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Automotive and 5G Industry Integration Development Report, 2022

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OEMs Rush into Mass Production of 5G Models Whose Sales May Reach 3.68 Million Units in 2025

By the end of 2021, China had built and opened in excess of 1.39 million 5G base stations, established over 2,300 virtual private networks and hybrid private networks, and seen over 1,800 5G+ industrial Internet projects under construction. Viewed from 5G coverage, all prefecture-level cities, at least 97% of counties, and 40% of townships in China have already been covered by 5G, to the amount of 450 million 5G terminal users in China, taking a lion's share above 80% of the world's total.

Integration of Vehicle and 5G

The accelerated construction of 5G networks will set the stage for deeper commercialization of 5G vehicles. To date, China's Internet of Vehicles (IoV) projects based on 5G communications have spread from pilot areas to commercialized scenarios, calling for the synergy of automakers, parts suppliers and internet firms as well as 5G ecosystem partners for the sake of cross-platform interconnection and interoperability.

5G Has Become the Sales Highlight of Many Brand Models

Chinese OEMs

Many Chinese automakers are aggressively exploring the use of 5G technology in autonomous driving and intelligent connectivity, and they have launched 5G production models as a main selling point:

In February 2021, **SAIC R** officially launched MARVEL R, the world's first "5G smart electric SUV" with the SRRC certificate and being the first model that passed the automotive-grade 5G /C-V2X terminal certification;

NIO ET7, which will be mass-produced in 2022, will use the 3rd-Gen Qualcomm Snapdragon? automotive digital cockpit platform and Qualcomm Snapdragon? 5G automotive platform. It is possessed of 5G, C-V2X, Bluetooth 5.0, WiFi-6, UWB, among others;

ARCFOX α-T, the first production SUV of BAIC BJEV ARCFOX, officially called "the 5G smart electric vehicle", is equipped with the MH5000 T-BOX based on Huawei's next-generation 5G chips;

In August 2021, **BYD Han** unveiled a 5G version, adding a 5G optional package (including Dynaudio loudspeakers and 5G chips) to the 2021 BYD Han EV flagship version;

Great Wall Motor's 5G automotive wireless terminal has been granted the “Radio Transmission Equipment Type Approval Certificate” by the Ministry of Industry and Information Technology of the People’s Republic of China.

Foreign OEMs

Among foreign OEMs, BMW, Ford, and Audi also quicken the pace of 5G vehicle production:

BMW's flagship battery-electric SUV, BMW iX, has debuted with 5G connectivity technology and Gigabit Ethernet for the first time;

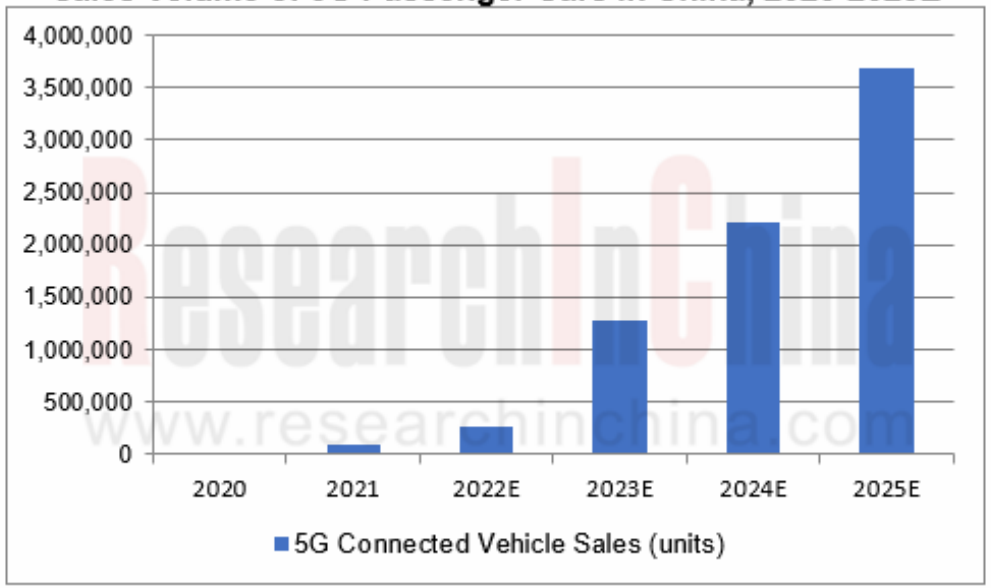
The **Ford** C-V2X System has been officially spawned and applied since January 1, 2021. Ford has therefrom become the first automaker in China that accomplished the mass production of C-V2X technology which is now available in Wuxi, Changsha and Guangzhou. In the next step, Ford will ramp up production of models using 5G C-V2X technology;

For **Audi**, the upcoming Audi A7 L and A6 L made in China will be equipped with 5G communication modules that support C-V2X.

5G Technology Application of OEMs

According to the production and assembly data of 5G passenger cars in China, the penetration rate of 5G vehicles constituted less than 0.4% of connected vehicles in 2021. As 5G feature gains popularity in medium and high-end passenger cars, China's 5G passenger car sales will reach 3.684 million units by 2025, with the penetration above 15% then.

Sales Volume of 5G Passenger Cars in China, 2020-2025E



Source: ResearchInChina

5G Technology Application of OEMs

	5G Intelligent Cockpit	5G Communication Module	5G BOX	5G C-V2X	5G RTK	5G Antenna	5G AVP
NIO	√	√	√	√			
Xpeng	O	O	O		√		O
Li Auto	O	O	O				
WM Motor	√	√	√	√			√
Voyah	√	√	√				
Hozon Neta	O	O	O				
Human Horizons	√	√	√	√	O		
Leapmotor	O	O					
BYD	√	√	√	O			
SAIC	√	√	√	√			
BAIC	√	√	√	O			
GAC	√	√	√	√	O		√
FAW Hongqi	√	√	√	√	√	√	
Great Wall	√	√	√	√	√		√
Changan	O	O	O	O			
Chery	O	O	O	O			
Geely	O	O	O	O			O
ZEEKR	√	√	√				
Tesla		O	O				
BMW	√	√	√				
Mercedes-Benz		O	O				
VW		O	O	O			
Audi	√	√	√	√			
Toyota		O	O				
GM		O	O	O			
Ford		O	O	√			
Volvo		O	O	O			

Note: √-mass-produced, O-planned
Source: ResearchInChina

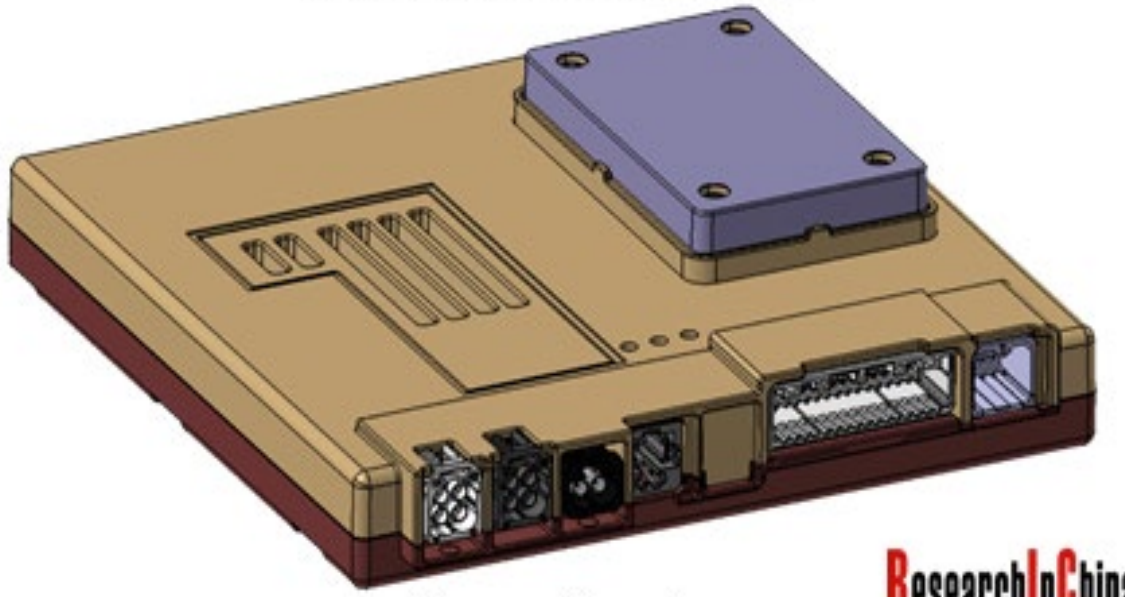
Localization of 5G Auto Parts – 5G Box

While 5G vehicles are in full swing, there have emerged more than fifty 5G terminal and technical solution providers in the Chinese intelligent vehicle industry chain. Here are a few typical 5G automotive product/solution suppliers:

As the first enterprise certified by A-SPICE CL3 and 5G SRRC, Neusoft has cooperated with over 20 world-renowned automakers in the field of intelligent communication for 100+ models, with the annual capacity up to one million units.

By far, Neusoft has spawned 5G/V2X BOX on a large scale, which will be installed in dozens of mid-to-high-end models from well-known OEMs such as Geely and Great Wall in the near future. The Neusoft 5G BOX carried by ZEEKR 001 integrates functions such as Gigabit Ethernet, WiFi 6 and BLE 5.0 to enable precise time synchronization, high-precision satellite positioning, and multi-channel data transmission, and to offer a data access channel for intelligent driving assistance system, coupled with the high speed, high bandwidth and low latency of 5G.

Neusoft's Onboard 5G BOX



Source: Neusoft

Localization of 5G Auto Parts – 5G Communication Modules

Fibocom's 5G Wireless Communication Module

- 5G SA/NSA
- Dual-frequency GNSS high-precision positioning, dead reckoning
- Support enhanced security system, secure boot, system file data protection, and guarantee data security and safe driving of users.

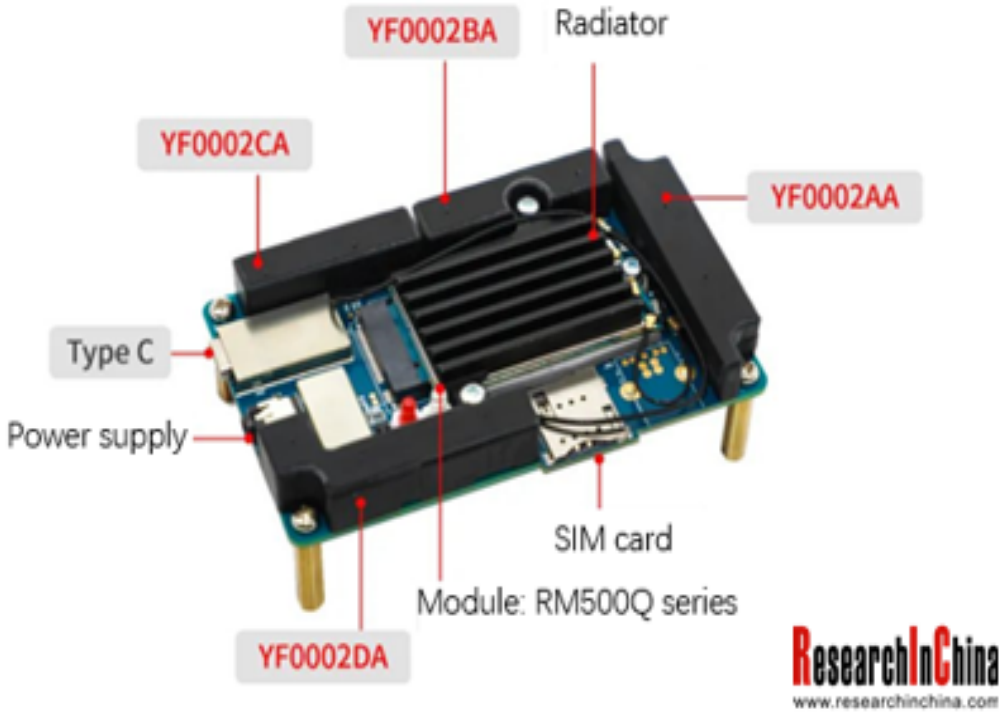
AN958-AE, the 5G automotive-grade module of Fibocom, has been certified by CCC (China Compulsory Product Certificate), SRRC (Radio Type Approval), and NAL (Network Access License for Telecom Equipment), indicating that AN958-AE meets the standard design goals in RF performance and data performance and fully suits the complex network environment of Chinese operators. It is qualified for mass production and shipment, so that Fibocom can accelerate the upgrade of automotive OEM module business from 4G to 5G.

AN958 is independently developed and designed by Fibocom Auto, Fibocom's wholly-owned subsidiary engaged in automotive OEM module business. It is a 5G NR Sub-6 automotive communication module targeting the global market. Based on Qualcomm's SA515M 5G automotive platform, AN958 supports 5G SA and NSA.

Localization of 5G Auto Parts – 5G Antennas

Quectel believes that the integrated design of wireless modules and antennas by a supplier that can provide application solutions at the same time will be the mainstream trend of terminal antenna design in the 5G era. Quectel's "wireless module + antenna" integrated design solution not only makes full use of its technical superiority and experience in modules, but also exerts its full-custom antenna design, integration and manufacturing capabilities.

Quectel's " 5G Module + Antenna" Integrated Design Solution



Typical Scenarios where the '5G + Vehicle' Fusion Prevails

5G technology has been given full play in excess of 10 scenarios such as test areas/demonstration areas, smart expressways, platooning, automated parking, remote control and remote chauffeur, low-speed autonomous driving in parks, special self-driving, and intelligent public transportation.

Typical Application Scenarios and Cases of 5G Integrated with Vehicle

Scenarios	Projects
5G test zones/demonstration zones	Beijing Fangshan 5G Autonomous Driving Demonstration Area
	Xiongan Citizen Service Center (5G remote autonomous driving tests)
	Xiamen 5G Application Innovation Center
5G smart expressways	Nanjing Airport Expressway
	Beijing-Chongli Expressway
	Hefei Xinqiao International Airport
5G platooning	Intelligent Container Truck Platooning Demonstration Project of Donghai Bridge Yangshan Port
	Changsha 5G Autonomous Sanitation Robot Platooning
	5G Sanitation Robot Cluster Platooning
5G automated parking	Bosch 5G Automated Valet Parking System Solution
	HiPhiX 5G+L4 Fully Automated Valet Parking
	WM 5G + L4 Autonomous Driving + AVP
5G remote control	Demonstration of 5G Network Remotely Controlling Port Machinery & Equipment
	5G Remote Driving Demonstration of China Mobile
	Chongqing 5G Remote Driving Project of China Telecom
5G park sweepers	The test road section by the Furong Lake in the urban-rural integration demonstration area of Xuchang City
	5G Industrial Application Demonstration Base of Tusincere Science and Technology City, Jianggan District, Hangzhou City
	5G+ autonomous sweepers on Tiantai Road, Tianyuan District, Zhuzhou
5G sightseeing cars	5G Autonomous Sightseeing Vehicles at Tang Paradise
	Skywell "Blue Whale 5G+ Autonomous Tourist Sightseeing Vehicle"
	"5G + Autonomous Driving" Project of Hainan Yanoda Rainforest Cultural Tourism Zone
5G mining trucks	5G Minecarts of Inner Mongolia Zhaha Naoer Open-pit Coal Mine
	5G Autonomous Mining Trucks of Baotou Bayan Obo Mining District
	5G Autonomous Mining Trucks of Magang Nanshan Mine - 5G-based Autonomous Mining Truck Project of Heshangqiao Mine
5G port heavy trucks	"Smart Port 2.0" of Xiamen Port
	5G+L4 Intelligent Heavy Trucks of SAIC
	5G Autonomous Smart Container Truck Demonstration Project of Tianjin Port
5G Robotaxi & robobus	Baidu - robotaxi
	WeRide - robotaxi
	UISEE - robotaxi
	Yutong Bus - robobus
	DeepBlue Technology - robobus

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