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China L2 and L2+ Autonomous Passenger Car Research Report, 2022

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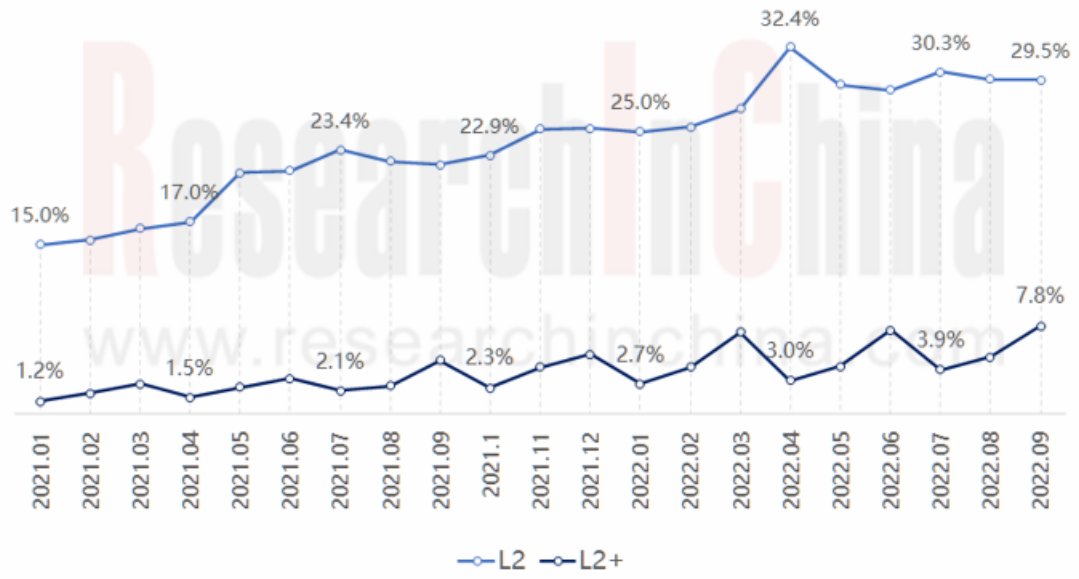
L2 and L2+ research: The installation rate of L2 and L2+ is expected to exceed 50% in 2025

So far, L2 ADAS has achieved mass production, and L2+ ADAS has seen development opportunities as the layout focus of OEMs and suppliers.

According to ResearchInChina, from January to September 2022, the L2 and L2+ ADAS installation rate of domestic passenger cars reached 33.5%, of which L2 accounted for 28.4% and L2+ 5.1%.

As Shenzhen, Shanghai, Guangzhou and other cities implement high-level autonomous driving policies and Li Auto, Xpeng, NIO and Great Wall mass-produce pilot assist functions, L2+ and higher-level ADAS will be popular quickly. It is estimated that the installation rate of L2 and L2+ ADAS will exceed 50% by 2025, of which L2+ may make up 15%.

Monthly Installation Rate of L2 and L2+ ADAS in Passenger Cars in China, 2021-2022



Source: ResearchInChina

“Multi-sensor fusion + HD maps" facilitates L2+ ADAS solutions to land

With the development of autonomous driving toward a higher level, the number of sensors in ADAS is gradually increasing. According to the statistics of ResearchInChina, L2.5/L2.9 models launched in China from January to September 2022 mainly adopt 1V5R and 6V1R1L solutions, which boast more cameras, radars and LiDARs than the mainstream 1V1R solution for L2.0.

Among them, LiDAR has become the key to the high-level autonomous driving of most automakers. Both ARCFOX αS HI and Avatr11 are equipped with three Huawei LiDARs to realize high-speed NCA and other functions. Saloon Mecha Dragon even said it will carry four LiDARs.

At present, most of the LiDAR models that have been mass-produced by OEMs mainly carry forward-looking LiDAR. However, as the application scenarios of intelligent driving systems spread from highways to cities, blind-spot-filling LiDAR has been introduced, such as FT120 released by Hesai Technology in November 2022, RS-LiDAR-E1 unveiled by RoboSense in November 2022, LDSatellite? launched by LiangDao Intelligence in May 2022, etc. In the future, blind-spot-filling LiDAR will be combined with long-range LiDAR to feature vehicle-wide perception and fill blind spots.

In addition to LiDAR, HD maps have become necessary for L2+ ADAS layout of automakers, especially for realization of assisted driving in high-speed scenarios. For example, NIO and GAC use Baidu Maps, while Xpeng and Li Auto cooperate with AutoNavi (amap.com).

Breakdown of ADAS Solutions for New Passenger Cars Launched in China (by Level and Sales Volume), January-September 2022

L2		L2.5		L2.9	
1V1R	50.3%	1V5R	82.1%	6V1R1L	41.9%
1V3R	34.0%	3V5R	9.6%	8V5R2L	30.1%
1V2R	11.6%	2V3R	3.1%	9V5R	10.3%
Others	4.1%	Others	5.2%	Others	17.7%

Source: ResearchInChina

From January to September 2022, more than 130,000 vehicles were involved with high-speed NOA solutions, and some vehicles began to adopt urban NOA solutions

NOA (Navigation on AutoPilot) is a typical function of L2+ assisted driving, and it is also the key to the transition from ADAS to FSD. It enables point-to-point autonomous driving on highways, urban expressways and ordinary urban roads. By application scenarios, NOA mainly includes high-speed NOA and urban NOA.

According to the data of ResearchInChina, from January to September 2022, more than 130,000 vehicles were involved with high-speed NOA solutions, swelling by 387.0%; meanwhile, Xpeng P5, Xpeng G9 and other models began to adopt urban NOA solutions.

High-speed NOA has been available in Tesla's models since 2018. NIO, Xpeng, Li Auto, Great Wall, GAC, ARCFOX, etc. followed suit to launch NOA featuring intelligent follow-up, intelligent lane change, automatic ramp up and ramp down, switching between main and side roads, etc. It is expected that in the next 1-2 years, a large number of new models will be equipped with high-speed NOA solutions.

Xpeng, ARCFOX and Great Wall have taken the lead in urban NOA layout. On September 17, 2022, Xpeng pushed urban NOA named "NGP" to some P5 customers in Guangzhou. On September 23, some Shenzhen-based users of ARCFOX αS HI were notified of urban NOA called "NCA". Great Wall plans to offer NOA with the official name "NOH" in Beijing and Baoding within this year. NIO and Li Auto will launch NOA in 2023.

NOA Release Schedule of Major Automakers and Models Supported in China

Automakers	2018-2019	2020	2021	2022	2023	2024
Tesla	October 2018: High-speed NOA Model: Model 3			August: Overseas testing of urban NOA		
Xpeng		October: High-speed NGP Model: Xpeng P7	September: Urban NGP Model: Xpeng P5		H1: XNGP Model: Xpeng G9	
NIO		September: High-speed NOP Model: ES6			Urban NOP	
Li Auto			December: High-speed NOA Model: Li ONE		Urban NOA	
ARCFOX				April: HIgh-speed/urban NCA Model: ARCFOX αS HI		
Great Wall WEY			August: High-speed NOH Model: WEY Mocha	April: Urban NOH Model: WEY Mocha DHT-PHEV (LiDAR version)		
GAC Aion			September: High-speed NDA Model: Aion V PLUS	January: Urban assist Model: Aion LX PLUS		
Lynk & Co			October: High-speed HWC Model: Lynk & Co 09			
IM Motors				April: High-speed NOA Model: IM L7		
Rising Auto				September: High-speed NOA Model: Rising Auto R7		
Geely				October: High-speed NOA Model: Boyue L		
ZEEKR				November: High-speed NZP Model: ZEEKR 009		
WM Motor				Upcoming high-speed NOA within the year Model: WM M7		
Leapmotor				Upcoming high-speed NAP within the year		Urban Pilot Assist
Changan Automobile					High-speed Pilot Assist	Urban Pilot Assist
Jidu Auto					High-speed/urban PPA	

Source: ResearchInChina

From highways to cities, the solution of "high-weight perception and low-weight maps" is coming out

Compared with high-speed NOA, urban NOA faces more complicated participants and scenarios, more difficult data collection and higher computing power requirements. In the context of the state's emphasis on data security, the examination and approval of the Grade A surveying and mapping qualification for HD maps has been tightened. Therefore, it is difficult for ADAS to hit urban roads on a large scale in a short time. In this case, some suppliers and automakers have introduced the urban NOA solution of "high-weight perception and low-weight maps" without reliance on HD maps.

(1) Xpeng Urban NGP

Compared with Li Auto and NIO, Xpeng acts faster in urban NGP. On September 17, Xpeng started to push urban NGP to P5 (based on XPILOT3.5) users in Guangzhou, and planned to offer it in Shenzhen and Shanghai before H1 2023. On September 21, Xpeng G9 was released, including the Max version equipped with XNGP covering all scenarios. The biggest difference between XNGP and XPILOT is that XNGP enables assisted driving in areas uncovered by HD maps.

The core perception technology of Xpeng XNGP is XNet, the next-generation perception architecture, which debuted in October 2022. It can fuse the images captured by multiple cameras in the bird's eye view (BEV) through Transformer, and output the dynamic and static information of targets.

Xpeng has cooperated with Alibaba Cloud to set up Fuyao, an intelligent computing center for autonomous driving with a computing power of 600PFLOPS, to implement urban NGP.

From highways to cities, the solution of "high-weight perception and low-weight maps" is coming out

(2) Great Wall Urban NOH

The urban NOH solution of "high-weight perception and low-weight maps", which is promoted by Haomo.AI under Great Wall, will be mass-produced for Mocha DHT-PHEV (LiDAR version) this year. With HPilot 3.0, the solution consists of 12 cameras, 5 radars, 2 LiDARs, 12 ultrasonic radars, and "Little Magic Box 3.0". Little Magic Box 3.0 was developed based on Qualcomm Snapdragon Ride, with the single-board computing power of 360TOPS, which can be upgraded to 1440TOPS.

By virtue of MANA, an intelligent autonomous driving data system developed by Haomo.AI, the Great Wall NOH integrates vision and LiDAR data on the underlying algorithm to accomplish the deep perception of space, time and sensors, so as to allow vehicles to intelligently recognize traffic lights, turn left unprotected, intelligently change lanes, intelligently avoid (static & dynamic) obstacles, etc.

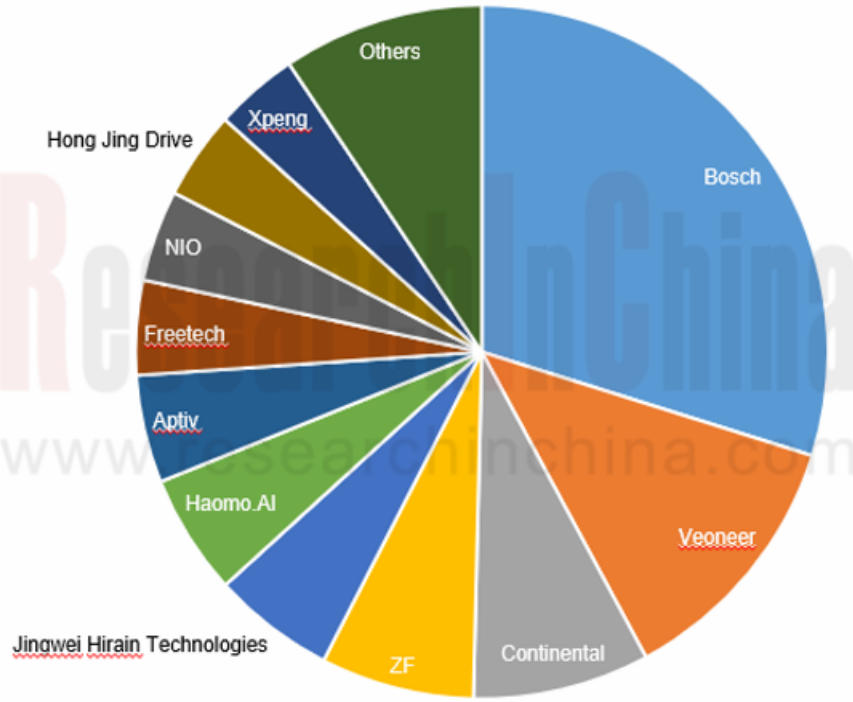
Main Functions of Urban NOH of Haomo.AI

Source: Haomo.AI

Local suppliers take the lead in launching NOA driving and parking integrated solutions to seize some market shares from foreign investors

At present, foreign investors still dominate the domestic L2 and L2+ ADAS market for passenger cars, especially Bosch, Continental and ZF in L2 ADAS market. According to the statistics of ResearchInChina, from January to September 2022, TOP4 brands in L2/L2+ ADAS market all belonged to foreign-funded enterprises, which enjoyed a combined market share of more than 60%.

Market Share of L2/L2+ ADAS Suppliers of Local Passenger Car Brands in China, Jan-Sep 2022

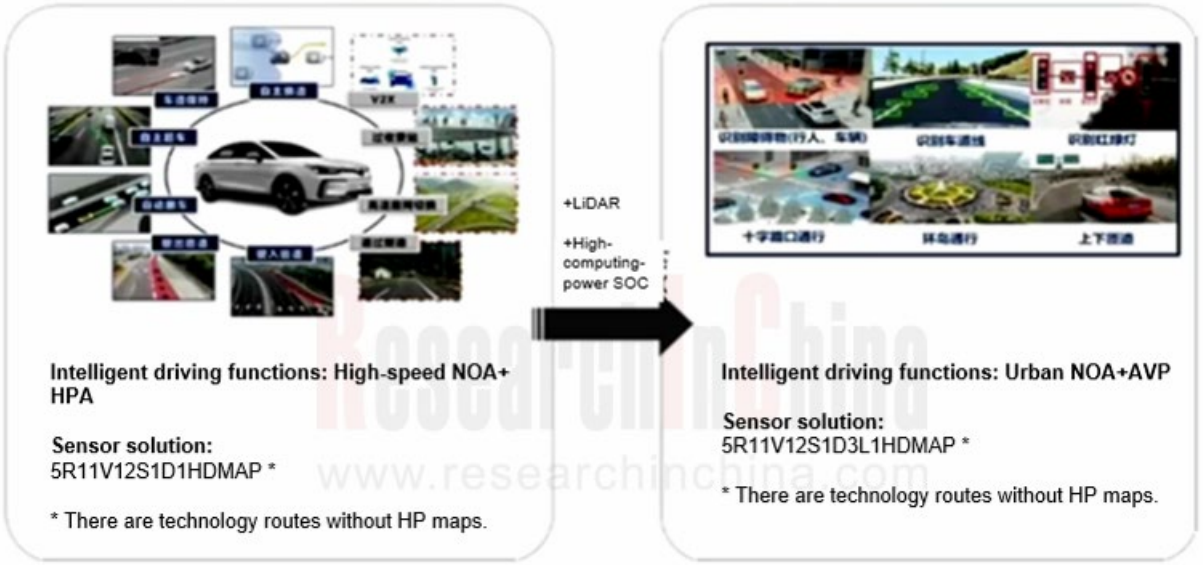


Source: ResearchInChina

Local suppliers take the lead in launching NOA driving and parking integrated solutions to seize some market shares from foreign investors

With the rising demand for advanced assisted driving, the EE architecture tends to be centralized. Local suppliers are the first to make layout and launch NOA driving and parking integrated solutions. In contrast, traditional Tier1 suppliers such as Bosch, Continental and ZF make slow progress, but some of them like Bosch have begun to exert their strength. In July 2022, Bosch cooperated with Volkswagen to jointly develop L2 assisted driving and L3 autonomous driving systems. Meanwhile, the L2+ intelligent driving solution (covering cities, viaducts, freeways and other application scenarios) developed by Bosch and WeRide together was designated, and it is expected to be mass-produced in 2023.

Evolution of NOA Driving and Parking Integrated Solutions



Source: Lin Dayang, Beijing Automotive Technology Center

Local suppliers take the lead in launching NOA driving and parking integrated solutions to seize some market shares from foreign investors

In 2022, domestic autonomous driving suppliers, including Yihang.AI, MAXIEYE, Freetech, Hong Jing Drive and so on, launched NOA driving and parking integrated solutions. Yihang.AI has offer its NOA driving and parking integrated solution to production SAIC MAXUS.

Yihang.AI's NOA driving and parking integrated solution consists of "5R11V + 12USS + perception algorithm + TDA4 domain controllers", which reduces the cost by more than 50% compared with NOA solution that has been launched. It can realize functions such as automatic overtaking, automatic road network switching, automatic ramp up and ramp down, memory parking (1,000 meters), etc., and can make NOA available on models priced below RMB150,000 through flexible hardware configuration solutions.

In July 2022, MAXIEYE unveiled MAXIPILOT?1.0 PLUS which supports NOM. It has been designated by HYCAN's new model production project.

Comparison between MAXIPILOT®1.0 and MAXIPILOT®1.0 PLUS of MAXIEYE

AD level	Function	MAXIPILOT®1.0		1.0 PLUS
		1R1V	3R1V	5R1V
L0-L2	LDW	✓	✓	✓
	LKA	✓	✓	✓
	AEB	✓	✓	✓
	FCW	✓	✓	✓
	TSR	✓	✓	✓
	ACC	✓	✓	✓
	ISL-ACC	✓	✓	✓
	TJA	✓	✓	✓
	TLR	✓	✓	✓
	AHBC	✓	✓	✓
	BSD		✓	✓
	RCTA(B)		✓	✓
	LCA		✓	✓
	RCW		✓	✓
	DOW		✓	✓
	ELK		✓	✓
L2+	FCTA(B)			✓
	ESA			✓
	ILC			✓
L2++	ALC			✓
	NOM			✓

Source: MAXIEYE

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