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China Automotive LiDAR Industry Research Report, 2022

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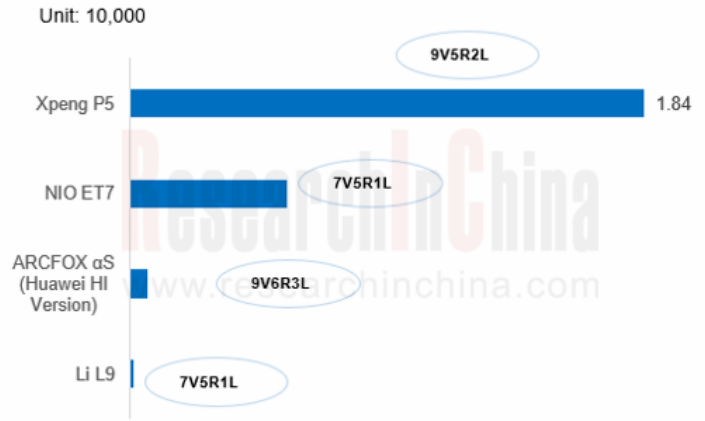
1. The mass production of LiDAR is accelerating, and the installations are expected to exceed 80,000 units in 2022

Since 2021, LiDAR industry has entered the stage of commercialization. Local OEMs have taken the lead in mass-producing a number of models, including Xpeng P5, Aion LX PLUS, NIO ET7, and Li L9.

According to the statistics from ResearchInChina, Chinese new passenger cars were equipped with 24,700 LiDAR sensors in the first half of 2022, of which 18,400 units or 74.4% was seen in Xpeng P5.

China's LiDAR Installations (by Model) and Sensor Solutions, Jan-Jun 2022



Source: ResearchInChina

In the second half of 2022, there will be more than 10 new models featuring LiDAR to be delivered in China, including Xpeng G9 and WM M7, which will spur LiDAR installations to exceed 80,000 units in the full year.

2021

- Oct Xpeng P5 **2**

2022

• Jan	Aion LX Plus	**3**
• Mar	NIO ET7	**1**
• May	ARCFOX αS (Huawei HI Version)	**3**
• Jun	Li L9	**1**
• Jun	NIO ES7	**1**
• Jul	HiPhi Z	**1**
• Jul	Neta S	**2**
• Aug	Avatr 11	**3**
• Sep	NIO ET5	**1**
• Sep	Xpeng G9	**2**
• Oct	WM M7	**3**
• H2	Saloon Mecha Dragon	**4**
• H2	Rising Auto R7	**1**
• H2	WEY Mocha	**3**
• H2	IM L7	**2 (reserved)**
• H2	Polestar 3	**1**

202X

- Jidu (ROBO-01) **2**
- Aiways Auto **1-2**
- FAW Hongqi
- BYD
- ZEEKR

2. The "rotating mirror + MEMS" technical solution is the first choice for mass production

At present, production models mainly adopt "rotating mirror + MEMS" technical solution, such as HESAI AT128, RoboSense M1, Huawei 96-channel LiDAR, Innovusion Falcon, etc...

RoboSense launched it semi-solid-state LiDAR - M1 in June 2021. Based on 2D MEMS smart chip scanning technology, it has “GAZE” function with intelligent zoom and detection distance of 150m for 10% reflectivity targets. So far, it has been designated by 40+ models. In 2022, it served GAC Aion LX Plus, IM L7, WM M7, Xpeng G9, Lotus, etc.

Huawei's 96-channel hybrid solid-state LiDAR adopts a rotating mirror solution, with a field of view of 120?x25? and a maximum detection distance of 150 meters. It has been mass-produced for ARCFOX αS (Huawei HI version), Neta S, and Avatr 11, and will be applied to other models such as Saloon Mecha Dragon which will boast 4 units located at the front, rear, and both sides of the front.

Technical Solutions of Chinese LiDAR Suppliers

Company	Mechanical	Semi-solid-state		Solid-state			FMCW
		MEMS	Rotating mirror	Prism	Flash	OPA	
HESAI	√		√(AT128)				√
RoboSense	√	√(M1)			√		
Huawei			√ (96-channel)				
Livox				√(HAP)			
LeiShen Intelligent System	√	√(CX 128 S1 for OEMs)					√
Innovusion		√(Falcon)					
Zvision		√					
Benewake	√		√				
SureStar	√				√		
VanJee Technology	√	√ (Planned in 2022)	√			√ (Planned in 2024)	
LiangDao Intelligence					√ (LDSense Satellite)		
Litra Technology	√					√	
Lorentech		√				√ (for logistics)	
Deepwater Optoelectronics	√						
RichBeam	√				√		
Tanway		√					
GENIUS PROS						√	
LuminWave						√	√
Senfoto					√		
AODTBJ							√

Source: Internet

2. The "rotating mirror + MEMS" technical solution is the first choice for mass production

In the short term, the "rotating mirror + MEMS" solution is still the mainstream for local LiDAR installations on vehicles. In the long run, solid-state solutions (flash, OPA) and FMCW LiDAR will be play main roles.

Especially, the flash solution has achieved a breakthrough. In May 2022, LiangDao Intelligence released its first self-developed flash lateral LiDAR - LD Satellite for Chinese market, with a chip-based design and a vertical field of view of 75°-90°. It will be mass-produced in the second half of 2023. In the future, **LiangDao Intelligence** will combine LD Satellite with its experience in perception development and verification testing to provide LiDAR software and hardware integrated solutions for Chinese market.

A number of enterprises have deployed OPA technology, such as **VanJee Technology, Litra Technology, GENIUS PROS, LuminWave, etc**. Among them, VanJee Technology plans to release silicon-based OPA LiDAR with a range of 30 meters in August 2022, and automotive silicon-based OPA LiDAR in June 2024.

In addition, Chinese companies such as LeiShen Intelligent System and HESAI are developing FMCW technology. In July 2022, **Aeva** announced that the first Aeries? II 4D LiDAR had been produced and shipped to customers as the world's first FMCW LiDAR delivered. This will inspire breakthroughs in FMCW technology in China.

3. Mass production and delivery capabilities should be improved comprehensively

Thanks to the definite LiDAR technology route, many Chinese suppliers have improved capacity swiftly through foundries, cooperation and self-built factories.

The "Maxwell" intelligent manufacturing center invested by HESAI with nearly US$200 million is expected to be fully put into operation in 2022, with an annual capacity of more than one million units. Innovusion cooperates with Joyson Electronics. The first automotive-grade LiDAR production line has an annual output of 100,000 units. The second production line located in Xiangcheng District, Suzhou is expected to be put into operation in 2022, with a monthly capacity of 20,000 units.

Production Line Construction of LiDAR Suppliers in China

Enterprises	Automotive-grade factories
HESAI	The "Maxwell" intelligent manufacturing center is expected to be fully put into operation in 2022, with an annual capacity of more than one million units
RoboSense	Through cooperation with Luxshare Precision and the self-built LiDAR production line, the company can produce one million units in 2022
Innovusion	Joyson Electronics, the shareholder of Innovusion manufactures LiDAR for Innovusion. The first production line has an annual output of 100,000 units. The second production line is expected to be put into operation in 2022, with a monthly capacity of 20,000 units.
Livox	It has built a fully automated LiDAR assembly line by itself, with an annual capacity of 200,000 units
Huawei	It has built its own production line, with an annual capacity of 100,000 sets
LeiShen Intelligent System	Xuzhou fully automated LiDAR production base will boast an annual capacity of 680,000 units within 5 years
VanJee Technology	Beijing Shunyi Phase II was completed in 2021, with a planned annual capacity of 300,000 units
LiangDao Intelligence	A solid-state flash LiDAR automated production line has an annual capacity of 400,000 units, supporting rapid expansion
Zvision	With an annual capacity of 50,000 units in the first phase, the second phase of self-built MEMS LiDAR production line started in 2022
Litra Technology	Covering a land area of 1,500 square meters, the production line in Baoan, Shenzhen went into operation in October 2021, with an annual capacity of over 200,000 units

Source: Internet

3. Mass production and delivery capabilities should be improved comprehensively

In addition to large-scale production, suppliers are reducing LiDAR cost and accelerating mass production and applications through hardware integration and chipization. For instance, HESAI AT128 is a long-range semi-solid-state LiDAR based on a VCSEL array (the second-generation chip is provided by Lumentum). The VCSEL array embedded in the chip replaces the traditional discrete light source to significantly slash the manufacturing cost of LiDAR.

The solid-state LiDAR of LiangDao Intelligence leverages the flash technology upgrade solution - VCSEL electric drive scanning and SPAD partition receiving technology to dramatically amplify the detection distance of flash LiDAR. Plus the design of optical lens, it offers a wide field of view.

In general, Chinese LiDAR suppliers mainly focus on cost reduction in laser transceiver module (about 60% of cost). For a long time, the technology of electronic components such as lasers and detectors has been monopolized by foreign companies. However, in recent years, some Chinese enterprises have gradually broken through technical barriers, launched automotive-grade products, and secure orders from automakers. Vertilite's VCSEL has been certified by AEC-Q102 and IATF 16949, and won the bid for a major LiDAR customer's OEM mass production project. In March 2022, the company received investment from Huawei, Xiaomi, BYD, DJI, etc.; in August, HESAI and RoboSense became its shareholders.

Fortsense began to develop LiDAR SPAD chips in 2019, successfully taped out in 2021, and received a custom order from a leading automaker in early 2022.

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Contact

Beijing Headquarters
TEL: 13718845418
FAX: 010-82601570
Email: report@researchinchina.com

Website:
www.researchinchina.com

WeChat: zuosiqiche

zuosiqiche

Chengdu Branch

TEL: 028-68738514
FAX: 028-86930659