IVISTA

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Intelligent Safety Index
Safety Assist
Side Support System Test Protocol

(Version 2023)

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Side Support System Test Protocol

1 Scope

This document specifies the test methods of IVISTA China Intelligent Vehicle Index - Intelligent Safety Index - Safety Assist - Side Support System.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute indispensable provisions of this document. For dated references, only the dated edition applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 18385-2005 Electric Vehicles - Power Performance - Test Method

GB/T 24158-2018 General Specifications for Electric Motorcycles and Electric Mopeds

GB/T39265-2020 Road Vehicles - Performance Requirements and Testing Methods for Blind Spot Detection (BSD) System

GB/T 39263-2020 Road Vehicles - Advanced Driver Assistance Systems - Terms and Definitions

ISO 17387 Intelligent transport systems-Lane change decision aid systems (LCDAS) - performance requirements and test procedures

3 Terms and Definitions

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

3.1

inertial frame

the inertial frame specified in ISO 8855:2011 used in this protocol, in which the X axis points towards the front of the vehicle, the Y axis towards the left side of the driver and the Z axis upwards (right-hand coordinate system)

Viewed from the origin to the positive directions of X, Y and Z axes, roll, pitch and yaw rotate clockwise around the x, y and z axes respectively. This frame is used for both left-hand and right-hand drive vehicles.

3.2

blind spot detection; BSD

a system that monitors the blind spot of the driver's visual field in real time, and gives a prompt or warning when other road users appear in the blind spot

[Source: GB/T 39265-2020, 3.1]

3.3

door open warning; DOW

a system that monitors the area on the lateral and rear sides of the vehicle for other road users when the door is to be opened with the vehicle in the parking state, and gives a warning when a collision may occur due to door open

[Source: GB/T 39263-2020, 2.2.19]

3.4

rear collision warning; RCW

a system that monitors the driving environment at the rear of the vehicle in real time and gives a warning when a rear collision may occur

3.5

subject vehicle; SV

a vehicle to be tested equipped with the BSD and DOW systems defined in this document

3.6

subject vehicle width

linear distance between the outermost (excluding rearview mirrors) points on left and right sides of the SV, expressed by WSV

3.7

target vehicle; TV

passenger car and two-wheeler target objects used in this document, which are the objects of BSD and DOW functions

3.8

target vehicle width

linear distance between the outermost (excluding rearview mirrors) points on both sides of the TV, expressed by WTV

3.9

adjacent zone on the left/right

zones located on the left and right sides of the SV and connected with it, as shown in Fig. 1

Note: The adjacent zone refers to the zone of the lane around the SV. The location and size of adjacent zones are defined according to the SV (regardless of lane marking).

[Source: GB/T 39265-2020, 3.3]

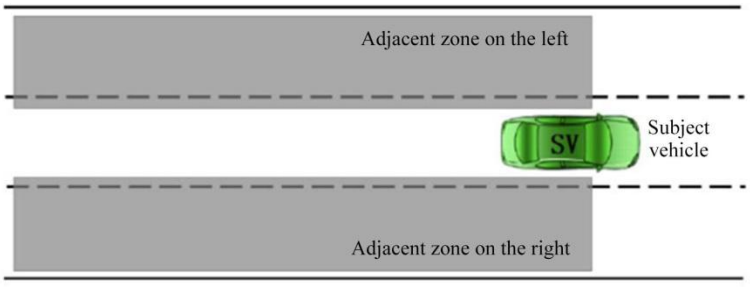


Fig. 1 Adjacent Zone on the Left/Right

3.10

rear clearance

the longitudinal distance between the foremost end of the front of the SV and the rearmost end of the rear of the TV

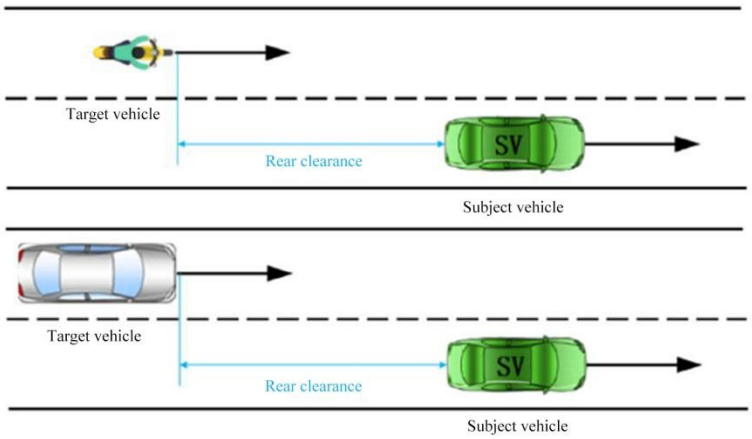


Fig. 2 Rear Clearance

3.11

lateral offset

the difference between distance of the planned path to the front axle center point of SV and that to rear axle center point of TV

When the center lines of both SV and TV coincide with the planned path, the lateral offset is zero.

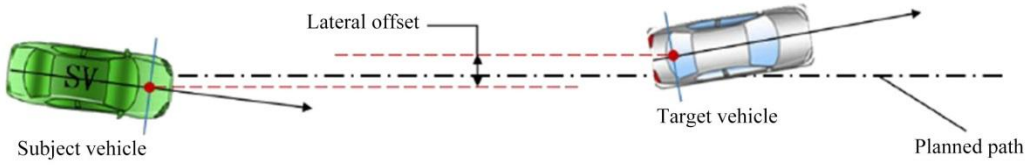


Fig. 3 Lateral Offset

4 Test Requirements

4.1 Test site and test environment

4.1.1 Requirements for test site

a) The test road surface shall be horizontal and dry without visible moisture, and the adhesion coefficient should be above 0.8;

b) The test road shall be flat without apparent pits, cracks and other defects, with a horizontal flatness of less than 1% and a length of 500 m at least;

c) During the test, there shall be no vehicles, obstacles or other objects affecting the test within 3 m on both sides of the test road and 30 m in front of the TV;

d) Signs, bridges and other objects or buildings on the test road shall be 5 m above the ground.

4.1.2 Requirements for test environment

a) The weather shall be good, without any bad weather such as rain, snow and dust except for special scenarios;

b) The temperature shall be 0 °C ~ 45 °C, and the wind velocity shall be less than 5 m/s;

c) The test shall be conducted under uniform natural lighting conditions. The illuminance shall not be lower than 2000 lux, unless other lower illuminance limit is specified by the VUT manufacturer.

4.2 Test Equipment

4.2.1 Target object

4.2.1.1 Passenger car

The passenger car target objects shall be common mass-produced M1 vehicles.

4.2.1.2 Two-wheeler

The two-wheeler target objects shall be common mass-produced electric/fuel motorcycles and electric/fuel mopeds (size requirements: 1.5 m ≤ length ≤ 2.5 m, 0.5 m ≤ width ≤ 1 m, 0.9 m ≤ height ≤ 1.5 m).

4.2.2 Data acquisition equipment

The data acquisition equipment for closed field test shall meet the following requirements:

a) The sampling and storage frequency for dynamic data shall not be less than 100 Hz, and DGPS time shall be used for data synchronization between the VUT and the target object;

b) The speed accuracy of the VUT and the target object shall be ±0.1 km/h;

c) The lateral and longitudinal position accuracy of the VUT and the target object shall be ±0.03 m.

4.3 Vehicle preparation

4.3.1 System initialization

If necessary, each SSS system can be initialized prior to the test, including the calibration of system functions and sensors like radars and cameras.

4.3.2 Vehicle condition confirmation

a) The VUT shall be new with a traveled mileage of not more than 5000 km;

b) The VUT shall be equipped with the original new tires designated by the VUT manufacturer. The tires shall be inflated to the standard cold tire pressure recommended by the VUT manufacturer, or to the pressure corresponding to the least loading condition if more than one tire pressure value is recommended;

c) The VUT shall be refueled to not less than 90% of the fuel tank capacity, with other fluids such as oil and water (e.g. coolant, brake fluid, and engine oil) added at least to the minimum indicated position. During the test, the fuel may decrease but shall not be lower than 50% of the fuel tank capacity;

d) The mass of the VUT shall lie between the complete vehicle curb mass plus the total mass of the driver and the test equipment (with the total mass of the driver and the test equipment not exceeding 200 kg) and the maximum allowable total mass. No change shall be made to the status of the VUT after the test starts;

e) For off-vehicle-chargeable new energy vehicles, the traction battery shall be fully charged according to 5.1 of GB/T 18385-2005. For non-off-vehicle-chargeable new energy vehicles, the test shall be prepared in their normal operation states. During the test, the power of the vehicle may decrease, but it shall not be less than 50% SOC.

4.4 Data recording and processing

a) For the lateral and longitudinal positions of the VUT, the original data shall be used, in m;

b) The VUT speed shall be GPS speed, and the original data shall be used, in km/h.

4.5 Test photos

a) Before the test equipment is installed, photos shall be taken of the VUT at front left 45° and of the vehicle nameplate;

b) After the test equipment is installed, photos shall be taken of the test equipment inside and outside the VUT.

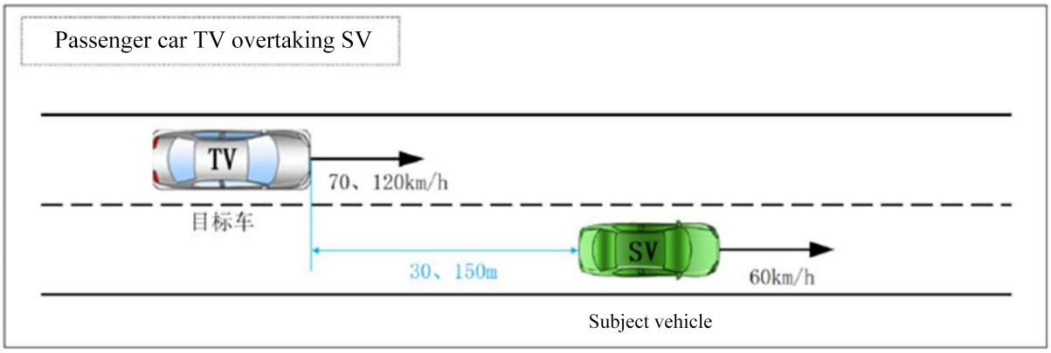
5 Test Methods

5.1 BSD function test

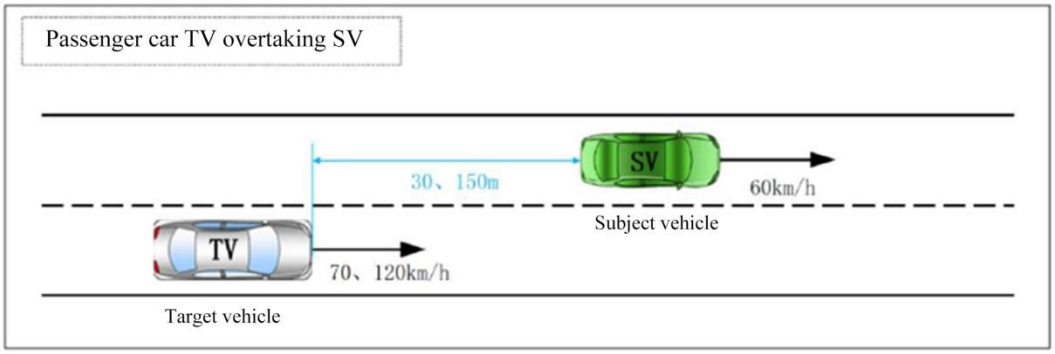
5.1.1 Scenario of passenger car TV overtaking SV

5.1.1.1 Scenario description

This scenario is used to evaluate the early warning capability of the passenger car TV when it overtakes the SV from the adjacent zone on the left/right of the SV, as shown in Fig. 4.



a) TV overtaking on the left side



b) TV overtaking on the right side

Fig. 4 Scenario of Passenger Car TV Overtaking SV

5.1.1.2 Test method

a) The SV is located on a straight road, and the TV is located in the adjacent lane area on the left (right) side respectively for the test;

b) The test starts when the TV keeps a proper distance from the SV, the SV accelerates to 60 km/h and the TV accelerates to 70 km/h and 120 km/h respectively, and the rear clearance between the two vehicles reaches 30 m and 150 m respectively;

c) The TV gradually approaches and overtakes the SV;

d) The test ends when the rear of TV passes the head of SV for 2 s.

Table 1 Test Cycle for Passenger Car TV Overtaking SV

Test Scenario	SV Speed (km/h)	TV Speed (km/h)	Number of Tests
Overtaking on the left side	60	70	2
		120	2
Overtaking on the right side		70	2
		120	2

5.1.1.3 Test validity requirements

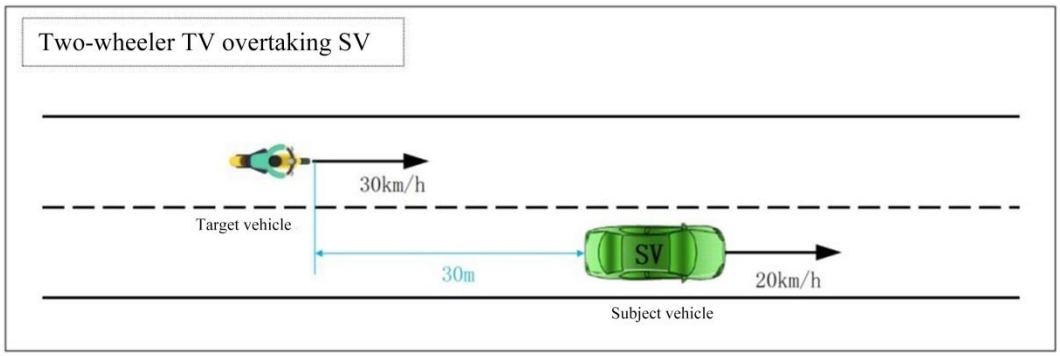
a) Speeds of the SV and the TV shall be kept stable at the specified speed ±1 km/h;

b) The lateral offset between the two vehicles is maintained at [1+0.5·(W_{SV}+W_{TV}), 2+0.5·(W_{SV}+W_{TV})] m.

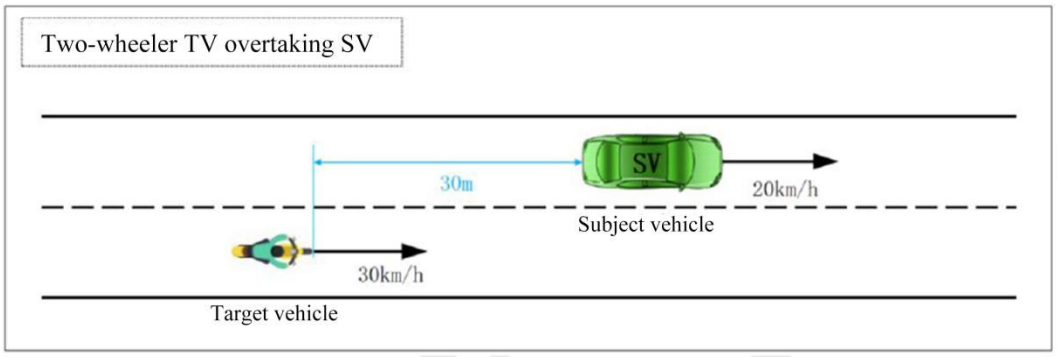
5.1.2 Scenario of two-wheeler TV overtaking SV

5.1.2.1 Scenario description

This scenario is used to evaluate the early warning capability of the two-wheeler TV when it overtakes the SV from the adjacent zone on the left/right of the SV, as shown in Fig. 5.



a) Two-wheeler TV overtaking on the left side



b) Two-wheeler TV overtaking on the right side

Fig. 5 Scenario of Two-wheeler TV Overtaking VUT

5.1.2.2 Test method

a) The SV is located on a straight road, and the two-wheeler TV is located in the adjacent lane area on the left (right) side respectively for the test;

b) The test starts when the two-wheeler TV keeps a proper distance from the SV, the SV accelerates to 20 km/h and the TV accelerates to 30 km/h, and the rear clearance between the two vehicles reaches 30 m;

c) The two-wheeler TV gradually approaches and overtakes the SV;

d) The test ends when the rear of two-wheeler TV passes the head of SV for 2 s.

Table 2 Test Cycle for Two-wheeler TV Overtaking SV

Test Scenario	SV Speed (km/h)	TV Speed (km/h)	Number of Tests
Overtaking on the left side	20	30	2
Overtaking on the right side	20	30	2

5.1.2.3 Test validity requirements

a) Speeds of the SV and the TV shall be kept stable at the specified speed ±2 km/h;

b) The lateral offset between the two vehicles is maintained at [1+0.5·(W_{SV}+W_{TV}), 2+0.5·(W_{SV}+W_{TV})] m.

5.2 DOW function test

5.2.1 Scenario of two-wheeler TV overtaking SV

5.2.1.1 Scenario description

This scenario is used to evaluate the capability of the SV to warn about the appearance of a two-wheeler TV in the adjacent zone on the left when the vehicle is stopped and the passenger intends to get off the vehicle after opening the door, as shown in Table 6.

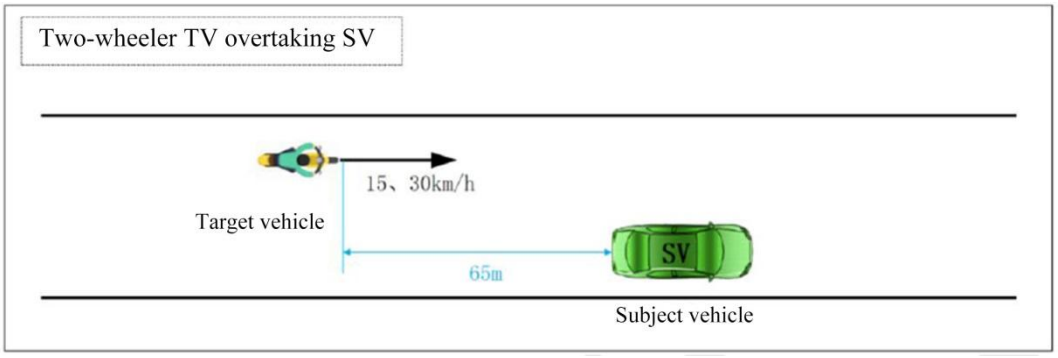


Fig. 6 Scenario of Two-wheeler TV Overtaking SV

5.2.1.2 Test method

a) The SV stops on a straight road when it is parked and idling, the mechanical lock of the front left door is unlocked, and the TV is located in the adjacent zone on the left;

b) The test starts when the head of TV is completely at a certain distance away from the rear of SV, the TV accelerates to 15 km/h and 30 km/h respectively, and the rear clearance between the two vehicles reaches 65 m;

c) The TV gradually approaches and overtakes the SV;

d) The test ends when the rear of TV completely passes the head of SV for 2 s;

e) Close the front left door, open the rear left door and carry out the test with the TV in the adjacent zone on the left according to the above steps.

Table 3 Test Cycle for Two-wheeler TV Overtaking SV

Test Scenario	SV Speed (km/h)	TV Speed (km/h)	Number of Tests
Front left door	0	15	2
		30	2
Rear left door		15	2
		30	2

5.2.1.3 Test validity requirements

a) Speeds of the SV and the TV shall be kept stable at the specified speed ±2 km/h;

b) The lateral offset between the two vehicles is maintained at $[0.8+0.5\cdot(W_{SV}+W_{TV}), 1.2+0.5\cdot(W_{SV}+W_{TV})]$ m.

5.3 Advanced assistance function verification test

5.3.1 RCW function

Check whether the SV is provided with RCW function according to the SV configuration information, and make judgment and function verification as per the functional description. No specific condition is specified for this test.

5.3.2 DOW rear-row independent alarm function

Check whether the SV is provided with a DOW rear-row independent alarm device. The system shall give a warning in a way that is easily perceived by passengers in rear seats, clearly indicating that the target is on the left or right side of the SV. The warning indication information shall be clearly distinguished from other warning information in the vehicle. It shall be in at least one of the forms of visual warning, audible warning and tactile warning.