This is a translation to English for reference purpose of JNCAP test method which is originally prescribed in Japanese language.
Please be sure to refer to the Japanese test method if you need to be precisely correct.

AUTONOMOUS EMERGENCY BRAKING SYSTEM [PEDESTRIAN TO CAR TURNING RIGHT OR LEFT IN INTERSECTION] PERFORMANCE TEST METHOD

Created: May 2, 2024

1. Effective Dates:

This testing method shall be put into force starting May 2, 2024.

2. Scope of Application:

This test procedure applies to Autonomous Emergency Brake System [Pedestrian to Car Turning Right or Left in Intersection] Performance Test of the vehicles exclusively used for carrying passengers with riding capacity of less than ten (10) persons and the vehicles used for carrying cargo with gross vehicle weight 2.8t or less equipped with the Autonomous Emergency Brake System (AEBS) [for Pedestrian] as part of the tests conducted under the new car assessment program by the National Agency for Automotive Safety and Victims' Aid (hereinafter, referred to as "NASVA").

3. Definition of Terms:

The terms used in this testing method are defined as follows.

(1) "AEBS (Autonomous Emergency Braking System)" refers to a system that automatically operates brakes to avoid collision with a crossing pedestrian or reduce the collision speed.

(2) "FCWS (Forward Collision Warning System)" refers to the warning using a combination of either "audio and visual information" or "audio and haptic information" for the purpose of urging the driver to operate brakes depending on the degree of risks of colliding with a crossing pedestrian.

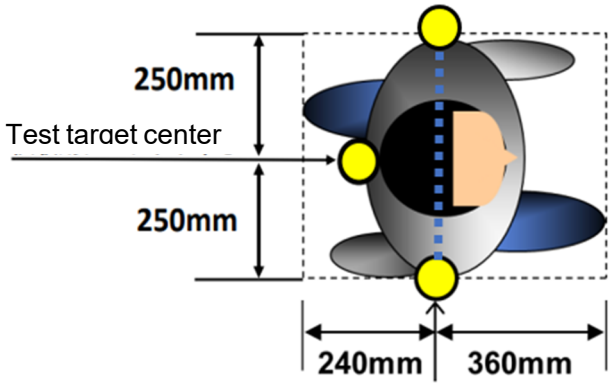
(3) "AEBS Activation Point" refers to the time when the deceleration by AEBS first crossed 0.3m/s2 (CPRN, CPRF test scenario) or 0.5m/s2 (CPLN, CPLF test scenario).

(4) "FCWS Activation Point" refers to the time when FCWS begins to provide alerts using auditory information.

(5) "Test Target" refers to the test device that simulates crossing pedestrians as indicated in Attachment A.

(6) "Test target center": the reference point at the center of the horizontal width toward the direction

of travel shown in Figure 1.



Test target center edge center (Shoulder center)

Figure 1 Definition of test target center

(7) "Reference crossing line": the target course through which the center of the test target should pass.

(8) "Reference runway": the target course through which the front axle center of the test vehicle should pass.

(9) “Target Interference Area”: The front (far) side section from the test vehicle in the straight line connecting the reference point in the center of the test target side end shown in Figure 1 parallel to the reference crossing line.

(10) “Collision”: a situation in which the tip center of the test vehicle enters the interference area. However, this excludes cases where the distance between the tip of center of the test vehicle and the rear end of the test target was at least 1/2 of the overall width of the test vehicle at the time of the collision.

(11) “Set collision point”: the location of the tip center of the test vehicle at the moment of collision of the test vehicle traveling on the reference runway.

(12) “Time to collision (TTC)": The time remaining before collision when the test vehicle and the test target maintain their current speed.

(13) "Collision Speed": Travel speed at the moment of collision.

(14) "Initial Velocity": the driving speed of the test vehicle at the time of AEBS activation for AEBS tests and at the time of FCWS activation for FCWS tests.

(15) "Velocity Reduction Amount": Subtracts the speed at the time of collision from the initial speed.

(16) "Velocity Reduction Rate": Divides the Velocity Reduction Amount by the Initial Speed.

(17) CPLF（Car-to-Pedestrian Left turn Far side）: Test scenario where the test target crosses from the right side while the test vehicle is turning left

(18) CPLN（Car-to-Pedestrian Left turn Near side）: Test scenario where the test target crosses from the left side while the test vehicle is turning left

(19) CPRN（Car-to-Pedestrian Right turn Near side）: Test scenario where the test target crosses from the left side while the test vehicle is turning right.

(20) CPRF（Car-to-Pedestrian Right turn Far side）: Test scenario where the test target crosses

from the right side while the test vehicle is turning right.

(21) “Lateral error”: the distance from each of the front axis center of the test vehicle and the test target center to reference runway and target running line.

(22) “Target arrival error”: the distance forth and back from the test target center to the set collision point at 4.0 seconds after the start of measurement (when TTC reaches 4.0 seconds).

(23) "Brake Pedal Stroke": The amount of depression applied on the test vehicle's brake.

(24) "Accelerator Stroke": The amount of depression applied on the test vehicle's accelerator.

(25) "Mass at Vehicle Delivery ": The test vehicle's condition when fully loaded with fuel, lubricants, coolants, etc. in the engine and fueling system, and equipped with onboard tools, spare tire, and standard accessories.

(26) "Pre-Braking Brake Temperature": The higher of the average temperatures of left and right wheels of each axle pursuant to the procedures of JIS D 0210 when the temperature of the brake lining or pad of each wheel is measured immediately before the start of each running for braking with the vehicle in fixed position.

(27) "Brake Temperature Check Unit": A device to check the brake temperature by thermocouple measurement before the test vehicle’s brake is used.

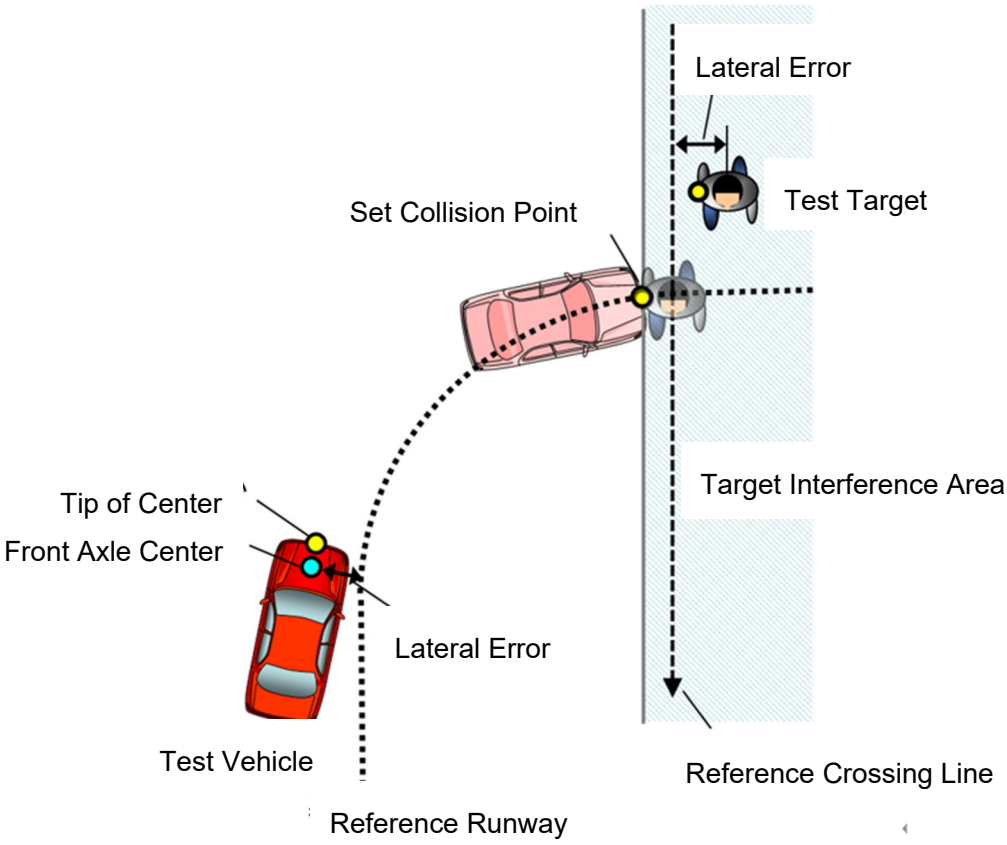


Figure 2 Definition of each term

4. Test Conditions

4.1 Provision of Data from Vehicle Manufacturer

The vehicle manufacturer is to provide NASVA with the data necessary for test preparation (Appendix 1)

4.2 Test Vehicle's Condition

The test vehicle's condition shall be as follows:

(1) Load Condition: The mass of the test vehicle with one driver (including the measurement equipment) shall be the Mass at Vehicle Delivery + 200kg (±1%). Front axle/rear axle weight distribution (%) shall be on a par (±5%) with that of the Mass at Vehicle Delivery.

If the preceding requirement is not met, parts may be removed or installed as long as the performance is not adversely affected. Weight-increasing parts should be securely fitted.

(2) Tires: The tires installed at the time of purchase of the test vehicle shall be used. The breaking-in of the tires shall be done in conjunction with the brake conditioning of the following items. Additionally, the tire air pressure shall be set before running (normal temperature) on a level surface, at the value for ordinary run defined in Section 5.1.

(3) Brake system: The brake discs, drums and linings that are installed at the time of the purchase of the test vehicle shall be used. The brake system shall be adjusted properly without any impact of abnormal heat history, getting wet, etc.

(4) Drive axis: When the drive axis may be selected, choose the default.

(5) AEBS and FCWS setup: If the driver can set up the activation timing of AEBS and/or FCW, use the median of the allowed scope. If there is no median (when the setup options are an even number), choose the value closest to the median on the side on which the timing of activation start will be later.

(6) Protection devices: If passenger or pedestrian protection devices are installed, set such devices not to be activated.

4.3 Test Track

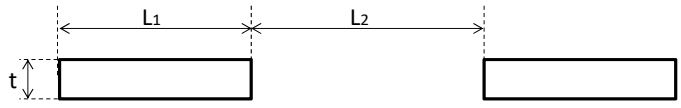
The test track shall meet the following requirements:

(1) In the condition that white dashed lane markers meeting ① through ③ for AUTONOMOUS EMERGENCY BRAKING SYSTEM [ON-COMING CAR TO CAR TURNING RIGHT IN INTERSECTION] PERFORMANCE TEST may be installed in the center of the test runway excluding within the intersection at the time of the test, the test will be conducted.

① Marker Length (L_1) : 5.00m

② Space Between Markers (L_2) : 5.00m

③ Marker Width : 0.15m



(2) The test track shall be a flat, dry, and clean paved road surface without any leaves, dirt, etc.

(3) The test track shall have a friction coefficient of about 0.9 (when the test tire is ASTM E1136) or 1.0 (when the test tire is ASTM F2493) under dry conditions. The measurement procedure shall comply with ASTM E1337.

(4) During testing, there shall be no obstacles within a lateral distance of 3.0m to either side of the Standard Track and with a longitudinal distance of 30m ahead of the test vehicle when the test

ends. Additionally, at the points where AEBS activation or deceleration by post-FCWS braking is expected to take place, there shall no road paint or markings.

4.4 Weather Conditions

The test shall be conducted under the following weather conditions.

(1) The temperature during testing shall be -5°C~40°C.

(2) The average wind speed during testing shall be 5m/s or less.

(3) Visibility during testing shall be at least 1km.

(4) A declaration by a vehicle manufacturer might allow the following tests under sunlight conditions to be avoided:

① Illumination during testing is 2000 lx or less

② A dark shadow from a source other than the test vehicle or test target near the Standard Track

③ Direct sunlight on the test vehicle from the front or the rear

④ The temperature during testing is under 5°C

4.5 Measurement Items

The items of the test shall be measured as described below and the sampling frequency shall be 100Hz or more. Furthermore, for yaw rate and longitudinal acceleration, the high-frequency component shall be eliminated at a cutoff frequency of 10Hz.

(1) AEBS Activation Point

(2) FCWS Activation Point

(3) Collision time

(4) Test vehicle and test target positions

(5) Test vehicle and test target speeds

(6) Test vehicle yaw rate

(7) Test vehicle longitudinal acceleration

(8) Test vehicle steering velocity

(9) Brake Pedal Stroke

(10) Accelerator Stroke

(11) Pre-Braking Brake Temperature

4.6 Measurement Equipment

The following measuring equipment for testing shall be capable of smoothly handling the data of the measurement items covered in Section 4.5. Additionally, before conducting the test, the test vehicle position shall be verified. As for the other measurement equipment, accuracy shall be checked based on the results of calibration by the measurement equipment manufacturer.

(1) Test vehicle position measurement device: Accuracy of test vehicle position for each test shall be ±0.03m.

(2) Test vehicle speed measurement device: Accuracy of test vehicle speed for each test shall be ±0.1km/h.

(3) Yaw rate measurement device: Accuracy of yaw rate for each test shall be ±0.1°/s.

(4) Longitudinal acceleration measurement device: Accuracy of longitudinal acceleration for each

test shall be ±0.1m/s^2.

(5) Steering wheel velocity measurement device: Accuracy of steering wheel velocity for each test shall be ±1°/s.

(6) Brake pedal stroke measurement device: Accuracy of brake pedal stroke for each test shall be ±1mm.

(7) Accelerator stroke measurement device: Accuracy of accelerator stroke for each test shall be ±1%.

(8) Brake Temperature Check Unit: Accuracy of temperature of each test shall be ±3%.

(9) Test target position measurement device: Accuracy of test target position of each test shall be within ±0.03m.

(10) Test target speed measurement device: Accuracy of test target speed of each test shall be within ±0.1km/h.

5. Pre-test run

5.1 Break-in run

To break-in the disc, drum, and friction material of the brake system of the test vehicle, 200 operations shall be performed in which the vehicle is accelerated to 64 km/h and then stopped by operating the brakes to generate a deceleration of 3.7 m/s2 (except for other tests in which similar break-in runs were performed). The interval between the first brake operation and the next brake operation shall be the time required to reduce the brake temperature between 110°C and 132°C or the distance traveled to reach 1.6 km, whichever is earlier. After each stop, the vehicle shall accelerate to 64 km/h and maintain that speed until the next braking. (Break-in runs are equivalent to those specified in FMVSS105 S7.4.1.1.)

If requested by the vehicle manufacturer, etc., the vehicle may be driven on general roads (not highway), etc., for up to 100 km for initialization work of the sensor device. If the conditions necessary for initialization are met, the initialization process may be performed in conjunction with the break-in run described above.

5.2 Re-break-in, etc.

In the case of a braking system test that is the first for the test vehicle (the generic term for a test in which a break-in is performed in accordance with Section 5.1), the vehicle shall undergo 35 re-break-in runs in accordance with Section 5.1. However, if more than 2 weeks have elapsed since the mortise run, the re-break-in run may be performed up to 50 times.

If this is the second or subsequent braking system test (the same applies if multiple days are required in the same test), the test may be re-run 35 times if more than one week has elapsed since the previous test date, and up to 50 times if more than two weeks have elapsed.

If re-brake conditioning test is not carried out on the day of test, warm up run should be carried out until the brake temperature exceed 100°C by the procedure of the Section 5.1.

6 Test Method

6.1 Testing

(1) Test scenarios: Tests shall be conducted using CPLF and CPLN scenarios (Figure 3-1), which simulate left-turn accident situations, and CPRN and CPRF scenarios (Figure 3-2), which simulate right-turn accident situations, for the AEBS evaluation test and FCWS evaluation test, respectively.
For both test scenarios, the test target speed is set at 5 km/h. The speed of the test vehicle is performed for the speed conditions shown in Section 6.1 (2). The collision configuration between the test vehicle and the test target is set at the timing when the tip center of the test vehicle intersects the center of the test target. The initial position of the test target on the reference transect line can be 9.5 m (CPLF and CPRF scenarios) or 6.0 m (CPLN and CPRN scenarios) from the set impact point, with a 2.0 m acceleration interval (Figure 4).

In addition, the distance between the reference runway and the reference crossing line before starting the right/left turn shall be 7.75 m for the CPLF and CPLN scenarios and 11.25 m (when the speed of the test vehicle is 10 to 20 km/h) or 14.75 m (when the speed of the test vehicle is 25 to 30 km/h) for the CPRN and CPRF scenarios. The reference runway for the test vehicle during right and left turns shall be set using the turning parameters shown in Table 1-1 and Table 1-2. When lane markers are installed, the reference runway shall be 1.75 m from the center of the lane markers.

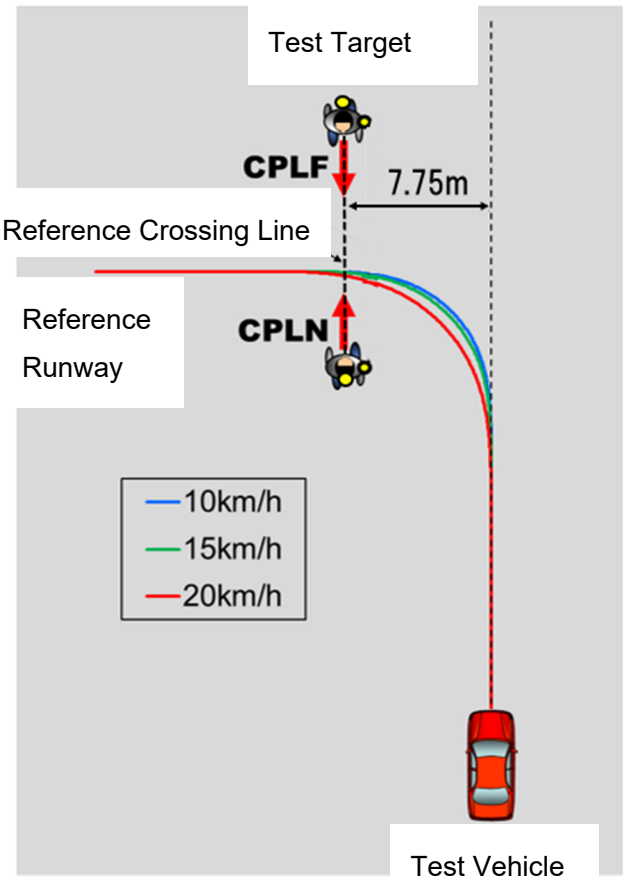


Figure 3-1 CPLF and CPLN Scenarios

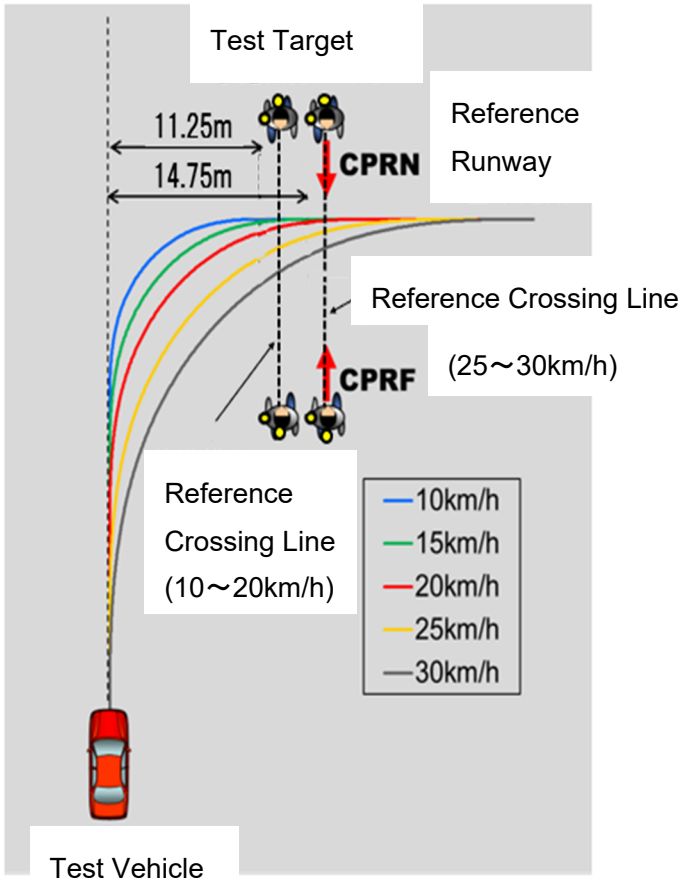


Figure 3-2 CPRN and CPRF Scenarios

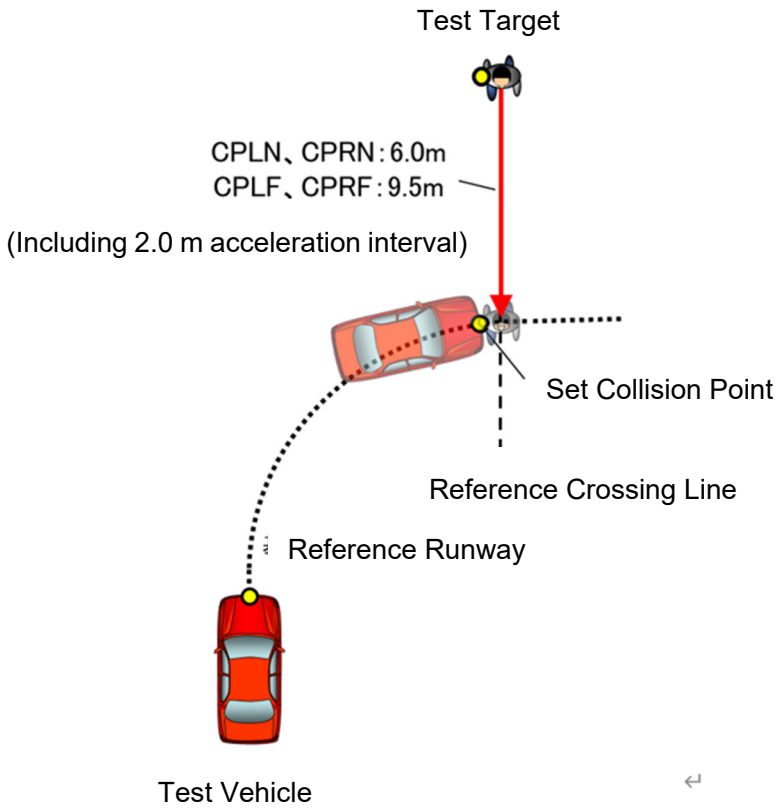


Figure 4 Initial position of test target

Table 1-1 Turning parameters for the reference runway (CPLF and CPLN scenarios)

Test vehicle speed	Crossoidal starting radius	Crossoid angle (first half)	Turning radius	Turning angle	Crossoid angle (Latter half)	clothoid End radius
10 km/h	1500 m	22.85 °	8.00 m	44.30 °	22.85 °	1500 m
15 km/h	1500 m	22.50 °	8.68 m	45.00 °	22.50 °	1500 m
20 km/h	1500 m	22.50 °	10.29 m	45.00 °	22.50 °	1500 m

Table 1-2 Turning parameters for reference runway (CPRN and CPRF scenarios)

Test vehicle speed	Crossoidal starting radius	Crossoid angle (first half)	Turning radius	Turning angle	Crossoid angle (Latter half)	clothoid End radius
10 km/h	1500 m	20.62 °	9.00 m	48.76 °	20.62 °	1500 m
15 km/h	1500 m	20.93 °	11.75 m	48.14 °	20.93 °	1500 m
20 km/h	1500 m	21.79 °	14.75 m	46.42 °	21.79 °	1500 m
25 km/h	1500 m	22.50 °	19.29 m	45.00 °	22.50 °	1500 m
30 km/h	1500 m	22.50 °	23.15 m	45.00 °	22.50 °	1500 m

(2) Test Vehicle Speed: The test speed of the test vehicle shall be in a scope described in Table 2, and the test will be performed by starting at the lowest speed and increasing in increments of 5km/h or 10km/h. Further, the starting vehicle speed may be raised upon declaration of the vehicle manufacturer. Likewise, the ending vehicle speed may be lowered upon declaration of the vehicle manufacturer. However, in either case, for the speeds not tested, results shall be handled in the same way as no activation of systems.

Table 2: Test Speed

	AEBS test	FCWS test
CPLF and CPLN	10～20 km/h	10～20 km/h
CPRN and CPRF	10～30 km/h	10～30 km/h

(3) Transmission: For test vehicles with automatic transmissions, use the D-range. For vehicles with manual transmissions, use the highest gear where the engine's RPM will be at least 1500 at the test speed, and do not disengage the clutch during testing.

(4) Test Measurement Sections: Measurements shall start when the test vehicle approaches the test target and the TTC reaches 4.0 sec. Measurements shall finish when any of the following conditions are reached:

- The test vehicle is stopped
- At the time of the test vehicle collision
- The point in time when the test vehicle avoids a collision

(5) Requirements for Successful Completion of Test: In the time between the initial measurement and the moment when the initial speed gap is obtained (at the time of AEBS activation for AEBS tests and at the time of FCWS activation for FCWS tests), if the prescribed measurement items deviate from the permissible error shown in Table 3, and when the test video of Section 6.3 is not acquired (except when the driving status of the test car, the operating status of the test target and the collision / avoidance status can be confirmed by the in-vehicle video or the outside video), the attempted test shall be deemed invalid (foul) and shall not be counted in the number of tests. In addition, the measured value etc. shall round off the value less than the unit in each item. (Same in case in below test method)

If any abnormality is observed in the operation of the test target, the recorded test video shall be checked and if the abnormality is evident, it shall be considered as a foul and shall not be included in the test count. The criteria shown in Attachment B may be used for such determination.

Table 3: Permissible Errors in Test Conditions

Test Condition	Permissible Range
Test Vehicle Speed	Test Speed + 1.0 km/h or less
Test Target Speed	Test Speed + 0.2 km/h or less (except for the target acceleration section)
Lateral Offset of Test Vehicle	± 0.10 m or less
Lateral Offset of Test Target	± 0.10 m or less (except for the target acceleration section)
Target Arrival Error	± 0.05 s or less
Yaw Rate	± 1.0°/s or less (Excluding Turning※)
Steering Wheel Velocity	± 15.0°/s or less (Excluding Turning※)
Brake Temperature before braking	65-100°C

※Turning refers to the section of the turning parameters of the Table 1 reference runway.

(6) Number of tests: The number of tests shall be 3 per test speed. However, the third test may be omitted in the following cases.

・When a collision is avoided twice in a row

・If the same rate of velocity reduction is achieved twice in a row

(7) The test shall start from the lowest speed condition, or the speed condition declared by the vehicle manufacturer for each test scenario. The interval of raising the test speed shall be 5km/h; however, when avoiding collisions more than 2 times out of 3 tests, the test speed may be raised by 10km/h (the 5km/h increment to be passed). When collisions are avoided also under a condition of an increase to 10km/h, collisions are deemed to be avoided for the 5km/h increment that is passed. However, when collisions could not be avoided more than 2 times out of 3 tests, the test speed shall be lowered by 5km/h and the test for the 5km/h increment that is passed must also be performed. Subsequently, take the same procedures to conduct tests up to the highest speed condition or the one declared by the vehicle manufacturer.

In addition, the order in which each test scenario is conducted is CPLF, CPLN, CPRN, and CPRF. However, the test scenario may be changed if requested by the vehicle manufacturer. The next test scenario shall not be started until the test scenario currently being conducted is completed.

(8) Accelerator Operation during the AEBS Test: During the measurement section, the accelerator stroke shall be held constant so as not to cause any impact on the activation of AEBS. Further, for those test vehicles on which the accelerator is controlled when AEBS is activated, upon

consultation with the vehicle manufacturer, the accelerator stroke during AEBS activation may be adjusted.

(9) Accelerator/Brake Operation during the FCWS Test: The test vehicle accelerator shall be released 1.0 seconds after T_{FCWS}. The brake pedal shall be pressed down 1.2 seconds after T_{FCWS}, taking 0.2 seconds to reach the point where deceleration under non-threat situation of 4.0 (+0.25)m/s^2 is generated (however, maximum pedal application rate is at 400mm/s), and prescribed pedal force shall be maintained. For these brake operation setup values (Brake Pedal Stroke, application rate and pedal force), the value declared by the vehicle manufacturer shall be used. When the vehicle manufacturer submits no setup values or when the deceleration under non-threat situation exceeds the permissible range (4.00~4.25m/s^2), the setup shall be performed by NASVA in accordance with the steps described in Attachment B. In order to conduct this test with high accuracy, it is desirable that the test vehicle be equipped with an automatic driving device or other operation input device.

(10) If it is clear that the FCWS test yields the same results as the AEBS test with or without the FCWS function, the results of the AEBS test may be used as the results of such test. Similarly, in the AEBS test, if the time taken from FCWS activation to impact is 1.2 seconds or less, the AEBS test result shall be the relevant test result.

6.2 Measurement Data and Recording

(1) Confirmed Completion of Testing: For each test, confirm whether the test conditions meet the permissible error of Table 3.

(2) Collision Avoided Yes/No: For each test, confirm whether collisions were avoided, and record the presence or absence of a collision and the measurement data for the next and subsequent items in Appendix 2.

(3) Initial Velocity: Record the Initial Velocity in units of 0.1km/h.

(4) Velocity Reduction Amount: Record the Velocity Reduction Amount in units of 0.1km/h.

(5) Velocity Reduction Rate: Rounding off to two decimal places and record the Velocity Reduction Rate obtained.

6.3 Recording Footage of the Tests

(1) Images inside the vehicle: Images of front of the test vehicle, near the driver's seats and FCWS activation status shall be recorded by a video camera installed in the test vehicle interior. (Filming can be canceled in consultation with the vehicle manufacturer if poor lighting conditions hinder the quality of these images.)

(2) Images outside the vehicle: A video camera installed on the side of the test track at the point where a collision between the test vehicle and the test target is expected to occur will be used to record the driving conditions of the test vehicle and the collision/avoidance conditions with the test target.

7. Organizing Test Results

Record test results, etc. in Appendix 2.

The Velocity Reduction Rate of each test speed shall be either the obtained value by the median of 3 valid test results. The Velocity Reduction Rate of the condition when collisions are avoided shall be 1.00.

Furthermore, if only 2 tests are conducted in accordance with the Sections in 6.1 (6) , the Velocity Reduction Rate shall be the obtained valued by two valid tests.

ATTACHMENT A: TEST TARGET SPECIFICATIONS

For the test target, those having specifications equivalent to those of ISO 19206-3, Road vehicles - Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions - Part 3：Requirements for passenger vehicle 3D targets shall be used.
Attached Diagram A shows the appearance of the test target (movable leg type) and Attached Table A shows the dimensional specifications. The test target is designed to be detected to exhibit detection characteristics similar to those of human pedestrians by such sensors as laser radars, millimeter-wave radars and cameras. A radio wave absorber shall be affixed to the side of the self-propelled platform. The top cover may be attached according to the declaration of the automobile manufacturer, etc.

Attached Diagram A: Appearance of Test Targets

Attached Table A: Dimensional Specifications of Test Targets

Item		Dimension
Walking posture height		1,800±20 [mm]
Shoulder center (diagram ○) height		1430 [mm]
Horizontal distance between shoulder center and platform center (diagram △)		-40 [mm]
Distance between right heel and left toe (max value during walking)		550±50 [mm]
Distance between elbows		500±20 [mm]
Torso thickness		235±20 [mm]
Forward tilt angle		85±2 [deg]
Strut angle (toward vehicle traveling direction)		5±2 [deg]
Upper arm angles	Right	60±2 [deg]
	Left	110±2 [deg]
Weight		MAX 4 [kg]

ATTACHMENT B: Criteria for Judging Movement Status of Test Target

B.1 Judgment by Behavior of Target Head and Leg

B.1.1 Measurement Item

On the Standard Crossing Line, measure the “speed of the Target head” between a point 3m short of the Standard Track to reaching 2m short of the Standard Track, and the “right leg position” and the “left leg position” at 2m short of the Standard Track. The image of the measurement shall be recorded at a sampling rate of 60FPS and have a resolution of 200 pixel/m.

B.1.2 Criteria for Judging Valid Test

Measurement items of B1.1 shall be within the permissible scope show in Attached Table B.

Attached Table B: Permissible Error for Target Head and Leg Behavior

(a) CPLF and CPRF scenarios

Measurement Point	2m short
Head Speed [km/h]	5.0±1.0
Right Leg Position [m]	-1.77±0.10
Left Leg Position [m]	-2.38±0.10

(b) CPLN and CPRN scenarios

Measurement Point	2m short
Head Speed [km/h]	5.0±1.0
Right Leg Position [m]	-2.38±0.10
Left Leg Position [m]	-1.80±0.10

ATTACHMENT C: HOW TO SET UP BRAKE OPERATIONS FOR FCWS TEST

C.1 Definitions

(1) T_{BRAKE}: When the brake pedal stroke exceeded 5mm

(2) T_{2m/s^2}: When the filtered deceleration data exceeded 2m/s^2 for the first time

(3) T_{6m/s^2}: When the filtered deceleration data exceeded 6m/s^2 for the first time

C.2 Measurement Method

Apply the measurement method and filtering described in Chapter 3.

C.3 Test Procedure for Brake Input Characteristics

C.3.1 Test Preparation

Perform the warm-up operation of brakes and tires defined in the remarks to Section 4.2 first. Check brake input characteristics right before conducting the FCWS test.

C.3.2 Brake Input Characteristics Test

(1) Accelerate the test vehicle to be 85km/h or more. For test vehicles with automatic transmissions, select D-gear. For vehicles with manual transmissions, select the highest gear where the RPM will be at least 1500 at the test speed.

(2) Release the accelerator and when the speed becomes slower than 80 (±1) km/h, start applying brakes at the pedal application rate of 20(±5)mm/s until deceleration becomes 7m/s^2. For manual transmissions, throw out the clutch at the earliest timing possible before the RPM will be 1500rpm or less. When the deceleration becomes 7m/s^2, end the test and measure the Brake Pedal Stroke and pedal force in operation.

(3) Perform the above test 3 times in a row. The interval between tests shall be between 90 seconds and 10 minutes, and when 10 minutes is passed, perform the warm-up operation again before resuming the test.

(4) Based on the deceleration data from the Brake Pedal Stroke between T_{2m/s^2} and T_{6m/s^2}, apply quadratic curve approximation using least square, and calculate the Brake Pedal Stroke corresponding to deceleration 4m/s^2 (which shall be “D4” in unit of m. For the pedal force as well, use the same method to obtain the pedal force value corresponding to deceleration 4m/s^2 (which shall be "F4" in unit of N).

C.3.3 How to Set Up Brake Pedal Force and Repeating the Procedure

(1) Run the test vehicle constantly at 80(+1) km/h. The test vehicle gear position shall be the same as C.3.2.

(2) By manual trigger, not in response to FCWS, apply the brakes in accordance with the steps described in C.4. Based on the measured deceleration data, obtain average deceleration of the sections from T_{BRAKE}+1 sec to T_{BRAKE}+3 sec. If the average deceleration deviates from 4 (+0.25) m/s^2, use the correction formula below to correct the F4 value.

$$F4_{new} = F4_{original} * (4 / \text{average deceleration})$$

(e.g., when average deceleration is 5m/s2, F4new = F4original * 4 / 5)
Use the corrected F4 and repeat brake operations of C.4 so that the average deceleration will be within a scope of 4 (+0.25)m/s2.

C.4 Brake Operations during FCWS Test
(1) Detect the activation of FCWS, time of which shall be T_{fcw}.
(2) Release the accelerator at T_{fcw} +1 sec.
(3) Brake pedal stroke control shall start at T_{fcw} +1.2 sec, and the application rate shall be either D4×5 mm/s or 400mm/s, whichever is smaller. (In other words, it shall be the speed at which the stroke reaches D4 in 200ms, and the upper limit value shall be 400mm/s.)
(4) Monitor the pedal force values processed by second-order filtering with a cutoff frequency 20Hz or moving average at 50ms, and upon reaching either of the following, switch to the pedal force control with target value of F4. The time of the switch shall be recorded as Tswitch.
a. When the stroke D4 defined in C.3 is exceeded for the first time.
b. When the pedal force value F4 defined in C.3 is exceeded for the first time.
Furthermore, when it is shifted to pedal force control before reaching enough pedal stroke after performing filtering, etc., upon consultation with the vehicle manufacturer, Tswitch timing may be adjusted. (For example, take a measure not to switch to pedal force control until reaching certain pedal stroke.)
(5) At Tswitch onward, control the brake pedal in such a way that the pedal force will be F4±25%.
Stable pedal force control should be realized within 200ms from Tswitch; however, even when the pedal force value exceeds F4±25% due to intervention by AEBS, it shall be acceptable when duration is 200ms or less.
(6) It is desirable that the pedal force average value will be in the range of F4±10N from T_{fcw} +1.4 sec to the end of the test.

APPENDIX 1: AUTONOMOUS EMERGENCY BRAKING SYSTEM [PEDESTRIAN TO CAR TURNING RIGHT OR LEFT IN INTERSECTION] PERFORMANCE TEST CONDITIONS AND TEST VEHICLE SPECIFICATION

[To be filled in by Vehicle Manufacturer]

1. Test Vehicle Specification

(1) Model/Type (Model Name):

(2) Overall width of vehicle

(3) Front axle overhang

(4) Sensor System:

(5) Installed Tires

	Front	Rear
Size		
Brand/Type		
Air Pressure (kPa)		

2. Declarations by Vehicle Manufacturer

(1) AEBS Test Start Vehicle Speed CPLF: _____km/h CPRN: _____km/h
CPLN: km/h CPRF: km/h

(2) AEBS Test End Vehicle Speed CPLF: _____km/h CRRN: _____km/h
CPLN: _____km/h CRRN: _____km/h

(3) FCWS Available or Not: Available / Not available

(4) FCWS Test Start Vehicle Speed CPLF: _____km/h CPRN: _____km/h
CPLN: km/h CPRF: km/h

(5) FCWS Test End Vehicle Speed CPLF: _____km/h CPRN: _____km/h
CPLN: km/h CPRF: km/h

(6) FCWS Function Specification: "Auditory and visual information" and "auditory and haptic information"

Frequency of auditory information: Hz Hz

Attach a document stating the location of the provision of such information (speaker location, display location, etc.).

(7) FCWS Test Brake Operation Setup Values

Brake Pedal Stroke: ____mm Application rate: ____mm/s Pedal force: _____N

(8) Manual setting of activation start timing: Yes ( )/No

(9) Restrictions on sunlight conditions during the test: Yes/No (No need to consider shadows, backlighting, etc.)

(10) Limit on the number of AEBS operations: Yes (up to times per trip) / No

(11) Protective devices: A written statement describing the method of deactivation of occupant and

pedestrian protective devices, or a written statement outlining the modifications to be made to deactivate them.

(12) Advance data submission: Yes (Appendix 3 or equivalent)/No

(13) Order of test scenarios ①　　②　　③　　④

(14) The existence of top cover :　Yes　・　No

(15) Other special notes, etc.

3. Functions and precautions concerning the system to support users, etc.

A written statement regarding the operating conditions under the object or environment specified by the automobile manufacturer, etc. and the concept concerning the functions of the system shall be attached.

APPENDIX 2: AUTONOMOUS EMERGENCY BRAKING SYSTEM [PEDESTRIAN TO CAR TURNING RIGHT OR LEFT IN INTERSECTION] PERFORMANCE TEST CONDITIONS AND TEST VEHICLE SPECIFICATION

[To be filled in by Testing Institute]

Test date (YYYY/MM/DD): _____ Place :_____

1. Test Vehicle Specifications

(1) Model/Type (Model Name):_____/_____(_____)

(2) Frame number:_____

(3) Overall width of vehicle

(4) Front axle overhang

(5) Sensor System:

(6) Installed tires

	Front	Rear
Size		
Brand/Type		
Air pressure (kPa)		

(5) Test Vehicle Load Allocation

		Left Wheel	Right Wheel	Subtotal	Grand Total	Front-rear Distribution
Load Distribution at Vehicle Delivery (daN)	Front Axle					%
	Rear Axle					%
Load Distribution at Testing (daN)	Front Axle					%
	Rear Axle					%

(Note) Indicate as 1daN = 1kgf

2. Items etc. to be reported by automobile manufacturers

(1) AEBS test start speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(2) AEBS test end speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(3) FCWS function availability: Available / Not Available

(4) FCWS test start speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(5) FCWS test end speed CPLF : km/h CPRN : km/h

CPLN： km/h CPRF： km/h

(6) Specifications of FCWS function: “Auditory and visual information” and “auditory and haptic information”

(7) Set value of brake operation during FCWS test:

Test implemented or not: Yes/No

Pedal stroke amount: mm Depression speed: mm/s Pedal force: N

(8) Manual setting of activation start timing: Yes ( )/No

3. Environmental Condition

Day 1 Test date (YYYY/MM/DD): Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

Day 2 Test date (YYYY/MM/DD): Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

Day 3 Test date (YYYY/MM/DD): Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

4. Test Results

(1) AEBS test in CPLF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(2) FCWS test in CPLF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(3) AEBS test in CPLN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(4) FCWS test in CPL scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(5) AEBS test in CPRN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(6) FCWS test in CPRN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(7) AEBS test in CPRF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(8) FCWS test in CPRF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

APPENDIX 3: AUTONOMOUS EMERGENCY BRAKING SYSTEM [PEDESTRIAN TO CAR TURNING RIGHT OR LEFT IN INTERSECTION] PERFORMANCE TEST CONDITIONS AND TEST VEHICLE SPECIFICATION

[For advance data as stipulated in the detailed regulations of the New Car, etc. Assessment Information Provision Project]

※Only the results of tests conducted on the same type of vehicle as the assessment test vehicle (with optional equipment similar to that of the test vehicle) using the test methods specified by NASVA may be submitted.

Test date (YYYY/MM/DD): _____ Place :_____

1. Test Vehicle Specifications

(1) Model/Type (Model Name):_____/_____(_____)

(2) Frame number:_____

(3) Overall width of vehicle

(4) Front axle overhang

(5) Sensor system:_____

(6) Installed tires

	Front	Rear
Size		
Brand/Type		
Air pressure (kPa)		

(5) Test Vehicle Load Allocation

		Left Wheel	Right Wheel	Subtotal	Grand Total	Front-rear Distribution
Load Distribution at Vehicle Delivery (daN)	Front Axle					%
	Rear Axle					%
Load Distribution at Testing (daN)	Front Axle					%
	Rear Axle					%

(Note) Indicate as 1daN = 1kgf

2. Items etc. to be reported by automobile manufacturers

(1) AEBS test start speed CPLF : km/h CPRN : km/h

CPLN : km/h CPRF : km/h

(2) AEBS test end speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(3) FCWS function availability: Available / Not Available

(4) FCWS test start speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(5) FCWS test end speed CPLF : km/h CPRN : km/h
CPLN : km/h CPRF : km/h

(6) Specifications of FCWS function: “Auditory and visual information” and “auditory and haptic information”

(7) Set value of brake operation during FCWS test:

Test implemented or not: Yes/No

Pedal stroke amount: mm Depression speed: mm/s Pedal force: N

(8) Manual setting of activation start timing: Yes ( )/No

(9) Accelerator / brake operation: Automated / by driver

[When the driver performs accelerator / brake operation, submit a document that records actual measurement values for each accelerator / brake operation provisions in test method section 6.1 (9).]

3. Environmental Condition

Day 1 Test date (YYYY/MM/DD):□ □ □ □ Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

Day 2 Test date (YYYY/MM/DD):□ □ □ □ Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

Day 3 Test date (YYYY/MM/DD):□ □ □ □ Place:

Start Time: Weather: Temp.: Wind Speed:

End Time: Weather: Temp.: Wind Speed:

Remarks:

4. Test Results

(1) AEBS test in CPLF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(2) FCWS test in CPLF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(3) AEBS test in CPLN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(4) FCWS test in CPLN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(5) AEBS test in CPRN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(6) FCWS test in CPRN scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(7) AEBS test in CPRF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented

(8) FCWS test in CPRF scenario

			(a)	(b)	(c)=(a)-(b)	(d)=(c)/(a)	
Speed Condition	Number of Tests	Avoided or Not (*)	Initial Speed	Speed at Collision	Velocity Reduction Amount	Velocity Reduction Rate	Velocity Reduction Rate Median
10 km/h	1st						
	2nd						
	3rd						
15 km/h	1st						
	2nd						
	3rd						
20 km/h	1st						
	2nd						
	3rd						
25 km/h	1st						
	2nd						
	3rd						
30 km/h	1st						
	2nd						
	3rd						

(*)○: Collision avoided, P: Passed (deemed avoided), △: Speed reduced, ×: No activation , －: Not implemented