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Leading Chinese Intelligent Cockpit Tier 1 Supplier Research Report, 2024

July 2024

Comprehensively build a cockpit product matrix centered on users' hearing, speaking, seeing, writing and feeling

Cockpit Tier1 Research: Comprehensively build a cockpit product matrix centered on users' hearing, speaking, seeing, writing and feeling.

ResearchInChina released Leading Chinese Intelligent Cockpit Tier 1 Supplier Research Report, 2024. The report mainly covers:

13 Chinese intelligent cockpit Tier 1s: Desay SV, ThunderSoft, ADAYO, iFlytek, PATEO, Joyson Electronics, Huawei, ECARX, Neusoft Group, Yuanfeng Technology, Auto-link, BICV, Banma, etc.

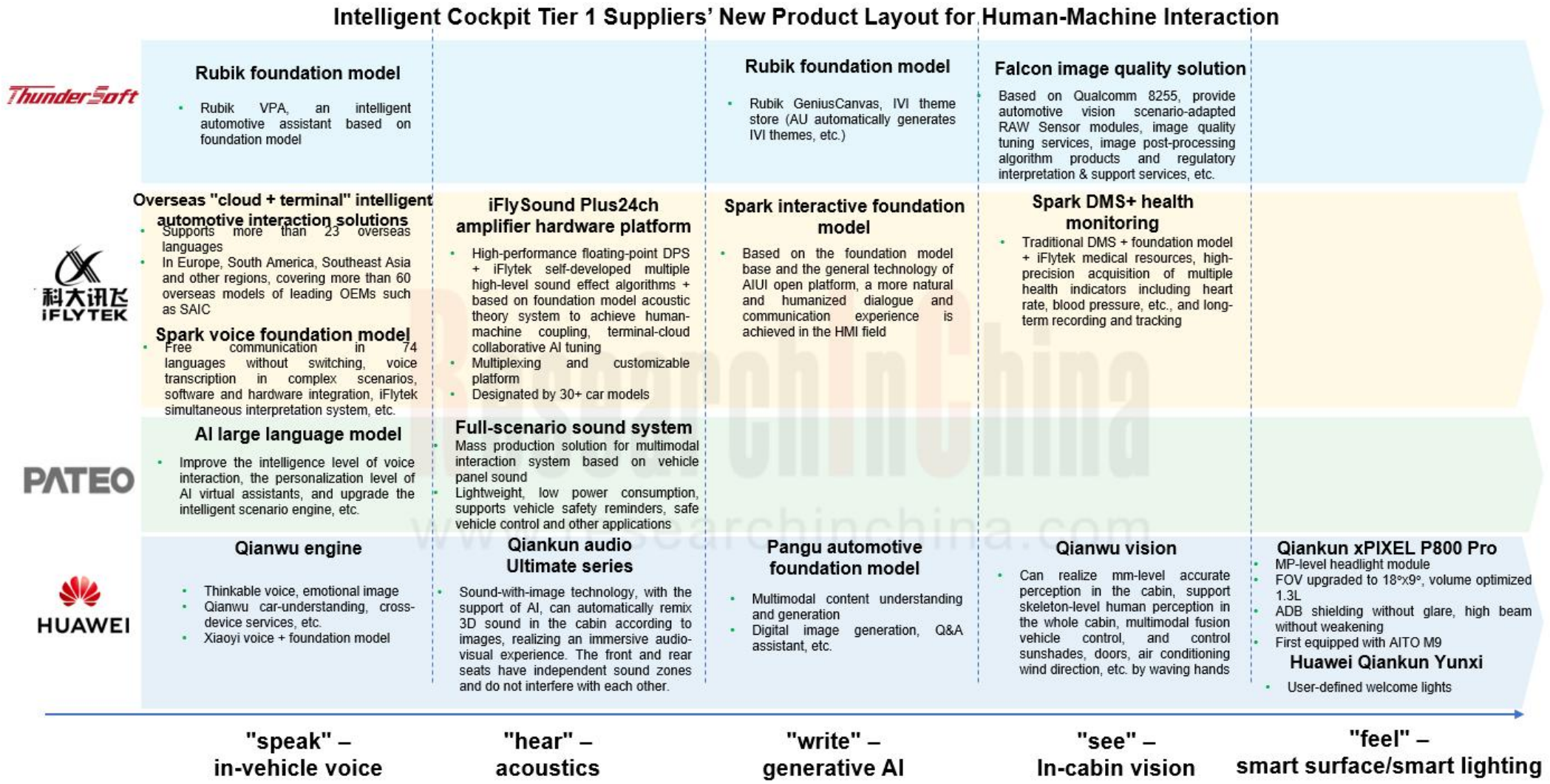
7 major business segments of cockpit
* Human-machine interaction (HMI) system: "speak" - voice, "see" - vision, "hear" - acoustics, "write" - generative AI, "feel" - smart surface/smart lighting, etc.
* Domain control computing platform: computing, in-cabin AI, cabin-driving-parking integration, central cross-domain computing, etc.
* Software system: evolution from cockpit OS to vehicle OS, SOA architecture and application atomization, navigation electronic map, etc.
* AI foundation model: general foundation model (hundreds of billions of parameters), vehicle-side application foundation model (billions of parameters), foundation model tools
* In-vehicle display system: 2.5K/4K ultra HD screen, AR-HUD display, light field display (naked-eye AR+3D), CMS, etc.
* Communication system: TBOX, C-V2X, smart vehicle antenna, etc.
* Connected system: connected services, OTA, intelligent diagnosis, etc.

Study the evolution of intelligent cockpit form and product development trends: summarize and analyze new products, new technologies, and new trends of major Tier1s' intelligent cockpit businesses

Cockpit HMI system: "speak" - voice, "see" - vision, "hear" - acoustics, "write" - generative AI, "feel" - smart surface/smart lighting, etc.

Tier 1 cockpit suppliers are continuously launching new HMI products to meet user needs such as "speak" - voice, "see" - vision, "hear" - acoustics, "write" - generative AI, "feel" - smart surface/smart lighting, etc.

Intelligent Cockpit Tier 1 Suppliers'New Product Layout for Human-Machine Interaction



Source: ResearchInChina

"Hear"——3D, immersive sound and other advanced sound algorithms constantly installed in cars

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In April 2024, Huawei unveiled its newest brand "Qian Kun", including the new-generation HarmonySpace, which features three major performance: smart IVI, smart audio, and smart display.

In terms of smart audio, Huawei unveiled the new Qiankun, creating a new track of smart audio, which includes three series with different positioning from entry to high-end, namely: DYNAMIC, SUPERIOR and ULTIMATE. The most luxurious ULTIMATE Series is the first to create sound-with-image technology, adopting AI sound and image analysis technology and AI spatial sound technology, which can remix 3D sound in the cabin according to images, realizing an immersive audio-visual experience. The newly upgraded intelligent sound field experience realizes independent sound zones in front and rear seats, so that singing in front row and watching movies in rear row do not interfere with each other.

Huawei Qiankun Audio Products

Solution	DYNAMIC	SUPERIOR	ULTIMATE
Positioning	Entry-level	Mid-end	High-end
Composition	15 speakers, 1000w amplifier	23 speakers, 2080w amplifier	43 speakers, 3000w amplifier
Support	Super-sensing spatial audio Smart audio	AI spatial sound Smart sound field S-class car audio	Independent sound zone Smart sound field Sound-with-image technology: AI sound and image analysis, AI spatial sound reconstruction
Core Technology and Functions	**Original smart sound quality** • **Sound-with-image, AI spatial sound**: bring panoramic cinema to the car • **Independent turbo subwoofer:** extreme low frequency: **20Hz,** smaller volume: **5L** **Original intelligent sound field** • **Self-developed all-round active noise reduction:** millions of sensor parameters + data mapping model + accurate identification of noise paths; **multi-channel high-computing power elimination technology, achieving 9dBA** quiet effect, library-level quietness • **Independent sound zones for front and rear seats:** self-developed directional acoustic headrest + original spatial sound field elimination technology, **99.8% sound energy isolation rate** for independent sound zones of front and rear seats, five-star sound isolation **Leading smart ambient** • Good sound: AI sound and light synchronization technology, ambient light field • AI ultra-precise lighting rhythm + intelligent fragrance scenario + Milan Institute's aesthetic color matching + seats/air conditioning/steering wheel and other multi-dispatch atmosphere and multi-sensory enjoyment		

Source: ResearchInChina

ADAYO digital acoustic system solutions

ADAYO digital acoustic system solutions support functions and configurations including 8~24 channels, planar surround sound, 3D surround sound, headrest audio, AVAS, RNC, ANC, ASE and OTA, and have been equipped with mass-produced models of many first-tier independent brand OEMs. Meanwhile, the ADAYO acoustic team focuses on the deep integration of acoustic technology and intelligent cockpits, continues to innovate, and further promotes the application of technologies such as immersive standard layout replication, independent sound zones, sound source restoration and a series of high-order sound effect algorithms in the vehicle environment.

In 2023, ADAYO's products supporting 3D immersive surround sound have been mass-produced, and a new dual DSP intelligent acoustic product platform has been launched, which has been designated by multiple customer projects.

"Write" - Generative AI is getting on board fast

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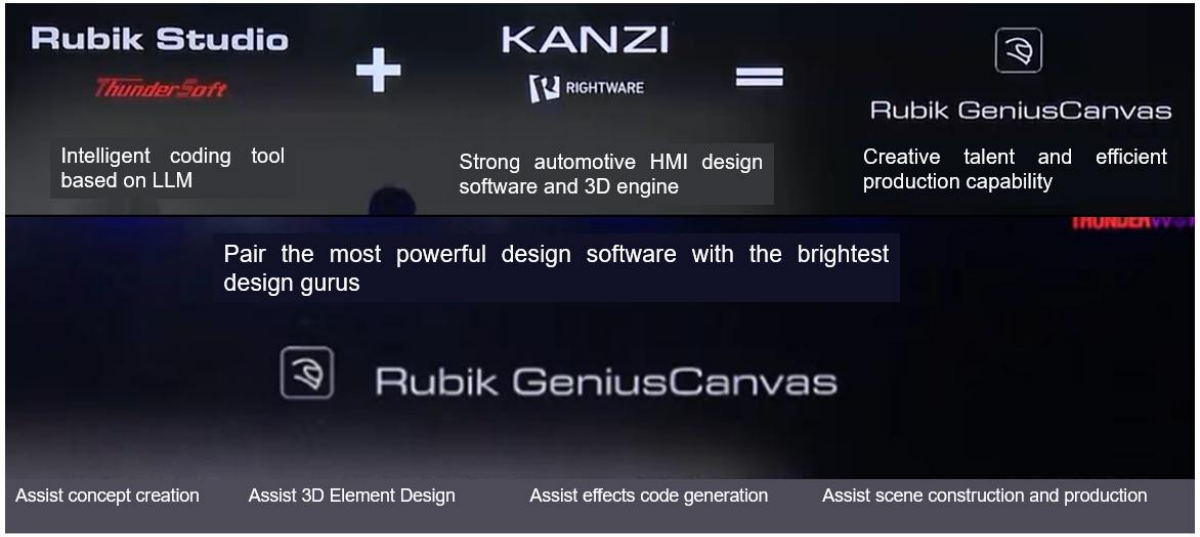
In the automotive field, the three application directions of ThunderSoft based on Rubik Foundation model, namely, Rubik GeniusCanvas (Genius Canvas Tool), Head Unit Theme Store (AU Automatically Generates head unit Theme, etc.), and LLM AI Assistant (Large Model Intelligent Assistant), have progressed rapidly and have basically matured.

Rubik GeniusCanvas, which is based on ThunderSoft intelligent coding large model Rubik Studio and powerful automotive HMI design software and 3D engine Kanzi, can provide designers with super intelligent assistance from concept creation, 3D element design, special effects code generation and scene construction and production.

Designers only need some simple language conversations, and Rubik GeniusCanvas can perform image design and model construction as required, which greatly enhances design efficiency and quality of HMI in the cockpit.
With the assistance of Rubik GeniusCanvas, the concept creation cycle can be shortened by 70%, from the original 3-4 weeks to about 1 week; 3D element design cycle can be shortened by 85%, from the original 4-6 weeks to about 3 days.



Source: ThunderSoft

“See”—in-cabin vision (DMS + OMS + CMS), electronic rearview mirrors, etc. are integrated with intelligent cockpit to achieve intelligent interaction capabilities

“See”—in-cabin vision (DMS + OMS + CMS), electronic rearview mirrors, etc. are integrated with intelligent cockpit to achieve intelligent interaction capabilities

In January 2024, ThunderSoft officially launched its latest research and development achievement - Falcon, a smart car image quality solution, which provides a one-stop delivery solution for in-vehicle vision image quality products based on domain control chips. Its 1.0 is based on Qualcomm 8255 and provides RAW Sensor modules for automotive vision scene adaptation, image quality tuning services, image post-processing algorithm products, image quality testing services, and regulatory interpretation & support services, which significantly enhances the perception experience in cockpit HMI field. Relying on powerful image quality optimization capabilities provided by platform portrait framework, it supports ISP image quality optimization of multi-channel RAW Sensor, supports AWB, AEC, ISP (BlackLevel, LSC, BPC, ABF, Demosaic, CC, Gamma, CST, NR, ASF) and other basic image quality optimization modules, and also supports BayerGTM, BayerLTM, LDC, CAC, ANR and other chip-specific image quality optimization modules. Currently it adapts and empowers AVM, CMS, DVR, DMS, OMS, Carlog and other automotive vision product scenarios.

Source: ThunderSoft

BICV released the latest DMS + OMS + CMS all-in-one solution "Qiuhao Vision-BOX"

In April 2024, BICV released the latest DMS + OMS + CMS all-in-one solution "Qiuhao Vision-BOX", which uses a domestic AI chip with a computing power of up to 8TOPS, supports multi-channel camera input, and supports multi-channel display output. It integrates functions such as CMS, DMS, OMS, E-MIRROR + DVR in and out of the cabin, taking into account safety and intelligence to bring the ultimate experience to users. In the design, it is strictly in accordance with European Union DDAW (Driver Drowsiness and Attention Warning), E-NCAP (European New Car Safety Evaluation Association), can meet the requirements of C-NCAP and domestic GB/T 41797-2022 "Driver Attention Monitoring System Performance Requirements and Test Methods", GB 15084 "Motor Vehicles, Indirect Vision Device Performance and Installation Requirements" and other regulations and standards, and the product can meet the corresponding regulatory requirements.

Cockpit AI foundation model product deployment: two layout models

Cockpit AI foundation model product deployment: two layout models

In the face of the new round of industrial revolution set off by AI and the growing demand for intelligence and personalization in the market, the cockpit Tier1 combines its own technical strength to actively seek innovation and change, and actively layout AI foundation model market. From the perspective of layout, there are two main directions.

Mode 1: self-research is the main one, and both general basic foundatiion model and industry application foundation model are laid out

Direction 1: Enterprises first develop a general basic foundation model, and build an industry application foundation model based on this. This part of the enterprise firstly has a strong underlying software R&D strength. Secondly, the company is involved in multiple industry fields in addition to automotive industry. Typical representatives such as Huawei, ThunderSoft, iFLYTEK, etc., they have launched a basic foundation model, and then launched related application products based on AI foundation model according to the industry.

In 2023, Huawei released the general basic foundation model Pangu, and based on this to create a number of industry application products, the latest version is 5.0 products, achieving a full range of multi-modal, strong thinking and other comprehensive upgrades.

At the cockpit application level, in April 2024, Huawei released the latest AI Qianwu engine, which is based on Huawei's Pangu model, MindSpore computing framework, and Ascend AI basic hardware platform. The new generation of Qianwu engine is not only a simple interaction tool, but also a smart partner who can deeply understand user requests and provide personalized services. It can help voice recognition, which can identify the location of each occupant through the user's voiceprint, perceive and record personal preferences, and realize personalized services. Qianwu understands the car, and the full vehicle Knowledge Graph can accurately solve user problems. In addition, Qianwu engine can also serve across devices, helping head unit directly navigate to the location sent by mobile phone, and truly achieve one-step service.

Huawei AI Qianwu Engine

Huawei AI Qianwu Engine	
Underlying basic architecture	• Pangu foundation model • MindSpore Yisi Computing Framework • Ascend AI basic hardware platform • HiSilicon Hardware Module
Access device	• Vehicle Sensor • Harmony visual perception • Xiaoyi speech perception
Scheduling scenario	• 1+8+N Harmony device • HUAWEI IVI ecosystem 200+Apps
Main functions	It has four core functions: ① "Person recognition" function: The system can recognize users' voices, perceive personal preferences, and provide personalized services. ② Built-in million story library: Realize the function of "coaxing" the baby through voiceprint replication. ③ Support Qianwu "understand" car function: built-in vehicle Knowledge Graph, can give accurate suggestions according to user requests. ④ Support cross-device services: not only cross-seat voice control, but also cross-device voice control.

Source: ResearchInChina

iFLYTEK released the general basic model iFLYTEK Spark Model V4.0.

On June 27, 2024, iFLYTEK released the general basic model iFLYTEK Spark Model V4.0. After this upgrade, iFLYTEK Spark fully benchmarked the ChatGPT-4 Turbo, which can realize multilingual dialogue and improve the automatic speech recognition ability in complex environments, bring broader application prospects for intelligent cockpit.

At the same time, iFLYTEK has newly upgraded intelligent cockpit of Spark Car based on V4.0. The smart cockpit can realize full-duplex interaction, realize multi-lingual and multi-dialect switching-free communication, multi-emotional and multi-modal anthropomorphic interaction, and can perceive in multiple modes, know the degree of physical health, whether it is tired, high blood pressure, and fast heartbeat; then it can also run through internal and external sources to complete real tasks in the car.

In addition, in terms of AI foundation model tools, iFLYTEK gives full play to its own technical advantages, deeply integrates and deploys smart car algorithms and smart car chips, supports multi-modal fusion interactive applications, and realizes efficient reasoning, efficient transplantation, and efficient debugging. Taking iFLYTEK's most representative speech algorithm as an example, after transplanting speech noise reduction, wake-up, recognition, and synthesis from CPU to NPU through heterogeneity, it can reduce CPU computing power requirements by 60%. And by deploying larger models on resource-rich NPUs, it can achieve automatic speech recognition effects comparable to the cloud locally. This is the technical secret behind the fast and accurate automatic speech recognition on a number of new models such as Hongqi EH7 and NIO ES8.

Mode 2: cooperation-based, mainly layout industry application foundation model

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Direction 2: Mainly through the model of cooperation + self-research, represented by traditional cockpit Tier1s with supply strength of a variety of cockpit type products. They usually do not develop basic foundation models by themselves, but mainly use open-source basic foundation models to create large model products for automotive cockpits and other industry applications. Typical representative companies include Neusoft Group, Desay SV, Joyson Electronics, PATEO, Auto-link, ECARX, etc.

PATEO is actively establishing strategic cooperation with leading general foundation model providers, establishing connections with vertical application developers and service providers, building an ecosystem based on foundation models, and providing customized services for OEMs through the ability to integrate foundation models to create personalized foundation model products that OEMs need.

In addition, PATEO is also actively building a foundation model-based industry knowledge base, a new generation of scene engines, and a number of foundation model-based intelligent application scenarios, and actively exploring a new generation of POC for intelligent cockpit interaction experience with several OEMs.

AI Foundation Model Layout and Products of Intelligent Cockpit Tier1s

Tier 1s	Layout mode	AI foundation model products	Release time
Desay SV	Self-research + cooperation Partners: Sun Yat-sen University, Nanyang Technological University and other universities, NVIDIA, Qualcomm, etc	Foundation model in-vehicle voice system	2023.10
		Foundation model-based active perception	-
		Desay digital person	2023.04
PATEO	Self-research + cooperation Partners: Baidu Cloud and ERNIE Bot, InternLM of Shanghai artificial intelligence laboratory, ChatGLM of Tsinghua University, new MiniMax, Amazon Bedrock, etc	PATEO AI language foundation model	-
		PATEO foundation model	-
Joyson Electronics	Self-research + cooperation Partner: Microsoft China	AI foundation model multimodal identification products	-
		Operation AI	2023
		Manufacturing & Operation AI	2023
ECARX	Cooperation + self-research Partners: Microsoft, Tencent, Baidu Cloud (ERNIE Bot, etc.), GigaStudio, etc	Terminal-cloud integration solution	2024.03
		AI foundation model –based simulation platform	2024.06
Auto-link	-	AL-A1 cockpit-driving integration products	2024.04
Banma	Access to Tongyi Qianwen foundation model Partners: Ali Damo Institute, etc	Banma Co-Pilot	2023.04

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