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Automotive Ultrasonic Radar and OEMs' Parking Route Research Report, 2024

Mar. 2024

Over 220 million ultrasonic radars will be installed in 2028

1. Over 220 million ultrasonic radars will be installed in 2028.

In recent years, the installations of ultrasonic radars in passenger cars in China surged, up to 121.955 million units in 2023, jumping by 13.7% year on year. It is expected to be more than 140 million units in 2025 and over 220 million units in 2028.

Installations of Ultrasonic Radars in Passenger Cars in China, 2021-2028E



Source: ResearchInChina

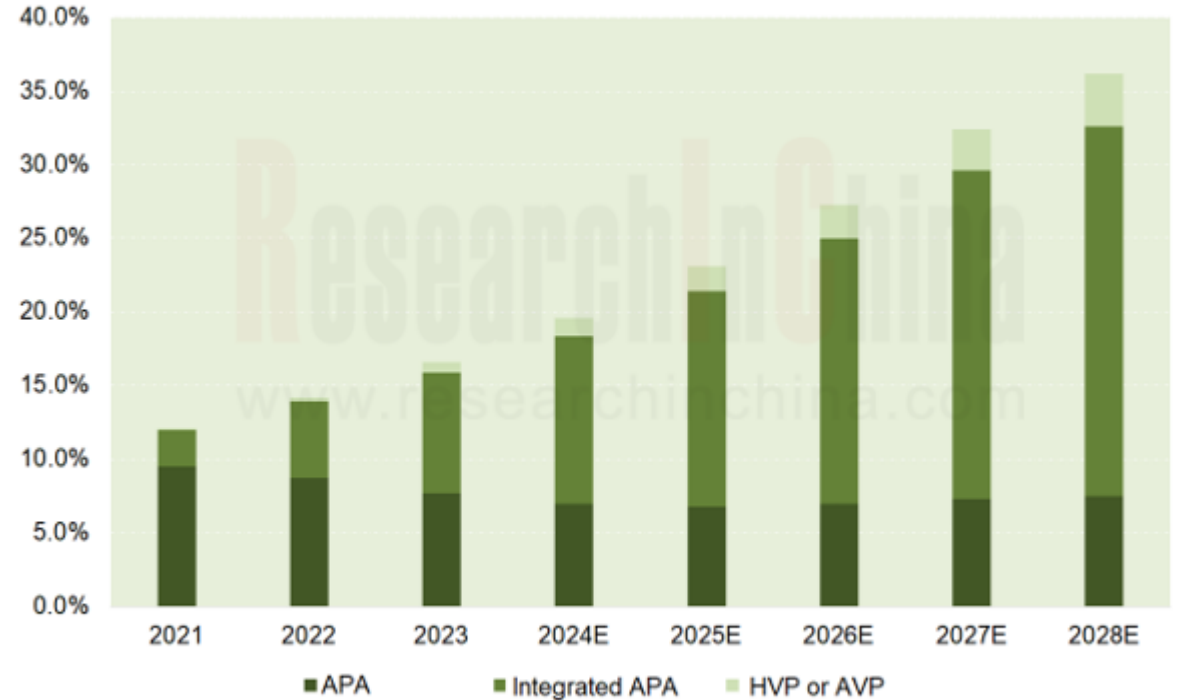
Ultrasonic radars can satisfy the requirements of autonomous driving solutions of differing levels and routes

There are two key driving factors:

First, ultrasonic radars can satisfy the requirements of autonomous driving solutions of differing levels and routes, and has a long lifecycle. In recent years, as vehicle intelligence has accelerated, parking systems have kept expanding function boundaries from semi-automated parking to APA (automated parking assist) and integrated APA, from short-range remote parking assist (RPA) to home-zone valet parking (HVP) and even long-range automated valet parking (AVP).

According to ResearchInChina, in 2023 the installation rate of integrated APA systems in passenger cars in China hit 8.2%, up 3.0 percentage points on the previous year; the installation rate of high-level parking (HVP or AVP) was 0.7%, up 0.4 percentage points. As driving-parking integration and cockpit-parking integration markets gather pace, low-speed APA (especially integrated APA), and high-level parking (especially HVP), are expected to enjoy a boom.

Installation Rate of Parking Systems in Passenger Cars in China, 2021-2028E



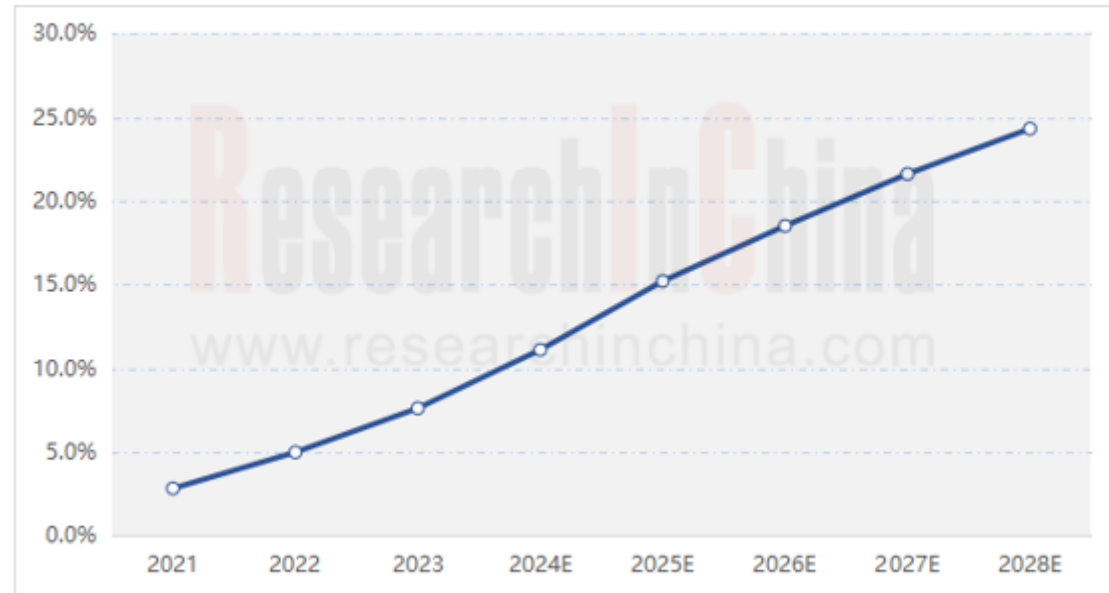
Source: ResearchInChina

Driving and parking systems previously independent of each other tend to be integrated

Second, under the domain controller architecture, driving and parking systems previously independent of each other tend to be integrated, namely, driving-parking integration with the biggest feature that driving and parking can deeply multiplex and share sensors and computing power. In 2023, driving-parking integration entered the stage of mass adoption, giving a big boost to the automated parking market and taking the core sensor, ultrasonic radar, into the "fast lane".

ResearchInChina's statistics shows that in 2023, driving-parking integration was installed in 1.602 million passenger cars in China, a year-on-year spurt of 61.4%, with the installation rate reaching 7.6%, up 2.6 percentage points. It is expected that in 2025, driving-parking integration will be installed in over 3 million passenger cars, with the installation rate higher than 15%, a figured projected to hit about 25% in 2028.

Installation Rate of Driving-parking Integration in Passenger Car in China, 2021-2028E



Source: ResearchInChina

New-generation AK2 ultrasonic radars are about to become widespread.

2. New-generation AK2 ultrasonic radars are about to become widespread.

The optimization and upgrading of parking systems and the promotion and application of driving-parking integration require higher ultrasonic radar performance, involving longer detection range, greater anti-interference, and compliance with higher functional safety. On this basis, quite a few companies have developed the new generation of ultrasonic radar AK2 technologies and products.

Greatly differing from AK1, AK2 is codable, and improves the anti-interference capability of products by adjusting signals.

When AK1 works, all probes on the same side of the bumper send out waves in turn to avoid co-channel interference, leading to a relatively system refresh time. AK2 enables multi-sensor simultaneous transmission and reception via some special encoding modes, and some also support simultaneous transmission of different ultrasonic signals, thus greatly shortening the system refresh time.

Technological innovations give AK2 large performance superiorities, including:

Longer detection range: up to 7-8m;

Smaller blind spot: within 10cm;

Support for multi-mode switching; for example, Audiowell AK2 supports up- and down-conversion modes, while Longhorn AK2 supports three transmission modes: fixed frequency, frequency upswep and frequency downswep;

Refresh time: <40ms, supporting 6 sensors to work simultaneously;

Diagnostic function;

DSI3 communication mode, with fast signal propagation, up to 444kbit/s;

ASIL B functional safety level.

More than a dozen companies have launched AK2 ultrasonic radar

Currently, more than a dozen companies like Audiowell, Baolong Automotive, ForVision and Longhorn Automotive Electronic have launched AK2 ultrasonic radar, and some of them have entered the mass production phase.

As an ultrasonic radar leader in China, with the ability to self-develop transducers and algorithms, Audiowell was the first to introduce the fourth-generation product, AK2, in 2021, and started batch delivery and sale of it in 2022. In early 2024, Audiowell AK2 has been designated by multiple automakers (including joint-venture and China's independent ones). It is expected that the driving-parking integration solution will be mounted on over 20 new models in the year.

Baolong Automotive invested in UDAS Automotive Technology in 2022. They co-funded BaoU Technology, a company specializing in ultrasonic radar for passenger cars.

In August 2023, Baolong Automotive released AK2, a new-generation high-performance ultrasonic radar featuring a self-designed transducer with the minimum vertical FOV, and 8K FM bandwidth. It improves anti-interference performance through variable frequency transmission, allows for transmission mixed with fixed frequency and encoding modes, and can meet ASIL B functional safety level requirements.

In Q3 2023, BaoU Technology under Baolong Automotive mass-produced AK2 ultrasonic radar sensors for China's independent automakers. In September 2023, the product was designated by another Chinese independent auto brand, and the volume production is scheduled to start in July 2024. In addition, Baolong Automotive has built a fully automated ultrasonic radar production line in Hefei Park, with AK2 capacity up to 300,000 units/month.

As a company engaged in "ADAS + autonomous driving in low-speed scenarios", ForVision received strategic investment from ThunderSoft in 2020 and launched an AK2 product in 2022, with the detection range of 8m and accuracy of 1cm. In July 2023, the product was designated by Voyah for its AK2 algorithm and hardware mass production project based on the new-generation intelligent driving platform on which Voyah builds mid-to-large-size luxury electric executive sedans and new mid-size electric SUVs, with planned lifecycle output of more than 400,000 vehicles.

To meet market demand, ForVision is building its own ultrasonic radar factory in 2024, with capacity expected to reach about 4 million units in May 2024, and annual capacity up to 10 million units. ForVision CEO Xin Yonglei said there will be nearly ten production models using ForVision's ultrasonic sensor technology in the coming year.

Product Features and Mass Production Deployment of Chinese AK2 Ultrasonic Radar Companies (Part)

Product Features and Mass Production Deployment of Chinese AK2 Ultrasonic Radar Companies (Part)			
Company	SOP	Key Indicators of AK2 Products	Production and Planning
 Audiowell	2022	<ul style="list-style-type: none"> Detection range: up to 7m FOV: 120°/60° Accuracy: ±3cm Frequency: 55.5±1.0KHz 	<ul style="list-style-type: none"> Started mass production and sales on market from 2022; Plan use of AK2 -based driving-parking integration in more than 20 models in 2024.
 Zongmu Technology	2022	<ul style="list-style-type: none"> Detection range: 10-550cm FOV: 110°/60° Frequency: 50kHz-64kHz Frequency coding: Chirp and AM Refresh cycle: <100 ms 	<ul style="list-style-type: none"> The parking platform Drop'nGo Lite has iterated to the second generation. It adopts 12 ultrasonic radars, is compatible with AK1 and AK2, and has been mass-produced for Changan and other models. Besides parking system, deploy driving-parking integration, cockpit-driving integration, etc.
 ForVision	2022	<ul style="list-style-type: none"> Detection range: 8m Accuracy: 1cm Function: support hidden installation on doors and in the cabin 	<ul style="list-style-type: none"> In July 2023, designated by Voyah for its AK2 algorithm and hardware mass production project based on the new-generation intelligent driving platform; In early 2024, became the first supplier designated by Voyah for its new SUV model platform in 2024. It is building its own ultrasonic radar factory with annual capacity of 10 million units.
 Baolong Automotive	2023	<ul style="list-style-type: none"> Detection range: >7.5m Accuracy: mm-level ranging, XYZ coordinate detection, multi-target recognition and contour detection, high temperature compensation Transmission mode: fixed frequency and encoding modes mixed transmission 	<ul style="list-style-type: none"> Built a fully automatic ultrasonic radar production line in Hefei Park, with AK2 capacity of 300,000 units/month; The first product has been mass-produced in Q2 2023 and has been designated for multiple projects.
 Longhorn	2023	<ul style="list-style-type: none"> Detection range: ~6m Blind spot: < 15cm Accuracy: ±1cm Transmission modes: support fixed frequency, frequency upsweep and frequency downsweep modes, and multiple-input multiple-output 	<ul style="list-style-type: none"> AK2 has been used in Xpeng G6; A production project for automotive intelligent driving sensing products (cameras, ultrasonic, and driving recorders), with planned investment of RMB159 million, is underway. After completion, it will boast annual capacity of 10 million ultrasonic sensing systems.

Localization of core components of AK2 speeds up

3. Localization of core components of AK2 speeds up.

Core components of AK2 ultrasonic radar include transducer, chip, and housing, of which transducer and chip makes up around 60% of the BOM cost.

Transducers are dominated by international Tier1s like Bosch and Valeo. China's local companies such as Audiowell, Zongmu Technology, Baolong Automotive and Youhang Technology make continuous investment and now have self-development and production capabilities.

Wherein, Youhang Technology, positioned as a Tier2, was the first to deliver AK2 ultrasonic radar transducers on large scale in late 2022. It has three fully automated transducer production lines and plans to have capacity of 40 million transducers in 2024.

In terms of chips, in addition to Bosch, the industry mainly purchases products from Germany's Elmos, whose chips can support highway or urban low-speed scenarios, with detection range up to 6m, and can detect obstacles, pedestrians, cyclists, or animals. In 2021, Elmos introduced E524.17, a new-generation ultrasonic radar chip which has become the preferred solution for many suppliers.

To improve chip localization, Ninestar's company, Geehy Microelectronics, has made continuous efforts on development, and mass-produced its first ultrasonic sensor chip on a large scale in 2023. The product features high integration, small size, high precision and comprehensive data collection, and can be used in automated parking assist, ultrasonic parking assist, ADAS and so on.

Moreover, Youhang Technology is also developing an ultrasonic radar chip, and plans to produce it in quantities in 2024. In October 2023, Youhang Technology raised tens of millions of yuan in its Pre-A funding round led by South China Venture Capital and co-invested by Dingjia Ventures. The raised funds are largely spent on projects including automotive-grade validation test and mass production of AK2 sensor chip, ultrasonic transducer capacity expansion, and R&D of automotive micro-crash sensor chip.

The steady development of the downstream parking market and the faster localization of upstream core components provide favorable support for mass adoption of ultrasonic radars. Yet amid fierce competition in vehicle intelligence and diverse market demands, ultrasonic radars still face many challenges.

For instance, since 2022 Tesla has eliminated 12 ultrasonic radars on Model 3/Model Y models in some regions and replaced them with Tesla Vision technology. Some OEMs or suppliers use short-range radars to replace ultrasonic radars. At CES 2024, Continental introduced Radar Vision Parking, a system based on high-resolution surround radars and surround view to replace conventional ultrasonic sensors.

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