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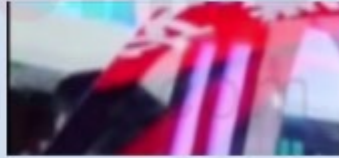
Global and China Automotive Smart Glass Research Report, 2024

Sept. 2024

Research on automotive smart glass: How does glass intelligence evolve

ResearchInChina has released the Automotive Smart Glass Research Report 2024. The report details the latest advances in dimming glass and glass antenna technologies in automotive smart glass, analyzes typical vehicle models, summarizes the layout and market share of suppliers, and predicts future development trends.

As an important part of automotive intelligent technology, automotive smart glass (including dimming glass, glass antennas, window intelligent information displays and touch-responsive glass) is gradually changing people's riding experience. As per the installation of automotive smart glass, the Automotive Smart Glass Research Report 2024 focuses on "smart dimming glass" and "glass antennas".

Smart dimming glass	Glass antenna
<p>Smart dimming glass is a new type of special optoelectronic glass formed by compounding a liquid crystal film into the middle of two layers of glass and bonding them under high temperature and high pressure. In the automotive field, there are four major types of dimming glass: polymer dispersed liquid crystal (PDLC), suspended particle devices (SPD), electrochromic (EC) and dye liquid crystal (DLC).</p>	<p>Glass antenna cleverly integrates antenna functions on automotive glass. It receives and transmits signals by embedding fine metal wires, printing conductive patterns, or attaching transparent conductive films to achieve many functions such as short-range communications, radio frequency recognition, V2X communications, and global positioning and navigation.</p>
<p>The third-generation Mercedes-Benz SLK is equipped with Magic Sky Control</p>	<p>Fuyao - 5G antenna glass</p>
	

Source: ResearchInChina

The Increase in Panoramic Canopy Installations Drives Higher Demand for Smart Dimming Glass

Driven by the demand for vertical space utilization of new energy vehicles and consumer demand for better cockpit experience, the panoramic canopy market is growing rapidly. In the first half of 2024, 1.16 million passenger cars in China were equipped with panoramic canopies, representing a 6.5% increase compared to the same period last year and accounting for 12.0%.

Against this background, the widespread application of panoramic canopies has encountered a severe challenge - dimming and heat insulation. With its unique advantages, smart dimming glass can meet the rigid market demand. More and more OEMs are offering smart dimming glass as a high-end or optional feature when launching models equipped with panoramic canopies, aiming to provide consumers with a more flexible, comfortable and energy-saving riding environment.

Installation and Application of Smart Glass on New Models, 2024 (partial)

OEM	Model	Launch time	Dimming glass Installation position	Dimming glass Standard/optional	Supplier	Technology route	Vehicle price (RMB)
Dongfeng Voyah	2025 FREE	June 2024	Canopy	Optional (RMB13,000)	Fuyao Glass	PDLC	RMB228,900-266,900
GAC Toyota	2024 Venza	June 2024	Canopy	Standard for the extreme version, not available for other versions	Fuyao Glass	PDLC	RMB216,800-271,800
BYD	Sea Lion 07 EV	May 2024	Canopy	Standard for the standard version, optional for other versions (RMB6,600)	Fuyao Glass, Ambilight	EC	RMB189,800-239,800
BYD	Seal	March 2024	Canopy	Standard for the top configuration version, optional for others	Fuyao Glass	EC	RMB179,800-249,800
ZEEKR	ZEEKR 001 GB/T 19056-2024	February 2024	Canopy	Standard for the top configuration version, optional for others (RMB16,000)	J1 AI Glass	SPD	RMB277,800-339,200
NIO	2024 ET7	April 2024	Canopy	Standard for the executive signature version, optional for others (RMB9,500)	Fuyao Glass, Ambilight	EC	RMB428,000-516,000
NIO	2024 EC6	February 2024	Canopy	Optional (RMB9,500)	Fuyao Glass, Ambilight	EC	RMB358,000-416,000
NIO	2024 ET5 Touring	February 2024	Canopy	Optional (RMB9,500)	Fuyao Glass, Ambilight	EC	RMB298,000-356,000
NIO	2024 EC7	February 2024	Canopy	Optional (RMB9,500)	Fuyao Glass, Ambilight	EC	RMB458,000-548,000
Polestar	Polestar 4	April 2024	Canopy	Standard	AGP	PDLC	RMB333,900-399,900
Changan	2024 Avatr 12	March 2024	Canopy + front windshield	Standard for the top configuration version	Ambilight, Fuyao Glass	EC	RMB265,800-400,800
Porsche	2024 Taycan	April 2024	Canopy	Optional (RMB31,400-46,800) except for the Turbo GT with Weissach Package	SGS (speculated)	PDLC	RMB1.008-1.998 million

Source: ResearchInChina

Avatr 12 is Equipped with a Front Intelligent Light-sensitive Color-changing Windshield and an Antelligent Light-sensitive Panoramic Canopy

The top configuration version of Avatr 12 is equipped with an intelligent light-sensitive front windshield and an intelligent light-sensitive panoramic canopy, which can effectively block the sun, insulate heat and protect privacy while ensuring an ultra-wide field of view. Among them, the intelligent light-sensitive color-changing front windshield uses 5-layer laminated glass with adaptive light-sensitive function, with a lighting area of up to 2.57 square meters, low energy transmittance and strong ultraviolet defense; the intelligent light-sensitive panoramic canopy uses 7-layer laminated canopy, which supports Zone control enables full color change within 90 seconds. The 7-layer laminated intelligent light-sensitive panoramic canopy supports zonal control, and changes color within 90 seconds.

All-sky intelligent light-sensitive color-changing dome

Front intelligent light-sensitive color-changing windshield/panoramic canopy

Front and rear zone control, 5-level adaptive brightness adjustment



Source: Avatr

NIO ET7 is equipped with a zoned smart dimming panoramic canopy

The 2024 ET7 executive signature version is equipped with a zoned smart dimming panoramic canopy, which uses EC light sensing technology to intelligently perceive ambient light, actively adjust shading, provide sun protection and heat insulation, and protect privacy. It can adjust the front and rear of the canopy separately. It supports four levels of independent adjustment for the front and rear zones, and can block 99.9% of ultraviolet rays and 86.3% of heat.



Source: NIO

The application of automotive smart glass is accelerating and expanding from sunroofs to all auto parts

At present, smart dimming glass is mainly used in automotive sunroofs/canopies. As the technology matures, dimming glass has gradually been integrated into core parts such as door glass, rear corner windows, front/rear windshields, etc.; and glass antenna technology has also been applied to sunroofs, front windshields, door glass, etc., demonstrating its versatility and high integration.

Parts That Can Be Integrated with Automotive Smart Glass

Auto glass product	Smart dimming glass	Glass antenna
Skylight/panoramic canopy	✓ <ul style="list-style-type: none"> Model supported: ID.7 VIZZION Solution: SkyView intelligent light-sensitive canopy 	✓ <ul style="list-style-type: none"> Model supported: ZEEKR 009 Solution: Satellite communication antenna glass 
Door glass	✓ <ul style="list-style-type: none"> Model supported: New Hongqi H9 Solution: Rear windows 	✓ <ul style="list-style-type: none"> Model supported: Halo.Car Solution: 5G-SUB6 
Front windshield	✓ <ul style="list-style-type: none"> Model supported: Avatr 12 Solution: Combination of front intelligent light-sensitive windshield and panoramic canopy 	✓
Rear corner window	✓ <ul style="list-style-type: none"> Model supported: ZEEKR 009 Grand Solution: Rear side windows and rear corner windows 	—
Rearview mirror	✓ <ul style="list-style-type: none"> Model supported: 2024 NIO ES7 Solution: All-solid-state EC automatic anti-glare rearview mirror 	—
Rear windshield	✓	✓
Lighting	✓	—

Source: ResearchInChina

The rear windows of the new Hongqi H9 feature stepless dimming

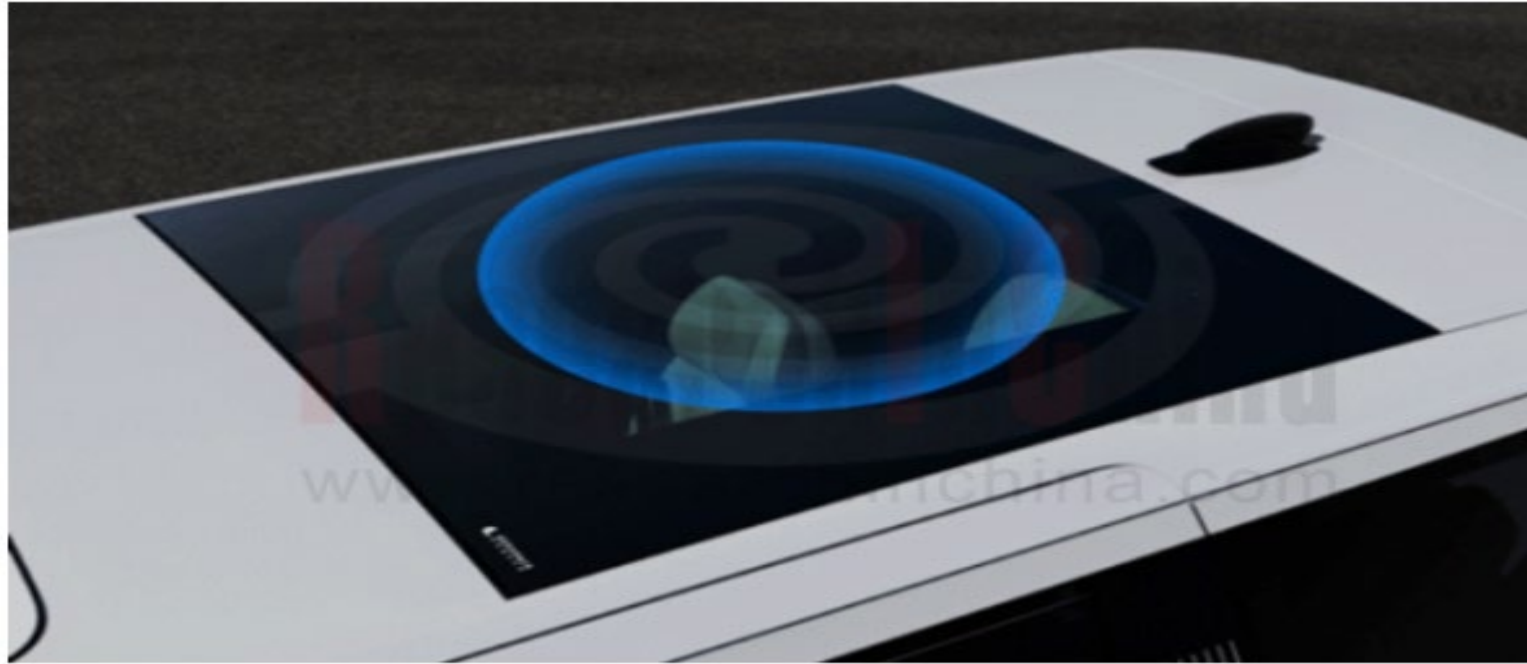
The new Hongqi H9 equipped with stepless LC dimming glass supports wide temperature intelligent dimming from -20°C to 85°C and can block 99.9% of ultraviolet rays and 99.5% of visible light. After the dimming function is turned on, the brightness of the left/right windows can be manually adjusted and the brightness can be stored. In addition, LC dimming glass offers ultimate privacy, ensuring that no one outside the car can peek into the car, while the view inside the car is unobstructed. It surpasses traditional gray glass to perfectly protect privacy even when the screen is always on at night.



Source: Smart Auto Club, Hongqi

ZEEKR 009 Installs Satellite Communication Antenna Glass on the Sunroof

The antenna is integrated into the sunroof of ZEEKR 009 through metal coating technology, which not only achieves heat insulation and sun protection, but also enables high-precision automotive satellite communication. In emergency situations, such as when the ground network is damaged, the vehicle can autonomously alarm through the satellite antenna.



Source: Fuyao Glass

How do OEMs and suppliers expand intelligent glass

The global automotive glass market is highly concentrated, with four leading companies accounting for approximately 90% of the market. According to public information, China-based Fuyao Glass ranked first with about 34% market share in 2023, followed by AGC with 23%, NSG with 18% (in FY2024) and Saint-Gobain with 14%.

Business Layout and Market Share of Automotive Smart Glass Suppliers (Part)

Supplier	Fuyao Glass	AGC	NSG (FY2024)	Saint-Gobain	Xinyi Glass
Established	1987	1907	1918	1665	1988
Main business/products	<p>➤The company is principally engaged in providing total solutions of safety glass and automotive accessories for various transportation vehicles, including the design, manufacture, and sale of automotive grade float glass, automotive glass, locomotive glass, luggage racks, vehicle window trims, and provision of relevant services.</p>	<p>➤Its business covers architectural glass, automotive glass, electronics, chemical, life science and ceramics</p>	<p>➤The main business includes architectural glass, automotive glass and technical glass. The automotive glass business includes new automotive glass OE (including dimming glass), repair glass, and industrial transportation equipment glass.</p>	<p>➤The company produces and sells automotive and architectural glass. The Group is organized into 5 business sectors: Flat Glass, Packaging, Construction Products, Building Distribution, and High-Performance Materials.</p>	<p>➤The company is engaged in float glass, automotive glass, energy-saving building glass, photovoltaic glass, new energy power stations, etc.</p>
Revenue in FY2023/2024	RMB33.161 billion	JPY2,019.3 billion	JPY832.5 billion	EUR47.9 billion	HKD26.7985 billion
Automotive glass revenue in FY2023/2024	RMB29.887 billion	JPY499.7 billion	JPY417.6 billion	EUR3.8 billion (Automotive glass is included in Performance Solution - Mobility)	HKD6 billion
% of automotive glass revenue in FY2023/2024	90.1%	25.0%	50.0%	7.7%	22.3%
Share in global automotive glass market in FY2023/2024	About 34%	About 23%	About 18%	About 14%	About 6%
Smart dimming glass	<ul style="list-style-type: none"> • PDLC dimming glass • EC dimming glass • LC dimming glass • Thermochromic glass 	<ul style="list-style-type: none"> • Digital Curtain (TM) 	<ul style="list-style-type: none"> • Instant light-controlled glass: UMU Smart Window • Sundym TM Select 	<ul style="list-style-type: none"> • EC dimming glass • PDLC dimming glass: AmpliSky® 	—
Smart glass antenna	<ul style="list-style-type: none"> • 5G glass antenna • GNSS glass antenna • V2X glass antenna 	<ul style="list-style-type: none"> • 5G-SUB6 glass antenna 	—	<ul style="list-style-type: none"> • SGS glass antenna 	<ul style="list-style-type: none"> • Electric heating antenna safety glass

Source: ResearchInChina

Automotive Smart Glass Expansion Cases of OEMs & Suppliers

With the accelerated development of automotive intelligence and connectivity, the manufacturing and research and development of automotive smart glass which is a core component of the vehicle is no longer limited to glass suppliers. OEMs are also actively involved, forming an ecosystem in which suppliers and OEMs participate. In this ecosystem, suppliers leverage their excellent manufacturing capabilities and professional technologies to produce high-performance smart glass products; OEMs vigorously join in the research and development process, gain insights into changes in market demand, and meet users' growing demand for personalization and customization, further broadening the application scope of automotive smart glass.

Automotive Smart Glass Expansion Cases of OEMs & Suppliers

	Enterprise	Smart glass features	Introduction
Supplier	Fuyao Glass	Dimming technology + Starry Dome/Projection	<ul style="list-style-type: none"> Relying on its advantages in electronically controlled glass technology, Fuyao Glass has launched smart display glass which can not only project text, patterns and other information, but can also act as a screen to display images and play videos, greatly enriching the in-car entertainment experience.
	Saint-Gobain	Heated glass, etc. + Glass antenna	<ul style="list-style-type: none"> All SGS heated glass solutions, whether heated by wire or coating, are antenna compatible.
	Webasto	Dimming technology + Solar power generation	<ul style="list-style-type: none"> At the Auto Shanghai 2023, Webasto realized solar power generation on a large-area panoramic sunroof. The regenerated energy can not only increase the cruising range, but also provide energy for the electric heater, making the interior environment in the car more comfortable. In addition, the solar roof can also integrate dimming technology to provide sun shading and privacy protection, and create a comfortable environment inside the vehicle.
OEM	GAC Honda	Dimming glass + Automotive gaming	<ul style="list-style-type: none"> In June 2023, GAC Honda issued a patent for "a window-based vehicle interactive display method, system, device and storage medium". Based on dimming glass technology, this patent is combined with the built-in human face and gesture recognition system in the cockpit to enable somatosensory games on the rear windows.
	General Motors	Dimming technology + AR-HUD	<ul style="list-style-type: none"> On January 17, 2023, General Motors announced its patent for an "auto-dimming augmented reality (AR) windshield." The patent shows that the AR windshield uses a combination of AR HUD and a transparent windshield with intelligent adjustable transmittance. Sensors are used to detect and recognize the headlights of vehicles ahead and other bright light sources. When the system detects that the light is above a certain threshold, it will prevent glare and ensure driving safety by dimming specific parts of the windshield.
	FAW	Smart window display	<ul style="list-style-type: none"> In June 2023, China FAW announced a patent for "a method and device for displaying special effects of exterior scenes based on window display". The patent obtains the scenery information outside the window, and finally combines the image special effects in real time with the automotive computer algorithm, so that passengers can observe the scenery outside the car through the window. Special effects are added to produce extraordinary and realistic visual effects.

Source: ResearchInChina

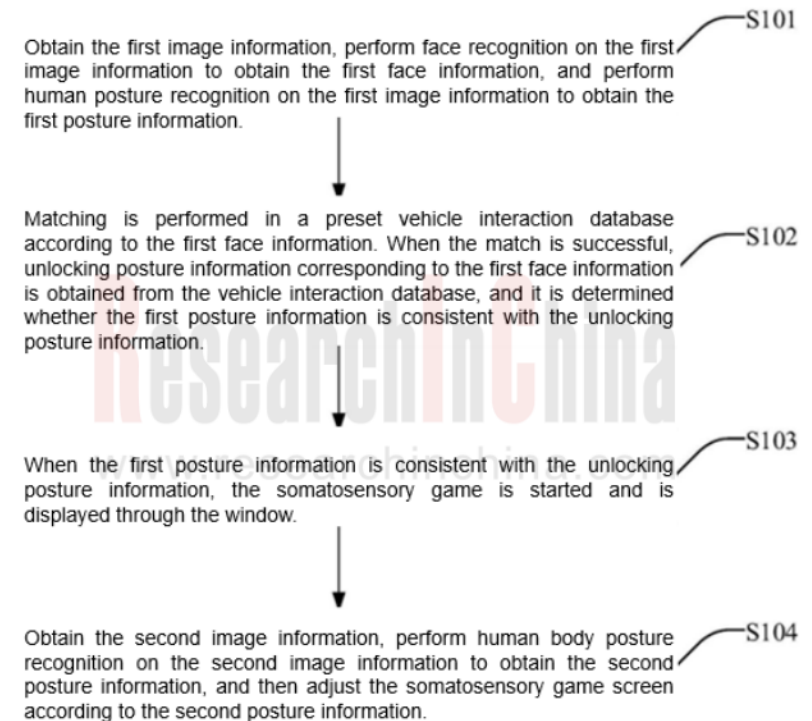
Automotive Smart Glass Expansion Cases : Fuyao & GAC Honda

The starry dome can be customized with patterns and create a romantic atmosphere with gorgeous lights. The projection canopy can display high-definition images in full color, forging an exclusive "private cinema" in the cockpit.



Source: Fuyao Glass

The window interactive display patent disclosed by GAC Honda in June 2023 uses double-layer dimming glass and double-sided OLED screen technology. Combined with the in-cockpit human recognition system, it brings an unprecedented immersive somatosensory gaming experience to rear passengers, significantly improving the interactivity and entertainment in the car.



Source: GAC Honda

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