We are pleased to be working with Microsoft to realize our vision".

And Microsoft VP of Data, AI, and Digital Applications Product Marketing Jessica Hawk said, "Generative AI is a new canvas that is amplifying human creativity and creating opportunities for creators and designers to completely transform the in-vehicle experience. We are proud of our collaboration with Sony Honda Mobility and excited to see their innovative use of Azure AI technologies and their ability to build with confidence knowing Microsoft Azure is providing a trusted platform as the AI landscape and mobility industry evolves. As these new technologies come forward, safe and responsible AI will continue to be a top priority for both organizations".

Mercedes

The first Mercedes-Benz to showcase MB.OS is the CLA Class concept, first shown in North America at CES this year. It's designed on the new Mercedes-Benz Modular Architecture (MMA).

Mercedes revealed more detail of their new integrated MBUX Virtual Assistant. Using software and generative AI, they called it a 'game changing development' which takes the Hey Mercedes voice assistant 'into a whole new visual dimension' with Unity's high resolution, games, and engine graphics on an in-house operating system. It will arrive with the first MMA-platform model, the next CLA Class. The system can now offer suggestions based on learned behaviour and situational context.

More natural dialogue is paired with visual feedback through advanced 3D graphics from the Unity game engine. A 'living' star avatar uses animations to express different moods and states of being. Emotions range from calm to excited and even sensitive. Further animations indicate whether the assistant is speaking, listening, thinking, suggesting, or providing a warning. Movement, brightness, intensity and colour interact to communicate intuitively with the driver.

The driver benefits from significantly enhanced situational awareness by being able to see what the car 'sees'. For instance, it shows the type of traffic ahead by indicating another car, van, truck, or a cyclist. It also shows pedestrians close to the roadside and other potential hazards and superimposes route guidance into a realistic representation of the surroundings.

OTA updates will ensure access to the latest content and features tailored to owner wishes and regional preferences.

Another presentation at CES: Mercedes is joining forces with Audible and Amazon Music to refine in-car storytelling. With Dolby Atmos, this collaboration will bring spoken-word audio to new dynamic heights, putting car users at the centre of a concert-hall sound experience including audio books and all kinds of other content.

MBUX virtual assistant: natural, conversational interaction

Vinfast

Underpinned by the message "Venture Beyond", VinFast introduced their new VF Wild EV concept; their VF 3 mini eSUV; their DragonFly electric bike, and other vehicle and technology snackbites. The VF Wild is VinFast's first attempt at a pickup truck. It is 5.3 m long and 2 m wide, with an expanding bed, a panoramic glass roof, and digital side mirrors. It was jointly developed by VinFast and Australian design studio GoMotiv.

Pininfarina

Pininfarina presented their collaboration with AC Future, a living-solutions innovator, to conceptualize and design a mobile living space called eTH (for Electric Transformer House). It aims to blend luxurious amenities, smart technology, and eco-friendly features to embrace the mobility demands of the future.

The cockpit shows a simple, very desk-like dashboard with everything routed through a central swilling touchscreen. A workspace is available for the passenger, and AC Future suggests a self-driving ability by animating a foldaway, lozenge-shaped steering wheel.

In addition to designing the interiors and exterior of the mobile living unit, Pininfarina crafted the brand identity, including the logo and all brand assets.

Xiaomi

The billionaire co-founder of Xiaomi unveiled their first EV, declaring ambitions to become a top global carmaker in 15 to 20 years and compete against Tesla, Porsche, and the rest.

This five-seater SU7 sedan (it's said to stand for Speed Ultra) will be powered by batteries from CATL and BYD, depending on whether it has a single- or dual-motor configuration.

The Communist Party of China has been limiting manufacturing permits to new market entrants, which means Xiaomi will have to partner with state-owned Beijing Automotive to produce cars.

Interior Suppliers

AUO

AUO showed a range of in-vehicle display HMI solutions and innovative applications, including microLED applications. Their Smart Cockpit 2024 brings an immersive and engaging visual experience, along with innovative applications that transform the usage and design of vehicle interiors, to meet the growing infotainment wants of vehicle occupants.

The Rollable RSE (rear seat entertainment), a CES Innovation Award recipient this year, leverages the flexible and bendable advantages of microLED technology by allowing the display to be rolled up and concealed within the front seat headrest when not in use.

For new mobility, AUO's Interactive Transparent Window is a car side glass concept with integral high-transparency microLED display to provide entertainment, online video conferencing, and safety warning information through touch technology.

MicroLED display and sensing technologies change the way drivers and passengers interact with the cockpit and the outside world, with intuitive touch experiences. The 'Blended HMI Surface' serving as the central control interface can be concealed under various materials to seamlessly integrate with the cabin's interior design, becoming visible only when operating essential functions.

VW

VW will initially offer ChatGPT in the ID.7, ID.5, ID.4, ID.3 models, the new Tiguan, the new Passat, and the new Golf. The software, which can form humanlike sentences, will be available within the in-house voice assistant IDA, and the first vehicles with this function were on display at CES.

The voice assistant is activated by saying "Hello IDA" or pressing the button on the steering wheel. The IDA automatically prioritizes whether a vehicle function should be executed, a destination searched, or the temperature adjusted. If the request cannot be answered by the VW system, it is forwarded anonymously to AI and the familiar VW voice responds.

The integration is being implemented with voice software specialist Cerence, whose solution is used in IDA. ChatGPT will be available in several production vehicles from the second quarter of 2024 onwards. The idea is to make communication with the car more natural-seeming, and to allow Volkswagen's voice assistance software to help with more questions beyond the operation of vehicle systems. According to Volkswagen, they will be the first volume manufacturer to install ChatGPT in series production vehicles.

VW presented it in a camouflaged prototype of the updated Golf GTI at CES, which despite the camouflage revealed a revised dashboard with a larger infotainment screen, plus more physical controls.

Continental + Swarovski

Continental showed their Crystal Centre Display, which is fully embedded in a crystal housing. It is a 10-inch display based on microLED technology. It was developed in collaboration with Swarovski Mobility, and recognized with a CES 2024 Innovation award this year. Continental's partnership with Swarovski focused on the volumetric crystal panel, which features distinctive faceting created using special grinding techniques. Swarovski conceived a durable crystal housing that meets the optical and technical challenges of in-vehicle use.

A tinted crystal element allows the driver and passengers to see right through to the centre console behind it, creating the illusion that the content being displayed is floating freely in the crystal.

MicroLED displays feature self-illuminating pixels and offer much greater brightness and superior contrast than comparable technologies.

Swarovski Mobility senior B2B VP and MD Peter Widmann called the display "the result of a combination of production and process technologies which together with Continental we implemented into an innovative new design element – one that is as impressive visually as it is technically".

LG

LG introduced a range of infotainment screens one of which is a front passenger display designed to be invisible to the driver by dint of viewing angle control technology, to let passengers do things like watching a movie without distracting the driver.

LG's Switchable Privacy Mode is designed to ensure that driver and passenger see different content on the same screen. According to the company, the release of the technology is part of LG's strategy to maintain their status as a leading supplier of infotainment screens for future mobility.

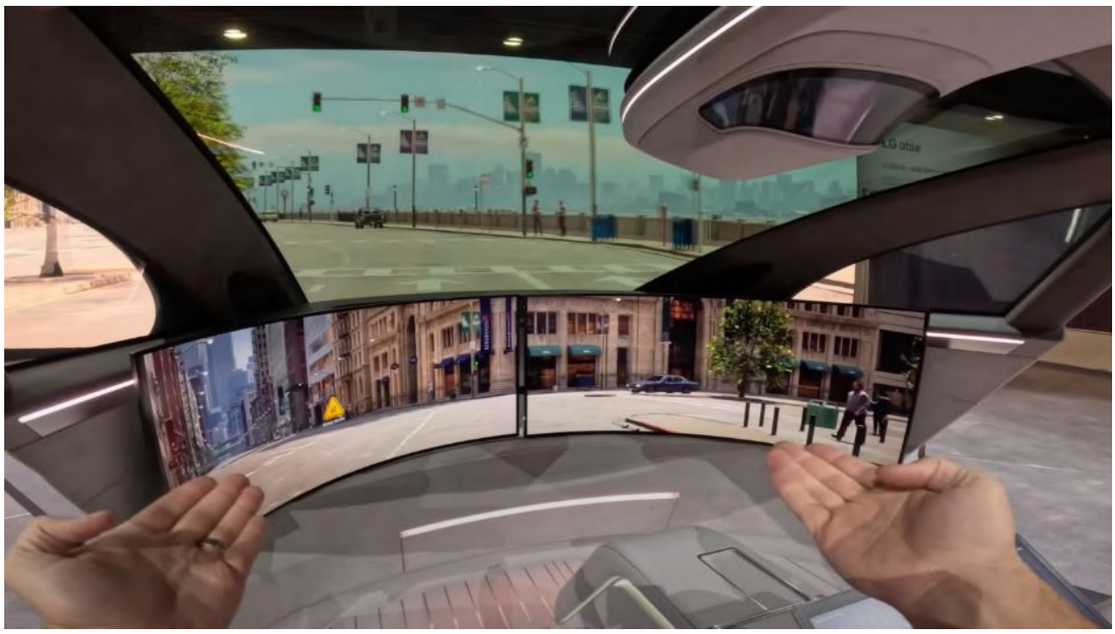
The new OLED displays are meant to play a significant role in the emerging era of autonomous software-defined vehicles, with the proliferation of in-vehicle screens referred to as 'screenification' by LG. These displays feature ultra-HD screens for both the driver and front passenger, as well as fold-down displays for rear passengers.

In addition to the passenger display, LG introduced a new HUD with 3D technology. It has technology including P-OLED, which lets the display follow the dashboard's curvature—a capability stated to be unique in the market.

Here's LG's idea of what future mobility will look like, integrating ADAS, automated driving), and in-vehicle infotainment technology. Called 'Alpha-able' (stylized as 'αble'), the concept car was developed in collaboration with Magna atop a platform that promises personalized user experiences.

Three key themes—transformable, explorable, and relaxed—underpin the future mobility concept. LG aims to transform the conventional car into a versatile space reminiscent of home or office environments, and this is where the company's prowess in cutting-edge display technologies and home appliances comes in.

Rollable, flexible, and transparent OLED displays adorn the concept car's interior, displaying tailored information and content to allow passengers to unwind while on the go. The αble recognizes hand gestures, with a particularly cool one revealing a second OLED screen at the front, which combines to offer passengers a wide view of the outside, which A-pillars would normally hinder.



The αble recognizes hand gestures to reveal a second OLED screen up front

While the αble is capable of autonomous driving, LG has provided passengers the option to take control, with a yoke-style steering wheel revealing itself from the centre console where it usually stays folded and hidden away.

LG has equipped the αble with an easily accessible refrigerator. Futuristic captain-style seats that rotate allow passengers to travel in comfort with gaming screens that drop from the ceiling—no more of that yucky feeling of withdrawal caused by being in a space where it is not possible to play video games at all times.

The concierge service comes from the trunk, with modules that slide down the centre console to present passengers with gaming controllers and drinks.

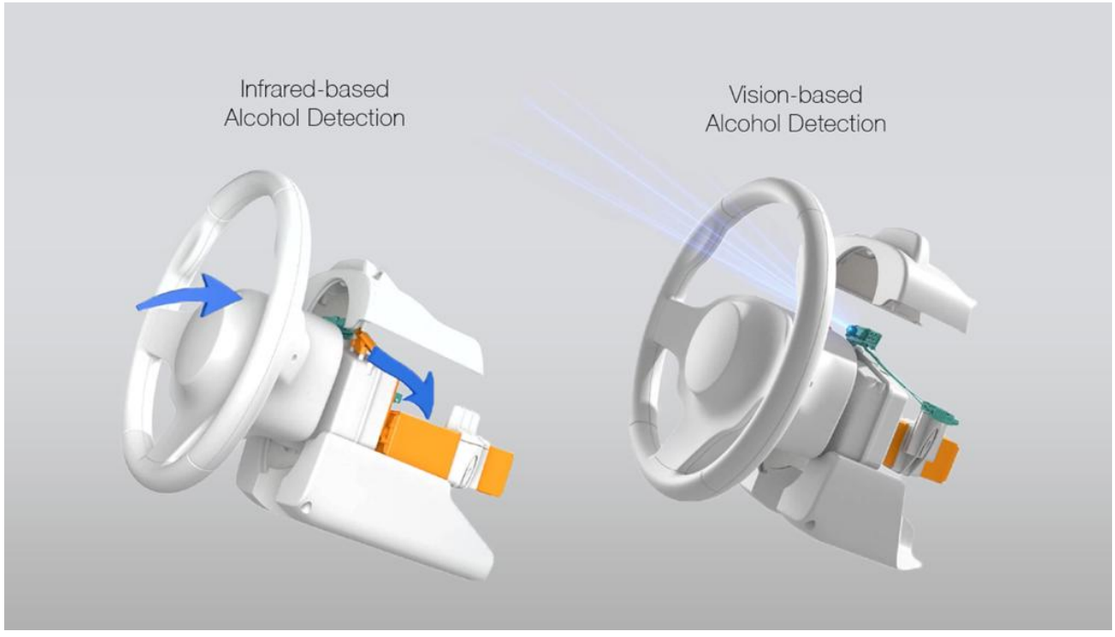
Plastic Omnium

Plastic Omnium won a CES Innovation Award for their dynamic interior dashboard projection system.
It illuminates the entire dashboard with colours and patterns to match the mood chosen by the driver. Already integrated into the interior of the new BMW Mini Cooper Electric, it creates an immersive driving experience including lights, animations, and projections.

This module comprises several microlens arrays (MLA), integrating different patterns. The light beam is generated by RGB LEDs and sent to the microlenses, which project the desired patterns onto the dashboard. It can be installed behind a central HMI at dashboard level or elsewhere in the interior.

Plastic Omnium CEO Laurent Favre says: "We are proud and delighted to have once again been honoured at CES 2024, the most influential tech event in the world! With our dynamic interior dashboard projection system, Plastic Omnium addresses key automotive industry trends in design and digital personalization".

Magna



Magna introduced a breath and camera-based pre-development technology designed to combat impaired driving, in line with forthcoming regulations. The affordable system determines if drivers are fit to drive quickly and reliably. It combines key elements of the interior sensing system, which uses cameras to detect driver distraction, drowsiness, and intoxication through pupillary signals, with infrared sensor technology developed by Swedish-based Senseair.

Embedded sensors near the driver measure and quantify the alcohol and CO_2 levels in diluted exhalations from the driver. The technology is intended to passively detect a would-be driver with a blood alcohol concentration above the legal limit.

Magna Electronics President Bill Snider says, "As we continue to support the company's vision of advancing mobility for everyone, our team is focused on delivering active safety innovations that help reduce accidents and fatalities. We are working with our customers and the industry to take a significant step forward in making the roads safer for all who share them".

Magna also showed off their seating demonstrator, designed for interior flexibility. Its long rails allow long travel. Foldable second row seat allows compact storage behind the first-row seat. It includes swivel table function to allow conversation mode. These seats have free form trimming technology to support concave and convex shapes, therefore maximizing foot room for occupants in the following seat row.

To enhance connectivity between residential and mobility spaces, Hyundai-Kia have signed an agreement with Samsung Electronics for a Car-to-Home and Home-to-Car service partnership.

Under the agreement, Hyundai-Kia's connected car services will be integrated with Samsung's Internet of Things platform, SmartThings. This will enable car users to remotely control digital appliances in their home via touch and voice commands through their vehicle's infotainment system, and control various vehicle functions from their home through AI speakers, TVs and smartphone apps.

Customers are urged to use this functionality throughout their daily lives. For example, the user can activate the 'Home Mode' from their car to turn on the registered air conditioner and air purifier in their house or turn on the lights for a comfortable and pleasant living space. Alternatively, before going out, they can initiate the 'Away Mode' to turn off unnecessary lights and start the robot vacuum to create a clean-living space to return to, as well as pre-activate the vehicle's air conditioning to a comfortable temperature.

In the case of the Car-to-Home service, users can register and use specific modes for each situation to minimize device operation while driving. Location-based automatic operation and touchscreen and voice commands will enable convenient service to users.

Hyundai and Kia have already been providing Car-to-Home and Home-to-Car services through collaborations with telecommunication companies and construction companies. The Car-to-Home service was previously available for six items (lighting, plugs, gas shut-off valves, ventilation, air conditioning and boilers) and the Home-to-Car service for vehicle air conditioning, remote start and charging management. Both features will be expanded to support connections with a wider range of devices.

Forvia

Forvia showcased a big bunch of products, spreading over their three strategic pillars: Electrification & Energy Management, Safe & Automated Driving, and Digital & Sustainable Cockpit Experiences. Combining the complementary strengths of Faurecia and Hella, Forvia received four CES Innovation Awards.

Horizon is an interior concept which provides fresh user experiences in a midsize SUV package. Exterior innovations included high-tech lighting and projection technologies, ensuring safety for occupants and other traffic participants. Selected lighting and sustainable materials communicate roominess and gracefulness. Forvia claims that no technology is shouting at the occupants, all is about serenity.

Then there were Forvia's HMI features: 3D graphics content floats in space and HMI feature selections are made by eye tracking. The entire interaction model is targeting a safer, more pleasing driving experience.

The interior is transforming into various configurations, all respecting safety and design integrity. Front seats will take a comfortable, relaxing position while the vehicle is recharging. The passenger seat is equipped with long-range tracks so, in a single movement, it can be positioned in place of part of the rear bench, enabling its occupant to interact fully with rear passengers. Thanks to a furniture-like table pod detaching itself from the instrument panel and moving backwards when the front seat is moved backwards, the passenger can also enjoy a dedicated work surface, while broadening their visual horizon and increasing their sense of space.

The Supremo seat is at the forefront of sustainable design. It is based on a compact structure thanks to recliner and tube positioning, thus freeing up extra space for batteries and foot-room for rear passengers. When the vehicle is recharging, occupants can enjoy optimum comfort in a high-reclined position, thanks to the design of the seat's compact frame as well as a headrest soft as a pillow.

CES 2024 Innovation Awards were proudly displayed at the Forvia booth.

Forvia + Smart Eye

Combining Emotion AI technology from Smart Eye's Affectiva branch with Forvia's cameras, the demo of this production-ready system showed how a vehicle's ambiance can be altered to create full immersive experience according to the detected emotions of its occupants. It integrates Emotion AI with in-car entertainment systems and connected experience, recommending content based on the passengers' emotional state, with claims made for better safety and personalisation.

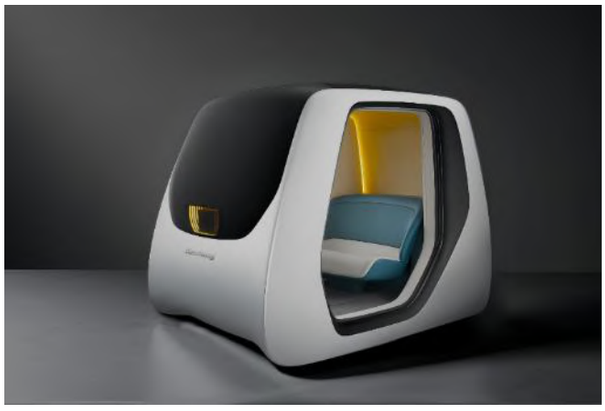
Last year, Forvia and Smart Eye were chosen by a global automotive manufacturer to integrate Forvia's top-tier cameras with Smart Eye's DMS (Driver Monitoring System) software into upcoming car models. This design win underscores the robustness and innovation of their combined tech offerings.

Yanfeng

Yanfeng displayed their latest seating, interiors, electronics, and safety systems innovations at this, their first go at CES. They debuted their EVI (electric vehicle interior) concept for future vehicle architecture; it eliminates the traditional instrument panel and incorporates all key features and interior functions into a smart cabin seat, including an active headrest with integrated audio, safety systems, smart surfaces, and storage and charging integrated into the seat. In case of regular old-fashioned manual driving, the centre console display becomes a steering element by dint of a smart cinematic arm, while the pedals move forward to be accessible. Besides functional benefits, like roominess, the concept also simplifies the assembly process, reduces weight, and eases end-of-life recovery.

They also showed off their 'Hover Seat', providing new levels of comfort by adding 'seat sensing posture ID' technology. The seat, based on zero-gravity research, adaptively forms to the curvature of the occupant's body and tailors the travel experience and comfort to occupant specifics. The seat features precise memory settings that allow users to save and recall their preferred seat configurations, massage functions, and more.

Also at the booth: ClickRim, a modular steering wheel concept with connectable segments that allows the automated wrapping of the steering wheel, integration of hands-on detection and heating functionality, and a broad choice of cover materials. It contains proprietary self-aligning shells and an electrical connection system. This product creates a steering wheel with a notable reduction in labour to finish the assembly. It also has sustainability features as well.



The Cymaticx sound flow cabin features immersive acoustic experiences for vehicle interior spaces. Based on the new self-developed Ouranos Sound Domain Controller platform, integrating a variety of innovative acoustic technologies such as Holosound immersive audio, somatosensory augmented sound, Sonix acoustic follower algorithms, and special flexible thin film transducers.

Valeo

Valeo showed many of their ADAS and interior products, including sensors and new HMI architecture and projection solutions. Different demonstrators were used in exclusive, private, customer-only parts of the booth, thus ensuring that Valeo non-customers couldn't see.

The ImagIn Q4 demo car, put together by Valeo and Sennheiser Mobility, is a multisensory exploration where light meets an immersive sound audio system to create the illusion of a sound stage around each passenger, transforming every ride into a breathtaking soundscape. The Valeo ImagIn interior lighting system is composed of projection modules, smart adaptable user interfaces, and software dedicated to projection and content management. It combines visual projected content— Valeo has developed improved technologies for daytime projection—with smart surfaces and sound for an immersive and intuitive experience for all passengers. The system has 26 loudspeakers, including in the headrests.

There's a smart adaptable user-interface based on gesture detection, and software dedicated to projection and content management. It will extend the useful surfaces and make them accessible for all passengers thanks to HMI in the front and the back of the vehicle. Beyond its practical utility, it transforms the vehicle design without impacting the hardware, combining visual projected content with smart surfaces and sound for an immersive and intuitive experience. Five patents are involved. The Immersive sound zone algorithm for headrest audio in all seats, along with animated visuals, increases the acoustic zonal separation between each seat row, allowing passengers to enjoy bespoke travel experiences.

Marelli

Marelli showcased their design-led approach to develop their software-defined vehicle interior concept (SDV-I), which leverages AI and is one of the first automotive applications of an OLED display. Marelli's SDV-I supports new display technologies including the next-generation Horizon View, Marelli's award-winning pillar-to-pillar display that boasts improved brightness and contrast compared to the previous generation, and a 12" hidden display that seamlessly blends into the cabin. It has up to four zone control units so content can be personalized by vehicle occupants.

The OLED movable display was developed by Marelli with the support of BOE Varitronix as part of a long running cooperation. A holographic display hosts a virtual assistant, an advanced HMI that acts as an in-vehicle copilot, creating a unique driving experience and transforming the interaction between the car and its occupants.

The driver can easily create a persona profile to define car settings: seat position, temperature, ambient lighting, music preferences, and ground illumination; the persona profile is stored in the cloud and transitions across different vehicles, ensuring a consistent personalized experience regardless of the vehicle.

Marelli's SDV-I also features their context-aware mobility experience ('CAMEX') solution, which enables interaction with the vehicle through analysis of the entire environment within and around the car. Leveraging Eyeris' in-cabin monocular 3D sensing AI, including depth-aware DMS and OMS, CAMEX analyses users' face, body and hands in 3D space to understand complex behaviours and discern subtle moods, adapting vehicle settings and functionalities accordingly, as well as prompting interactions with the virtual assistant. The vehicle's external environment also assumes an active role in shaping the driving experience, from adjusting the A/C to cool down the driver according to their taste on a warm summer day, to suggesting a detour for a stop at their favourite restaurant.

Ambient lighting solution offers multiple combinations of colours, intensity levels, and cabin areas to adapt to user preferences, also in combination with decorative and smart surfaces. Particularly in combination with CAMEX, this becomes a powerful feature for occupant-vehicle interactions.

Their new sound zoning allows the driver to transform the car into their own personal conference room. An optimized background noise cancellation system will effectively isolate the speaker's voice from any background noise, including music being played, allowing for clear and uninterrupted speaker calls even with passengers not participating in the call.

Gentherm

Gentherm, specialists in thermal management and pneumatic comfort technologies for the automotive industry and in medical patient temperature management systems, unveiled WellSense at CES. It's a software-defined system that delivers customized in-cabin comfort sensations the company says promote wellness and well-being.

The technology leverages science-based physiology research as the foundation for proprietary software that orchestrates heating, cooling, lumbar and massage comfort effectors.

Gentherm CEO and President Phil Eyler says, "Trends are shifting towards consumers using their vehicles as a third living space, offering an additional revenue opportunity for automakers to address consumer health and wellness needs. The launch of WellSense is the next evolution of our software enabled technologies that positions the Company at the nexus of health, wellness, comfort, and energy efficiency".

The WellSense software development kit can be combined with additional vehicle features like in-cabin audio, visual and aromatic stimulation to deliver unique sensations that go beyond traditional comfort regulation to help promote individual wellness and wellbeing.

Senior VP and CTO Vishnu Sundaram says, "We see opportunities at the intersection of the software defined vehicles market and consumer desire for total well-being to deliver health and wellness-based experiences leveraging our expertise in thermal and pneumatic comfort. WellSense is not only a scalable solution that fits future SDV architecture, but also a system that delivers a symphony of sensations that promote passenger relaxation and rejuvenation".

WellSense currently offers a library of experiences around the following themes:

• Physical wellbeing: heating and massage stimulate muscles, ease tension, and relax the mind to support lower back health

• Cognitive wellbeing: coordinates thermal and pneumatic technology to help keep a driver alert.

• Healthy Lifestyle: helps promote fitness by offering pre- and post-workout solutions. Further support for a healthy lifestyle is offered through experiences to help target stress management.

Grewus

Grewus, based in Hamburg, Germany, has been developing and making haptic actuators and acoustic components since 2007. Those kinds of components are increasingly being used on automotive smart surfaces. At CES, Grewus showed a demo seat, developed with the integration support of Typ 1, demonstrating the value of haptics in a vehicle seat.

Using haptic actuators powerful enough to be felt by seat occupants, and small enough to be packaged into the seat without spoiling comfort, helps the seat to become an affective element of the HMI system. Haptic feedback to the seat occupant, especially the driver, delivers warning signals immediately understood and felt in case of a safety hazard. It is even important in case of autonomous and electric vehicle It is as well a local alert, which will not bother any other occupant of the vehicle.

Emotion3D

Emotion3D presented two demos featuring a 2D camera, highlighting various active safety features while introducing expression recognition capabilities on top of established user experience features. Visitors saw a 3D body key point analysis from 2D image outputs, which presented a novel approach on the passive safety front, providing useful and high-quality information at a lower cost.

The second demo leveraging a Time of Flight (ToF) camera provided by Melexis, showcased even higher accuracy and redundancy in depth values by combining the algorithmic estimation with ToF measurements. Despite ToF cameras being traditionally solely associated with passive safety features, such as adaptive restraint control systems, it demonstrated the versatility of this technology by successfully integrating the Cabin Eye software stack, including active safety and user experience features. Showcasing thereby, the industry's lowest resolution DOMS demo, and collecting positive feedback for accurate eye gaze analysis and associated features at this low pixel density.

The integration of Cabin Eye software stack with BlackBerry's Ivy platform resulted in a vehicle showcase at the Las Vegas Convention Center. This collaboration showcased the seamless integration and adaptability of technology across embedded platforms.

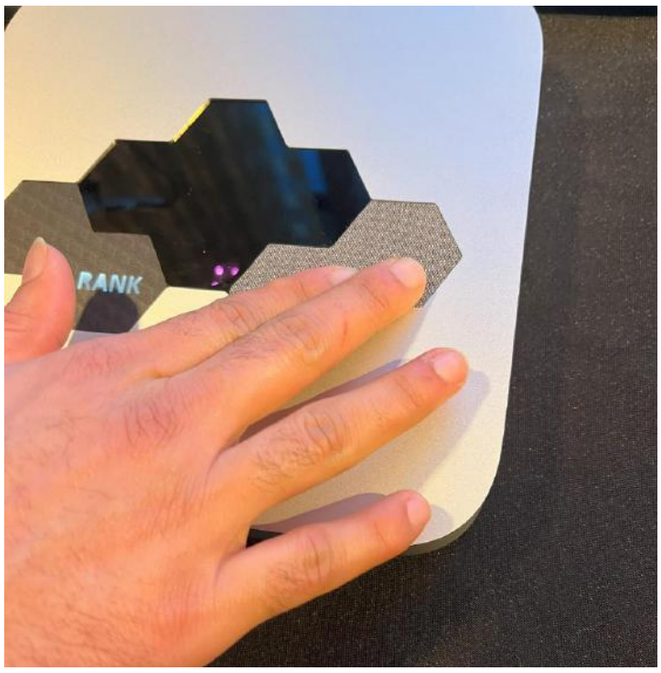
In parallel, at CES, Luxoft, a DXC Technology Company and emotion3D have built a strategic partnership to jointly develop and supply automotive solutions and services for in-cabin monitoring (occupant and driver monitoring). These solutions will enable clients to reduce costs and fulfil the requirements of new regulations. Luxoft, delivers digital advantage for software-defined organizations, leveraging domain knowledge and software engineering capabilities.

Arkamys

Arkamys are experts in audio signal processing, based in Paris, France. Their in-car audio experience features the integration of Dolby Atmos and Arkamys' Sound Stage solution. This collaboration represents a significant leap in delivering immersive audio to mainstream car models.

The highlight of this year's showcase was an SUV outfitted with a 4-channel, 6-speaker system that merges Dolby Atmos' advanced decoding and rendering capabilities with Arkamys' Sound Stage post-processing. The combination results in an audio experience that not only deepens bass but also refines the sound stage for precise and immersive audio. This collaboration demonstrates the synergistic potential of combining leading audio technologies to enhance the in-car listening experience.

Elmos



Elmos presented semiconductor solutions for ADAS, autonomous driving, electromobility and comfort, based on innovative mixed-signal semiconductor solutions.

Their 3rd-generation LIN RGB LED drivers for interior lighting create coloured light even during the day with a 50-per-cent increase in output capacity. For dynamic RGB applications, the new driver IC can control up to six RGBs and guarantees the best colour accuracy without flickering. The differential mode + UART bus enables sudden colour changes, which can be used for driving safety (e.g., warning lights).

Gesture recognition with ToF and Halios ICs As a pioneer in innovative gesture recognition technology using hand tracking, Elmos presented affordable ToF and HALIOS sensor ICs that enable reliable optical detection of gestures, primarily for the operation of displays.

Another demonstrator shows how quickly and reliably hand gestures can be recognized using Elmos sensor ICs. Thermal Management with motor control ICs.

Epicnpoc

Epicnpoc creates smart product experiences better and faster with their development tools to quickly turn concepts into an interactive prototypes. With a team of design and software engineering experts that have supported concept cars and completed over 25 high-profile PoCs with global corporations (Renault, Forvia, etc.) government, and educational institutions to finalize smart products that provide interaction and generate emotions.

Describe and iterate your user scenario with BOWL and Starter Kit. The kit includes all Human Machine Interface functionalities including an instrument cluster, centre information display, audio, e-mirror, light, stream deck, LED matrix, LED strip, NFC reader, Neonode IR sensor, and tablet.

FEV + Streetscope

FEV, a global engineering service provider in the mobility industry, and Streetscope, which measures and indexes traffic collision hazard so that the world can quantitatively assess the traffic safety of drivers, streets, and operations. Streetscope is a startup creating innovative tools to evaluate the safe movement of vehicles. They have entered into a partnership, employing industry-exclusive quantitative measures to dramatically enhance ADAS/AD development.

Specifically, FEV will innovate autonomous vehicle technologies by incorporating the Streetscope Hazard Measure (SHM) proprietary measurement of collision hazards, into the life cycle of mobility development. The unique software platform can process data from AV sensors such as cameras, lidar and more, to analyse all varieties of driving situations and objectively characterize potential hazards within the field of view. It then calculates a "Hazard Measure" based on kinematic relationships between elements present in the scenario, resulting in a quantifiable metric that correlates with collision risk.

Audio Foundry + Dirac + Tymphany + Trèves

Trèves is a French Acoustic Supplier, Dirac an audio research company and Tympany a premium automotive audio company. The Sonified system was demonstrated in a Tesla Model Y that retained its complete stock audio system for comparison. The Sonified system used the Tesla's three midrangers and two tweeters, but turned off the door speakers in favour of two of these panel speakers placed behind carpet on the sides of the centre console. The subwoofer in the cargo area was replaced by two subwoofers in the carpet under the front seats, two Sonified speakers were mounted in each front headrest as well. These bring the huge advantage of being able to reproduce sound across the entire range of human hearing, from 12,000 to 60 or 80 Hz (typical small speakers bottom out at 130 Hz). This makes them way better at their side-hustle of cancelling road or tire noise.

AI · EE · Digital Cockpits

Hisense demonstrator with holographic HUD

ES 2024 was a big show for AI, with countless announcements and products trying to capitalize on AI hype. Companies highlighted the enormous potential of AI to improve products and services with cutting-edge applications that will transform how we communicate, do business, and take care of one another.

AI isn't new, as such; it's been present for some years, but this year the focus was not on AI able to operate vehicles with no driver. It was much more centred around better communication between the car and the driver—probably a byproduct of the whole industry backing off from earlier predictions, now considered premature and overly optimistic, about the speed with which driverless cars would come to predominate. Turns out, human drivers will be the norm for the foreseeable future, so cockpits are crucial. AI is changing them.

The vehicle cockpit is evolving to provide occupants with a highly digital experience. There'll be a single user interface through which a driver can access data from different sources and manage various digital assistants. It will combine multiple screens dedicated to the driver, side-passenger, rear passengers, and even telematics.

The goal is to enhance safety by reducing distraction; maximizing personalization; tracking the health and wellness of occupants, and delivering a stress-free in-vehicle experience, while monitoring vital parameters enabling early detection of emergencies. That is the visible and functional side of the digital cockpit. The back-of-house stuff is also important, with its electronics architecture to reduce the cost and complexity, and to improve computing power.

AI also helps to understand context by integrating information from a variety of sources: GPS tells where the car is, and information like speed limits. Radar and lidar detect objects, traffic lights, bicyclists and pedestrians, and animals, especially when weather conditions reduce visibility.

Here's a look at our selected digital cockpit, AI, and electronic architecture highlights of CES 2024:

Stellantis + BlackBerry + Amazon

Stellantis and BlackBerry are collaborating on a 'virtual cockpit' said to allow much faster delivery of infotainment technology and cut development costs. It recreates car controls and systems in the cloud, and the companies say it will drastically slash development times—in some cases from months to hours.

The cockpit platform is part of Stellantis' Virtual Engineering Workbench development tool. BlackBerry's QNX Hypervisor provides the software, while Amazon Web Services provides cloud services.

The collaboration was announced to coincide with CES 2024, where BlackBerry showed an unbranded demonstration of their QNX Hypervisor platform. Stellantis Chief Software Officer Yves Bonnefont says, "Essentially, we're able to get closer to our customers' needs through this technology with faster development cycles, faster feedback loops, and quicker delivery of the technology they know and love".

Stellantis expects to generate €20bn in revenue from software and connected-car services by 2030 as part of their Dare Forward 2030 plan. The group is developing three software-based technology platforms: STLA Brain, STLA AutoDrive, and STLA SmartCockpit.

Hyundai Mobis

Hyundai Mobis showed their latest EV tech: a holographic transparent display screen, one of 20 new mobility innovations they declare are ready for immediate mass production. The display appears on a transparent panel, making it easier for drivers to keep their eyes on the road, as with a HUD. The company said the transparent display can magnify images on the front windshield. This way, drivers can check key info without taking their eyes off the road for too long.

They also introduced their future mobility vehicle for the first time. They showed their innovative display series, including their world-first rollable display and swivel display.

They also unveiled the Quantum Dot and Local Dimming Display (QL) display, and a 3D display featuring OLED-level performance.

Elektrobit

Elektrobit are a wholly-owned, independently-operated subsidiary of Continental, specialized in automotive software. They presented their newest curved-screen display to make for an immersive in-vehicle experience. It's powered by Unreal Engine and Android Automotive, and features innovations such as the recently announced Elektrobit Theming Engine, allowing automakers, fleet managers, rental car operators, and shared-mobility service providers to personalize the look and feel of a vehicle at will. The idea is to make opportunities for revenue generation, improved customer management, and enhanced brand loyalty beyond a vehicle—or fleet's—point of purchase.

Elektrobit software and services have been employed by automakers, including newcomers like Sony Honda Mobility with their Afeela software-defined vehicle.

Eyelights

Eyelights, a Toulouse, France-based startup, showed their new vision of the cockpit. It's defined by natural driving interactions made possible by generative AI and accelerated computing optimized by Nvidia. They demonstrated how they'd transform the windshield into an augmented reality screen.

Visible to all passengers, Eyelights windshield display technology combines the virtual and real world. The technology has demonstrated a 32-per-cent better reaction time than traditional displays because the driver's eyes remain focused on the road. It also includes an AI copilot, based on ChatGPT, to deliver more intuitive conversations and unrivalled cockpit customization capabilities.

Eyelights AR technology opens up new experiences for everyone in the vehicle. While the driver remains focused on the road with crucial safety information overlaid on the windshield, the passenger can enjoy a cinema experience and interact with a 3D avatar copilot. Everything will be gamified and cartoonified!

Eyelights leverages the Nvidia accelerated computing platform to support multi-modal and highly intensive tasks such as real-time AR overlay and user interactions with 3D graphics content, as well as merging various interaction channels, such as AI speech, gestures and eye tracking.

Seven major makers have taken up with Eyelights, including BMW announcing recently that Eyelights windshield display technology will be standard equipment on the Neue Klasse.

Eyelights's demo car Features included:

- Augmented reality windshield (black and transparent display)
- Holographic 3D cluster
- Car Cinema for the passenger
- Avatar projection on side windows
- Human machine interface based on eye tracking
- AI and Avatar Co-pilot
- Headrest Sound bubbles
- Force and capacitive sensors to interact with virtual screens

Eyelights brought their future cockpit experience to CES with their five ecosystem partners: Nvidia for accelerated computing; AGC for multilayer glass; Arkamys and Treves for sound systems, and Nanomade for force and capacitive sensors.

Harman

Harman's presentation was all about amplifying life experiences across their Automotive, Lifestyle and DTS businesses; it included automotive products like Ready Care and Ready Vision, HUD, to the debut of a seat-based audio experience SeatSonic, as well as their new JBL One Ecosystem, JBL Authentics series.

The Ready Vision system displays important information such as speed and route on the lower portion of the windshield without obstructing the overall view. Harman touts this as an example of AR for automotive cabins. Ready care is their in-cabin monitoring product. Both products are driven by Samsung Neo QLED, the Ready Upgrade Advanced with Samsung Exynos processor that powers consumer experiences.

Ultrasense

Ultrasense Systems, headquartered in Silicon Valley, offers a suite of sensors, subsystem modules, full products, and software focused on pioneering smart surfaces with rapid product integration capabilities.
The company's main line is in delivering multisensory silicon and modules integrating functions like touch, haptic, and lighting with extensive software algorithms and machine learning. The core silicon supplies sensor fusion capabilities through novel multi-physics detection and feedback for hard and soft surfaces including metals, glass, plastics, wood, and leather.

In-plane sensing technology is the ability to enable multi-mode sensing and HMI control in the plane of the smart surface. It drastically reduces the size and weight, enabling modern designs and varietal configurations while reducing parts count and build complexity. This brings advantages in sustainability and recyclability, increases driving range, and enables modern designs and new user experiences that were not possible before such as supporting controls for retractable steering wheels that require elegant slim form factors.

With several demonstrators at their booth, including shy-tech with cap-force in-place sensing with TouchPoint HMI controller, steering wheel, tactical haptic surface, door release, and more.

Bosch

The trend toward software-defined mobility goes hand in hand with a centralized vehicle and electric/electronic architecture. Bosch unveiled their concept for fusion of infotainment and driver assistance functions in a software-intensive central computer on a single SoC. Named the Cockpit & ADAS integration platform, it processes a variety of functions from the two domains of infotainment and driver assistance simultaneously. This includes, for example, automated parking and lane detection, paired with smart, personalized navigation and voice assistance. Advantages for vehicle manufacturers: less space and cabling required, meaning lower costs.

Many digital players, such as Intel, Nvidia and Qualcomm, highlighted new forms of consolidated vehicle architecture that can combine many microprocessors into two or three system-on-chips.

Bosch introduces a pair of new AI-powered technologies. The German-based supplier has eye-tracking tech that detects whether you are and can be leveraged into a system to detect alcohol impairment. The system will ask you if you want coffee when you get home and will connect to your smart appliance to get it brewing. This may seem a bit contrived, but it is meant to show car-to-home-connected communication.

The other eye-tracking tech from Bosch can be used while driving to detect what you're looking at and other information about the street sign, building, business or point of interest. With a virtual voice assistant, it can tell you if the attraction is open and even how likely it is to be crowded.

Intel

Intel imagined AI everywhere with customer and partner momentum have announced new mobile and desktop processors as well as a commitment to software-defined vehicles. The new family of AI-enhanced SDV SoCs address a critical industry need for power and performance scalability. The family of SoCs feature AI acceleration capabilities from Intel's AI PC roadmap to enable the most desirable in-vehicle AI use cases, such as driver and passenger monitoring.

A demo showed 12 advanced workloads, including generative AI, e-mirrors, high-definition video conference calling, and PC games, running concurrently across multiple operating systems, including mixed critical-use cases. The demo shows how automakers can consolidate legacy ECU architecture to improve efficiency, manageability and scalability while integrating their own custom solutions and AI applications. Zeekr, for example, will use Intel's new SDV SoC to bring enhanced AI 'living room experiences' to their vehicles.

Nvidia

Nvidia said their automotive partners have unveiled a range of new technology, showcasing the power of AI in automotive design, engineering, and performance. Among the biggest partners is Mercedes-Benz, with a variety of software-driven features and advancements within the Mercedes-Benz MB.OS showcased in a number of cars, including the CLA Class concept, which is equipped with Nvidia Drive Orin SoC as the core platform for automated driving and display.

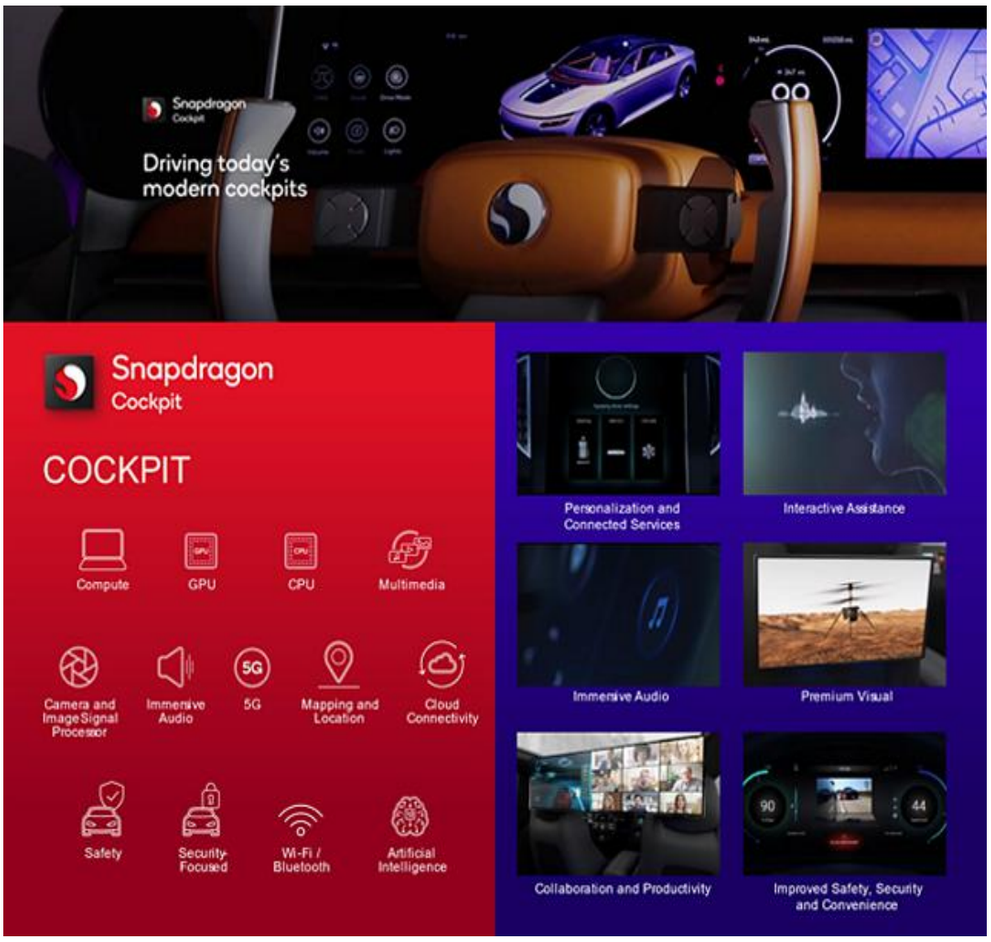
Nvidia support is also part of Cipia Cabin Sense, a driver and occupancy monitoring system ready for serial production this year. Nvidia products were also present in displays at CES from Ansys, Luminar, Cerence, Peeble, Polestar, and Zoox.

Panasonic

Panasonic and Infiniti announced the integration of a segment-exclusive Klipsch Reference Premiere Audio System on the new 2025 QX80.

The QX Monograph concept vehicle, previewing the exterior of the all-new 2025 QX80, is featured at Panasonic's booth. The Klipsch Reference Premiere Audio System delivers accurate, authentic, audiophile-quality performance throughout the cabin driven by 24 specifically designed speakers, including titanium tweeters, a high-performance 8-inch TriPower subwoofer, Highline roof-mount speakers, and Panasonic's DJX 3D surround sound processing.

Qualcomm



The Qualcomm Snapdragon Cockpit Platform delivers advanced functionality to help automakers create immersive, intuitive, in-vehicle experiences by leveraging enhanced graphics, multimedia and AI capabilities that can be scaled across vehicle tiers and personalized for every occupant.

Qualcomm, with support from diverse ecosystem partners, showed off their new Snapdragon Cockpit Experience Toolkit and the latest digital cockpit advancements as a part of the Snapdragon Digital Chassis concept vehicle.

The AI employs deep neural networks (DNNs). Modelled on the way information is processed by the human brain, DNNs learn how to traverse the real world of driving by learning from experience, rather than by being told what to do by a programmer. The DNN works by accepting multiple inputs, assigning different weights to them and drawing inferences. It requires an extremely high-performing yet energy-efficient computing platform in order to do all of that in real time.

Automakers are moving toward large-format HUDs, integrating the infotainment system, vehicle information, hazard warnings, navigation arrows, and all the rest. This makes challenges with HUD packaging size. AR-HUDs offer enhanced vision systems by integrating ADAS with autonomous features, such as navigation aids and lane-keep assist alerts, in real-time, displayed on a large portion of the windscreen. ADAS visual alerts on larger AR-HUD displays require head or eye-tracking and image distortion correction. Holographic projection is becoming increasingly feasible.

Rightware

Rightware showcased the tools to get to the best possible HMI software for digital cockpits. From the almost limitless toolchain and immersive design in the current Kanzi to an AI integration demo that previews the future, with HMI at the heart of your vehicle. You look at it. You listen to it. You touch it. There's two-way communication as you feed each other information.

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