

**Conformance test specifications for
SAE J2945/1 - On-board System Requirements for
V2V Safety Communications
Test Suite Structure and Test Purposes (TSS & TP)**

| | |
|---------------------|--------------------|
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1 Scope

This document provides the Test Suite Structure and Test Purposes for Basic Safety Message structure, content, and transmission as defined in SAE J2945/1 [1].

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [3] and ISO/IEC 9646-2 [4]) as well as the ETSI rules for conformance testing (ETS 300 406 [5]) are used as a basis for the test methodology.

2 References

2.1 Normative References

The following referenced documents are necessary for the application of the present document.

- [1] SAE J2945/1 Draft 5.0 (2015): "Surface Vehicle Standard: On-board Systems Requirements for V2V Safety Communications"
- [2] SAE J2735 (2016-01): "Dedicated Short Range Communication (DSRC) Message Set Dictionary"
- [3] ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework - Part 1: General concepts".
- [4] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".
- [5] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [6] IEEE Std 1609.3-2016 "IEEE Standard for Wireless Access in Vehicular Environments (WAVE) — Network Services".
- [7] IEEE Std. 1609.2-2016: "IEEE Draft Standard for Wireless Access in Vehicular Environments - security Services for Applications and Management Messages".
- [8] IEEE Std. 1609.4-2016 "IEEE Standard for Wireless Access in Vehicular Environments (WAVE) -- Multi-Channel Operation".
- [9] IEEE Std. 1609.12-2016 "IEEE Standard for Wireless Access in Vehicular Environments – Identifier Allocations".

2.2 Informative References

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

3 Definitions and Abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions are given in SAE J2735 [2]

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|------|---|
| BI | Behavior Invalid |
| BSM | Basic Safety Message |
| BV | Behavior Valid |
| CH | Channel |
| EDCA | Enhanced Distributed Channel Access |
| ITS | Intelligent Transport Systems |
| IUT | Implementation Under Test |
| MAC | Medium Access Control |
| SAE | Society of Automotive Engineers |
| SCMS | Security Certificate Management System |
| TAI | International Atomic Time |
| TP | Test Purposes |
| TSS | Test Suite Structure |
| V2V | Vehicle-to-Vehicle |
| V2X | Vehicle-to-Device |
| WAAS | Wide Area Augmentation System |
| WAVE | Wireless Access in Vehicular Environments |
| WGS | World Geodetic System |

4 Prerequisites and Test Configurations

4.1 Test Configurations

This clause introduces the test configurations that are used for the definition of test purposes. The test configurations cover the various scenarios of the J2945/1 tests for BSM conformance. Distance between the IUT and DSRC Packet Capture Tool shall not exceed five meters. In all test configurations antenna locations are located at an unspecified measured location and the test system is configured to account for the location. More information about the requirements for the DSRC Packet Capture Tool can be found in the DSRC Sniffer and Logger section of the Appendix.

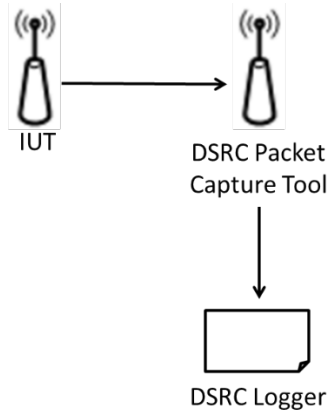


Figure 1: Test Configuration 1 (TC1)

TC2 is used for moving vehicle tests, related to event conditions and data accuracy. Both the IUT and DSRC Packet Capture Tool are mounted inside of the test vehicle. Note that while TC2 explicitly requires the IUT to be mounted on a test platform, tests which are designed for TC1 can also be run on TC2. More information about the requirements for the Ground Truth device can be found in the Ground Truth Determination Unit section of the Appendix. More information about the requirements for the DSRC Packet Capture Tool can be found in the DSRC Packet Capture Tool section of the Appendix.

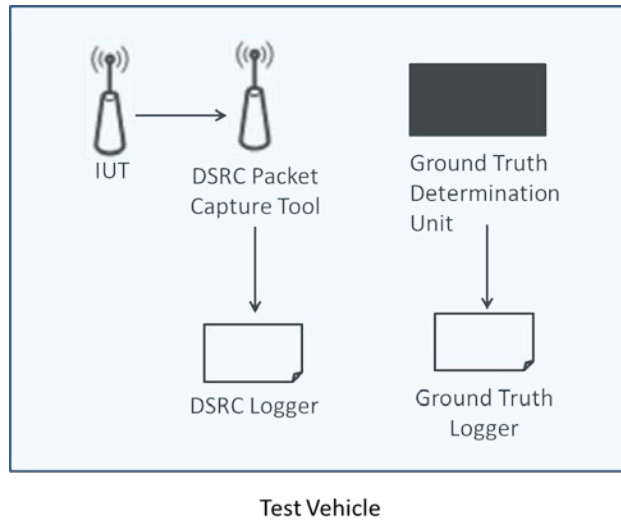


Figure 2: Test Configuration 2 (TC2)

TC3 is required for situations in which the IUT responds to BSMs sent from remote vehicles or tests that require exact measurements of the IUT. The IUT, DSRC Reference Unit, Ground Truth Determination Unit, and DSRC Packet Capture Tool are mounted in the test vehicle. More information about the requirements for the Ground Truth Determination Unit can be found in the Ground Truth Determination Unit section of the Appendix. More information about the requirements for the DSRC Packet Capture Tool can be found in the DSRC Packet Capture Tool section of the Appendix.

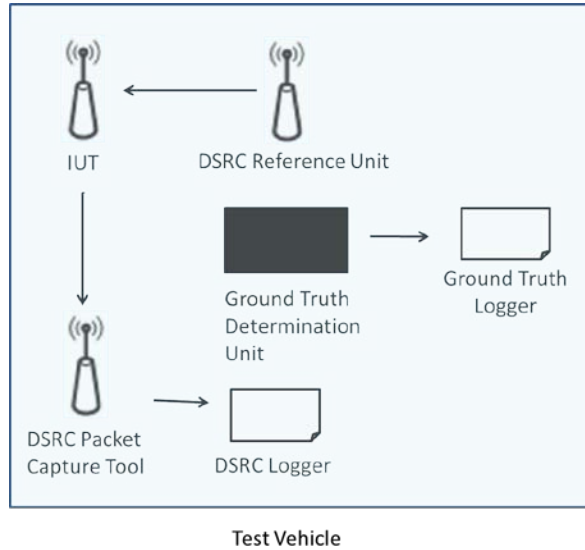


Figure 3: Test Configuration 3 (TC3)

TC4 is used for situations in which the test operator requires direct access to information located on the IUT.

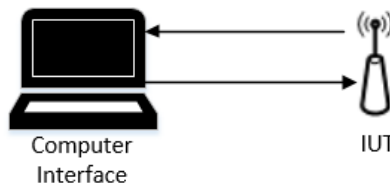


Figure 4: Test Configuration 4 (TC4)

TC5 is used for situations in which the test operator requires direct access to an SCMS device. For example, certificate revocation. The SCMS interactions are handled by an SCMS Emulator that implements the same interface as the production SCMS.

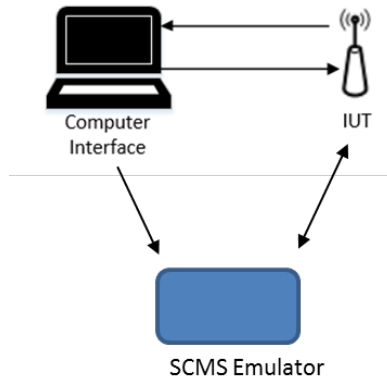


Figure 5: Test Configuration 5 (TC5)

4.2 Feature Restriction and Pre-Enrolment

4.2.1 Feature Restriction

In this clause all feature restrictions are listed:

- No external DSRC units within range of IUT, DSRC Packet Capture Tool, and DSRC Reference Unit are transmitting outside of the test setup.
- WAAS corrections are present for all devices.
- Signature and certificate content is assumed to be tested and validated through 1609.2 test method.
- Any reference to VehicleEventFlags only accounts for the Critical Event Flags: Hard Braking, ABS, Traction Control, and Stability Control. Testing is not required for any other VehicleEventFlags. All possible combinations of Critical Event Flags are organized in Section 7.6 of the Appendix.

States in Initial Conditions

Each TP contains a pre-test condition. The pre-test condition defines the initial state in which the IUT has to be to apply the actual TP. Most of the TPs start from the “initial state” which is defined as follows:

- The IUT is powered up
- GNSS in open-sky conditions[1] is being received.
- Unless otherwise stated, the IUT is not transmitting
- Unless otherwise stated, Congestion Control is enabled
- Unless otherwise stated, the IUT has the certificates available to successfully transmit BSMs for the duration of the test.

Some TPs start from a different initial condition which is explicitly defined in the TP. However, the “initial state” defined above is the starting point before the different initial conditions are established.

When the execution of the pre-test condition does not succeed, it leads to the assignment of an Inconclusive verdict.

4.3 Variants, Variables and Snippet Naming Convention

The TPs use the concept of variants. Their definition, how they are used and their naming conventions are defined in this clause.

Variants: In cases where for a single field multiple values can be tested, then a table is appended after the TP. This table lists all the different values which need to be tested. The TP identifier is appended with -X (e.g. TP/SEC/ITS-S/ENR/NB-02-X). If there are two fields for which multiple values can be tested then X and Y are appended. The field itself is written as X_FIELD_NAME (e.g. X_PKT_SIGNATURE).

Vendor Tests: In cases where requirements cannot be tested through black-box field tests (for example, hardware security or internal clock representation) these tests require hardware vendors to report on and confirm the functionality of the IUT. The TP identifier is appended with -V.

5 Test Suite Structure (TSS)

5.1 Structure for Content and Accuracy Tests

Table 1 shows the Test Suite Structure (TSS) including its subgroups defined for conformance testing.

Table 1: TSS for BSM

| Root | Group | category |
|-------------|--------------------|-----------------|
| BSM | Stationary Vehicle | Valid |
| BSM | Moving Vehicle | Valid |
| BSM | Local Data | Valid |
| BSM | Local Data | Invalid |

The test suite is structured as a tree with the root defined as BSM. The tree is of rank 2 with the first rank a group and the second a category. The third rank is the standard ISO conformance test categories.

5.2 Test Groups

The test suite has a total of three levels. The first level is the root. The second level separates the root based on the IUT's operating condition. The third level is the standard ISO conformance test categories.

5.2.1 Root

The root identifies the on-board system requirements for V2V Safety Communications given in SAE J2945/1 [1].

5.2.2 Groups

This level contains three message types identified as:

Stationary Vehicle: The vehicle used in the test does not move during the test

Moving Vehicle: The vehicle is required to move at any time during the test

Local Data: The test contains requirements that cannot be tested through BSM transmission and require either grey box testing or a vendor's assurance that the IUT implements the the required aspect of the IUT

5.2.3 Categories

This level contains the standard ISO conformance test categories limited to the behavior valid event and behavior invalid event.

6 Test Purposes (TP)

6.1 Introduction

6.1.1 TP Definition Conventions

The TP definition is built according to EG 202 798 [i.1].

The TPs are defined by the rules shown in table 2.

Table 2: TP definition rules

| | |
|---------------------|--|
| TP ID | The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in the clause below. |
| Test Objective | Short description of test purpose objective according to the requirements from the base standard. |
| References | The reference indicates the sub-clauses of the reference standard specifications in which the conformance requirement is expressed. |
| Test Configuration | References the test configuration selected for this TP |
| Pre-test conditions | Define the initial state the IUT has to be in to apply the actual TP. In the corresponding Test Case, when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict. |
| Test Sequence | Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding Test Case, Pass or Fail verdicts can be assigned there. |
| Event Types | |
| Stimulus | Corresponds to an event that forces an IUT to proceed with a specific protocol action |
| Check | Ensures the conditions are appropriate to move to the next step in the test procedure, e.g. the receipt of protocol messages on reference points (i.e. output of the test system) with valid content, typically before the IUT stimulus is triggered. These events are not associated with the verdict evaluation (i.e. Pass/Fail) |
| Configure | Performs some internal modification of the IUT that places it in a specific behavior state |
| Verify | Consists of verifying that the IUT behaves according to the expected behavior (for instance the IUT behavior shows that it receives the expected message). Outcome of this event typically evaluate for verdict (i.e. Pass/Fail) |
| Procedure | Procedural action directing the flow of TP execution. |

6.1.2 TP Identifier Naming Conventions

The identifier of the TP is built according to table 2.

Table 3: TP naming convention

| Identifier | TP-<root>-<gr>-<x>-<nn> | | |
|------------|--------------------------|-----|-----------------------------------|
| | <root> = root | BSM | |
| | <gr> = group | SV | Stationary Vehicle |
| | | MV | Moving Vehicle |
| | | LD | Local Data |
| | <x> = type of testing | BV | Valid Behaviour tests |
| | | BI | Invalid Syntax or Behaviour Tests |
| | <nn> = sequential number | | 01 to 99 |

6.1.3 Rules for the Behavior Description

The description of the TP is built according to EG 202 798 [i.1].

The base standards are not using finite state machine concept. As consequence, the test purposes use a generic "Initial State" that corresponds to a state where the IUT is ready for starting the test execution.

Being in the "Initial State" refers to the starting point of the initial device configuration. There are no pending actions, instantiated buffers, or variables which could disturb the execution of a test.

6.1.4 Sources of TP Definitions

All TPs are specified according to SAE J2735 [2] and SAE J2945/1 [1].

6.2 Test Purposes for BSM

6.2.1 Transmission Requirements

| | | | |
|---|---|---|----------------|
| Identifier | TP-BSM-SV-BV-01-X | | |
| Test Objective | Verify that DE_VehicleEventFlags is only included if an event is occurring and is not included if an event is not occurring | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-BSMCONT-006, V2V-STD-J2735-040 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • No conditions corresponding to an event flag are met • The IUT is transmitting BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Verify | A BSM is transmitted with the DE_VehicleEventFlags element not included | Pass / Fail |
| 2 | Stimulus | One set of conditions (X) corresponding to an Event Flag is met as per Section 7.6 | |
| 3 | Verify | A BSM is transmitted with the DE_VehicleEventFlags element included within time period = 3*vEventDetectLatency | Pass / Fail |
| 4 | Verify | A BSM is transmitted with the DE_VehicleEventFlags element included with corresponding bits set according to Bit Location as per Section 7.6 | Pass / Fail |
| 5 | Stimulus | The previously set of Event Flags are removed | |
| 6 | Verify | The BSM contains no DE_VehicleEventFlags within time period = vDetectLatency | Pass / Fail |
| 7 | Procedure | Steps 2 – 6 are repeated for variants from the Variants table in Section 7.6 | |

| | | | |
|--|---|--|----------------|
| Identifier | TP-BSM-SV-BV-02 | | |
| Test Objective | Verify that the first BSM transmitted after device restart uses a random time | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-GENTIM-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is configured to transmit BSMs automatically upon restart • The IUT is in the initial state | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The device is restarted | |
| 2 | Verify | The BSM is transmitted and its start time secMark is recorded[D3][LJR4] | Pass / Fail |
| 3 | Procedure | Steps 1 – 2 are repeated enough times to ensure a statistically significant sample size, as defined in Section 7.1 | |
| 4 | Verify | The sample of start times is deemed sufficiently random according to criteria set in Section 7.1 | Pass / Fail |

| | | | |
|-------------------|-----------------|--|--|
| Identifier | TP-BSM-SV-BV-13 | | |
|-------------------|-----------------|--|--|

| | | | |
|--|--|---|----------------|
| Test Objective | Verify that BSMs are generated within $-vBSMRateTolerance$ and $+vBSMRateTolerance$ of their scheduled generation time | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-GENTIM-002 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> There are no nearby vehicles that influence the Congestion Control The IUT is configured to transmit BSMs automatically upon restart The IUT is in the initial state | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The device is restarted | |
| 2 | Check | A BSM is transmitted each 100 milliseconds and secMark is recorded for each message | |
| 3 | Verify | A value between $-vBSMRateTolerance$ [D5][LJR6] and $+vBSMRateTolerance$ has been added to the transmission time of the most recent BSM | Pass / Fail |
| 4 | Procedure | Steps 3 – 5 are repeated a statistically significant amount of times as defined by Section 7.1 | |

| | | | |
|--|---|--|----------------------|
| Identifier | TP-BSM-SV-BV-03-X | | |
| Test Objective | Verify BSMs are transmitted with correct contents and transmission parameters | | |
| Test Configuration | TC2 | | |
| Reference: | [1] V2V-BSMTX-BSMCONT-[001-004], V2V-BSMDTX-CHDATARATE-[001-002], V2V-STD-J2735-[001-015, 020-039, 041-045], V2V-BSMTX-DATAACC-001, V2V-BSMTX-MINTX-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs on a 10 MHz channel at $vChannelNumber$ Congestion Control is turned off | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | The BSM is signed using credentials defined by 1609.2 [6] | Pass / Fail |
| 3 | Verify | The BSM is transmitted using a WAVE Short Message containing WSM version =3 | Pass / Fail |
| 4 | Verify | The BSM is encoded using Unaligned Packed Encoding Rules (UPER) | Pass / Fail |
| 5 | Verify | The BSM contains X_BSM_CONTENT with value X_FRAME_VALUE | Pass / Fail |
| 6 | Procedure | Repeat steps 1-5 for all variants of X_BSM_CONTENT and X_FRAME_VALUE | |
| 7 | Verify | The BSMs are transmitted on a 10 MHz channel | Pass / Fail |
| 8 | Verify | The BSMs are transmitted on $vChannelNumber$ | Pass / Fail |
| 9 | Verify | The BSMs are transmitted at a data rate of $vDataRate$ | Pass / Fail |
| Variants | | | |
| X | X_BSM_CONTENT | | X_FRAME_VALUE |
| 1 | DE_DSRC_MessageID, contained within Part I [V2V-STD-J2735-002] | | 2 |
| 2 | DF_BSMcoreData, contained within Part I | | Valid Frame |

| | | |
|----|--|------------------------------------|
| | [V2V-STD-J2735-007] | |
| 3 | DF_PositionalAccuracy, contained within DF_BSMcoreData [V2V-STD-J2735-012] | Valid Frame |
| 4 | DE_SemiMajorAxisAccuracy, contained within DF_PositionalAccuracy [V2V-STD-J2735-030] | 0 <= Value <= 255 |
| 5 | DE_SemiMajorAxisOrientation, contained within DF_PositionalAccuracy [V2V-STD-J2735-031] | 0 <= Value <= 65535 |
| 6 | DE_SemiMinorAxisAccuracy, contained within DF_PositionalAccuracy [V2V-STD-J2735-032] | 0 <= Value <= 255 |
| 7 | DE_DSecond, contained within DF_BSMcoreData [V2V-STD-J2735-021] | 0 <= Value <= 65535 |
| 8 | DE_Elevation, contained within DF_BSMcoreData [V2V-STD-J2735-022] | -4096 <= Value <= 61439 |
| 9 | DE_Heading, contained within DF_BSMcoreData [V2V-STD-J2735-024] | 0 <= Value <= 28800 |
| 10 | DE_Latitude, contained within DF_BSMcoreData [V2V-STD-J2735-025] | -900000000 <= Value <= 900000001 |
| 11 | DE_Longitude, contained within DF_BSMcoreData [V2V-STD-J2735-026] | -1799999999 <= Value <= 1800000001 |
| 12 | DE_MsgCount, contained within DF_BSMcoreData [V2V-STD-J2735-027] | 0 <= Value <= 127 |
| 13 | DE_Speed, contained within DF_BSMcoreData [V2V-STD-J2735-033] | 0 <= Value <= 8191 |
| 14 | DE_SteeringWheelAngle, contained within DF_BSMcoreData [V2V-STD-J2735-035] | -126 <= Value <= 127 |
| 15 | DE_TemporaryID, contained within DF_BSMcoreData [V2V-STD-J2735-036] | Octet String, Size 4 |
| 16 | DE_TransmissionState, contained within DF_BSMcoreData [V2V-STD-J2735-039] | Enumerated (0 - 7) |
| 17 | DF_BrakeSystemStatus, contained within DF_BSMcoreData [V2V-STD-J2735-006] | Valid Frame |
| 18 | DE_TractionControlStatus, contained within DF_BrakeSystemStatus [V2V-STD-J2735-038] | Enumerated (0 - 3) |
| 19 | DE_StabilityControlStatus, contained within DF_BrakeSystemStatus [V2V-STD-J2735-034] | Enumerated (0 - 3) |
| 20 | DF_AccelerationSet4Way, contained within DF_BSMcoreData [V2V-STD-J2735-005] | Valid Frame |
| 21 | DE_Acceleration (Lateral), contained within DF_AccelerationSet4Way [V2V-STD-J2735-015] | -2000 <= Value <= 2001 |
| 22 | DE_Acceleration (Longitudinal), contained within DF_AccelerationSet4Way [V2V-STD-J2735-015] | -2000 <= Value <= 2001 |
| 23 | DE_VerticalAcceleration, contained within DF_AccelerationSet4Way [V2V-STD-J2735-043] | -127 <= Value <= 127 |
| 24 | DE_YawRate, contained within DF_AccelerationSet4Way [V2V-STD-J2735-045] | -32767 <= Value <= 32767 |
| 25 | DF_VehicleSize, contained within DF_BSMcoreData [V2V-STD-J2735-014] | Valid Frame |
| 26 | DE_VehicleLength, contained within DF_VehicleSize [V2V-STD-J2735-014] | 0 <= Value <= 4095 |
| 27 | DE_VehicleWidth, contained within DF_VehicleSize [V2V-STD-J2735-014] | 0 <= Value <= 1023 |
| 28 | DF_VehicleSafetyExtensions, contained within Part II [V2V-STD-J2735-013] | Valid Frame |

| | | |
|----|---|----------------------------|
| 29 | DF_PathHistory, contained within DF_VehicleSafetyExtensions [V2V-STD-J2735-008] | Valid Frame |
| 30 | DF_PathHistoryPointList, contained within DF_PathHistory [V2V-STD-J2735-009] | Valid Frame |
| 31 | DE_OffsetLL-B18, contained within DF_PathHistoryPointList [V2V-STD-J2735-028] | -131072 <= Value <= 131071 |
| 32 | DF_PathHistoryPoint, contained within DF_PathHistoryPointList [V2V-STD-J2735-010] | Valid Frame |
| 33 | DE_TimeOffset, contained within DF_PathHistoryPoint [V2V-STD-J2735-037] | 1 <= Value <= 65535 |
| 34 | DE_VertOffset-B12, contained within DF_PathHistoryPoint [V2V-STD-J2735-044] | -2048 <= Value <= 2047 |
| 35 | DE_ExteriorLights, contained within DF_VehicleSafetyExtensions [V2V-STD-J2735-023] | Bit String, Size (9, ...) |
| 36 | DF_PathPrediction, contained within DF_VehicleSafetyExtensions [V2V-STD-J2735-011] | Valid Frame |
| 37 | DE_Confidence, contained within DF_PathPrediction [V2V-STD-J2735-020] | 0 <= Value <= 200 |
| 38 | DE_RadiusOfCurvature, contained within DF_PathPrediction [V2V-STD-J2735-029] | -32767 <= Value <= 32767 |

6.2.2 Message Identification

| | | | |
|---|--|---|----------------|
| Identifier | TP-BSM-SV-BV-04 | | |
| Test Objective | Verify identification data is randomized to facilitate user privacy after certificate expiration | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-DATAACC-[003,006], V2V-SECPRIV-IDRAND-002, V2V-SECPRIV-BSMSIGN-008 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in its initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | Two BSMs are transmitted without a certificate change | |
| 2 | Verify | DE_MsgCount is incremented between BSMs | Pass / Fail |
| 3 | Verify | DSRC MAC address does not change | Pass / Fail |
| 4 | Verify | DE_TemporaryID does not change | Pass / Fail |
| 5 | Stimulus | Certificate expiration causes a certificate change | |
| 6 | Stimulus | A first BSM is transmitted after certificate change | |
| 7 | Verify | The IUT populates a value for DE_MsgCount | Pass / Fail |
| 8 | Verify | The IUT populates a value for DE_TemporaryID | Pass / Fail |
| 9 | Verify | The IUT populates a value for DSRC MAC Address | Pass / Fail |
| 10 | Verify | A full certificate is attached to the BSM | Pass / Fail |
| 11 | Procedure | Steps 5 – 10 are repeated a statistically significant amount of times as defined by Section 7.1 | |
| 12 | Verify | DE_MsgCount's values over the previous iterations are random according to criteria set in Section 7.1 | Pass / Fail |
| 13 | Verify | DE_TemporaryID's values over the previous iterations are random according to criteria set in Section 7.1 | Pass / Fail |
| 14 | Verify | DSRC MAC Address' values over the previous iterations are random according to criteria set in Section 7.1 | Pass / Fail |

| | | | |
|---|--|---|----------------|
| Identifier | TP-BSM-SV-BV-14 | | |
| Test Objective | Verify identification data is randomized to facilitate user privacy after device restart | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-DATAACC-[002,005], V2V-SECPRIV-IDRAND-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in its initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The IUT is restarted | |
| 2 | Stimulus | A BSM is transmitted | |
| 3 | Verify | The IUT populates a value for DE_MsgCount | Pass / Fail |
| 4 | Verify | The IUT populates a value for DE_TemporaryID | Pass / Fail |
| 5 | Verify | The IUT populates a value for DSRC MAC Address | Pass / Fail |
| 6 | Procedure | Steps 1 – 5 are repeated a statistically significant amount of times as defined in Section 7.1 | |
| 7 | Verify | DE_MsgCount's values over the past iterations are random according to criteria set in Section 7.1 | Pass / Fail |
| 8 | Verify | DE_TemporaryID's values over the past iterations are random according to criteria set in Section 7.1 | Pass / Fail |
| 9 | Verify | DSRC MAC Address' values over the past iterations are random according to criteria set in Section 7.1 | Pass / Fail |

| | | | |
|---|---|---|----------------|
| Identifier | TP-BSM-SV-BV-05 | | |
| Test Objective | Verify DE_MsgCount is properly incremented and rolls over when reaching 127 and DE_TemporaryID is not changed | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-DATAACC-[004, 007] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs, with the first's DE_MsgCount less than 127 Does not change again during this test | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | Two BSMs are transmitted, the first with a DE_MsgCount less than 127 | |
| 2 | Verify | The DE_TemporaryIDs of both BSMs are identical | Pass / Fail |
| 3 | Verify | DE_MsgCount of the second of the two BSMs is one greater than first DE_MsgCount | Pass / Fail |
| 4 | Procedure | The IUT continues to send BSMs until the DE_MsgCount of a BSM is exactly 127 | |
| 5 | Stimulus | A BSM is transmitted | |
| 6 | Verify | DE_TemporaryID has not changed | Pass / Fail |
| 7 | Verify | DE_MsgCount of the previous BSM is 0 | Pass / Fail |

6.2.3 Security

| | | | |
|-----------------------|--|--|--|
| Identifier | TP-BSM-SV-BV-06 | | |
| Test Objective | Verify the IUT signs every BSM and attaches a certificate or certificate digest to every BSM | | |

| | | | |
|---|-------------------------------|---|----------------|
| Test Configuration | TC1 | | |
| Reference: | V2V-SECPRIV-BSMSIGN-[001-002] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | A full certificate or certificate digest is attached to the BSM | Pass / Fail |
| 3 | Verify | The BSM is signed by the certificate stored in the IUT | Pass / Fail |

| | | | |
|---|--|--|----------------|
| Identifier | TP-BSM-SV-BV-07 | | |
| Test Objective | Verify the IUT attaches full certificates after vMaxCertDigestInterval or more has passed since the previous transmission of a certificate | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-SECPRIV-BSMSIGN-003 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted with a full certificate | |
| 2 | Stimulus | Wait for the next BSM with full certificate attached to be transmitted | |
| 3 | Verify | A BSM is transmitted with a full certificate attached within interval not exceeding vMaxCertDigestInterval | Pass / Fail |

| | | | |
|--|--|---|----------------|
| Identifier | TP-BSM-SV-BV-08-X | | |
| Test Objective | Verify the IUT attaches a full certificate when a Critical Event Flag is set | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-SECPRIV-BSMSIGN-004 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state No event conditions are present The IUT is transmitting BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Verify | The IUT transmits BSMs containing no DE_VehicleEventFlags element | Pass / Fail |
| 2 | Stimulus | A critical Event Flag set is raised | |
| 3 | Verify | The BSM contains a full certificate attached to the BSM is transmitted within 3*vEventDetectLatency | Pass / Fail |
| 4 | Stimulus | The critical Event Flag set is cleared | |
| 5 | Procedure | Steps 1 – 4 are repeated for all critical event flag sets from the Variants table in Section 7.6 | |

| | | | |
|---------------------------|---|--|--|
| Identifier | TP-BSM-SV-BV-09 | | |
| Test Objective | Verify the IUT does not transmit changes if no certificates are available | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-SECPRIV-BSMSIGN-[005, 006] | | |

| Pre-test conditions | | | |
|--|----------|--|-------------|
| <ul style="list-style-type: none"> The IUT is in the initial state One certificate is available on the IUT The radio is prevented from receiving new certificates Certificate expiration does not occur unless explicitly stated The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Check | At least one BSM is transmitted | |
| 2 | Stimulus | Certificate validity has expired in the IUT and no other certificates are made unavailable | |
| 3 | Verify | BSMs are not transmitted for vCertChangeInterval | Pass / Fail |

| Identifier | TP-BSM-SV-BV-10 | | |
|--|--|--|-------------|
| Test Objective | Verify the IUT does not transmit BSMs with certificates on a revocation list | | |
| Test Configuration | TC5 | | |
| Reference: | V2V-SECPRIV-CERTREV-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state One certificate is available on the IUT The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Verify | At least one BSM is transmitted | Pass / Fail |
| 2 | Stimulus | The one certificate is placed on the revocation list | |
| 3 | Verify | The IUT does not transmit BSMs with that revoked certificate for vCertChangeInterval | Pass / Fail |

| Identifier | TP-BSM-SV-BV-11 | | |
|---|---|---|-------------|
| Test Objective | After a device startup, the first BSM transmitted by the IUT has an entire certificate attached | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-SECPRIV-BSMSIGN-007 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs on device restart automatically | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The IUT is restarted | |
| 2 | Verify | The IUT transmits the first BSM | Pass / Fail |
| 3 | Verify | The first BSM contains a full certificate | Pass / Fail |

| Identifier | TP-BSM-LD-BV-04-V | | |
|--|--|-------------|---------|
| Test Objective | Verify storage of certifications | | |
| Test Configuration | TC5 | | |
| Reference: | V2V-SECMGMT-CERTSTORE-[001-004], V2V-SECMGMT-CRLLOAD-[001-002] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is off | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |

| | | | |
|---|-----------|---|-------------|
| 1 | Stimulus | The IUT is turned on | |
| 2 | Verify | The vendor's report indicates that the IUT has at least vCertNvMemSize of non-volatile memory for storage of pseudonym certificates | Pass / Fail |
| 3 | Verify | The vendor's report indicates that the IUT has at least vCrlStoreSize of non-volatile memory for storing the Certificate Revocation List | Pass / Fail |
| 4 | Verify | The vendor's report indicates that the IUT has at least vSecMemSize of secure memory available for data requiring secure storage | Pass / Fail |
| 5 | Stimulus | The IUT retrieves an individual pseudonym certificate, RA address, RA intermediate CA, PCA certificate, System configuration, and security policy | |
| 6 | Configure | The IUT retrieves Root CA certificate, Enrollment certificate, and system private keys | |
| 7 | Verify | The vendor's report indicates that the data retrieved in Step 5 is contained within secure, tamper-evident, non-volatile memory | Pass / Fail |
| 8 | Stimulus | The IUT retrieves a Certificate Revocation List | |
| 9 | Verify | The vendor's report indicates that the Certificate Relocation List is stored in non-volatile memory | Pass / Fail |

| | | | |
|---|--|--|----------------|
| Identifier | TP-BSM-LD-BV-08 | | |
| Test Objective | Verify the IUT's ability to verify incoming BSMs | | |
| Test Configuration | TC3 | | |
| Reference: | V2V-SECPRIV-BSMVERIFY-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state IUT is configured to verify all BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A signed BSM with a full certificate is transmitted from the reference unit to the IUT | |
| 2 | Verify | The IUT verifies the BSM, resulting in success | Pass / Fail |
| 3 | Stimulus | A signed BSM with a certificate digest of the previous BSM's certificate is transmitted from the reference unit to the IUT | |
| 4 | Verify | The IUT verifies the BSM using the previous BSM's full certificate, resulting in success | Pass / Fail |

| | | | |
|---|--|--|----------------|
| Identifier | TP-BSM-LD-BV-09-V | | |
| Test Objective | Verify the IUT's ability to securely update root CA certificates | | |
| Test Configuration | TC5 | | |
| Reference: | V2V-SECMGMT-CERTLOAD-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Configure | The computer interface makes an updated root CA certificate available on the SCMS device | |
| 2 | Configure | The IUT is configured to attempt to update its root CA certificate | |
| 3 | Verify | The IUT's root CA is updated with the SCMS device's CA | Pass / Fail |
| 4 | Verify | The vendor's report indicates that the IUT's root CA is updated securely | Pass / Fail |

| | | | |
|---|--|--|----------------|
| Identifier | TP-BSM-MV-BV-17-X | | |
| Test Objective | Verify certificate is not changed during event conditions unless the certificate expires | | |
| Test Configuration | TC4 | | |
| Reference: | V2V-SECPRIV-CERTCHG-002 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • The IUT is configured to transmit BSMs • Certificate expiration does not occur unless explicitly stated | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Verify | The IUT transmits BSMs with the DE_VehicleEventFlags element not included | Pass / Fail |
| 2 | Stimulus | One critical set of Event Flag from Section 7.6 [LJR7] is set | |
| 3 | Verify | The IUT transmits BSM containing full security certificate | Pass / Fail |
| 4 | Verify | The certificate of the BSM Transmitted in Step 1 and the BSM Transmitted in Step 3 are identical | Pass / Fail |
| 5 | Stimulus | The certificate change [D8][LJR9] time passes while the Event Flag set remains persistent | |
| 6 | Stimulus | The IUT transmits at least one BSM | |
| 7 | Verify | The certificate of Step 6's BSM and Step 3's BSM are different | Pass / Fail |
| 8 | Procedure | Steps 1 – 7 are repeated for all critical event sets from Section 7.6 | |

| | | | |
|---|---|--|----------------|
| Identifier | TP-BSM-MV-BV-18 | | |
| Test Objective | Verify certificate is not changed if travel distance is less than vCertChangeDistance unless reset or the certificate expires | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-SECPRIV-CERTCHG-[001, 003] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • The IUT is configured to transmit BSMs • Certificate change does not occur unless explicitly stated | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The IUT travels vCertChangeDistance while continually transmitting BSMs | |
| 2 | Verify | All BSMs transmitted in Step 1 have identical certificates | Pass / Fail |
| 3 | Stimulus | The IUT travels more than vCertChangeDistance from the starting point | |
| 4 | Verify | BSMs transmitted after traveling further than vCertChangeDistance from the starting point have a different certificate than those transmitted before traveling more than vCertChangeDistance from the starting point | Pass / Fail |
| 5 | Stimulus | Time passes until certificate expiration | |
| 6 | Verify | BSMs transmitted after certificate expiration have a different certificate than those transmitted after traveling more than vCertChangeDistance from the starting point | Pass / Fail |
| 7 | Stimulus | The IUT is reset | |
| 8 | Verify | BSMs transmitted after reset have a different certificate than those | Pass / Fail |

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| | transmitted after certificate expiration | |
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6.2.4 Data Accuracy

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|---|--|--|----------------|
| Identifier | TP-BSM-SV-BV-12 | | |
| Test Objective | Verify data retention across IUT restart | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAPERSIST-[001-004] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT has a last known heading value and a last known path history | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The IUT travels at a speed greater than vHeadingSpeedThresh to allow the IUT to lock its heading | |
| 2 | Verify | The IUT transmits at least one BSM | Pass / Fail |
| 3 | Stimulus | The IUT is restarted | |
| 4 | Check | The IUT completes restart | |
| 5 | Verify | The IUT transmits at least one BSM | Pass / Fail |
| 6 | Verify | The last known headings of both BSMs are identical | Pass / Fail |
| 7 | Verify | The last known path histories of both BSMs are identical | Pass / Fail |

| | | | |
|--|--|--|----------------|
| Identifier | TP-BSM-MV-BV-01-V | | |
| Test Objective | Verify accuracy of localization data provided by IUT | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-POSTIM-WAAS-001, V2V-POSTIM-COORDSYSREF-001, V2V-BSMTX-DATAACC-[011-014, 017, 019, 024-027], V2V-POSTIM-POSDETER-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state WAAS is available to the IUT (Note: Because WAAS must always be available to the IUT to achieve the required accuracy, the effects of removing WAAS cannot be tested) The IUT is configured to transmit BSMs All tests to be conducted are Open Sky and all road test conditions are of a grade less than .2% and a cross-slope less than .2% | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A statistically significant amount of BSMs are transmitted by the IUT as defined by Section 7.1 | |
| 2 | Verify | The IUT transmits BSMs with the correct coordinates and confidences based on the GNSS positioning system | Pass / Fail |
| 3 | Verify | The vendor's report indicates that the GNSS reading is supplemented with WAAS correction | Pass / Fail |
| 4 | Verify | The horizontal position is given with reference to the WGS-84 coordinate system | Pass / Fail |
| 5 | Verify | The DE_Longitude and DE_Latitude values are within vPosAccuracy of the baseline position under open sky conditions over 68% of the test measurements as compared to the Ground Truth | Pass / Fail |
| 7 | Verify | The DE_Elevation value is set to the "Height above Reference Ellipsoid" above or below the WGS-84 reference ellipsoid | Pass / Fail |
| 8 | Verify | The DE_Elevation data element is within vElevAccuracy of the | Pass / Fail |

| | | | |
|----|--------|--|-------------|
| | | reference elevation over 68% of the test measurements as compared to the Ground Truth | |
| 9 | Verify | The DE_Speed data element is within vSpeedAccuracy of the actual vehicle speed under open sky conditions 68% of the test measurements as compared to the Ground Truth | Pass / Fail |
| 11 | Verify | If the IUT supports the DE_SteeringWheelAngle element, DE_SteeringWheelAngle is accurate to within vStWhAnAccuracy of the actual vehicle steering wheel angle over 95% of test measurements as compared to the Ground Truth. If the IUT does not support DE_SteeringWheelAngle, it is set to unavailable | Pass / Fail |
| 12 | Verify | DE_Acceleration (Longitudinal) and DE_Acceleration (Lateral) are accurate to within vAccelAccuracy over 68% of test measurements as compared to the Ground Truth | Pass / Fail |
| 13 | Verify | DE_VerticalAcceleration is accurate to within vVertAccelAccuracy over 68% of test measurements as compared to the Ground Truth | Pass / Fail |
| 14 | Verify | DE_YawRate is accurate to within vYawRateAccuracy over 68% of test measurements as compared to the Ground Truth | Pass / Fail |

| | | | |
|--|---|--|----------------|
| Identifier | TP-BSM-MV-BV-02 | | |
| Test Objective | Verify accuracy of DE_Heading element provided by IUT when vehicle speed is less than or equal to vHeadingSpeedThresh | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-020 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • The vehicle speed is less than or equal to vHeadingSpeedThresh • The IUT is configured to transmit BSMs • Test is conducted as an Open Sky Test where road test conditions are of a grade less than .2% and a cross-slope less than .2% | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | At least a statistically significant amount of [D10][LJR11]BSMs are transmitted by the IUT as defined in Section 7.1 with speed less than or equal to vHeadingSpeedThresh | |
| 2 | Verify | The DE_Heading data element is accurate to within vHeadAccuracyB of actual heading, indicated as clockwise from north, over 68% of test measurements as compared to the Ground Truth | Pass / Fail |

| | | | |
|---|--|--|--|
| Identifier | TP-BSM-MV-BV-03 | | |
| Test Objective | Verify accuracy of DE_Heading element provided by IUT when vehicle speed is greater than vHeadingSpeedThresh | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-021 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • The vehicle speed is greater than vHeadingSpeedThresh • The IUT is configured to transmit BSMs • Test is conducted as an Open Sky Test where road test conditions are of a grade less than .2% and a cross-slope less than .2% | | | |

| Test Sequence | | | |
|---------------|----------|--|-------------|
| Step | Type | Description | Verdict |
| 1 | Stimulus | At least a statistically significant amount of BSMs are transmitted by the IUT as defined in Section 7.1 with speed greater than vHeadingSpeedThresh | |
| 2 | Verify | The DE_Heading data element is accurate to within vHeadAccuracyA of actual heading, indicated as clockwise from north, over 68% of test measurements as compared to the Ground Truth | Pass / Fail |

| Identifier | TP-BSM-MV-BV-04 | | |
|---|--|---|-------------|
| Test Objective | Verify the heading latches and unlatches properly at low speed | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-[022-023] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The value of DE_Heading is set to the last known heading value when the speed was above vHeadLatchThresh | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle's speed drops below vHeadLatchThresh | |
| 2 | Verify | The value of DE_Heading does not change | Pass / Fail |
| 3 | Stimulus | The vehicle's speed goes above vHeadUnlatchThresh | |
| 4 | Verify | DE_Heading updates with vehicle angle | Pass / Fail |

| Identifier | TP-BSM-MV-BV-05 | | |
|---|--|---|-------------|
| Test Objective | Verify content of DF_PathHistory and DF_PathPrediction | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-[036-048] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs The vehicle is moving in a steady curve above vStationarySpeedThresh | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | DF_PathHistory is populated with itemCnt: Count | Pass / Fail |
| 3 | Verify | DF_PathHistory is populated with crumbData: pathHistoryPointsSets-04 | Pass / Fail |
| 4 | Verify | DF_PathHistory does not include any additional data elements or frames | Pass / Fail |
| 5 | Verify | DF_PathHistory is populated with the minimum number of path history points such that the represented PH distance is at least vMinPHistDistance and no more than vMaxPHistDistance unless there is less than vMinPHistDistance of PH available | Pass / Fail |
| 6 | Verify | A vehicle path is maintained that is comprised of data elements derived from the positioning system sampled at a periodic time interval, and interpolated in between by circular arcs | Pass / Fail |
| 7 | Verify | DF_PathHistory points are chosen as the minimum set of points such that the perpendicular distance between any point on the vehicle path | Pass / Fail |

| | | | |
|----|----------|---|-------------|
| | | and the straight line connecting two consecutive PH points is less than vPathPerpendicularDist | |
| 8 | Verify | DF_PathHistory points are ordered chronologically, such that the first PH point is the closest in time to the current UTC time | Pass / Fail |
| 9 | Verify | DF_PathHistory points does not contain more than vMaxPHistPoints regardless of other requirements | Pass / Fail |
| 10 | Verify | DF_PathPrediction is populated with radiusOfCurve: Integer | Pass / Fail |
| 11 | Verify | DF_PathPrediction is populated with confidence: Integer | Pass / Fail |
| 12 | Verify | DF_PathPrediction is populated with a calculated radius that has less than vPPredRadiusError error from the actual radius when the vehicle is in steady state (change of yaw rate less than 0.5 deg/s/s) conditions over a range from vMinCurveRadius to vMaxCurveRadius in magnitude | Pass / Fail |
| 13 | Verify | DF_PathPrediction is repopulated after a transition from the original constant radius R1 to the target constant radius R2 within vPPredTransitionTime under the maximum allowable error bound defined above | Pass / Fail |
| 14 | Stimulus | The vehicle speed drops below vStationarySpeedThresh | |
| 15 | Verify | The IUT reports a radius of value 32,767 and a confidence of 100% | Pass / Fail |

| | | | |
|---|-------------|--|----------------|
| Identifier | | TP-BSM-MV-BV-06-X | |
| Test Objective | | Verify proper critical event flags are set | |
| Test Configuration | | TC2 | |
| Reference: | | V2V-BSMTX-DATAACC-[034-035] | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle undergoes a critical event set (X) as listed in the table in Section 7.6 at time T0 | |
| 2 | Verify | The first BSM with the corresponding DE_VehicleEventFlags element corresponding to the Event Flag [D12][LJR13] is transmitted at time T1 | Pass / Fail |
| 3 | Verify | The difference between T1 and T0 is less than or equal to vEventDetectLatency | Pass / Fail |
| 4 | Procedure | Repeat steps 1-3 for all critical event sets (X) in Section 7.6 | |

| | | | |
|--|-------------|---|----------------|
| Identifier | | TP-BSM-MV-BV-07[D14] | |
| Test Objective | | Verify proper values of Traction, ABS, SCS, brakeBoost, and auxBrakes | |
| Test Configuration | | TC2 | |
| Reference: | | V2V-BSMTX-DATAACC-[028, 032], V2V-STD-J2735-[016-017, 019] | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The vehicle bus is available Braking status is available The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |

| | | | |
|----|----------|---|-------------|
| 2 | Verify | The IUT uses the vehicle bus as the data source for DF_BrakeSystemStatus | Pass / Fail |
| 3 | Verify | Traction, ABS, SCS, brakeBoost, and auxBrakes fields are set in accordance with J2735 [2] | Pass / Fail |
| 4 | Stimulus | The vehicle engages Traction, if available | |
| 5 | Verify | Traction is correctly reported as engaged or unavailable if not available | Pass / Fail |
| 6 | Stimulus | The vehicle engages ABS, if available | |
| 7 | Verify | ABS is correctly reported as engaged or unavailable if not available | Pass / Fail |
| 8 | Stimulus | The vehicle engages SCS, if available | |
| 9 | Verify | SCS is correctly reported as engaged or unavailable if not available | Pass / Fail |
| 10 | Stimulus | The vehicle engages brakeBoost, if available | |
| 11 | Verify | brakeBoost is correctly reported as engaged or unavailable if not available | Pass / Fail |
| 12 | Stimulus | The vehicle engages auxBrakes, if available | |
| 13 | Verify | auxBrakes is correctly reported as engaged or unavailable if not available | Pass / Fail |

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|---|---|--|----------------|
| Identifier | TP-BSM-MV-BV-08 | | |
| Test Objective | Verify proper value of wheelBrakesUnavailable when no braking status is available | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-031 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • There is no braking status available • The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | wheelBrakesUnavailable field is set to 1 | Pass / Fail |

| | | | |
|---|--|--|----------------|
| Identifier | TP-BSM-MV-BV-09 | | |
| Test Objective | Verify proper values of DE_ExteriorLights | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-049, V2V-BSMTX-BSMCONT-005 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • DE_ExteriorLights data is available • All exterior lights are off • The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | The DF_VehicleSafetyExtensions data frame does not include DE_ExteriorLights | Pass / Fail |
| 3 | Stimulus | At least one exterior light is turned on | |
| 4 | Stimulus | A BSM is transmitted | |
| 5 | Verify | The DF_VehicleSafetyExtensions data frame includes DE_ExteriorLights | Pass / Fail |

| | | | |
|---|-----------|---|-------------|
| 6 | Verify | DE_ExteriorLights data element has bits set corresponding to the turned on lights | Pass / Fail |
| 7 | Procedure | Steps 3 – 6 are repeated for all exterior lights | |

| | | | |
|---|-------------|--|----------------|
| Identifier | | TP-BSM-MV-BV-10 | |
| Test Objective | | Verify proper values of wheelBrakes and wheelBrakesUnavailable when braking status for each wheel is available | |
| Test Configuration | | TC2 | |
| Reference: | | V2V-BSMTX-DATAACC-029, V2V-STD-J2735-018 | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • Braking status is available for each wheel • The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle carrying the IUT applies its brakes and changes the overall brake status of the IUT | |
| 2 | Stimulus | A BSM is transmitted | |
| 3 | Verify | Bits within the wheelBrakes field are set depending on braking status | Pass / Fail |
| 4 | Verify | wheelBrakesUnavailable is set to false | Pass / Fail |
| 5 | Stimulus | The vehicle carrying the IUT releases its brakes | |
| 6 | Stimulus | A BSM is transmitted | |
| 7 | Verify | Bits within the wheelBrakes field are all set to false | Pass /Fail |

| | | | |
|--|-------------|--|----------------|
| Identifier | | TP-BSM-MV-BV-11 | |
| Test Objective | | Verify proper values of wheelBrakes and wheelBrakesUnavailable when only a single braking status indication is available | |
| Test Configuration | | TC2 | |
| Reference: | | V2V-BSMTX-DATAACC-030 | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> • The IUT is in the initial state • A single braking status indication is available • ABS and Stability Control is disabled on the vehicle • The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle carrying the IUT applies its brakes | |
| 2 | Verify | At least one BSM is transmitted within 3*vEventDetectLatency | Pass / Fail |
| 3 | Verify | Bits for all wheels are set on | Pass / Fail |
| 4 | Verify | wheelBrakesUnavailable is set to false | Pass / Fail |
| 5 | Stimulus | The IUT removes brakes | |
| 6 | Verify | At least one BSM is transmitted within 3*vEventDetectLatency | Pass / Fail |
| 7 | Verify | Bits for all wheels are set off | Pass / Fail |

| | | | |
|----------------------------|--|---|--|
| Identifier | | TP-BSM-MV-BV-13 | |
| Test Objective | | Verify vehicle transmission is properly reported if available | |
| Test Configuration | | TC2 | |
| Reference: | | V2V-BSMTX-DATAACC-018 | |
| Pre-test conditions | | | |

| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is in some unspecified initial transmission state | | | |
|--|-----------|---|-------------|
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle changes transmission state | |
| 2 | Verify | At least one BSM is transmitted within 3*vEventDetectLatency | Pass / Fail |
| 3 | Verify | DE_TransmissionState properly reflects the new transmission state or not available | Pass / Fail |
| 4 | Procedure | Steps 1 – 2 are repeated for each transmission state on the vehicle as defined in J2735 | |

| Identifier | TP-BSM-MV-BV-14 | | |
|---|--|--|-------------|
| Test Objective | Verify vehicle length and width are accurate | | |
| Test Configuration | TC2 | | |
| Reference: | V2V-BSMTX-DATAACC-033 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted | |
| 2 | Verify | DE_VehicleLength and DE_VehicleWidth are accurate to within vSizeAccuracy of actual vehicle length and width | Pass / Fail |

| Identifier | TP-BSM-MV-BV-15 | | |
|---|---|--|-------------|
| Test Objective | Verify IUT can operate normally after receiving unused data frames/elements | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-DATAACC-051 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The IUT receives a BSM with an unused data frame | |
| 2 | Verify | The IUT continues to send valid BSMs after receiving the incorrect BSM | Pass / Fail |
| 3 | Stimulus | The IUT receives a BSM with an unused data element contained within a valid data frame | |
| 4 | Verify | The IUT continues to send valid BSMs after receiving the incorrect BSM | Pass / Fail |
| 5 | Stimulus | The IUT receives a BSM with an unused data element contained within an unused data frame | |
| 6 | Verify | The IUT continues to send valid BSMs after receiving the incorrect BSM | Pass / Fail |

| | | | |
|---------------------------|---|--|--|
| Identifier | TP-BSM-MV-BI-16 | | |
| Test Objective | Verify IUT does not send data elements/frames not required in the J2945/1 specification | | |
| Test Configuration | TC1 | | |
| Reference: | V2V-BSMTX-DATAACC-050 | | |

| Pre-test conditions | | | |
|---|----------|--|-------------|
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is sent | |
| 2 | Verify | There are no non-standard data elements contained within the BSM | Pass / Fail |

6.2.5 Internal Timing and Prioritization

| Identifier | TP-BSM-LD-BV-01 | | |
|---|---|--|-------------|
| Test Objective | Verify message prioritization and EDCA values | | |
| Test Configuration | TC4 | | |
| Reference: | V2V-BSMTX-UPEDCA-[001-003] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state There are no events active The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted by the IUT with no events active | |
| 2 | Verify | The user priority field is 5 | Pass / Fail |
| 3 | Verify | The EDCA values are set as defined by table 18 in section 6.3.4 of J2945/1 | Pass / Fail |
| 4 | Stimulus | Events are made active | |
| 5 | Configure | The IUT is configured to transmit a BSM using user priority field | |
| 6 | Stimulus | A BSM is transmitted | |
| 7 | Verify | The user priority field is 7 | Pass / Fail |
| 8 | Verify | The EDCA values are set as defined by table 18 in section 6.3.4 of J2945/1 [1] | Pass / Fail |

| Identifier | TP-BSM-LD-BV-02-V | | |
|---|--|---|-------------|
| Test Objective | Verify the IUT's system clock is synchronized to facilitate communication between vehicles | | |
| Test Configuration | TC4 | | |
| Reference: | V2V-POSTIM-SYSTIMCOORD-[001-002] | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Verify | The output of the IUT's reference clock conforms to UTC | Pass / Fail |
| 2 | Verify | The vendor verifies that the IUT's system clock is within vTimeAccuracy ms of UTC | Pass / Fail |

| Identifier | TP-BSM-LD-BV-03 | | |
|---|--|--|--|
| Test Objective | Verify timing of message transmissions | | |
| Test Configuration | TC4 | | |
| Reference: | V2V-BSMTX-DATAACC-[008-010, 015-016], V2V-POSTIM-SYSTIMCOORD-003 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state | | | |

| ● The IUT is configured to transmit BSMs | | | |
|--|----------|--|-------------|
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | A BSM is transmitted by the IUT | |
| 2 | Verify | The time represented by DE_Dsecond is the time at which BSM Part I vehicle location data was determined, using the UTC-conformant reference by the reference positioning system | Pass / Fail |
| 3 | Verify | The value of DE_Dsecond value is offset from the GNSS timestamp by less than vTimeAccuracy | Pass / Fail |
| 4 | Verify | The difference between DE_Dsecond and the transmit time is less than vMaxPosAge | Pass / Fail |
| 5 | Verify | DF_PositionalAccuracy is set to the values provided by the positioning system for each determined position | Pass / Fail |
| 6 | Verify | DF_PositionalAccuracy provides the errors for the semi-major and semi-minor axes of the error ellipsoid at one standard deviation, as well as the orientation of the semi-major axis | Pass / Fail |

| Identifier | TP-BSM-LD-BV-06 | | |
|--|---|---|-------------|
| Test Objective | Verify that the IUT generates BSMs using the congestion control algorithm defined in Sections 6.3.8.1 – 6.3.8.8 [1] | | |
| Test Configuration | TC3 | | |
| Reference: | V2V-BSMTX-CONGCTRL-001 | | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> ● The IUT is in the initial state ● The IUT is configured repeatedly send BSMs scheduled using the congestion control algorithm ● Channel saturation used in steps 7 – 12 is defined as $(100 * \text{Dratation Channel Indicated as Busy}) / \text{vCBPMeasInt}$ | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Configure | The DSRC Reference Unit is configured to generate some number of TempIDs and certificates less than or equal to vDensityCoefficient, effectively mimicking some number of unique vehicles | |
| 2 | Verify | Over time the scheduled time between transmitted BSMs asymptotically approaches 100 milliseconds apart | Pass / Fail |
| 3 | Configure | The DSRC Reference Unit is configured to mimic some number of vehicles in the range $(\text{vDensityCoefficient}, (\text{vMax_ITT}/100) * \text{vDensityCoefficient})$ | |
| 4 | Verify | Over time the scheduled time between transmitted BSMs asymptotically approaches $100 * (\text{VehicleNumber} / \text{vDensityCoefficient})$ | Pass / Fail |
| 5 | Configure | The DSRC Reference Unit is configured to mimic some number of vehicles greater than or equal to $(\text{vMax_ITT}/100) * \text{vDensityCoefficient}$ | |
| 6 | Verify | Over time the scheduled time between transmitted BSMs approaches vMax_ITT seconds apart | Pass / Fail |
| 7 | Configure | The IUT's transmission channel's saturation is less than vMinChanUtil | |
| 8 | Verify | Over time the radiated power of the IUT approaches vRPMMax | Pass / Fail |
| 9 | Configure | The IUT's transmission channel's saturation is greater than vMinChanUtil and less than vMaxChanUtil | |
| 10 | Verify | Over time the radiated power of the IUT approaches $((\text{vRPMMax} -$ | Pass / Fail |

| | | | |
|----|-----------|--|-------------|
| | | $vRPMin) / (vMaxChanUtil - vMinChanUtil)) * (CBP - vMinChanUtil)$ | |
| 11 | Configure | The IUT's transmission channel's saturation is greater than or equal to $vMaxChanUtil$ | |
| 12 | Verify | Over time the radiated power of the IUT approaches $vRPMin$ | Pass / Fail |

| | | | |
|--|-------------|---|----------------|
| Identifier | | TP-BSM-LD-BV-12 | |
| Test Objective | | Verify vehicle position updates at the proper frequency | |
| Test Configuration | | TC4 | |
| Reference: | | V2V-POSTIM-POSDETER-002 | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The IUT is not moving throughout the duration of the test The IUT is configured to transmit BSMs | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Stimulus | The vehicle determines a first location | |
| 2 | Stimulus | The vehicle determines a second location | |
| 3 | Stimulus | The vehicle determines a third location | |
| 4 | Verify | The frequency of position updates is greater than or equal to $vPosDetRate$ | Pass / Fail |
| 5 | Verify | Each sequential position has a sufficiently accurate $DE_DSecond$ value | Pass / Fail |

6.2.6 Hardware

| | | | |
|---|-------------|---|----------------|
| Identifier | | TP-BSM-LD-BV-07 | |
| Test Objective | | Verify the IUT's DSRC Radio Subsystem's transmission capabilities | |
| Test Configuration | | TC4 | |
| Reference: | | V2V-RFPERF-DSRCTX-[001-004] | |
| Pre-test conditions | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state | | | |
| Test Sequence | | | |
| Step | Type | Description | Verdict |
| 1 | Configure | IUT is configured to transmit at $(MaxTxPowerCap - PwrRange)$ dB, where $MaxTxPowerCap$ and $PwrRange$ are defined in section 6.4.1 of J2945/1 | |
| 2 | Verify | The IUT's DSRC Radio Subsystem meets the 802.11 transmitter requirements for 10MHz channel spacing with QPSK and $\frac{1}{2}$ rate coding | Pass / Fail |
| 3 | Configure | The IUT is configured to transmit $vTxPwrCtrlStep$ dB higher | |
| 4 | Procedure | Steps 2 – 3 are repeated so long as the IUT's transmission is less than or equal to $MaxTxPowerCap$ | |
| 5 | Configure | The IUT is configured to transmit at $MaxTxPowerCap - PwrRange$ | |
| 6 | Verify | The transmit power out of the DSRC Radio Subsystem as measured at the antenna connector of the Subsystem housing is within $vTxPwrAcc$ of its setting | Pass / Fail |
| 7 | Configure | The IUT is configured to transmit $vTxPwrCtrlStep$ dB higher | |
| 8 | Procedure | Steps 6 – 7 are repeated so long as the IUT's transmission is less than or equal to $MaxTxPowerCap$ | |

| | | | |
|---|--------|--|-------------|
| 9 | Verify | At least 95% of the test measurements in step 6 are true | Pass / Fail |
|---|--------|--|-------------|

| | | | | |
|---|-------------|---|--|---|
| Identifier | | | | TP-BSM-LD-BV-10-V |
| Test Objective | | | | Verify that all private key operations are performed within secure hardware |
| Test Configuration | | | | TC4 |
| Reference: | | | | V2V-SECMGMT-SECHW-[001-002] |
| Pre-test conditions | | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state | | | | |
| Test Sequence | | | | |
| Step | Type | Description | | Verdict |
| 1 | Configure | The IUT and computer interface is configured to attempt a private key operation | | |
| 2 | Verify | The IUT completes the operation | | Pass / Fail |
| 3 | Verify | The vendor indicates that all steps of the operation utilizing the private key is done within secure hardware | | Pass / Fail |
| 4 | Procedure | Repeat steps 1 – 3 for all available private key operations | | |

| | | | | |
|---|-------------|---|--|----------------------------------|
| Identifier | | | | TP-BSM-LD-BV-11 |
| Test Objective | | | | Verify DSRC Receiver Sensitivity |
| Test Configuration | | | | TC3 & TC1 |
| Reference: | | | | V2V-RFPERF-DSRCRXSENS-[001-002] |
| Pre-test conditions | | | | |
| <ul style="list-style-type: none"> The IUT is in the initial state The environment is at room temperature (21° Celsius, +/- 5°) | | | | |
| Test Sequence | | | | |
| Step | Type | Description | | Verdict |
| 1 | Configure | The IUT is configured to receive packets with a PSDU length of 400 | | |
| 2 | Configure | The IUT is configured to receive at input level vRxSense | | |
| 3 | Configure | The computer interface is configured to execute a packet test | | |
| 4 | Stimulus | The computer interface sends test packets to the IUT and tracks the amount of successfully sent packets | | |
| 5 | Verify | At the end of the test, at least 90% of the packets were received with no error | | Pass / Fail |
| 6 | Verify | The DSRC Radio Subsystem complies with the standard (dot11ACRType = 1) adjacent and non-adjacent channel rejection requirements for 6 Mbps (QPSK with ½ rate coding), as specified in 802.11. The minimum input levels are measured at the antenna connector of the System housing. | | Pass / Fail |

7 Appendix

7.1 Determining Randomness of Value Sets

For the purposes of testing the randomness of the values in the context of DSRC certification, a limited battery of tests will be run against a representative sample of values generated by the IUT.

$$SS = \frac{(Z^2 * (p) * (1 - p))}{c^2}$$

SS = sample size

Z = confidence level

p = a priori judgement (0.5 represents the worst case, unknown a priori)

c = confidence interval

Assuming no a priori judgement on the randomness of the dataset, **a p of 0.5 is used**. Substituting values for a 95% confidence with an interval of 5%, **a sample size of 385 is necessary to achieve a statistically significant result**.

7.2 Ground Truth Determination Unit

| Identifier | TP-GT-<x>-<nnn> | | |
|------------|------------------------------|---------|---------------------------------|
| | <x> = type of procedure | GTDU | Ground Truth Determination Unit |
| | | MOVECOL | Moving Data Collection |
| | <nnn> = sequential numbering | | 001 - 999 |

| Requirement # | Requirement |
|--------------------|---|
| TP-GT-MOVECOL-001 | The Ground Truth Determination Unit shall contain an interface to a standard 12v auto power plug, or sufficient battery to power in capture mode for a minimum of four hours. |
| TP-GT-MOVECOL-002 | The Ground Truth Determination Unit shall have an interface to the vehicle CAN bus, capable of determining the current steering angle. Steering position data must be recorded at the frequency it is given. |
| TP-GT-MOVECOL-003 | The Ground Truth Determination Unit shall provide a UTC timestamp to all individual and fused sensor data, such that timestamps match those of incoming BSMS. |
| TP-GT-MOVECOL-004 | The Ground Truth Determination Unit shall be mounted such that it does not affect the performance of the IUT, e.g., through obstruction of open sky view of the GNSS. |
| TP-GT-MOVECOL-005 | The Ground Truth Determination Unit shall be capable of providing 3 dimensional acceleration data within the range ±2g, with accuracy better than ±0.01g. |
| TP-GT -MOVECOL-006 | The Moving Vehicle Data Collection Tool shall be capable of providing yaw rate data within the range ±300 deg/s, with accuracy better than ±.05 deg/s. |
| TP-GT -MOVECOL-007 | The Ground Truth Determination Unit shall provide a fused localization estimate at a rate of at least 100 Hz. |
| TP-GT -MOVECOL-008 | The fused localization from the Ground Truth Determination Unit shall provide, at a minimum, longitudinal acceleration, lateral acceleration, latitude, longitude, altitude, heading, and rate of heading change (yaw |

| | |
|--------------------|--|
| | rate). |
| TP-GT -MOVECOL-009 | The Ground Truth Determination Unit shall provide indication of its current compliance with accuracy requirements. |
| TP-GT -MOVECOL-010 | The Ground Truth Determination Unit shall provide an interface to begin data recording. |
| TP-GT -MOVECOL-011 | The Ground Truth Determination Unit shall provide an interface to monitor data recording. |
| TP-GT -MOVECOL-012 | The Ground Truth Determination Unit shall provide an interface to end data recording. |
| TP-GT -MOVECOL-013 | The Ground Truth Determination Unit shall provide an interface for moving data to data repository. |
| TP-GT -MOVECOL-014 | The Ground Truth Determination Unit shall provide an interface for configuring transformations from actual position to vehicle center. |
| TP-GT -MOVECOL-015 | The Ground Truth Determination Unit shall save recorded data, including at a minimum GPS, Accelerometer, Gyro, steering encoder, and fused localization readings, in a form which can be interpreted by the Moving Vehicle Data Analysis Tool. |
| TP-GT -MOVECOL-016 | The Ground Truth Determination Unit shall provide an interface to confirm successful collection of data. |
| TP-GT -MOVECOL-017 | The Ground Truth Determination Unit shall save recorded data in a common format which can be interpreted by the manufacturer of the IUT. |
| TP-GT-GTDU-005 | The Ground Truth Determination Unit shall be capable of providing an HDOP value. |
| TP-GT-GTDU-006 | The Ground Truth Determination Unit shall require an absolute accuracy of 10 cm per 2 sigma. |

7.3 DSRC Packet Capture Tool

| | | | |
|-------------------|------------------------------|--|-----------|
| Identifier | TT-REF-<nnn> | | |
| | <nnn> = sequential numbering | | 001 - 999 |

| Requirement # | Requirement |
|----------------|--|
| TT-PACKCAP-001 | The DSRC Packet Capture Tool shall contain an interface to a standard 12 V auto power plug, or sufficient battery to power in capture mode for a minimum of four hours. |
| TT-PACKCAP-002 | The DSRC Packet Capture Tool shall store data such that the packet and moving vehicle analysis tools can trivially differentiate between data received from the IUT, DSRC Reference Unit, and DSRC radios not within the test setup. |

| | |
|----------------|---|
| TT-PACKCAP-003 | The DSRC Packet Capture Tool shall capture all DSRC packets originating from the IUT or DSRC Reference Unit on channel 172. |
| TT-PACKCAP-004 | The DSRC Packet Capture Tool shall timestamp all recorded packets with corresponding received UTC time. |
| TT-PACKCAP-005 | The DSRC Packet Capture Tool shall provide an interface for viewing the current DE_temporaryID in use by the IUT. |
| TT-PACKCAP-007 | The DSRC Packet Capture Tool shall save captured data in a format which can be interpreted by the manufacturer of the IUT. |

7.4 Requirements Traceability Matrix (Requirement to Scenario)

| Requirement | Test Procedure | Scenario |
|-------------------------|-------------------|---------------|
| 6.1.6-V2V-STD-J2735-001 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-002 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-003 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-004 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-005 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-006 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-007 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-008 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-009 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-010 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-011 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-012 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-013 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-014 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-015 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-016 | TP-BSM-MV-BV-07 | All Scenarios |
| 6.1.6-V2V-STD-J2735-017 | TP-BSM-MV-BV-07 | All Scenarios |
| 6.1.6-V2V-STD-J2735-018 | TP-BSM-MV-BV-10 | All Scenarios |
| 6.1.6-V2V-STD-J2735-019 | TP-BSM-MV-BV-07 | All Scenarios |
| 6.1.6-V2V-STD-J2735-020 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-021 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-022 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-023 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-024 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-025 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-026 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-027 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-028 | TP-BSM-SV-BV-03-X | All Scenarios |

| | | |
|--------------------------------------|-------------------|---|
| 6.1.6-V2V-STD-J2735-029 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-030 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-031 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-032 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-033 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-034 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-035 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-036 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-037 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-038 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-039 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-040 | TP-BSM-SV-BV-01-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-041 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-042 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-043 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-044 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.1.6-V2V-STD-J2735-045 | TP-BSM-SV-BV-03-X | All Scenarios |
| 6.2.1-V2V-POSTIM- POSDETER-001 | TP-BSM-MV-BV-01-V | Positioning |
| 6.2.1-V2V-POSTIM- POSDETER-002 | TP-BSM-LD-BV-12 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.2.2-V2V-POSTIM-WAAS- 001 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.2.3-V2V-POSTIM- COORDSYSREF-001 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.2.4-V2V-POSTIM- SYSTMCOORD-001 | TP-BSM-LD-BV-02-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |

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| 6.2.4-V2V-POSTIM-SYSTMCOORD-002 | TP-BSM-LD-BV-02-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.2.4-V2V-POSTIM-SYSTMCOORD-003 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-001 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-002 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-003 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-004 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-005 | TP-BSM-MV-BV-09 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.1-V2V-BSMTX-BSMCONT-006 | TP-BSM-SV-BV-01-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, |

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| | | CLW - Control Loss Warning |
| 6.3.2-V2V-BSMTX-CHDATARATE-001 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.2-V2V-BSMTX-CHDATARATE-002 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.3-V2V-BSMTX-GENTIM-001 | TP-BSM-SV-BV-02 | BSM Exchange |
| 6.3.3-V2V-BSMTX-GENTIM-002 | TP-BSM-SV-BV-13 | BSM Exchange |
| 6.3.4-V2V-BSMTX-UPEDCA-001 | TP-BSM-LD-BV-01 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.4-V2V-BSMTX-UPEDCA-002 | TP-BSM-LD-BV-01 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.4-V2V-BSMTX-UPEDCA-003 | TP-BSM-LD-BV-01 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.5-V2V-BSMTX-MINTX-001 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-001 | TP-BSM-SV-BV-03-X | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, |

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| | | LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-002 | TP-BSM-SV-BV-14 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-003 | TP-BSM-SV-BV-04 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-004 | TP-BSM-SV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-005 | TP-BSM-SV-BV-14 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-006 | TP-BSM-SV-BV-04 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-007 | TP-BSM-SV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-008 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |

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| 6.3.6-V2V-BSMTX-DATAACC-009 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-010 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-011 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-012 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-013 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-014 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-015 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-016 | TP-BSM-LD-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, |

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| | | CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-017 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-018 | TP-BSM-MV-BV-13 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-019 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-020 | TP-BSM-MV-BV-02 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-021 | TP-BSM-MV-BV-03 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-022 | TP-BSM-MV-BV-04 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-023 | TP-BSM-MV-BV-04 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |

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| 6.3.6-V2V-BSMTX-DATAACC-024 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-025 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-026 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-027 | TP-BSM-MV-BV-01-V | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-028 | TP-BSM-MV-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-029 | TP-BSM-MV-BV-10 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-030 | TP-BSM-MV-BV-11 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-031 | TP-BSM-MV-BV-08 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, |

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| | | CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-032 | TP-BSM-MV-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-033 | TP-BSM-MV-BV-14 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-034 | TP-BSM-MV-BV-06-X | EEBL - Lead Vehicle Decelerating |
| 6.3.6-V2V-BSMTX-DATAACC-035 | TP-BSM-MV-BV-06-X | EEBL - Lead Vehicle Decelerating |
| 6.3.6-V2V-BSMTX-DATAACC-036 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-037 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-038 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-039 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-040 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, |

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| | | IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-041 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-042 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-043 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-044 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-045 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-046 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX- DATAACC-047 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |

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| 6.3.6-V2V-BSMTX-DATAACC-048 | TP-BSM-MV-BV-05 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-049 | TP-BSM-MV-BV-09 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-050 | TP-BSM-MV-BI-16 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.6-V2V-BSMTX-DATAACC-051 | TP-BSM-MV-BV-15 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.3.7-V2V-BSMTX-DATAPERSIST-001 | TP-BSM-SV-BV-12 | Shutdown |
| 6.3.7-V2V-BSMTX-DATAPERSIST-002 | TP-BSM-SV-BV-12 | Startup |
| 6.3.7-V2V-BSMTX-DATAPERSIST-003 | TP-BSM-SV-BV-12 | Shutdown |
| 6.3.7-V2V-BSMTX-DATAPERSIST-004 | TP-BSM-SV-BV-12 | Startup |
| 6.3.8-V2V-BSMTX-CONGCTRL-001 | TP-BSM-LD-BV-06 | BSM Exchange, EEBL - Lead Vehicle Decelerating, FCW- Forward, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.4.1-V2V-RFPERF-DSRCTX-001 | TP-BSM-LD-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |

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| 6.4.1-V2V-RFPERF-DSRCTX-002 | TP-BSM-LD-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.4.1-V2V-RFPERF-DSRCTX-003 | TP-BSM-LD-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.4.1-V2V-RFPERF-DSRCTX-004 | TP-BSM-LD-BV-07 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.4.2-V2V-RFPERF-DSRCRXSENS-001 | TP-BSM-LD-BV-11 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.4.2-V2V-RFPERF-DSRCRXSENS-002 | TP-BSM-LD-BV-11 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.5.1-V2V-SECPRIV-IDRAND-001 | TP-BSM-SV-BV-14 | Startup |
| 6.5.1-V2V-SECPRIV-IDRAND-002 | TP-BSM-SV-BV-04 | Privacy |
| 6.5.2-V2V-SECPRIV-BSMSIGN-001 | TP-BSM-SV-BV-06 | Security |
| 6.5.2-V2V-SECPRIV-BSMSIGN-002 | TP-BSM-SV-BV-06 | Security |
| 6.5.2-V2V-SECPRIV-BSMSIGN-003 | TP-BSM-SV-BV-07 | Security |
| 6.5.2-V2V-SECPRIV-BSMSIGN-004 | TP-BSM-SV-BV-08 | EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.5.2-V2V-SECPRIV-BSMSIGN-005 | TP-BSM-SV-BV-09 | Security |

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| 6.5.2-V2V-SECPRIV-BSMSIGN-006 | TP-BSM-SV-BV-09 | Security |
| 6.5.2-V2V-SECPRIV-BSMSIGN-007 | TP-BSM-SV-BV-11 | Security |
| 6.5.2-V2V-SECPRIV-BSMSIGN-008 | TP-BSM-SV-BV-04 | Security |
| 6.5.3-V2V-SECPRIV-CERTCHG-001 | TP-BSM-MV-BV-18 | Privacy |
| 6.5.3-V2V-SECPRIV-CERTCHG-002 | TP-BSM-MV-BV-17-X | Privacy |
| 6.5.3-V2V-SECPRIV-CERTCHG-003 | TP-BSM-MV-BV-18 | Privacy |
| 6.5.4-V2V-SECPRIV-BSMVERIFY-001 | TP-BSM-LD-BV-08 | Security, EEBL - Lead Vehicle Decelerating, Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning |
| 6.5.5-V2V-SECPRIV-CERTREV-001 | TP-BSM-SV-BV-10 | |
| 6.6.2-V2V-SECMGMT-CERTLOAD-001 | TP-BSM-LD-BV-09-V | Security |
| 6.6.3-V2V-SECMGMT-CERTSTORE-001 | TP-BSM-LD-BV-04-V | Security |
| 6.6.3-V2V-SECMGMT-CERTSTORE-002 | TP-BSM-LD-BV-04-V | Security |
| 6.6.3-V2V-SECMGMT-CERTSTORE-003 | TP-BSM-LD-BV-04-V | Security |
| 6.6.3-V2V-SECMGMT-CERTSTORE-004 | TP-BSM-LD-BV-04-V | Security |
| 6.6.4-V2V-SECMGMT-CRLLOAD-001 | TP-BSM-LD-BV-04-V | |
| 6.6.4-V2V-SECMGMT-CRLLOAD-002 | TP-BSM-LD-BV-04-V | |
| 6.6.5-V2V-SECMGMT-SECHW-001 | TP-BSM-LD-BV-10-V | Security |
| 6.6.5-V2V-SECMGMT-SECHW-002 | TP-BSM-LD-BV-10-V | Security |

7.5 Requirements traceability Matrix (Scenario to Test Procedure)

| Scenario | Test Procedure | Requirement |
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| Startup | TP-BSM-SV-BV-12 | 6.3.7-V2V-BSMTX-DATAPERSIST-002 |
| | TP-BSM-SV-BV-12 | 6.3.7-V2V-BSMTX-DATAPERSIST-004 |
| | TP-BSM-SV-BV-14 | 6.5.1-V2V-SECPRIV-IDRAND-001 |
| Shutdown | TP-BSM-SV-BV-12 | 6.3.7-V2V-BSMTX-DATAPERSIST-001 |

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| | TP-BSM-SV-BV-12 | 6.3.7-V2V-BSMTX-DATAPERSIST-003 |
| Security | TP-BSM-SV-BV-06 | 6.5.2-V2V-SECPRIV-BSMSIGN-001 |
| | TP-BSM-SV-BV-06 | 6.5.2-V2V-SECPRIV-BSMSIGN-002 |
| | TP-BSM-SV-BV-07 | 6.5.2-V2V-SECPRIV-BSMSIGN-003 |
| | TP-BSM-SV-BV-09 | 6.5.2-V2V-SECPRIV-BSMSIGN-005 |
| | TP-BSM-SV-BV-09 | 6.5.2-V2V-SECPRIV-BSMSIGN-006 |
| | TP-BSM-SV-BV-11 | 6.5.2-V2V-SECPRIV-BSMSIGN-007 |
| | TP-BSM-SV-BV-04 | 6.5.2-V2V-SECPRIV-BSMSIGN-008 |
| | TP-BSM-LD-BV-08 | 6.5.4-V2V-SECPRIV-BSMVERIFY-001 |
| | TP-BSM-LD-BV-09-V | 6.6.2-V2V-SECMGMT-CERTLOAD-001 |
| | TP-BSM-LD-BV-04-V | 6.6.3-V2V-SECMGMT-CERTSTORE-001 |
| | TP-BSM-LD-BV-04-V | 6.6.3-V2V-SECMGMT-CERTSTORE-002 |
| | TP-BSM-LD-BV-04-V | 6.6.3-V2V-SECMGMT-CERTSTORE-003 |
| | TP-BSM-LD-BV-04-V | 6.6.3-V2V-SECMGMT-CERTSTORE-004 |
| | TP-BSM-LD-BV-10-V | 6.6.5-V2V-SECMGMT-SECHW-001 |
| | TP-BSM-LD-BV-10-V | 6.6.5-V2V-SECMGMT-SECHW-002 |
| BSM Exchange | TP-BSM-SV-BV-02 | 6.3.3-V2V-BSMTX-GENTIM-001 |
| | TP-BSM-SV-BV-13 | 6.3.3-V2V-BSMTX-GENTIM-002 |
| | TP-BSM-LD-BV-06 | 6.3.8-V2V-BSMTX-CONGCTRL-001 |
| Privacy | TP-BSM-SV-BV-04 | 6.5.1-V2V-SECPRIV-IDRAND-002 |
| | TP-BSM-MV-BV-18 | 6.5.3-V2V-SECPRIV-CERTCHG-001 |
| | TP-BSM-MV-BV-17-X | 6.5.3-V2V-SECPRIV-CERTCHG-002 |
| | TP-BSM-MV-BV-18 | 6.5.3-V2V-SECPRIV-CERTCHG-003 |
| Positioning | TP-BSM-MV-BV-01-V | 6.2.1-V2V-POSTIM-POSDETER-001 |
| EEBL - Lead Vehicle Decelerating | TP-BSM-LD-BV-12 | 6.2.1-V2V-POSTIM-POSDETER-002 |
| | TP-BSM-MV-BV-01-V | 6.2.2-V2V-POSTIM-WAAS-001 |
| | TP-BSM-MV-BV-01-V | 6.2.3-V2V-POSTIM-COORDSYSREF-001 |
| | TP-BSM-LD-BV-02-V | 6.2.4-V2V-POSTIM-SYSTIMCOORD-001 |
| | TP-BSM-LD-BV-02-V | 6.2.4-V2V-POSTIM-SYSTIMCOORD-002 |
| | TP-BSM-LD-BV-03 | 6.2.4-V2V-POSTIM-SYSTIMCOORD-003 |

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| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-001 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-002 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-003 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-004 |
| | TP-BSM-MV-BV-09 | 6.3.1-V2V-BSMTX-BSMCONT-005 |
| | TP-BSM-SV-BV-01-X | 6.3.1-V2V-BSMTX-BSMCONT-006 |
| | TP-BSM-SV-BV-03-X | 6.3.2-V2V-BSMTX-CHDATARATE-001 |
| | TP-BSM-SV-BV-03-X | 6.3.2-V2V-BSMTX-CHDATARATE-002 |
| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-001 |
| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-002 |
| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-003 |
| | TP-BSM-SV-BV-03-X | 6.3.5-V2V-BSMTX-MINTX-001 |
| | TP-BSM-SV-BV-03-X | 6.3.6-V2V-BSMTX-DATAACC-001 |
| | TP-BSM-SV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-002 |
| | TP-BSM-SV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-003 |
| | TP-BSM-SV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-004 |
| | TP-BSM-SV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-005 |
| | TP-BSM-SV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-006 |
| | TP-BSM-SV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-007 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-008 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-009 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-010 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-011 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-012 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-013 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-014 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-015 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-016 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-017 |
| | TP-BSM-MV-BV-13 | 6.3.6-V2V-BSMTX-DATAACC-018 |

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| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-019 |
| | TP-BSM-MV-BV-02 | 6.3.6-V2V-BSMTX-DATAACC-020 |
| | TP-BSM-MV-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-021 |
| | TP-BSM-MV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-022 |
| | TP-BSM-MV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-023 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-024 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-025 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-026 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-027 |
| | TP-BSM-MV-BV-07 | 6.3.6-V2V-BSMTX-DATAACC-028 |
| | TP-BSM-MV-BV-10 | 6.3.6-V2V-BSMTX-DATAACC-029 |
| | TP-BSM-MV-BV-11 | 6.3.6-V2V-BSMTX-DATAACC-030 |
| | TP-BSM-MV-BV-08 | 6.3.6-V2V-BSMTX-DATAACC-031 |
| | TP-BSM-MV-BV-07 | 6.3.6-V2V-BSMTX-DATAACC-032 |
| | TP-BSM-MV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-033 |
| | TP-BSM-MV-BV-06-X | 6.3.6-V2V-BSMTX-DATAACC-034 |
| | TP-BSM-MV-BV-06-X | 6.3.6-V2V-BSMTX-DATAACC-035 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-036 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-037 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-038 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-039 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-040 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-041 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-042 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-043 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-044 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-045 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-046 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-047 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-048 |

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| | TP-BSM-MV-BV-09 | 6.3.6-V2V-BSMTX-DATAACC-049 |
| | TP-BSM-MV-BI-16 | 6.3.6-V2V-BSMTX-DATAACC-050 |
| | TP-BSM-MV-BV-15 | 6.3.6-V2V-BSMTX-DATAACC-051 |
| | TP-BSM-LD-BV-06 | 6.3.8-V2V-BSMTX-CONGCTRL-001 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-001 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-002 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-003 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-004 |
| | TP-BSM-LD-BV-11 | 6.4.2-V2V-RFPERF-DSRCRXSENS-001 |
| | TP-BSM-LD-BV-11 | 6.4.2-V2V-RFPERF-DSRCRXSENS-002 |
| | TP-BSM-SV-BV-08 | 6.5.2-V2V-SECPRIV-BSMSIGN-004 |
| | TP-BSM-LD-BV-08 | 6.5.4-V2V-SECPRIV-BSMVERIFY-001 |
| FCW-Forward | TP-BSM-LD-BV-06 | 6.3.8-V2V-BSMTX-CONGCTRL-001 |
| Crash Warning, BSW /LCW- Blind Spot Warning/Lane Change Warning, IMA-Intersection Movement Assist, LTA - Left Turn Assist, CLW - Control Loss Warning | TP-BSM-LD-BV-12 | 6.2.1-V2V-POSTIM-POSDETER-002 |
| | TP-BSM-MV-BV-01-V | 6.2.2-V2V-POSTIM-WAAS-001 |
| | TP-BSM-MV-BV-01-V | 6.2.3-V2V-POSTIM-COORDSYSREF-001 |
| | TP-BSM-LD-BV-02-V | 6.2.4-V2V-POSTIM-SYSTIMCOORD-001 |
| | TP-BSM-LD-BV-02-V | 6.2.4-V2V-POSTIM-SYSTIMCOORD-002 |
| | TP-BSM-LD-BV-03 | 6.2.4-V2V-POSTIM-SYSTIMCOORD-003 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-001 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-002 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-003 |
| | TP-BSM-SV-BV-03-X | 6.3.1-V2V-BSMTX-BSMCONT-004 |
| | TP-BSM-MV-BV-09 | 6.3.1-V2V-BSMTX-BSMCONT-005 |
| | TP-BSM-SV-BV-01-X | 6.3.1-V2V-BSMTX-BSMCONT-006 |
| | TP-BSM-SV-BV-03-X | 6.3.2-V2V-BSMTX-CHDATARATE-001 |
| | TP-BSM-SV-BV-03-X | 6.3.2-V2V-BSMTX-CHDATARATE-002 |

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| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-001 |
| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-002 |
| | TP-BSM-LD-BV-01 | 6.3.4-V2V-BSMTX-UPEDCA-003 |
| | TP-BSM-SV-BV-03-X | 6.3.5-V2V-BSMTX-MINTX-001 |
| | TP-BSM-SV-BV-03-X | 6.3.6-V2V-BSMTX-DATAACC-001 |
| | TP-BSM-SV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-002 |
| | TP-BSM-SV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-003 |
| | TP-BSM-SV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-004 |
| | TP-BSM-SV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-005 |
| | TP-BSM-SV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-006 |
| | TP-BSM-SV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-007 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-008 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-009 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-010 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-011 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-012 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-013 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-014 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-015 |
| | TP-BSM-LD-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-016 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-017 |
| | TP-BSM-MV-BV-13 | 6.3.6-V2V-BSMTX-DATAACC-018 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-019 |
| | TP-BSM-MV-BV-02 | 6.3.6-V2V-BSMTX-DATAACC-020 |
| | TP-BSM-MV-BV-03 | 6.3.6-V2V-BSMTX-DATAACC-021 |
| | TP-BSM-MV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-022 |
| | TP-BSM-MV-BV-04 | 6.3.6-V2V-BSMTX-DATAACC-023 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-024 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-025 |
| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-026 |

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| | TP-BSM-MV-BV-01-V | 6.3.6-V2V-BSMTX-DATAACC-027 |
| | TP-BSM-MV-BV-07 | 6.3.6-V2V-BSMTX-DATAACC-028 |
| | TP-BSM-MV-BV-10 | 6.3.6-V2V-BSMTX-DATAACC-029 |
| | TP-BSM-MV-BV-11 | 6.3.6-V2V-BSMTX-DATAACC-030 |
| | TP-BSM-MV-BV-08 | 6.3.6-V2V-BSMTX-DATAACC-031 |
| | TP-BSM-MV-BV-07 | 6.3.6-V2V-BSMTX-DATAACC-032 |
| | TP-BSM-MV-BV-14 | 6.3.6-V2V-BSMTX-DATAACC-033 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-036 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-037 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-038 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-039 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-040 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-041 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-042 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-043 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-044 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-045 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-046 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-047 |
| | TP-BSM-MV-BV-05 | 6.3.6-V2V-BSMTX-DATAACC-048 |
| | TP-BSM-MV-BV-09 | 6.3.6-V2V-BSMTX-DATAACC-049 |
| | TP-BSM-MV-BI-16 | 6.3.6-V2V-BSMTX-DATAACC-050 |
| | TP-BSM-MV-BV-15 | 6.3.6-V2V-BSMTX-DATAACC-051 |
| | TP-BSM-LD-BV-06 | 6.3.8-V2V-BSMTX-CONGCTRL-001 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-001 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-002 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-003 |
| | TP-BSM-LD-BV-07 | 6.4.1-V2V-RFPERF-DSRCTX-004 |
| | TP-BSM-LD-BV-11 | 6.4.2-V2V-RFPERF-DSRCRXSENS-001 |
| | TP-BSM-LD-BV-11 | 6.4.2-V2V-RFPERF-DSRCRXSENS-002 |

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| | TP-BSM-SV-BV-08 | 6.5.2-V2V-SECPRIV-BSMSIGN-004 |
| | TP-BSM-LD-BV-08 | 6.5.4-V2V-SECPRIV-BSMVERIFY-001 |
| All Scenarios | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-001 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-002 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-003 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-004 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-005 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-006 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-007 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-008 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-009 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-010 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-011 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-012 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-013 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-014 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-015 |
| | TP-BSM-MV-BV-07 | 6.1.6-V2V-STD-J2735-016 |
| | TP-BSM-MV-BV-07 | 6.1.6-V2V-STD-J2735-017 |
| | TP-BSM-MV-BV-10 | 6.1.6-V2V-STD-J2735-018 |
| | TP-BSM-MV-BV-07 | 6.1.6-V2V-STD-J2735-019 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-020 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-021 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-022 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-023 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-024 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-025 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-026 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-027 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-028 |

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| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-029 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-030 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-031 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-032 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-033 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-034 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-035 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-036 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-037 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-038 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-039 |
| | TP-BSM-SV-BV-01-X | 6.1.6-V2V-STD-J2735-040 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-041 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-042 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-043 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-044 |
| | TP-BSM-SV-BV-03-X | 6.1.6-V2V-STD-J2735-045 |

7.6 Critical Event Flag Variant Table

| Critical Event Flag Variants | | |
|------------------------------|---|--------------|
| X | Event Flag | Bit Location |
| 1 | ABS Activated | 2 |
| 2 | Traction Control Loss | 3 |
| 3 | Stability Control Activated | 4 |
| 4 | Hard Braking | 7 |
| 5 | ABS Activated, Traction Control Loss | 2, 3 |
| 6 | ABS Activated, Stability Control Activated | 2, 4 |
| 7 | ABS Activated, Hard Braking | 2, 7 |
| 8 | Traction Control Loss, Stability Control Activated | 3, 4 |
| 9 | Traction Control Loss, Hard Braking | 3, 7 |
| 10 | Stability Control Activated, Hard Braking | 4, 7 |

| | | |
|----|--|---------------------|
| 11 | ABS Activated, Traction Control Loss, Stability Control Activated | 2, 3, 4 |
| 12 | ABS Activated, Traction Control Loss, Hard Braking | 2, 3, 7 |
| 13 | ABS Activated, Stability Control Activated, Hard Braking | 2, 4, 7 |
| 14 | Traction Control Loss, Stability Control Activated, Hard Braking | 3, 4, 7 |
| 15 | ABS Activated, Traction Control Loss, Stability Control Activated, Hard Braking | 2, 3, 4, 7 |

Revision History [D15][LJR16]

| | | |
|---------------|-------------------|--|
| V0.1.0 | Aug 2015 | Initial Draft |
| V0.2.0 | Jan 2016 | Updated to agreed upon format and Draft 5 of the J2945/1 standard |
| V0.3.0 | Feb 2016 | Updated based on comments received from USDOT and walkthrough |
| V0.4.0 | April 2016 | Updated based on comments received from industry review |

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