



China LTE-V2X Communication Standard Progress

Regulations:

In November 2018, the Ministry of Industry and Information Technology (MIIT) issued the *Frequency Management Regulations for the use of 5905-5925MHz frequency band in the Direct Communication of the Internet of Vehicles (Intelligent Connected Vehicles) (Interim)*, which determined the working frequency and usage requirements for direct communication of the internet of vehicles based on LTE-V2X technology.

Government standards:

In June 2018, MIIT released the *Guide on the Construction of the National ICV Standard System (Information and Communication Section)*.

This Guide is a government planning document for China's standard system of the information and communication of connected vehicles and has a great influence on standardization in this field.

According to this Guide, China's connected vehicle industry (information and communication) standard system is mainly composed of four parts including most of the basic standards, communication protocols and equipment, communication services and application technologies, as well as network and data security standards. Among them, communication protocols and equipment technology standards mainly involve LTE-V2X technology, 5G eV2X technology, satellite communication, navigation and positioning technology, and vehicle communication equipment technology. This guide does not include IEEE 802.11p technology.

In terms of LTE-V2X technology, the internet of vehicles communication standards proposed in this Guide include: LTE-V technology standards, interface standards, terminal equipment standards, network equipment standards, network layer/application layer standards, and interoperability standards. The Guide also proposed the relevant standard system table as follows:

Standard project	National standard/Sector standard	Recommended/Mandatory	Current status
LTE based IoV wireless communication technology Air interface technical requirements and test methods	National standard	Recommended	The sector standard of <i>Air Interface Technical Requirements</i> has been formulated and published
LTE network based wireless communication technology General technical requirements	National standard	Recommended	The sector standard has been formulated and published
LTE based IoV wireless communication technology	National standard	Recommended	The sector standards of <i>Network Layer Technical Requirements</i> and <i>Network Layer Test Methods</i> have been formulated and are in the approval stage





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Network layer technical requirements and test methods			
LTE based IoV wireless communication technology Application layer technical requirements and test methods	National standard	Recommended	The standards of <i>Message Layer Technical Requirements</i> and <i>Message Layer Test Methods</i> have been formulated and are in the approval stage
LTE-V2X communication security test methods	National standard	Recommended	No project proposed/initiated/available
LTE-based IoV wireless communication technology Base station equipment technical requirements	Sector standard	Recommended	Published
LTE based IoV wireless communication technology Terminal equipment technical requirements	Sector standard	Recommended	Approval stage
LTE based IoV wireless communication technology Roadside equipment technical requirements	Sector standard	Recommended	Approval stage
LTE based IoV wireless communication technology Core network technical requirements	Sector standard	Recommended	Published
LTE based IoV wireless communication technology Core network test methods	Sector standard	Recommended	Project approved





LTE based IoV Communication security technical requirements	Sector standard	Recommended	Published
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In addition to the standards included in the standard system table, other sector standard projects currently underway are as follows:

- LTE based IoV wireless communication technology - Test methods for terminal equipment supporting direct communication
- LTE based IoV wireless communication technology - Technical requirements for terminal equipment supporting direct communication
- LTE based IoV wireless communication technology - Test methods for roadside equipment supporting direct communication
- LTE based IoV wireless communication technology - Technical requirements for roadside equipment supporting direct communication
- LTE based IoV wireless communication technology - Test methods for base station equipment

The above sector standards are in the approval stage.

- LTE based IoV wireless communication technology - Technical requirements for security certificate management system
- LTE based IoV wireless communication technology - Application ID allocation and mapping
- LTE-V2X oriented multi-access edge computing - Business architecture and overall requirements
- LTE-V2X oriented multi-access edge computing - Service capability opening and interface technical requirements

The above sector standards are in the stage of call for comments.

Summary:

- According to the government's plan, China's internet of vehicles communication standard system mainly uses LTE-V2X technology, 5G eV2X technology, satellite communication, navigation and positioning technology, and in-vehicle communication equipment technology in the communication protocol and equipment parts, while IEEE 802.11p technology has not been taken into consideration. In actual work, no domestic standardization organization has been engaged in the development of standards related to IEEE 802.11p technology. Therefore, it can be determined that the IEEE 802.11p technology has been excluded from the communication standard system of the Chinese vehicle network.
- According to the plan, China's IoV communication standards are mainly composed of national standards and sector standards. However, in practice, these IoV communication standards have been formulated as sector standards. The possible reasons are: the number of national standards has been reduced greatly due to the standardization reform, and the project approval for related standards has become difficult. In order to meet the needs of the market and the construction of standard systems, these standards have been developed in the form of sector standards, so that related standard projects can be more easily approved.
- China's IoV communication standards are mainly developed by CCSA, which has always been the main developer of government standards in the communications field. Specific standard projects are undertaken by CCSA/TC10 (Internet of Things)/WG1 (Overall Group), CCSA/TC5 (Wireless Communication), etc. According to the published standards for internet of vehicles, the major participants in China's IoV communication standards include: industry giants and research institutions such as Datang Telecom, Huawei, CAICT, Neusoft, China Mobile, China Unicom, ZTE, Qualcomm, Shanghai Nokia Bell, Beijing University of Posts and Telecommunications, Ericsson and China Telecom, while small and medium-sized IoV companies have not joined these projects.





- There are currently several standard projects on terminal equipment and roadside equipment in the area of direct communications of the IoV under development (the approval phase), and specific projects are undertaken by CCSA/TC5.

Association standards:

1. C-ITS (China ITS Industry Alliance)

China ITS Industry Alliance, in 2013, was voluntarily established by 45 domestic intelligent transportation-related enterprises, scientific research institutes, colleges and universities, etc. Based on the formulation of standards and the basis of testing, it has carried out relevant work such as the development of intelligent transportation-related standards, technical testing and inspection, project application, scientific and technological achievements transformation, intellectual property transaction and protection, and international exchange and cooperation. The alliance was registered in Beijing in February 2015.

Standards published:

- *Application Layer and Application Data Interaction Standard for the Vehicle Communication System of the Cooperative Intelligent Transportation System*
- *General Technical Requirements for Wireless Communication Technology of LTE-based IoV*
- *ISO ITS Framework Based LTE-V2X Standard Technical Specifications*

Standards under development:

- LTE-based IoV wireless communication technology – Network layer technical requirements
- LTE-based IoV wireless communication technology – Message layer technical requirements

2. China Industry Innovation Alliance for the Intelligent and Connected Vehicles

With support from the MIIT, the Society of Automotive Engineers of China and the China Association of Automobile Manufacturers, in conjunction with enterprises, universities, and research institutions in the fields of automobiles, communications, transportation, and the internet, established the China Industry Innovation Alliance for Intelligent and Connected Vehicles on June 12, 2017. The alliance has established working groups for V2X, information security, autonomous driving maps and positioning, new high-speed vehicle networks, basic data platforms, commercial vehicles, AVP, industrial investment and financing, operating systems, and test demonstration (partially in preparation). At present, the member units of the alliance have covered 64 directors from the fields of automobile, information and communication, and transportation, and more than 330 ordinary member. The published ICV standards are:

- T/CSAE 53-2017 Cooperative intelligent transportation system - Application layer of vehicle communication system and application data interaction standard
- T/CSAE 101-2018 Technical requirements for on-board information security of intelligent connected vehicles
- T/CSAE 100-2018 IoV data collection requirements

3. TIAA (Telematics Industry Application Alliance)

The Telematics Industry Application Alliance was established on February 4, 2010, is a non-governmental organization registered in the Civil Affairs Department of China and is committed to applying advanced electronic information technology to the fields of automobiles and transportation. TIAA currently has more than 600 members from six fields: automotive, electronics, software, communications, internet, and information services;





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and from 12 countries and regions. TIAA has established 10 committees including market, technology, standards, intellectual property (legal affairs), 3 secondary organizations such as the Smart Parking Alliance and the Charging and Exchanging Alliance, and 6 national representative offices including one in Russia. It has undertaken more than 40 tasks entrusted by the Chinese government, including ITU's global frequency unification of intelligent transportation, and has released, approved, and researched 54 standards. Its achievements have been applied to 62 brands and millions of vehicles.

TIAA was involved in the research and testing of the IoV spectrum since early on, and participated in MIIT's 2016 research project for LTE-V2X technology application and frequency demand.

Currently, TIAA's standards related to LTE-V2X include:

- *Radio Frequency and Communication Performance of IoV Terminals Based on Long Term Evolution (LTE)*
- 4. Zhongguancun CCCC Guotong Intelligent Transportation Industry Alliance
 - T/ITS 0066—2017 ISO intelligent transportation system framework-based LTE-V2X technical specifications
- 5. Zhongguancun Standardization Association
 - T/ZSA 56—2018 ISO intelligent transportation system framework-based LTE-V2X technical specifications

Summary:

- At present, there are many organizations in China involved in the formulation of standards related to LTE-V2X, among which the more influential ones include C-ITS (with focus on transportation), China Industry Innovation Alliance for Intelligent and Connected Vehicles (with focus on applications) and TIAA (with focus on spectrum research). According to the standards or standard projects they published, these organizations have a rather shallow involvement in the development of communication technology standards.
- There are many organizations formulating association standards related to LTE-V2X technology, but the standardization work of each standard organization overlaps with each other. For example, Zhongguancun CCCC Guotong Intelligent Transportation Industry Alliance and Zhongguancun Standardization Association have developed a standard with the same name, but the differences in specific technical details require further investigation.

Other reference materials: CAICT IoV White Paper (C-V2X Volume), C-V2X Business Evolution White Paper, and LTE-V2X Security Technology White Paper. <http://www.caict.ac.cn/kxyj/qwfb/bps/>



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