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Test Methods of Message Layer of LTE-Based Vehicular Communication

基于 LTE 的车联网无线通信技术消息层测试方法

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Test Methods of Message Layer of LTE-Based Vehicular Communication

1 Scope

This Standard specifies the test method for the message layer of the LTE-based vehicle to everything technology; and regulates the test parameters and indicators, test methods, and test cases for the message layer of the LTE-based vehicle to everything technology.

This Standard is applicable to the message layer of the LTE-based vehicle to everything technology.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB 2312-1980 Code of Chinese Graphic Character Set for Information Interchange - Primary Set

GB 5768.2-2009 Road Traffic Signs and Markings - Part 2: Road Traffic Signs

GB/T 16263.2 Information Technology - ASN.1 Encoding Rules - Part 2: Specification of Packed Encoding Rules (PER)

GB/T 27967-2011 Format of Weather Forecast on Highway Traffic

GB/T 29100-2012 Road Traffic Information Service - Traffic Event Classification and Coding

YD/T 3340-2018 Technical Requirements of Air Interface of LTE-Based Vehicular Communication

YD/T 3400-2018 General Technical Requirements of LTE-Based Vehicular Communication

YD/T 3709-2020 Technical Requirements of Message Layer of LTE-Based

Vehicular Communication

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions apply.

3.1 Vehicle to everything, V2X

The communication between the on-board unit and other devices includes but not limited to the communication between the on-board units, the communication between the on-board unit and the roadside unit, the communication between the on-board unit and the pedestrian equipment, and the communication between the on-board unit and the network.

4 Abbreviations

The following abbreviations are applicable to this Document.

AID: Application ID;

BSM: Basic Safety Message;

DUT: Device Under Test;

LTE: Long Term Evolution;

LTE-V2X: LTE Vehicle to Everything;

OBU: On Board Unit;

RSU: Road Side Unit;

RSI: Road Side Information;

RSM: Road Side Message;

SPAT: Signal Phase and Timing Message;

TS: Test System;

TTCN-3: Testing and Test Control Notation-3;

UPER: Unaligned Packet Encoding Rules.

In Step 4, the msgCnt value in the subsequent BSM message sent by the DUT is 1 greater than the msgCnt value of the previous BSM message; In Step 5, after the msgCnt value in the BSM message sent by the DUT is 127, the msgCont value in the next BSM message is 0

6.1.2 Test of vehicle ID in BSM message

Test No.: TC_ML_BSM_MST_BV_02
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle ID information in the BSM message sent by the DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Configure the DUT to send BSM messages at the specified frequency; Step 2: Verify whether the DUT sends a BSM message; Step 3: Verify the encoding mode of the BSM message sent by the DUT; Step 4: Verify whether the vehicle ID parameter value in the BSM message sent by the DUT is legal
Expected results: In Step 2, the TS system receives the BSM message; In Step 3, the encoding mode of the BSM message sent by the DUT is UPER; In Step 4, the vehicle ID value in the BSM message sent by the DUT meets the requirements of OCTET STRING (SIZE(8))

6.1.3 Test of 3D coordinate in BSM message

Test No.: TC_ML_BSM_MST_BV_03
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the 3D coordination information in the BSM message sent by DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Set the parameter value of the 3D coordinate information (Position3D) in the BSM message

sent by the DUT to be pPosition3D; Step 2: Configure the DUT to send BSM messages at the specified frequency; Step 3: Verify whether the DUT sends a BSM message; Step 4: Verify the encoding mode of the BSM message sent by the DUT; Step 5: Verify whether the Position3D value in the BSM message sent by the DUT is consistent with the content configured by the TS
Excepted results: In Step 3, the TS system receives the BSM message; In Step 4, the encoding mode of the BSM message sent by the DUT is UPER; In Step 5, the Position3D value in the BSM message sent by the DUT is pPosition3D, which is consistent with the content set by TS

6.1.4 Test of vehicle gear status information in BSM message

Test No.: TC_ML_BSM_MST_BV_04
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle gear status information in BSM message sent by DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Set the parameter value of the vehicle gear information (TransmissionState) in the BSM message sent by the DUT to be pTransmissionState; Step 2: Configure the DUT to send BSM messages at the specified frequency; Step 3: Verify whether the DUT sends a BSM message; Step 4: Verify the encoding mode of the BSM message sent by the DUT; Step 5: Verify whether the TransmissionState value in the BSM message sent by the DUT is consistent with the content configured by TS
Expected results: In Step 3, the TS system receives the BSM message; In Step 4, the encoding mode of the BSM message sent by the DUT is UPER; In Step 5, the TransmissionState value in the BSM message sent by the DUT is pTransmissionState, which is consistent with the content set by TS

6.1.5 Test of vehicle speed information in BSM message

Test No.: TC_ML_BSM_MST_BV_05
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle speed information in BSM message sent by DUT is correct
Precondition:

1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Set the parameter value of vehicle speed information (Speed) in the BSM message sent by the DUT to be pSpeed; Step 2: Configure the DUT to send BSM messages at the specified frequency; Step 3: Verify whether the DUT sends a BSM message; Step 4: Verify the encoding mode of the BSM message sent by the DUT; Step 5: Verify whether the Speed value in the BSM message sent by the DUT is consistent with the content configured by TS
Expected results: In Step 3, the TS system receives the BSM message; In Step 4, the encoding mode of the BSM message sent by the DUT is UPER; In Step 5, the Speed value in the BSM message sent by the DUT is pSpeed, which is consistent with the content set by TS

6.1.6 Test of vehicle heading angle in BSM message

Test No.: TC_ML_BSM_MST_BV_06
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle heading angle in BSM message sent by DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Set the parameter value of vehicle heading angle information (Heading) in the BSM message sent by the DUT to be pHeading; Step 2: Configure the DUT to send BSM messages at the specified frequency; Step 3: Verify whether the DUT sends a BSM message; Step 4: Verify the encoding mode of the BSM message sent by the DUT; Step 5: Verify whether the Heading value in the BSM message sent by the DUT is consistent with the content configured by TS
Excepted results: In Step 3, the TS system receives the BSM message;

In Step 4, the encoding mode of the BSM message sent by the DUT is UPER; In Step 5, the Heading value in the BSM message sent by the DUT is pHeading, which is consistent with the content set by TS

6.1.7 Test of vehicle 4-axis acceleration in BSM message

Test No.: TC_ML_BSM_MST_BV_07
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle 4-axis acceleration information in BSM message sent by DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system
Test steps: Step 1: Set the parameter value of vehicle 4-axis acceleration information (AccelerationSet4Way) in the BSM message sent by the DUT to be pAccelerationSet4Way; Step 2: Configure the DUT to send BSM messages at the specified frequency; Step 3: Verify whether the DUT sends a BSM message; Step 4: Verify the encoding mode of the BSM message sent by the DUT; Step 5: Verify whether the AccelerationSet4Way value in the BSM message sent by the DUT is consistent with the content configured by TS
Expected results: In Step 3, the TS system receives the BSM message; In Step 4, the encoding mode of the BSM message sent by the DUT is UPER; In Step 5, the AccelerationSet4Way value in the BSM message sent by the DUT is pAccelerationSet4Way, which is consistent with the content set by TS

6.1.8 Test of vehicle brake system status in BSM message

Test No.: TC_ML_BSM_MST_BV_08
Test item: Test of DUT sends BSM message
Test purpose: Verify whether the vehicle brake system status information in BSM message sent by DUT is correct
Preconditions: 1) The DUT has been powered on and started; 2) The DUT has locked the GNSS-based position and synchronized with the GNSS clock; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of the DUT or test system; 4) The DUT shall not actively send messages except for receiving related commands from the test system
Test structure: See 5.1 Architecture of test system

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