

Toyota's New "LQ" Wants to Build an Emotional Bond with Its Driver

Onboard Artificial Intelligence Agent "Yui" delivers personalized driving experience

Toyota-developed SAE Level 4 equivalent automated driving

LQ to be displayed at "Future Expo" special exhibition of the 2019 Tokyo Motor Show

Test drive experience available from June to September 2020 in Tokyo

Toyota City, Japan, October 11, 2019—Toyota Motor Corporation (Toyota) today announced the "LQ", a concept vehicle that leverages advanced technology to build an emotional bond between car and driver. The next generation of the Toyota "Concept-i", a concept vehicle first exhibited at the 2017 Consumer Electronics Show, LQ is equipped with automated driving capabilities and "Yui," a powerful artificial intelligence-powered interactive agent designed to learn from the driver and deliver a personalized mobility experience.



"In the past, our love for cars was built on their ability to take us to distant places and enable our adventures," said LQ development leader Daisuke Ido. "Advanced technology gives us the power to match customer lifestyles with new opportunities for excitement and engagement. With the LQ, we are proud to propose a vehicle that can deliver a personalized experience, meet each driver's unique mobility needs, and build an even stronger bond between car and driver."

As a mobility company, Toyota believes that when people are free to move, anything is possible. This vision is built on an understanding that mobility goes beyond physical transportation to include the human need to be moved and engaged emotionally.

LQ follows this philosophy under a core development theme of "Learn, Grow, Love." Yui and LQ's automated driving technology, both developed in partnership with Toyota Research Institute (TRI), combine to create a unique mobility experience that builds the relationship between vehicle and driver by learning from and responding to individual preferences and needs. The name expresses Toyota's hope that this approach will "cue" the development of future vehicles that enhance the relationship between car and driver.

LQ will be on public display at the "Future Expo", a special exhibition of the 2019 Tokyo Motor Show¹ from October 24 to November 4. In addition, Toyota today announced "Toyota Yui Project Tours 2020", a public test-drive event scheduled to run from June to September 2020. The public will have the opportunity to register for a chance to be selected to experience the LQ and the "Yui" AI. By using a smartphone app in advance to provide their interests and preferences, selected participants will join a test drive of the "LQ" with "Yui".

More details for the Toyota Yui Project Tours 2020 will be announced on a dedicated website: <https://toyota-yuiproject.com/en/>

Main Features

The main features and technologies of the LQ include:

1. Yui Mobility Expert and AI Agent

LQ features an on-board artificial intelligence agent named "Yui" that provides a personalized mobility experience based on the driver's emotional state and alertness. In order to ensure safety and comfort, the AI can engage with the driver using interactive voice communications, in-seat functions designed to increase alertness or reduce stress, in-vehicle illumination, air conditioning, fragrances and other human-machine interactions (HMI). Yui can also select and play music based on the driving environment and provide real-time information on topics of interest to the driver.

In addition to research conducted at TRI, Toyota received support from the following companies in the development and implementation of Yui:

- JTB Corporation: Provided facility information and driving routes suitable to meet customer preferences;
- AWA Co., Ltd.: Offered streaming music suitable for vehicle driving routes and customer preferences
- NTT DoCoMo, Inc.: Provided a high-speed and stable communication environment by installing a 5G base station at the test drive base

Going forward, Toyota will continue to work on further expanding Yui's implementation through integration with other products such as smartphones.

2. Technology designed to provide safety, peace of mind, and a comfortable mobility experience

i) Automated Driving: The LQ is equipped with an SAE² Level 4 equivalent automated driving function.

ii) Automated Valet Parking System (Jointly developed with Panasonic Corporation)

The system eliminates the need to search for parking spaces by automatically driving between a drop-off spot and an assigned parking space in nearby parking lot, improving accessibility for those with mobility limitations including seniors, people with physical disabilities, pregnant women, customers with infants, and anyone who has difficulty parking. The system also maximizes space in the parking lot by reducing clearance between adjacent vehicles to 20 centimeters.

Automated parking uses an on-vehicle system that identifies the current position of the vehicle using multiple cameras, sonar and radar, 2D road mapping, cameras installed in the parking lot and a control center. Vehicle sensors and parking lot cameras also monitor for other vehicles and pedestrians on the automated driving route, automatically stopping the vehicle when another vehicle or a pedestrian is detected.

iii) AR-HUD (Jointly developed with Panasonic Corporation)

LQ's Augmented Reality Head's Up Display (AR-HUD) uses Augmented Reality (AR) to expand the information display area of the Head's Up Display (HUD), supporting safe driving by reducing driver eye movement.

Driving information such as lane warnings, road signs, and route guidance can be displayed in a three-dimensional and easy-to-understand manner over the scenery seen through the windshield. The system helps keep the driver's eyes on the road thanks to a large screen display (equivalent to 230 inches) that has a depth of 7 m to 41 m ahead of the vehicle.

iv) Seat with alertness and relaxation functions (world-first) (Jointly developed with Toyota Boshoku Corporation)

LQ's advanced seating system consists of multiple inflatable air bladders embedded into the seat with an in-seat air conditioning system to help keep the driver awake or relaxed depending on the driving situation.

When the system recognizes that the driver is tired, it inflates the air bladder in the seat back to support an upright sitting posture and directs cool air from the ventilation system located in the seat.

When conditions allow the driver to relax, such as in automated driving mode, the air bladder in the seat back gradually inflates and contracts to encourage abdominal breathing.

3. Other advanced equipment and technology

i) New HMI functions

LQ uses the roof and floor mat areas as an intuitive communications platform to share information between the vehicle and passengers. Embedded lighting displays different colors to indicate automated or manual driving mode, and lights up different foot wells to indicate which passenger Yui is addressing.



LQ can also communicate information such as road surface conditions to people inside and outside of the vehicle using the Digital Micromirror Device (DMD) installed in its headlights. The system can activate one million tiny embedded mirrors to project complex figures on the road ahead.



- ii) Organic LED meter display (Toyota's first)
A first for Toyota, LQ's dashboard and meters are displayed using organic LEDs (OLEDs). The advanced instrument panel design wraps around the driver while ensuring high visibility.

- iii) Air purification coating (Jointly developed with Aisin Chemical Co., Ltd. and Cataler Corporation)
LQ features a newly developed catalyst coating that decomposes ozone into oxygen on the radiator fan, allowing ozone near the ground surface, a cause of photochemical smog, to be decomposed as the vehicle moves. Toyota has measured the effect of the coating as purifying about 60 percent of ozone contained in 1,000 liters of air over the course of an hour drive.

Toyota expects this technology to help clean harmful emissions like ozone from the air during drives and is considering the coating for use in commercial vehicles in the future.

4. Design

The LQ cabin is designed with a futuristic, forward-projecting silhouette that puts Yui at the center of the instrument panel, with lines that flow from the inside of the vehicle out across its exterior.

The minimalist interior is smooth and sleek, with key elements like air conditioner vents hidden behind invisible registers. The 3D-printed center console is reinforced using the design technique of topology optimization, which provides optimal strength and supports an advanced vehicle interior with fewer support structures visible to the driver. The exterior doors feature glass that seamlessly connects with the interior of the vehicle, creating an integrated, elegant design.

LQ Main Specifications

Length / Width / Height	(mm)	4,530 / 1,840 / 1,480
Wheelbase	(mm)	2,700
Occupancy	(Persons)	4
Powertrain		BEV
Vehicle weight	(kg)	1,680
EV cruising rang	(km)	Approximately 300

*1 The special invitation days is on October 24; the show is open to the general public from October 25 to November 4.

*2 SAE Level references can be found [here](#)

View additional Tokyo Motor Show 2019 news releases, images, and more here:

<https://global.toyota/en/mobility/toyota-brand/features/tms/2019/>