UPDATE ON C-V2X DEPLOYMENT IN CHINA

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1. C-V2X Development Progress in China
2. On-going deployment activities across China region
3. Global EU-China cooperation in connectivity
Timeline for Deployment of C-V2X

**C-V2X (R14) chipsets from various vendors**
- **H1/2017**: Testing, Availability of products
- **H2/2017**: Chipsets for tests
- **H1/2018**: Inter-Operability Tests
- **H2/2018**: Mode 4 Chips and Modules
- **2019**: Integration, Validation Testing with OEMs (EU, China, US)
- **2020**: Start of vehicle deployment
- **2021 ff**: Availability of products

**C-V2X (R14) RSUs and OBUs (EU, China, US)**
- **2020**: 5.9 GHz Spectrum Target Availability
- **EU**: Spectrum available
- **CHINA**: Test Spectrum Available
- **US**: Spectrum for Deployment

**5.9 GHz Spectrum Target Availability**
- **EU**: Spectrum available
- **CHINA**: Test Spectrum Available
- **US**: Spectrum for Deployment
- **2020**: C-V2X is real and ready with commercial chipsets set for 2018
- **EU**: Final CEPT report
- **Start of vehicle deployment**
- **In-vehicle commercial deployment (i.e., type approved) is foreseen at the latest by 2020 globally**

**3GPP LTE ADVANCED PRO RELEASE 14**
- **3GPP 5G RELEASE 15**
- **3GPP 5G RELEASE 16**
C-V2X: Evolution to 5G maintains backward compatibility

3GPP Rel. 8-13
... – March 2016

3GPP Rel. 14
March 2017

3GPP Rel. 15
June 2018

3GPP Rel. 16
December 2019

LTE V2N Uu

5G NR V2N Uu
High bandwidth/low latency

5G NR Uu URLLC
Direct Communication 5G NR V2V/V2I

V2V safety use case

Enhanced Navigation & Infotainment

V2V/V2I

Cooperative automated driving

Hazard warning

C-V2X: Evolution to 5G maintains backward compatibility

LTE V2V/V2I (PC5)

5G NR V2V/V2I
**Policy Environment for C-V2X in China**

- **2017 H1**: IoV (Internet of Vehicle) Industry Development Special Committee was established to improve the LTE-V2X testing and certification.
- **2017 H2**: MIIT included LTE-V2X into Intelligent Connected Vehicles Industry Standard System.
- **2018 H1**: LTE-V2X city pilot project initiated in Wuxi means "5+2" IoV demonstration completes Industrial Concentration and Application Promotion.
- **2018 H2**: NDRC defined a target of LTE-V2X Network Coverage rate reaching 90% in 2020.
- **2019 H1**: 1. MIIT and SAC co-released the guidelines for the construction of national automotive network industry standards.
   2. MIIT released the 5905-5925MHz band management regulations for IoV direct communication (draft for public comments).
- **2020**: 1. MIIT officially regulated the 5905-5925MHz band for IoV direct communication.
   2. MIIT released the guideline document for IoV industry development.

**Note:** MIIT (Ministry of Industry and Information Technology), NDRC (National Development and Reform Commission), SAC (Standardization Administration of the People’s Republic of China)
Policy Environment for C-V2X in China

MIIT officially allocated the LTE-V2X Spectrum for IoV direct communication.

- 5905-5925MHz spectrum can be used for IoV based on LTE-V2X and its bandwidth can also been expanded in the future.
- The Usage regulation for 5905-5925MHz
  - Organizations or companies of IoV should apply the licenses from MIIT in the first.
  - The provincial radio-control regulator must approve the spectrum usage for IoV.
  - The portable V2X device or Vehicle Onboard electronics do not need spectrum permission and radio station license.
Currently there are 16 IoV test demonstration zones all over China, and for the purpose of accelerating the launch of IoV, the MIIT collaborates with other organizations or local governments to promote the establishment of test zones by capital cooperation and other ways.
C-V2X Trials and Areas in China

The Tongji University area (F-Zone) was co-built by SAIC and Tongji university in 2016, which has high-quality test environment and supports various LTE-V2X/5G V2X test scenarios including V2V/V2P/V2N, etc.

Test infrastructure and equipment

Remote automated driving control center
C-V2X Trials and Areas in China

LTE-V2X has been put in future plan of transport network building and national smart highways.

<table>
<thead>
<tr>
<th>Highways for trial</th>
<th>Areas</th>
<th>Length(Km)</th>
</tr>
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<tbody>
<tr>
<td>Yanchong Highway</td>
<td>Hebei-Beijing</td>
<td>123</td>
</tr>
<tr>
<td>Beijing-Hongkong-Macao Highway G4</td>
<td>Hebei-Beijing</td>
<td>480</td>
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<td>New Airport Highway</td>
<td>Beijing</td>
<td>35</td>
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<td>Jingjingtang Highway</td>
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<td>Huantaihu Highway</td>
<td>Jiangsu</td>
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<td>Hangzhou-Shaoxing-Ningbo Highway G92</td>
<td>ZheJiang</td>
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<td>Guangfo Highway S15</td>
<td>Guangdong</td>
<td>15.7</td>
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<td>Huiwu Highway G12</td>
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<td>889</td>
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<td>Rongwu Highway G18(Baoding-Tianjing part)</td>
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<td>105</td>
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<td>Airport West Highway</td>
<td>Henan</td>
<td>107</td>
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<tr>
<td>G107(Xinxiang-Zhengzhou part)</td>
<td>Henan</td>
<td>-</td>
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<tr>
<td>Changjiu Highway G70</td>
<td>Jiangxi</td>
<td>138</td>
</tr>
</tbody>
</table>

- MOT(Ministry of Transport the People's Republic of China) initiates more than 10 smart highways or transport network building including 10 areas.

- For the preparation of Beijing Winter Olympic Game, the Yanchong Smart Highway will be installed 200 LTE-V2X RSUs along 33km in Beijing Part.
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The current C-V2X applications in China

C-V2X application scenarios

- **Information service applications**
  - Partial information processing capability
  - Global information processing capability
  - Partial support for user personalization
  - Full support for user personalization

- **Safety applications**
  - Preliminary: Safety warning
  - Mid-term: L3 self driving
  - Maturity: Full self-driving service

- **Transportation efficiency applications**
  - Preliminary: Local traffic efficiency improvement
  - Mid-term: Improve user experience
  - Maturity: Global traffic efficiency improvement

Collaborative Service Businesses

- **Vehicle Platooning**
  - High synergy of "Vehicle-road-cloud-pedestrain"

- **Sensor extending**
  - Advanced / fully automated driving

- **Remote driving**
  - Fully automatic driving

- **Advanced driving**
  - On-going deployment activities across China region
On-going deployment activities across China region

- C-V2X industry activities across China

1. ‘Three Layers’ Interoperability V2X Application Demonstration in Shanghai

2. More LTE-V2X trials are under developing in Wuxi, Shanghai, Beijing and other cities.

CCSA finished LTE-V2X spectrum study includes spectrum needs, coexistence study with incumbents

LTE-V2X trial for spectrum coexistence, performance, RF tests in Chongqing
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Global EU-China cooperation in connectivity

- The on-going cooperation between EU and China
  - IoV Standards and Regulations
    - CATARC and German automotive industry association (VDA) co-signed IoV MOU
    - IoV sub-committee of NTCAS and German Automotive Standards Committee co-signed IoV MOU
    - CATARC and French Automobile Standards Bureau co-signed MOU
  - Good cooperation in international standardization organization, like 5GAA/3GPP.
Global EU-China cooperation in connectivity

- Potential cooperation in the future
  - **Standards and Regulations**: Strengthen exchanges between enterprises or organizations between EU and China, and jointly promote the research and formulation of IoV standards and regulations
  - **Scaled test**: EU and China regularly exchange test zones planning and related technical progress, and build a coordinated cross-regional IoV test environment
- Cooperation on industry eco-system and business model
  - Co-explore a more scientific and rational business model
Thanks