



Communications Model Lines, Innovation and Technology

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The equipment, data, and prices specified in this document refer to the model range offered in Germany. Subject to change without notice; errors and omissions excepted.



Condensed Information

From driving experience to experience the drive: Audi at the 2019 CES

Audi will be presenting some of its strongest ideas for the future at the Consumer Electronics Show (CES) in Las Vegas this year. The spotlight will be on two technologies for the in-car entertainment of the future.

The Audi e-tron (combined electric power consumption in kWh/100 km (62.1 mi)*: 26.2 - 22.6 (WLTP); 24.6 - 23.7 (NEFZ); combined CO₂ emissions in g/km (g/mi): 0) features innovative online and charging services as well as the possibility to book functions on demand. It thereby demonstrates once again that premium mobility at Audi is not only sustainable, but also individual and easy.

Audi is breaking new ground—the brand with the four rings is developing innovative concepts for individual mobility and connecting these concepts with the digital world. The future self-driving Audi models will be on-demand entertainment spaces that will grant their occupants a “25th Hour” in the day. The Audi Aicon, a “2+2” seater with fully electric drive, is one example of this. Due to the fact that they are even more connected, such cars will offer their users completely new ways to spend their time, for example with the next generation of in-car entertainment. At the CES, Audi will demonstrate how the journey from A to B can turn into an experience for all the senses.

In the “Audi Experience Ride,” Audi has transformed the car into a mobile amusement park. Backseat passengers will be able to experience movies, video games, and interactive content even more realistically in the future using virtual reality glasses. The premium brand is presenting a technology that adapts virtual content to the movement of the vehicle in real time. In order to establish this new form of entertainment on the market as quickly and comprehensively as possible, a subsidiary of Audi, Audi Electronics Venture GmbH, has co-founded a startup named holoride GmbH, in which it holds a minority interest.

The “Audi Immersive In-Car Entertainment” project provides plenty of action while the vehicle is stationary. The technology takes up the action in movie scenes and translates it into real vehicle movements. The result is a special kind of cinema—the blockbuster literally moves its audience and can be enjoyed with all of the senses. Viewers can also get an idea of how the car of the future will become more than “just” a car.



The Audi e-tron integrates seamlessly into the customers' digital environment, making everyday mobility even simpler and more convenient. The brand's first fully electric series production model can be equipped with Amazon's voice service Alexa upon request. Functions on demand is a further highlight. For the first time ever, Audi is offering its customers the possibility to book functions on demand, even after purchasing the vehicle. This opens up a completely new form of individualization. Functions can be booked with differing terms—it's as simple as with well-known online shops. Features such as the e-tron route planner or the e-tron charging service make charging on the road with direct and alternating currents simple and convenient. Many online services from the Audi connect portfolio are bundled in the free myAudi app, which connects the customer's smartphone to the vehicle. The virtual exterior mirrors on the Audi e-tron offer customers an entirely new technological experience; they transport design and functionality into the electronic age.

Audi will use a 1:3 model to illustrate how the interaction between a self-driving car and pedestrians in cities could take place in the medium term. The lighting technologies from Audi combine visual fascination and pure high-tech.



Audi at the 2019 CES

From driving experience to experience the drive

Audi is completely redefining in-car entertainment and turning the inside of the car into an amusement park at the 2019 CES. The brand will showcase how entertainment in the vehicle can be experienced with all the senses in various situations. Audi is driving the digitalization of the car forward at full speed and with a clear goal: In the future, mobility will be not only sustainable, but also individual and intelligent – the Audi e-tron (combined electric power consumption in kWh/100 km (62.1 mi)*: 26.2–22.6 (WLTP); 24.6 - 23.7 (NEFZ); combined CO₂ emissions in g/km (g/mi): 0) already demonstrates this today. It offers functions that can be booked flexibly and on demand, as well as online and charging services that make mobility even easier and more convenient.

Digital technologies give us a great deal of freedom: Audi is working at full speed to develop new, attractive concepts that connect its customers' everyday mobility seamlessly with the digital world. With the fully connected and self-driving cars such as the Audi Aicon design study, Audi is giving its customers time for things that are important to them. In this "25th Hour", the Audi of the future will transform into the perfect workplace, a space to relax, or a world of entertainment.

Detailed information on the Audi Aicon is available [here](#).

Audi has been investigating the extent to which self-driving cars will change our everyday life as part of the "25th Hour" project since 2017. Today, drivers spend an average of roughly 50 minutes per day behind the wheel. In an autonomous car, drivers can make good use of this time: Occupants can relax, work, or make use of various entertainment offers. This is highly relevant to the strategists and designers at Audi. Digitalization and urbanization are changing cities, mobility, and user behavior. Automotive concepts are currently being planned developed—they must merge intelligently and efficiently with urban traffic systems in the future.

Further information on the "25th Hour" project is available [here](#).



New experiences in the rear seat: Audi Experience Ride

Audi will present a pioneering concept that offers completely new experiences. Backseat passengers will be able to experience movies, video games, and interactive content even more realistically in the future using virtual reality glasses. The technology that will be presented adapts virtual content to the movements of the vehicle in real time. Audi is demonstrating the immersive futuristic technology for the first time at its CES showcase with an interactive in-car VR experience. Wearing VR glasses, the backseat passenger in an Audi e-tron (combined electric power consumption in kWh/100 km (62.1 mi)*: 26.2 -22.6 (WLTP); 24.6 - 23.7 (NEFZ); combined CO₂ emissions in g/km (g/mi): 0) is transported into a fantastical depiction of outer space: The Audi e-tron now functions as the spaceship and the passenger makes their way through an asteroid field. Every movement of the car is reflected in the experience in real time. If the car turns a tight corner, the player curves around an opposing spaceship in virtual reality. If the Audi e-tron accelerates, the ship in the experience does the same.

This is made technically possible by means of high-precision localization that uses approaches from the field of automated driving. The VR glasses are connected to the car's data bus system. The suspension control unit provides them with detailed information on the car's movement, i.e. how it accelerates, brakes, and steers around corners. This movement data is transferred to the virtual world and thus to the spaceship. This adds fitting sensations of movement and acceleration to the visual image provided by the VR glasses that allow the backseat passenger to delve into the events of the game and entertainment.

In order to establish this new category of entertainment on the market as quickly and comprehensively as possible, Audi is taking a new approach: The premium brand has co-founded a startup named holoride GmbH, in which it holds a minority interest through the subsidiary Audi Electronics Venture GmbH, which developed the technology. Furthermore, Audi will license the technology to holoride. The startup intends to launch the entertainment offer for backseat passengers that uses commercially available standalone VR glasses on the market within the next three years. An open platform will allow carmakers and content developers to create and offer additional extended reality formats. From arcade games, underwater adventures, and space exploration to educational trips through historical cities or the human bloodstream, there are almost no limits to what is possible. The technology also allows backseat passengers to consume conventional movies, series, or presentations with a significantly reduced chance of experiencing motion sickness, as visual and sensory positional impressions are synchronized. In the long term, the continued expansion of car-to-X infrastructure could also see traffic events becoming a part of the experience: Stopping at traffic lights could introduce unexpected obstacles to a game or interrupt a learning program with a quick quiz.



Dynamics at a standstill: Audi Immersive In-Car Entertainment

The “Audi Immersive In-Car Entertainment” project presents a novel approach to experiencing movies, TV series, and streaming content in an automobile with all of your senses. From a technical perspective, it takes the exact opposite path to the “Audi Experience Ride”. The car remains stationary; only its body moves—to match the images the occupants are seeing. They are immersed into the world of the movie as seat vibrations, sound, and interior light animations intensify this effect. Exciting car chases, stormy winds, and even the heat of a ride through the desert can be felt with the viewer’s own body.

The crowd will be fired up with action movies at the CES. The “Audi Immersive In-Car Entertainment” will be demonstrated in an Audi A8. The movie scenes will be shown on a large screen positioned in front of the car, as well as on the MMI display in the car, and the tablets in the rear. It will be a moving experience for the occupants!

The luxury sedan is equipped with the optional active suspension that will go into production shortly. It uses four electromechanical actuators to load or relieve each wheel with up to 1,100 Nm (*811.3 lb-ft*) in a targeted way and thereby regulate the position of the body. The active suspension can lift the body by up to 85 millimeters (*3.3 in*) from its central position at all four corners within five-tenths of a second. The active suspension performs a very special task in the “Audi Immersive In-Car Entertainment” project: It translates the action from the movie into physical vertical movements. In doing so, the vehicle body is shaken at a high frequency, enabling movements such as lifting and lowering, pitching, and wavering. Each movement matches the sequences shown in the movie exactly.

To make the experience even more spectacular, the cushions and backrests of the front seats each contain ten small motors that generate vibrations with a frequency of up to 200 Hz, similar to the motion seats in modern 4D movie theaters. This way, there is no lack of surprise effects during action or horror movies. This “cinematic experience” is further enhanced by the air conditioning and the 40 LEDs of the ambient and contour lighting, which can be actuated individually and in time with the movie scenes. With a total of 23 loudspeakers, the high-end sound system of the demonstrator vehicle creates a special surround sound to round off the unique experience.

A computer located in the luggage compartment accesses the car’s technology and transmits its commands to the corresponding control units. This requires an electronics architecture that enables complete networking of all vehicle functions and intelligent actuation of the control units. The “Audi Immersive In-Car Entertainment” project is currently in the preliminary development stage. It has the potential to turn idle and waiting times, whether in your garage or while you are stuck in traffic, into fun times. Even at slow driving speeds, it is possible to experience entertainment content in an entirely new way and to increase the degree to which the passengers become immersed in the action. In such situations in particular, the project could function as an addition to the “Audi Experience Ride.”



While the content will be shown on the MMI screen of the test mule and on the tablets in the rear at the CES, it is conceivable to display content via VR goggles in the future—like with the “Audi Experience Ride”—to further amplify the cinematic effect.

Audi is already thinking ahead: The technology is also to be used for video games in the future to considerably increase the degree to which players become immersed in the game. This could potentially enable a realistic racing game experience as we currently know it only from simulators in a series production vehicle in the future.

The mobility of the future is sustainable and intelligent even today

Digitalization allows us to look at things from a new perspective. In this context, it is important to focus consistently on the customers’ needs while creating a unique product experience. The e-tron (combined electric power consumption in kWh/100 km (62.1 mi)*: 26.2–22.6 (WLTP); 24.6 - 23.7 (NEFZ); combined CO₂ emissions in g/km (g/mi): 0), which is the first fully electric series production model from Audi, is setting the pace here. Audi seamlessly integrates services and platforms such as Amazon Alexa, which are part of the customers’ everyday life. With functions on demand, customers can adapt the car to their personal needs even after the purchase. Personalization also plays an important part when it comes to lighting technologies of the future.

The start of a new era: The Audi e-tron

The sporty SUV combines the space and comfort of a full-size SUV with a range suitable for daily use, dynamic all-wheel drive, and a whole new level of networking. The optional virtual exterior mirrors are both a visual and aerodynamic highlight. Thanks to the comprehensive range of charging options with intelligent solutions for home and on the move, customers can enjoy electric driving without compromises. The e-tron (combined electric power consumption in kWh/100 km (62.1 mi)*: 26.2–22.6 (WLTP); 24.6 - 23.7 (NEFZ); combined CO₂ emissions in g/km (g/mi): 0) is catapulting its customers and the Audi brand into a new era. There are currently roughly 20,000 reservations for the model worldwide even before it has been launched on the market.

Detailed information on the Audi e-tron is available [here](#).



More freedom for customers: functions on demand

With the market introduction of the Audi e-tron, the brand is taking a big step toward digital business as a new business segment. Beginning in mid-2019, customers will be granted the flexibility to book various functions from the fields of lighting, driver assistance, and infotainment as required, even after they have purchased the vehicle. Which functions can be booked and how much they cost is regulated in the individual markets. In terms of vehicle configuration, everything will stay the same for customers. However, for the first time, customers can now also book functions that were not selected during the initial configuration on demand after the vehicle has been delivered to them. Customers can select between various terms in the process. If they want to get to know a function first before committing themselves, they can book a one-time, one-month test phase. Customers can extend the booking even during this phase, either for a further month, a year, or permanently. If the customer decides not to extend the term, the booking expires automatically and without requiring active termination at the end of the term.

Functions are always booked for the particular car, just like during the initial vehicle configuration. When the car is sold, they therefore remain active for the remaining term and can be used by the next owner. The rates for functions on demand are based on the classic price list and are specified for each market. Booking and payment are done via the myAudi app or the shop in the MMI of the Audi e-tron. We attach great importance to secure processing of the transaction. After the booking process has been completed, the Audi IT back-end sends a signed data package to the car via the mobile network. The transmission takes just a few seconds. The function becomes active and can be used the next time the vehicle is started.

After this feature is launched in the Audi e-tron, additional vehicle models and functions will follow shortly. Audi is also working on further usage and subscription models to offer its customers the greatest possible flexibility.

Shopping, streaming, staying up to date—Amazon Alexa

Upon request, the Audi e-tron can be equipped with Amazon's Alexa voice service. This way, customers can enjoy many functions and services that they also use at home or with other end devices that are compatible with Alexa. The cloud-based service is integrated into the MMI operating system—no smartphone is necessary. As soon as the driver has activated voice control and said the activation word "Alexa," the LTE module in the MMI system establishes the connection via an Audi back-end and sends the queries to the Amazon servers. The requested information is played back through the car's audio system.



With Alexa, e-tron drivers can get information on the news, weather, and current scores of sports events. They can order groceries or add items to their task list without taking their hands off the wheel or their eyes off the road. Alexa streams music and audiobooks and provides access to over 50,000 Alexa Skills. The smart home control allows users to lock doors in the house, adjust the lighting, and close the garage door from within the car. Because the voice service is cloud-based, Alexa learns new things continuously, which allows it to adapt to the user even better.

Intelligent: The e-tron route planner

The Audi e-tron offers a special connect service: The e-tron route planner. Customers can use it in the myAudi app. As an alternative, the service can also be used in the MMI system in the car. In both cases, the appropriate route is shown with the required charging points. The navigation system considers not only the battery's current charge but also the traffic situation, and includes the required charging duration in its arrival time calculation. The e-tron route planner prefers DC fast-charging stations for calculating the optimum route according to user specifications. Needless to say, the route planner also includes all charging points from an up-to-date database into its calculations. Information on the remaining range is shown in the Audi virtual cockpit during the journey; the driver can have it displayed as a graph in the form of a range carpet. Alternatively, customers can also access the topography-dependent range around their current location in the navigation map. Charge planning is continuously updated to the prevailing conditions. For example, a new suggestion is made if a targeted DC fast-charging station can no longer be reached. Charge planning is synchronized between the display in the car and in the myAudi smartphone app. During an active charge process, it displays the remaining charging time and the battery's current charge status.

With the myAudi app, customers can plan, remotely control, and monitor charging processes and the pre-entry climate control of the Audi e-tron on their smartphone. They can set a departure time, for example, so that the electric SUV is charged and/or heated/cooled at the desired time. Customers can select preferred zones in the car to be heated/cooled and activate the seat, steering wheel, and rear window heaters on cold winter days.



On-the-road charging without obstacles: The e-tron Charging Service

Audi's own charging service, the e-tron Charging Service, provides e-tron customers with easy access to more than 72,000 charging points in 16 countries in Central and Western Europe. Whether AC or DC, 11 kW or 150 kW—a single card is all customers need to start the process. To use the e-tron Charging Service, customers must register on the myAudi portal and conclude an individual charging contract. Automatic billing is carried out bundled and centrally via this contract at the end of the month. In the myAudi portal, customers can not only view current invoices, but also the current charging history of their Audi e-tron and manage the concluded charging contract.

In the USA, Audi is working together closely with Electrify America. Audi is also cooperating with Amazon in the USA to offer e-tron customers a strong partner for the installation of the charging equipment in their homes. The Plug & Charge function makes charging even more convenient: The Audi e-tron uses state-of-the-art cryptographic procedures to authorize itself at charging terminals and enable them—a card or app is no longer necessary. This requires a valid charging contract (Europe: e-tron Charging Service, USA: Electrify America). This function will become available in the course of 2019. Customers can also use Plug & Charge privately to unlock their “connect” charging system. This then eliminates the need to enter a PIN as protection against unauthorized use.

Reliable and intelligent charging at home

Audi offers various solutions for charging in the garage at home: The standard “compact” mobile charging system can be connected to both domestic and industrial sockets. It allows a charging power of up to 11 kW. The optional “connect” charging system doubles the charging power to as much as 22 kW. The second on-board charger required for this will become available as an option in the course of 2019. The “connect” charging system also offers intelligent charging functions, such as charging at times when electricity is cheaper or documenting the charged energy in myAudi.



In combination with a compatible home energy management system (HEMS), the “connect” charging system offers additional functions such as the optimization of the charging process with regard to the use of self-generated solar power, provided that the house is equipped with a photovoltaics system. In combination with a HEMS, the customer is also protected in the event of a blackout. The customer always charges with the maximum available capacity that the home electrical system and the car allow. The charging system also considers the power requirements of other consumers to avoid overloading the home electrical system and thus tripping the master breaker. Upon request, the Audi partner will set customers up with a certified electrician who will check the electrical installation in their house, provide advice on what would be the best possible charging solution, and will also install the charging equipment upon request. In selected markets, Audi will also provide green electricity offers for charging at home in collaboration with local energy suppliers.

Further information can be found [here](#).

Aerodynamics in the electronic age: Virtual exterior mirrors in the Audi e-tron

The virtual exterior mirrors are celebrating their world premiere in a series production car in the Audi e-tron; they are both a visual and aerodynamic highlight. Their flat support incorporates a small camera with a resolution of 1,280 x 1,080 pixels at its hexagonal end. Image brightness is adjusted automatically for the ambient conditions, such as when driving through a tunnel. A heating function protects the camera from misting over or freezing. Each support also incorporates an LED indicator and optionally a TopView camera. Compared with standard mirrors, the virtual exterior mirrors reduce the width of the Audi e-tron by 15 centimeters (5.9 in). They can be folded manually like conventional exterior mirrors.

Inside the car, the camera’s digitally processed images are displayed on high-contrast OLED displays. These have a diagonal of 7 inches, a resolution of 1,280 x 800 pixels, automatic brightness adjustment, and proximity sensor technology. If the driver moves their finger toward the surface, symbols are activated with which the driver can reposition the image. A switching function allows the driver to also adjust the virtual passenger-side mirror.



The displays adjust automatically to three driving situations: highway, turning, and parking. The highway view appears when the driver is traveling at a speed above 90 km/h (55.9 mph) and the navigation data reports that the vehicle is on the highway. The field of vision is reduced so that the driver can better estimate speeds when driving fast—other vehicles then appear larger in the display. If the driver signals an intention to turn or change lanes by indicating, the indicator view extends the image detail on the relevant side. This reduces the blind spot. If the driver selects reverse, the curb view improves visibility for maneuvering and parking. The image is extended downward—similar to the automatic lowering function with a conventional exterior mirror. The display visualizes the turn signal as a green contour on its outer frame and also displays notifications from the Audi side assist lane-change assistant and the exit warning.

Of course, the Audi e-tron also offers additional connectivity highlights. Some examples are shown here:

- ▶ [Modular infotainment platform 2+ \(MIB 2+\)](#)
- ▶ [Natural voice control on the basis of the modular infotainment platform 2+ \(MIB 2+\)](#)
- ▶ [Audi connect](#)

Swarm Intelligence: The Car-to-X principle

The car-to-x technologies developed by Audi open up numerous new possibilities for making driving safer, more relaxed, and more intelligent. Cars that are networked together can warn one another about hazards, for example.

C-V2X: Audi on the data highway

The closest networking between road users possible is essential for autonomous driving of the future. When cars, motorcycles, and commercial vehicles exchange data among each other and with the infrastructure in real time, everyone will be traveling safely, comfortably, and efficiently. Audi is working together with strong partners to develop a networking technology called “Cellular Vehicle to Everything” (C-V2X). The technology can use both today’s mobile network and the future 5G network; the transmission times are in the millisecond range.



At the CES, Audi will demonstrate the state of development on the basis of a cross-brand showcase together with Ducati, Ford, and Qualcomm. The aim here is to defuse dangerous situations, for example when making a left turn, at intersections with poor visibility, or as a warning when vehicles driving ahead brake heavily. All participating vehicles, including two Audi Q8s (combined fuel consumption in l/100 km: 6.8 – 6.6**; combined CO₂ emissions in g/km: 179 – 172**), will send their position data to the other vehicles; their instrument clusters will display noticeable information messages if the situation is critical. A new use case for the C-V2X communication affects the 4-way stop intersections frequently found in the USA. Here, the vehicles communicate with one another independently and specify when each car is to drive—in accordance with the applicable traffic rules. The vehicles do this ad hoc: They use the position data of all vehicles involved to calculate the specified order and confirm the calculations with one another. The information gained is used to show the drivers when they can cross the intersection.

At close range, C-V2X communication takes place directly from device to device. At a distance, it uses the mobile network, which enables participants and the infrastructure to inform each other early on and across many miles.

The Car-to-X Service Portfolio

In most Audi models, the Audi connect offer integrates multiple car-to-X services that use the swarm intelligence of the Audi fleet. Cars that are equipped with this feature warn each other of hazardous spots such as fog or black ice, and report current speed limits.

On-street-parking, a further service, makes looking for a parking space easier. The cars in the swarm report to the servers in the cloud when they pull into and out of a parking space. An algorithm uses this information and statistical models to calculate the number of available parking spaces on the roadside. Drivers receive information on their chances of finding a spot via a display in the navigation map on the MMI display. Depending on the likelihood of finding open spots, the corresponding street is marked on the navigation map either in green if the likelihood is high, in yellow if there is a medium chance, or in orange if the likelihood is low.

Audi offers a further car-to-X service in selected cities on the US market: Online Traffic Light Information. When the vehicle approaches a traffic light which is connected to the service, drivers can see in the Audi virtual cockpit or the head-up display whether they will reach the light while it is still green if they drive at the permitted speed. If this is not the case, the service counts down the time until the next green phase; this lets drivers know that they can take their foot off the accelerator pedal sooner. Audi is working with project partner Traffic Technology Services TTS on the traffic light information. TTS processes the data of the traffic light computers and sends it to the Audi vehicles via the mobile network.



New Communication channels: Lighting technologies of the future

The lighting technologies from Audi are a defining element of the vehicle design; they combine visual fascination and pure high-tech. At the CES, the brand with the four rings will offer a glimpse into the future—to lighting that customers can configure themselves and technologies that are beneficial to safety on the road.

With the LUX (Light Urban eXperience) showcase, Audi will open a window into a future where there will be many self-driving cars on the roads. Its purpose is to increase safety on the road and to give other road users, pedestrians and cyclists in particular, a feeling of trust. The LUX concept, which will be displayed with a 1:3 model at the CES, translates human communication behavior into technical expressions that can be understood intuitively. The model shows a large sedan whose long roof dome runs seamlessly from the front to the rear and has numerous small light spots shining on it. They form a net that moves around constantly, thereby indicating that the car is alert. The central topic is communication with pedestrians and cyclists whom the car detects using its on-board sensor system. For example, if the vehicle is standing at a crosswalk, there is a bright green light in the area where the pedestrian is. It instructs the pedestrian to cross the road and accompanies them. If, in a different situation, the pedestrian were to stop walking, the light shines red; in addition, a stop sign or the palm of a hand can be displayed on the windscreen. Contact with cyclists is similar: A green light at the side indicates that they have been noticed and can pass.

The LED daytime running light signature is an important distinctive feature of all Audi headlights. Visitors can use a design on demand function to design it themselves on a tablet. On the showcase model, their drafts will be transmitted to the front of the exhibited vehicle by means of an animation. During the 360 degree “flight” around the car, visitors will also see that the signature was also integrated in the rear of the car automatically.

A matrix OLED exhibit will also be on display. This is a three-dimensional arrangement of 60 OLED units like the ones optionally installed in the rear lights of Audi’s flagship, the A8. Each of these ultra-thin lamps is divided into multiple segments. Similar to the design on demand function, visitors can design a static and an animated signature on the tablet that then springs to life in real time on the OLED sculpture.



The digital matrix LED headlight showcases the next generation of light from headlights. It divides the light into numerous tiny pixels and illuminates the road with a new type of precision and resolution. A similar form of the technology is used in many video projectors. Each headlight contains a matrix of more than one million micromirrors whose edge length is just a few hundredths of a millimeter. With the help of electrostatic fields, each individual mirror can be tilted separately up to 5,000 times per second.

The digital matrix LED headlight allows Audi to generate the ideal illumination for every driving situation. Targeted light that illuminates the road as if there were a carpet rolled out in front of the car helps drivers to estimate curves and keep within the lane. In construction sites, the lighting function provides assistance by displaying the vehicle width on the lane. The high-resolution light can relieve, inform, and warn drivers; it can highlight important traffic signs and avoid other road users from being dazzled with surgical precision. The next generation of headlights offer a great improvement to the safety of drivers and all other road users around them. For example, relevant information for pedestrians and cyclists can be projected onto the road.