Annex C

IVISTA

China Intelligent Vehicle Index

Test and Evaluation Protocol for Intelligent Parking Index

(Version 2026)

IVISTA

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Foreword

At present, intelligent parking assist systems are becoming increasingly popular, with consumers using them more frequently and in a wider range of situations. Their functions have gradually expanded from traditional perpendicular and parallel parking slots to complex parking slots, actual garages and diverse parking scenarios. However, with the continuous enrichment of parking scenarios, intelligent parking assist systems still face many challenges in terms of parking slot recognition accuracy, parking success rate, dynamic obstacle response, and environmental adaptability, which affect user experience and confidence.

To scientifically evaluate the overall performance of intelligent parking assist systems and promote improvements in system safety and intelligent upgrades, China Automotive Engineering Research Institute Co., Ltd. has upgraded its intelligent parking testing system by focusing on typical high-frequency parking scenarios, complex edge scenarios, and real-world garage scenarios, while integrating elements and characteristics from both closed-course facilities and public parking lots. The company has officially launched the IVISTA China Intelligent Vehicle Index (Version 2026) - Test and Evaluation Protocol for Intelligent Parking Index. The procedure covers three core modules: "complex parking slot completion", "real garage adaptability" and "test and evaluation of special items". The system has built a full range of evaluation capabilities from standard parking slots to complex obstacles, from static environments to dynamic interference, and from closed proving grounds to public parking garages.

The complex parking slot completion test sets up a variety of interference and difficult parking slot scenarios in a closed proving ground, focusing on evaluating the system's recognition ability, safety response and parking stability under challenges such as dynamic obstacles, low light, slopes, narrow spaces, which is of great significance to improving the reliability and completion rate of the system in complex scenarios. The real garage adaptability test relies on standardized indoor parking lots and public parking lots to comprehensively test the system's scenario adaptability, continuous traffic efficiency, human-like decision-making performance and overall user experience in the real garage environment, providing a verification basis for the system's performance in actual use. The test and evaluation of special items is carried out by selecting advantageous projects from the alternative test projects through the "self-selection" method of automobile companies. The whole set of test and evaluation procedures takes into account both fairness and flexibility of testing.

The purpose of this procedure is to provide consumers with an objective and reliable reference for car purchases; provide clear guidance for industry technology research and development and function optimization, thereby promoting the iteration of intelligent parking technology and the upgrading of the industrial chain; and continuously inject core momentum into the high-quality development of the field of intelligent vehicles.

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Test and Evaluation Protocol for Intelligent Parking Index

1 Scope

This document specifies the test and evaluation methods of IVISTA China Intelligent Vehicle Index (Version 2026) - Intelligent Parking Index.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute indispensable provisions of this document. Among them, for dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB 34660 Road Vehicles - Requirements and Test Methods of Electromagnetic Compatibility

GB 5768.3 Road Traffic Signs and Markings - Part 3: Road Traffic Markings

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

GB/T 34590 (all parts) Road Vehicles - Functional Safety

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

GB/T 39980-2021 Mechanical Parking System - Design Rules

GB/T 40429-2021 Taxonomy of Driving Automation for Vehicles

GB/T 41630-2022 Performance Requirements and Test Methods for Intelligent Parking Assist System

GB/T 43267-2023 Road Vehicles - Safety of the Intended Functionality

GB/T 44373-2024 Intelligent and Connected Vehicle - Terms and Definitions

GB/T 47031-2026 Intelligent and Connected Vehicles - Performance Requirements and Test Methods for Automated Parking System

JGJ 100 Code for Design of Parking Garage Building

ISO 16787 Intelligent Transport Systems-assisted Parking Systems (APS) - Performance Requirements and Test Procedures

ISO 19206-2 Road Vehicles - Test Devices for Target Vehicles, Vulnerable Road Users and Other Objects, for Assessment of Active Safety Functions - Part 2: Requirements for Pedestrian Targets

ISO 19206-3 Road Vehicles - Test Devices for Target Vehicles, Vulnerable Road Users and Other Objects, for Assessment of Active Safety Function - Part 3: Requirements for Passenger Vehicle 3D Targets

ISO 19206-5 Road Vehicles - Test Devices for Target Vehicles, Vulnerable Road Users and Other Objects, for Assessment of Active Safety Functions - Part 5: Requirements for Powered Two-wheeler Targets

3 Terms and Definitions

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

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3.1

parking assist system; PAS

a system that can automatically detect the parking space and provide the driver with assistance functions such as parking indication and/or direction control during vehicle parking

Note 1: Direction control includes lateral control or lateral and longitudinal combined control.

Note 2: Parking space may also be called "parking slot".

Note 3: The parking assist system is hereinafter referred to as the "system".

[Source: GB/T 41630-2022, 3.1, modified]

3.2

vehicle under test; VUT

a vehicle equipped with a parking assist system for testing

[Source: GB/T 41630-2022, 3.2, modified]

3.3

target vehicle; TV

a vehicle that can interfere with the completion of the driving task for parking assist system of VUT when it is running ahead of or near the VUT

3.4

background vehicle; BV

a necessary vehicle stationary near the VUT for constructing the test scenario

3.5

target parking space

a parking space used for parking-in and parking-out tests on the PAS of the VUT

3.6

adult pedestrian target; APT

an adult pedestrian test device for testing the active safety system

3.7

child pedestrian target; CPT

a child pedestrian test device for testing the active safety system

3.8

crouched child target; CCT

a crouched child test device for testing the active safety system

3.9

slot search status

working status of the PAS searching for a parking slot

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[Source: GB/T 41630-2022, 3.3]

3.10

assisted parking status

working status of the PAS assisting the driver in parking in or out of the parking slot by lateral control or lateral and longitudinal control

[Source: GB/T 41630-2022, 3.4, modified]

3.11

number of parking maneuvers

during parking of the VUT, gear shifting to R and vehicle movement starting counted as the first kneading, and gear shifting from R to D or from D to R during kneading counted as one time of kneading respectively

[Source: GB/T 41630-2022, 3.8, modified]

4 Test Requirements

4.1 Requirements for test site and environment

4.1.1 Requirements for test site

4.1.1.1 The closed test site shall meet the following requirements:

a) The test site shall be flat and dry pavement, without visible moisture, obvious pits, cracks and other defects;

b) Except for the ramp between floors, the ground slope shall be less than 1%;

c) The outdoor test site shall be concrete or asphalt pavement, and the indoor test site shall be epoxy floor pavement.

d) There shall be no barriers affecting the operation of the sensor on the test site;

e) The parking slot marking lines shall be in pristine condition and easily visible, characterized by white solid lines with a width of 0.10m~0.15m.

f) Lane lines may be white solid lines, white dotted lines, yellow solid lines or yellow dotted lines and shall meet the requirements of GB 5768.3;

g) Unless otherwise specified, the relevant parameters of the parking slot in this document are as follows, based on the inner edge of the line:

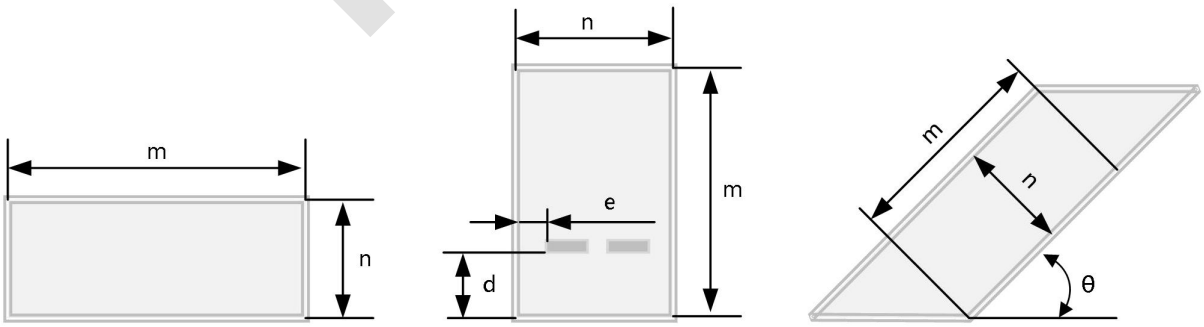


Fig. 1 Parameter Marking Diagram of Parking Slot with Markings

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Table 1 Parameters of Parking Slot with Markings

Parameters of Parallel Parking Slot with Markings		Parameters of Perpendicular Parking Slot with Markings				Parameters of Diagonal Parking Slot with Markings		
Length (m)	Width (m)	Length (m)	Width (m)	Position of the stop block (d)	Position of the stop block (e)	Length (m)	Width (m)	Inclination angle (θ)
5.9 m	2.4 m	5.9 m	2.4 m	0.8 m	0.1 m	5.9 m	2.4 m	45°

4.1.1.2 The public parking lot site shall meet the following requirements:

a) The VUT shall be able to pass smoothly on the test route without any movable obstacles.

b) The markings of the parking slot shall be in pristine condition and easily visible.

c) The size of the parking slot shall be larger than the body size of the VUT.

4.1.2 Requirements for test environment

4.1.2.1 The closed proving ground environment shall meet the following requirements:

a) The wind speed shall not exceed 5 m/s, and there shall be no rain, snow, fog, dust, etc.;

b) The temperature shall be 0°C ~ 45°C;

c) Unless required by the test scenario, the ambient illuminance of the driving route and target parking space in the outdoor parking lot shall not be less than 1000 lx, and that in the indoor parking lot shall not be less than 30 lx.

4.1.2.2 The public parking lot environment shall meet the following requirements:

a) The temperature shall be 0°C ~ 45°C;

b) The ambient illuminance along driving routes and at target parking spaces in indoor public parking lots shall not be less than 5 lx.

4.2 Requirements for test equipment

4.2.1 Object target

a) The CCT of the target (as shown in Fig. 2) for a crouched child (3 to 6 years old, height 522 mm) shall be that the surface characteristic parameters can represent the above-mentioned crouched child. For specific requirements, refer to standard ISO 19206-2;

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Fig. 2 Crouched Child Target

Note 1: For soft targets, the requirements of applicable national standards shall prevail after they are published.

Note 2: If the manufacturer of the VUT believes that the soft target does not meet the requirements of the VUT sensor for the target, please contact the IVISTA Management Center.

b) The target of the tricycle (as shown in Fig. 3) shall be that the surface characteristic parameters can represent the above-mentioned tricycle. For specific requirements, refer to standard ISO 19206-3;



Fig. 3 Tricycle Target

Note 1: For soft targets, the requirements of applicable national standards shall prevail after they are published.

Note 2: If the manufacturer of the VUT believes that the soft target does not meet the requirements of the VUT sensor for the target, please contact the IVISTA Management Center.

c) The scooter target shall comply with the requirements of ISO 19206-5.

4.2.2 Data acquisition equipment

4.2.2.1 Requirements for test data acquisition equipment in closed proving ground:

a) Sampling and storage frequency of dynamic data: not less than 50 Hz;

b) Speed accuracy of VUT: 1.0 km/h;

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c) The acceleration accuracy of the VUT shall be 0.1 m/s^2.

4.2.2.2 Requirements for test data acquisition equipment in public parking lot:

a) Sampling and storage frequency of dynamic data: not less than 50 Hz;

b) Speed accuracy of VUT: 1.0 km/h.

4.2.3 Background vehicle and target vehicle

M1 passenger vehicles may be used as background vehicles and target vehicles, or dummy vehicles with the same reflection characteristics as M1 passenger vehicles may be used as background vehicles and target vehicles.

Note: If the VUT's manufacturer considers that the background vehicle (BV) cannot meet the requirements of the VUT PAS sensor for the target, please contact the IVISTA Management Center directly.

4.2.4 Road curb

The road curb is arranged with reference to the dimension of "TF-type curb" in Urban Road - Curb (Atlas No. 05MR404) and the relevant construction requirements. The cross-sectional parameters of the curb are shown in Fig. 4, with a height from the ground of 12 cm~20 cm, a width of 28 cm~32 cm and a chamfer of 45°~90°.

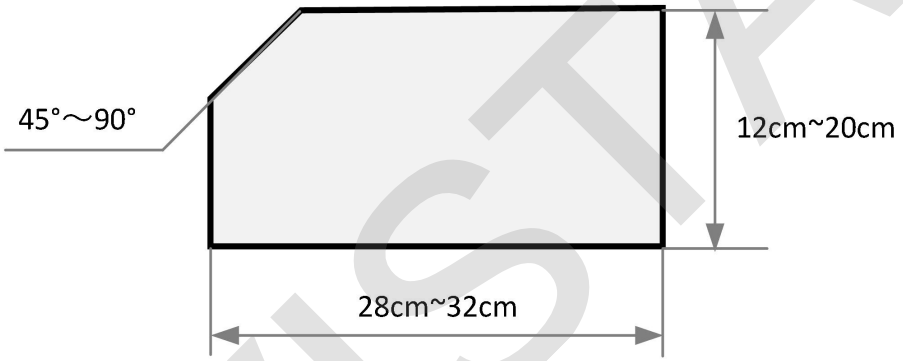


Fig. 4 Schematic Diagram of Curb Size

4.3 Requirements for VUT

4.3.1 System initialization

If necessary, the PAS may be initialized before the test, including calibration of sensors such as radar and camera.

4.3.2 Vehicle status confirmation

Before the test, the state of VUT shall meet the following requirements:

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

b) The VUT shall be equipped with original new tires designated by the manufacturer. The tire pressure shall be the standard cold tire pressure recommended by the manufacturer. If more than one value is recommended for tire pressure, the tire shall be inflated to the pressure with the lightest load;

c) The VUT shall be refueled to not less than 90 % of the fuel tank capacity, with other fluids (such as 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;

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

4.3.3 Functional inspection

Before starting the test, check that the human-machine interaction of the VUT's parking assist system, including buttons, displays and voice prompts, is functioning properly, and proceed with the test only after confirming that the system is operating normally.

4.4 Requirements for data processing and recording

4.4.1 Data record contents

4.4.1.1 Contents of proving ground test data record:

a) VUT speed;

b) longitudinal acceleration of VUT;

c) Position and motion data of the object target;

d) Video information reflecting the driver and human-machine interaction state;

e) video information reflecting the driving state and external environment of the VUT.

4.4.1.2 Contents of test data records in public parking lot:

a) Video information reflecting the driver and human-machine interaction state;

b) video information reflecting the driving state and external environment of the VUT.

4.4.2 Data processing requirements

The test data processing shall meet the following requirements:

a) The VUT speed shall be the wheel speed, and the original data (in km/h) shall be used;

b) The longitudinal acceleration data of the VUT needs to be filtered by a 12-pole phaseless Butterworth filter with a cutoff frequency of 6 Hz, the average value taken every 2 s and measured in m/s^2.

4.5 Test shooting requirements

The test shooting shall meet the requirements below:

a) Before installing the test equipment, take photos of the front left 45° of the VUT and the nameplate of the vehicle;

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

5 Test Method

5.1 Overview

5.1.1 The real vehicle test items of the parking assist system include three parts: complex parking slot completion test, real garage adaptability test, and special item test.

5.1.2 The complex parking slot completion test consists of two parts: the parking-in test with interference and the difficult parking-in test. Both tests are carried out in a closed proving ground. The parking-in test with interference focuses on examining the VUT's ability

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to identify and respond to multiple types of dynamic object targets, while the difficult parking-in test examines the VUT's ability to park under different parking conditions.

5.1.3 The real garage adaptability test consists of two parts: scenario passability test and full-process passability test. The former is tested in the indoor parking lot of a closed proving ground, and the latter is tested in a public parking lot that is open to the public. The VUT first undergoes a scenario passability test and then a full-process passability test.

5.1.4 The manufacturer of the VUT shall take the initiative to apply for up to 2 items from the alternative test items for testing. If no application is made, the test will not be conducted.

Table 2 Intelligent Parking Test Framework

Test and Evaluation Dimensions	Test Items	Project Type	Test Direction
Complex parking slot completion	Parking-in with interference	Mandatory items	Test the system's parking slot recognition and safety response capabilities under dynamic obstacle interference
	Parking into difficult parking slots		Test the parking stability and success rate of the system under complex physical conditions (such as low light, slopes, narrow spaces)
Real garage adaptability	Scenario passability		Test the continuous passing and decision-making ability of the system in simulating typical garage traffic scenarios (such as obstacle bypassing, passing oncoming vehicles, and passing through narrow section)
	Full-process passability		Test the overall adaptability of the system under long-distance cruising and complex traffic flow in a real public parking lot environment
Test and evaluation of special items	Mechanical parking-in, Head-in Parking, vehicle parking-out, etc.	Optional	Test the realization and performance of special functions of the system in specific scenarios or personalized parking scenarios

5.1.5 The VUT manufacturer may provide a pre-test report issued by a qualified third-party testing organization before the formal test. Where the VUT manufacturer does not provide a pre-test report, unless otherwise specified, the test shall be conducted once under each test condition. If the VUT manufacturer provides a pre-test result, the test shall be conducted according to the following rules:

a) The first test:

- The first test result is taken as the final result under the specific test condition if it is the same as the pre-test result;

- If the first test result deviates much from the pre-test result, the second test is conducted.

b) The second test:

- The second test result is taken as the final result under the specific test condition if it is the same as the pre-test result;

- The average of the first and second test results is taken as the final result under the specific test condition if the second test result still deviates much from the pre-test result, but it is the same as the first test result;

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- If the second test result deviates much from both the first test result and the pre-test result, the third test is conducted.

c) The third test:

- If the third test result is the same as either the first or the second test result, the average of the two test results is taken as the final result under the specific test condition;

- If the third test result still deviates much from those of the previous two tests, stop the test, and conduct the test again after the reason is analyzed.

Note 1: If a sharp deviation exists between the final result of one test and the pre-test result, this one test will be recorded as invalid. After a total of 3 tests are recorded as invalid, the pre-test result will no longer be used. Only 1 test will be conducted under each follow-up test condition.

Note 2: Whether there is a sharp deviation in the test results under the same test condition is judged by whether the absolute value of the difference between the pre-test score and the formal test score under the same test condition exceeds 5%.

5.2 Test method for completion of complex parking slots

5.2.1 Test method for parking-in with interference

5.2.1.1 The test items of the parking-in test with interference are shown in Table 3. For each part of the test content, the parking-in test without interference is carried out first, and then the parking-in test with interference of object target is carried out. For detailed test and evaluation rules, see Appendix A.

Table 3 Test Items for Parking-in with Interference

S/N	Test Items	Test Group	Number of Tests
1	Test of parking-in with interference of tricycle	Parking-in test without interference	1
2		Parking-in test with interference of tricycle	1
3	Test of parking-in with interference of crouched child	Parking-in test without interference	1
4		Parking-in test with interference of crouched child	1
5	Test of parking-in with interference of scooter	Parking-in test without interference	1
6		Parking-in test with interference of scooter	1

5.2.1.2 The tester shall carry out the test according to the following steps:

a) Carry out the parking-in test without interference first as shown in Fig.5. The VUT shall start the parking assist system from a stationary state and then enter the parking slot searching state. In this state, within r in front of the target parking space, the speed is controlled at V, and the distances (excluding the rearview mirrors of both vehicles) between the outermost ground contact points of the front and rear tires on the side close to the parking slot and the outer boundary of the parking slot are df and dr respectively. The test shall be started for the VUT with a vacant parking slot on the right side of the driving direction as the target parking space.

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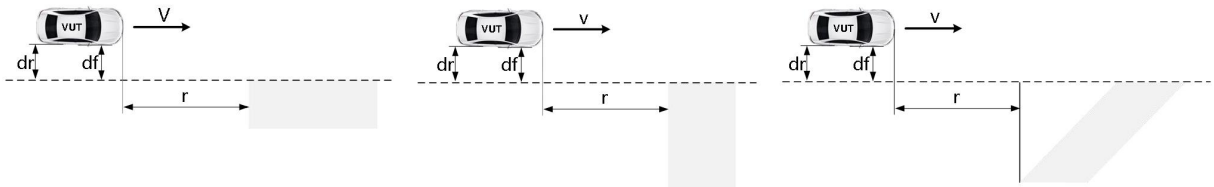


Fig.5 Schematic Diagram for Initial State of Parking into Parallel, Perpendicular and Diagonal Parking Slots

b) After the VUT is parked in the target parking space, record its parking posture and the number of kneading during parking.

c) Continue to carry out the parking-in test with interference of object target. The VUT shall start the parking assist system from a stationary state and then enter the parking slot searching state. In this state, within r in front of the target parking space, the speed is controlled at V, and the distances (excluding the rearview mirrors of both vehicles) between the outermost ground contact points of the front and rear tires on the side close to the parking slot and the outer boundary of the parking slot are df and dr, respectively. The test shall be started for the VUT with a vacant parking slot on the right side of the driving direction as the target parking space.

d) When the VUT detects the target parking space, it starts to park into the target parking space. When the rear of the VUT passes line L (Fig. A.1, Fig. A.3, Fig. A.5) for the first time, the object target starts from the rt position and runs forward at a speed of Vt. During the driving process, ensure that the lateral distance between the object target and the target parking space is dt.

e) The tester records the recognition of and response to the object target during vehicle parking-in.

5.2.1.3 Test validity requirements:

- Ensure that the parking assist system of the VUT is turned on from a standstill, and then enter the slot search status of the parking assist system;

- Ensure that the speed of the VUT when searching for a parking slot meets the allowable error range required by the test scenario at a certain distance from the target parking space;

- When the VUT searches for a parking slot, the distance between the outermost ground contact point of the front and rear tires on the side close to the parking slot and the outer boundary of the parking slot (excluding the rearview mirrors of both vehicles) meets the allowable error range required by the test scenario.

5.2.1.4 The test ends when one of the following conditions occurs:

- The function of PAS is disabled in advance;

- The PAS sends a takeover request, indicating that it is unable to continue to complete the task;

- The VUT collides with the bordering vehicle, object target, curb, pillar or wall.

5.2.2 Test method for parking into difficult parking slot

5.2.2.1 The test items of the test on parking into difficult parking slot are shown in Table 4, and the detailed test and evaluation rules are shown in Appendix A.

Table 4 Test Items for Parking into Difficult Parking Slot

S/N	Test Items	Number of Tests
1	Parking into sloped parallel parking slot	1
2	Parking into low-light parallel parking slot	1
3	Parking into narrow perpendicular parking slot	1

5.2.2.2 The tester shall carry out the test according to the steps in 5.2.1.2.

5.2.2.3 The test validity requirements are the same as those in 5.2.1.3.

5.2.2.4 The conditions for the end of test are the same as those in 5.2.1.4.

5.3 Real garage adaptability test method

5.3.1 Test method for scenario passability

5.3.1.1 Set up a test route in the parking lot, and build 5 test scenarios between the starting point and the ending point, namely, a scenario of "品"-shaped obstacle avoidance, a scenario of yielding to oncoming vehicles, a scenario of passing through a narrow lane, a scenario of temporary obstacle and a scenario of parking slot occupied. For detailed test and evaluation rules, see Appendix B.

Table 5 Test Items of Scenario Passability

S/N	Test Items
A	Scenario of "品"-shaped obstacle avoidance
B	Scenario of yielding to oncoming vehicles
C	Scenario of passing through a narrow lane
D	Scenario of temporary obstacle
E	Scenario of parking slot occupied

5.3.1.2 The tester shall carry out the test according to the following steps:

a) The tester drives the VUT into the parking lot from its entrance/exit, parks it in the "function activation area" set up in the parking lot, and activates the parking function of parking assist according to the system prompt to drive towards the "parking-in completion area";

b) During the process of driving the VUT from the "function activation area" through the "test scenario" to the "parking-in completion area", the tester focuses their attention on monitoring the operation state of the VUT and the parking assist system. Unless it is an emergency, no operations are performed on the speed and direction of the VUT;

c) If the VUT prompts to take over before the "test scenario" or stops for a long time without any prompt, the tester removes the test scenario and then continues to enable the parking assist system to drive towards the "parking-in completion area";

d) When the VUT parks smoothly in the target parking space of the "parking-in completion area" and prompts that parking is completed, this test ends.

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5.3.1.3 Test validity requirements:

- When the parking function of parking assist is enabled, the VUT shall be in the "function activation area" of the parking lot;

- Scenario parameters such as placement position, triggering time, movement speed of moving obstacle and deviation of movement route in the test scenario shall be within the allowable range.

5.3.1.4 The test ends when one of the following conditions occurs:

- Collision occurs when the parking assist system drives the vehicle;

- The number of parking application tests exceeds 3.

5.3.2 Full-process passability test method

5.3.2.1 IVISTA selected 36 public indoor parking lots in Chongqing as alternative test sites for full-process passability testing. After comprehensively evaluating factors such as the number of levels, slope gradients, cruising distance, lighting conditions, traffic volume, and minimum passage width, these parking lots were classified into three difficulty levels: easy, moderate and challenging. Twelve parking lots were selected for each difficulty level, with one test route established at each site. During testing, one parking lot from each difficulty level is randomly chosen for the tests.

5.3.2.2 In parking lot tests of easy level, there is no need to navigate across different floors. However, in moderate to challenging level parking lot tests, maneuvering through multiple floors is required.

5.3.2.3 In order to ensure the consistency of test scenario difficulty in the public parking lot test as much as possible, the test is carried out from 10:00 to 16:00 on weekdays.

5.3.2.4 Select a target parking space within the parking lot based on the VUT's maximum cruising range. The total length of the test route from the parking lot entrance to the target parking space shall match the VUT's maximum cruising range. When selecting a test route within the parking lot, provided that the required test distance is met, the route shall cover as many challenging dynamic and static scenarios within the parking lot as possible.

5.3.2.5 When it comes to the same test route, the VUT is allowed a maximum of 5 chances to learn and map. If it fails to successfully learn and map within these 5 opportunities, the test will end.

5.3.2.6 When it comes to the same test route, the VUT is required to undergo 3 parking application tests. If the VUT fails to successfully complete the learning and mapping process for the route, the parking application test for that route will not be conducted.

5.3.2.7 The tester shall carry out the public parking lot test with reference to the steps of Proving Ground test.

5.3.2.8 The driving directions for the parking application test 3 times are divided into two cases, based on whether the parking assist system of the VUT supports reverse cruise from the target parking space to the entrance/exit of the parking lot, according to the learned and mapped route from the entrance/exit of the parking lot to the target parking space.

a) If the parking assist system of the VUT does not support reverse cruise control, the driving direction of the VUT for 3 times is "from the entrance/exit of the parking lot to the target parking space";

b) If the parking assist system of the VUT supports reverse cruise control, the driving directions of the VUT in the 3 tests are "from parking lot entrance/exit to target parking

space", "from target parking space to parking lot entrance/exit" and "from parking lot entrance/exit to target parking space".

5.3.2.9 Refer to the Proving Ground test for the test validity requirements and end-of-test conditions of public parking lot tests.

5.3.2.10 In the parking application test in a public parking lot, if the VUT cruises to the front of the target parking space, it is considered that the parking application task has been completed, and there is no need to park into the target parking space.

5.3.2.11 During a parking application test in a public parking lot, if there are traffic jams, accidents or other short-term situations that completely prevent the VUT from detouring from its planned path, the test will be considered invalid. In such cases, the tester will select another test route based on the site conditions.

5.3.2.12 If the VUT fails to activate and enable its parking function after traveling more than 50 meters upon entering the parking lot (i.e., due to shielding of the satellite positioning signal), it is deemed that the VUT cannot complete this test, and the test ends.

5.4 Test methods of special items

The VUT manufacturer may independently select up to 2 alternative test items for testing according to the capabilities of the VUT:

Table 6 Test of Special Items

S/N	Name of Test Item
1	Parking test in mechanical parking slot
2	Back-to-back parking test
3	Test of the front of vehicle parking into the parking slot
4	Parking-out test
5	Offset parking test
6	Parking lock lifting and lowering test

6 Evaluation Method

6.1 Overview

The full score of the mandatory items for the actual vehicle test of the parking assist system is 90 points, and the full score of the optional items is 10 points. The full score of the complex parking slot completion test is 60 points, the full score of the real garage adaptability test is 30 points, and the full score of the special item test is 10 points.

Table 7 Weight Distribution of Intelligent Parking Evaluation Score

Test and Evaluation Dimensions	Test Items	Project Type	Full Score
Complex parking slot completion	Parking-in with interference	Mandatory items	30 points
	Parking into difficult parking slots		30 points
Real garage adaptability	Scenario passability		10 points
	Full-process passability		20 points
Test and evaluation of special items	Mechanical parking-in, Head-in Parking, vehicle parking-out, etc.	Optional	10 points

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6.2 Evaluation method for completion of complex parking slots

6.2.1 Evaluation method for parking-in with interference

The full score for the test and evaluation of parking into a parking slot with interference is 30 points, including 3 scenarios: parking into a parking slot with interference of a tricycle, parking into a parking slot with interference of a crouched child and parking into a parking slot with interference of a scooter. Each scenario has a full score of 10 points.

Table 8 Weight of Test and Evaluation Score for Parking-in with Interference

Test Items	Test Classification	Rating Indicator	Full Score
Parking-in with interference of tricycle	First time: parking without interference	Number of kneading	3.0 points
		Deflection angle	0.5 points
		Distance from curb	0.5 points
		Absolute value of maximum longitudinal acceleration	1.0 points
	Second time: parking with interference	Whether the object target is detected and the vehicle is safely parked	5.0 points
Parking-in with interference of crouched child Parking-in with interference of scooter	First time: parking without interference	Number of kneading	3.0 points
		Deflection angle	0.5 points
		Whether the vehicle is parked in the target area	0.5 points
		Absolute value of maximum longitudinal acceleration	1.0 points
	Second time: parking with interference	Whether the object target is detected and the vehicle is safely parked	5.0 points

6.2.2 Evaluation method for parking into difficult parking slot

The full score for the test and evaluation of parking into difficult parking slots is 30 points, including 3 scenarios: parking into a sloped parallel parking slot, parking into a low-light parallel parking slot and parking into a narrow perpendicular parking slot. The full score for each scenario is 10 points.

Table 9 Test Items for Parking into Difficult Parking Slot

Test Items	Rating Indicator	Full Score
Parking into sloped parallel parking slot	Whether the vehicle is safely parked into the slot without collision	10.0 points
Parking into low-light parallel parking slot	Whether the vehicle is safely parked into the slot without collision	10.0 points
Parking into narrow perpendicular parking slot	Whether the vehicle is safely parked into the slot without collision	10.0 points

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6.3 Evaluation method of real garage adaptability

6.3.1 Evaluation method for scenario passability

The scenario passability test takes the test route as the smallest unit for overall comprehensive evaluation, with a full score of 10 points. It includes two parts: "response to test scenarios" and "performance on test route", each with a full score of 5 points. There are 5 test scenarios on the test route. The test is carried out in the indoor parking lot of a closed proving ground. It is carried out continuously in 5 scenarios for 3 times, and the average score of the 3 tests is taken as the final score.

Table 10 Score Distribution of Scenario Passability Evaluation

Rating Dimension	Full Score	Test Items	Full Score
Response to test scenarios	5.0 points	Scenario of "品"-shaped obstacle avoidance	1.0 points
		Scenario of yielding to oncoming vehicles	1.0 points
		Scenario of passing through a narrow lane	1.0 points
		Scenario of temporary obstacle	1.0 points
		Scenario of parking slot occupied	1.0 points
Performance on test route	5.0 points	Average speed	3.0 points
		Absolute value of maximum longitudinal acceleration	2.0 points

6.3.2 Full-process passability evaluation method

The full score of the full-process passability test and evaluation is 20 points, and the full scores for evaluation of the performance in the parking lots with three difficulty levels (easy, moderate and challenging) are 2.5 points, 7.5 points and 10 points, respectively. The overall evaluation is carried out based on the actual performance of the VUT on the test routes of the parking lots with three difficulty levels. For each test route, both the evaluations of learning and mapping and of parking application shall be carried out, with a full score weight of 20% and 80%, respectively. The final score of the public parking lot evaluation is the sum of the actual scores of the VUT on the test routes of the parking lots with three difficulty levels.

Table 11 Score Distribution of Public Parking Lot Rating

Difficulty Level of Parking Lot	Full Score	Rating Items	Weight
Easy	2.5 points*K	Learning and mapping	20%
		Parking application	80%
Moderate	7.5 points*K	Learning and mapping	20%
		Parking application	80%
Challenging	10.0 points*K	Learning and mapping	20%
		Parking application	80%

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Table 12 Relationship between Cruise Distance (D) and Coefficient (K) of VUT with Parking Assist System

Maximum Cruise Distance (D)	Coefficient (K)
D≥2500m	1
2000m≤D＜2500m	0.9
1500m≤D＜2000m	0.8
1000m≤D＜1500m	0.7
500m≤D＜1000m	0.6
200m≤D＜500m	0.5
D＜200m	0.4

6.4 Evaluation methods of special items

The full score for the test and evaluation of special items is 10 points, and the VUT model will obtain the final score for the test and evaluation of special items based on the sum of the actual scores under the corresponding test items.

Table 13 Score Weight of Special Item Test

S/N	Name of Test Item	Full Score
1	Parking test in mechanical parking slot	10.0 points
2	Back-to-back parking test	10.0 points
3	Test of the front of vehicle parking into the parking slot	5.0 points
4	Parking-out test	5.0 points
5	Offset parking test	3.0 points
6	Parking lock lifting and lowering test	3.0 points

6.5 Comprehensive grade evaluation

The overall rating of intelligent parking index is divided into five levels: Good + (G+), Good (G), Acceptable (A), Marginal (M) and Poor (P). The specific rating methods are shown in Table 14.

a) The overall rating is Good+ (G+): scoring rate of the parking assist system test ≥ 90%;

b) The overall rating is Good (G): 90% > scoring rate of the parking assist system test ≥ 80%;

c) The overall rating is Acceptable (A): 80% > scoring rate of the parking assist system test ≥ 60%;

d) The overall rating is Marginal (M): 60% > scoring rate of the parking assist system test ≥ 40%;

e) The overall rating is Poor (P): scoring rate of the parking assist system test < 40%.

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Table 14 Overall Rating of Intelligent Parking Index

Intelligent Parking Index Rating	Score Range
Good+ (G+)	Scoring rate ≥ 90%
Good (G)	90% > scoring rate ≥ 80%
Acceptable (A)	80% > scoring rate ≥ 60%
Marginal (M)	60% > scoring rate ≥ 40%
Poor (P)	Scoring rate < 40%

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Appendix A

(Normative)

Test and Evaluation Rules for Completion of Complex Parking Slots

A.1 Test and evaluation rules for parking-in with interference

A.1.1 Test and evaluation rules for parking-in with interference of tricycle

A.1.1.1 Scenario description

This scenario is used to assess the parking-in efficiency and effect of the VUT in a parallel parking slot, as well as its capability to recognize and respond to tricycles during parking. The target parking space is formed by two stationary background vehicles (BVs) and a curb on one side to form a parallel parking slot. The ground is marked with parking slot lines. The outer sides of the front and rear wheels of the background vehicle (BV) are close to the inner sides of the parking slot lines. The distance between the two background vehicles (BVs) is c. The test includes two phases: non-interference and interference. The non-interference test is that the VUT performs the parking slot search process according to the test requirements, autonomously identifies the target parking space and parks in it. The interference test is that the VUT performs the parking slot search process as required, and when it identifies that parking is intended at the target parking space, a tricycle object target comes from behind to interfere with and interrupt the parking-in process of the VUT.

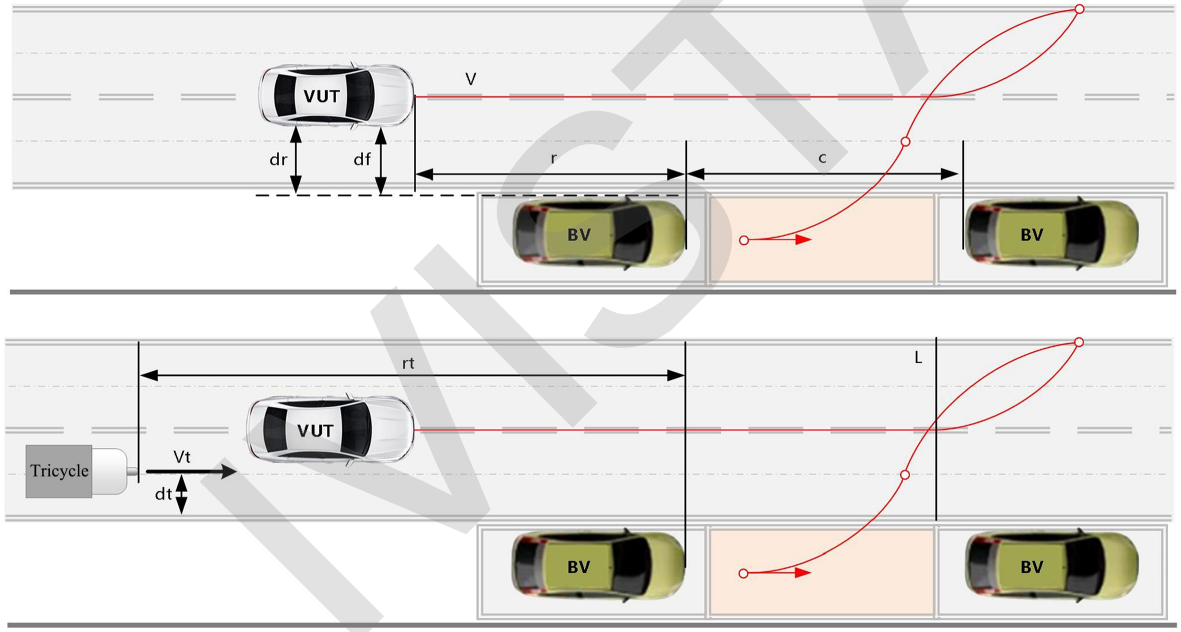


Fig. A.1 Schematic Diagram for Test and Evaluation Scenario of Parking-in with Interference of Tricycle

Table A.1 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	=20m
c	(H+1.0) m
df	(1.5±0.1) m

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Scenario Parameter	Parameter Range
dr	(1.5±0.1) m
Vt	(20±1) km/h
rt	(30±1) m
dt	(1.5±0.1) m

Note: H represents the body length of the VUT; the same applies below.

A.1.1.2 Evaluation methods

The full score for this scenario is 10 points, and the evaluation indicators include "number of kneading", "deflection angle", "distance from curb", "absolute value of maximum longitudinal acceleration" and "whether it is safe to avoid collision". Different scores are given according to the different performances of the VUT in the test scenarios:

- After completing the parking-in test without interference, measure the distances Df and Dr between the outer contact points of the front and rear wheels of the VUT and the curb of the target parking space. Take the smaller distance as the "distance from curb" and calculate the angle α formed between the vehicle body and the parking slot boundary using Df and Dr. See Fig. A.2 for the schematic diagram of measurement. If the VUT ends the test as listed in 5.2.1.4 of this document, no score will be given under this condition. The specific scoring method is shown in Table A.2.

- For the interference test, if the VUT successfully detects the interfering object target and successfully avoids a collision or passively collides after stopping before the collision, 5 points will be given; otherwise, no points will be given.

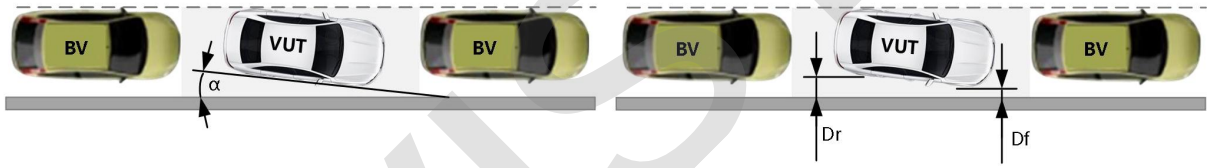


Fig. A.2 Schematic Diagram of Evaluation Method for Parallel Parking Slot without Interference

Table A.2 Scenario Scoring

Scoring Indicator	Rating Level
Number of kneading, 3.0 points	≤ 4 times, 3.0 points
	= 5 times, 2.5 points
	= 6 times, 2.0 points
	= 7 times, 1.5 points
	> 7 times, 0.0 points
Deflection angle, 0.5 points	Within -3°~3°, 0.5 points
	Out of -3°~3°, 0.0 points
Distance from curb, 0.5 points	[0.30 m, inf), 0.0 points
	[0.25 m, 0.30 m), 0.4 points
	[0.10 m, 0.25 m), 0.5 points

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Scoring Indicator	Rating Level
	[0.05 m, 0.10 m), 0.4 points
	[0.00 m, 0.05 m), 0.0 points
Absolute value of maximum longitudinal acceleration, 1.0 points	[0.0 g, 0.1 g), 1.0 points
	[0.1 g, 0.2 g), 0.5 points
	[0.2 g, inf), 0 points

Note 1: If it takes more than 50 s to park into a parking slot, the scoring indicator "absolute value of maximum longitudinal acceleration" is 0 points.

Note 2: "Time for parking into the parking slot" refers to the time from the moment the vehicle switches to reverse gear to the end of parking into the parking slot (e.g., when the vehicle switches to a non-driving gear or when the system issues a prompt indicating the end of parking into the parking slot).

Note 3: After the parking-in test without interference is completed, if the distance between the VUT and the curb is less than 0.10 m, and the door on the side of the vehicle closest to the curb is higher than the curb and can be fully opened, the vehicle will receive 0.50 points for the “Distance from curb” criterion.

A.1.2 Test and evaluation rules for parking-in with interference of crouched child

A.1.2.1 Scenario description

This scenario is used to assess the parking-in performance and posture of the VUT in a perpendicular parking slot, as well as its safety response capability to crouched children. The target parking space is formed by two stationary background vehicles (BVs) in a vertical space, with parking slot lines on the ground. The ground projection of the front of the background vehicle (BV) is close to the inner side of the parking slot line, and the distance between the two background vehicles (BVs) is c. The test includes two phases: non-interference and interference. The non-interference test is that the VUT performs the parking slot search process according to the test requirements, autonomously identifies the target parking space and parks in it. The interference test is that the VUT performs the parking slot search process as required, and when it identifies that parking is intended at the target parking space, a crouched child target is located in the target parking space, with its back to the direction of the oncoming vehicle, interfering with the parking-in process of the VUT.

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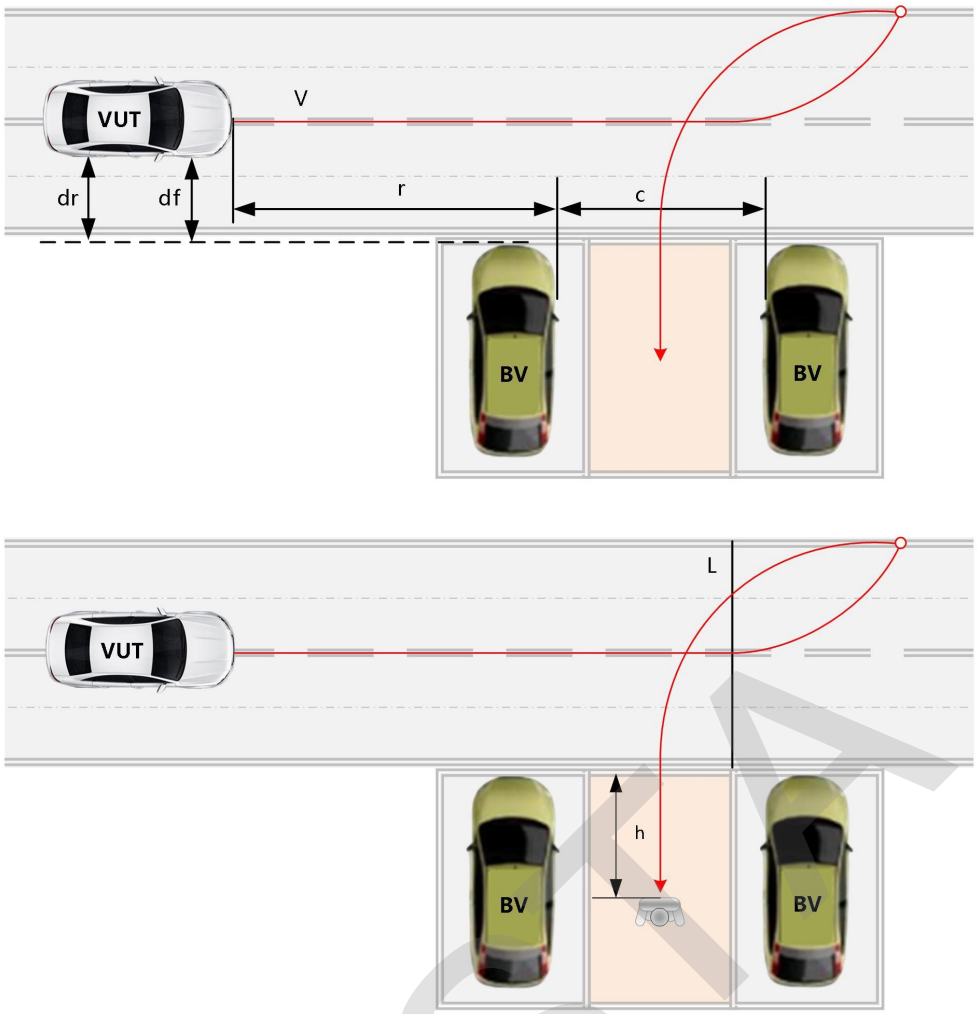


Fig. A.3 Schematic Diagram for Test and Evaluation Scenario of Parking-in with Interference of Crouched Child

Table A.3 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	=20m
c	(B+1.0) m
df	(1.5±0.1) m
dr	(1.5±0.1) m
h	(3.0±0.1) m

Note: B represents the body width of the VUT (excluding the exterior rearview mirrors); the same applies below.

A.1.2.2 Evaluation methods

The full score for this scenario is 10 points, and the evaluation indicators include "number of kneading", "deflection angle", "whether the vehicle is parked in the target area", "absolute value of maximum longitudinal acceleration" and "whether it is safe to avoid collision". Different scores are given according to the different performances of the VUT in the test scenario:

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- For the test without interference, after completing the parking-in test, measure the distances between the outer contact points of the front and rear wheels of the VUT and the inner edge of the target parking space. Judge whether the VUT is parked in the target area, and calculate the included angle β between the vehicle body and the parking slot boundary. See Fig. A.4 for the schematic diagram of measurement. The target area refers to the rectangular area in which the distance between the VUT and the left and right edge lines of the target parking space is Δd, and the value of Δd is 0.1 m. If the VUT ends the test as listed in 5.2.1.4 of this document, no score will be given under this condition. The specific scoring method is shown in Table A.4.

- For the interference test, if the VUT successfully detects the interfering object target and safely stops to avoid it before the collision, 5 points will be given; otherwise, no points will be given.

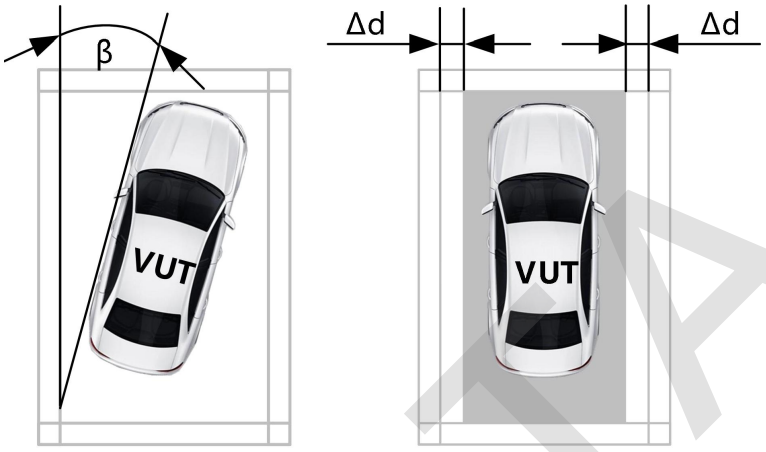


Fig. A.4 Schematic Diagram of Evaluation Method for Perpendicular Parking Slot without Interference

Table A.4 Scenario Scoring

Rating Indicator	Rating Level	
Number of kneading, 3.0 points	Length of VUT < 5 m	≤ 3 times, 3.0 points
		= 4 times, 2.5 points
		= 5 times, 2.0 points
		= 6 times, 0.5 points
		> 6 times, 0.0 points
	Length of VUT ≥ 5 m	≤ 4 times, 3.0 points
		= 5 times, 2.5 points
		= 6 times, 2.0 points
		= 7 times, 1.5 points
		> 7 times, 0.0 points
Deflection angle, 0.5 points	Within -3°~3°, 0.5 points	
	Out of -3°~3°, 0.0 points	
Whether the vehicle is parked in the target area, 0.5 points	Yes, 0.5 points	
	No, 0.0 points	
Absolute value of maximum longitudinal acceleration, 1.0 points	[0.0 g, 0.1 g), 1.0 points	
	[0.1 g, 0.2 g), 0.5 points	
	[0.2 g, inf), 0.0 points	

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Note 1: If it takes more than 50 s to park into a parking slot, the scoring indicator "absolute value of maximum longitudinal acceleration" is 0 points.

Note 2: "Time for parking into the parking slot" refers to the time from the moment the vehicle switches to reverse gear to the end of parking into the parking slot (e.g., when the vehicle switches to a non-driving gear or when the system issues a prompt indicating the end of parking into the parking slot).

A.1.3 Test and evaluation rules for parking-in with interference of scooter

A.1.3.1 Scenario description

This scenario is used to assess the parking-in performance and posture of VUT in a diagonal parking slot, as well as its safety response capability to scooters. The target parking space is formed by two stationary background vehicles (BVs) to form an inclined parking slot, with parking slot lines on the ground. The ground projection of the front of the background vehicle (BV) is close to the inner side of the parking slot line, and the distance between the two background vehicles (BVs) is c. The test includes two phases: non-interference and interference. The non-interference test is that the VUT performs the parking slot search process according to the test requirements, autonomously identifies the target parking space and parks in it. The interference test is that the VUT performs the parking slot search process as required, and when it identifies that parking is intended at the target parking space, a scooter object target comes from behind to interfere with and interrupt the parking-in process of the VUT.

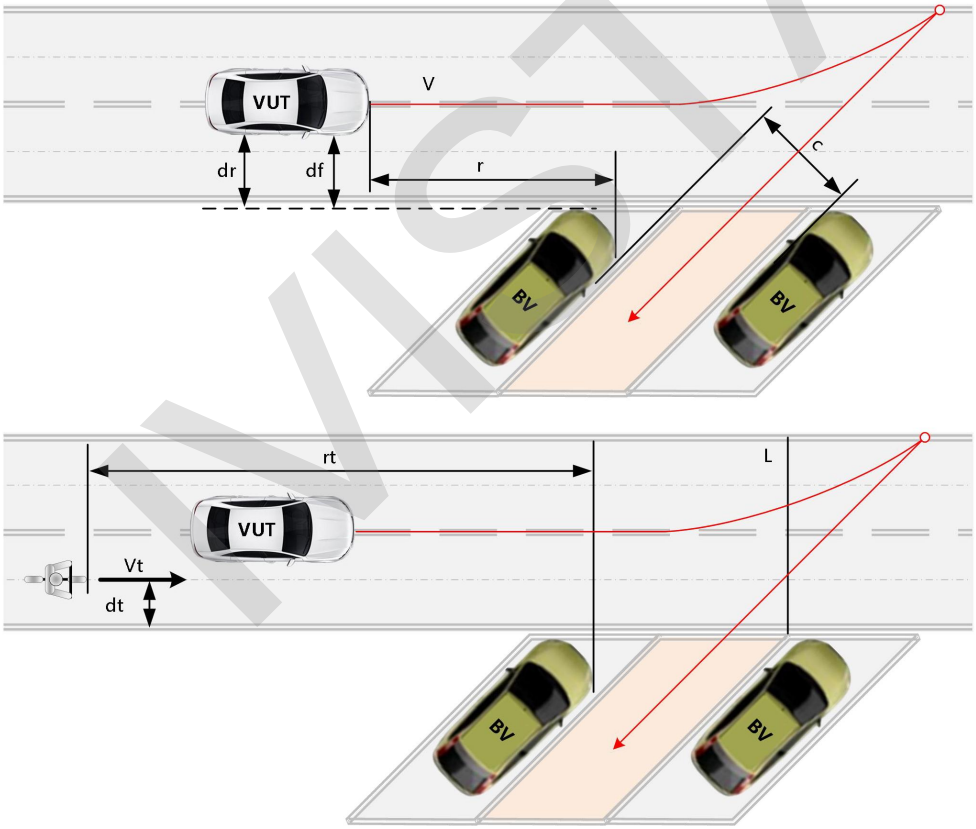


Fig. A.5 Schematic Diagram for Test and Evaluation Scenario of Parking-in with Interference of Scooter

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Table A.5 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	=20m
c	(B+1.0) m
df	(1.5±0.1) m
dr	(1.5±0.1) m
Vt	(15±1) km/h
rt	(30±1) m
dt	(1.5±0.1) m

A.1.3.2 Evaluation methods

The full score for this scenario is 10 points, and the evaluation indicators include "number of kneading", "deflection angle", "whether the vehicle is parked in the target area", "absolute value of maximum longitudinal acceleration" and "whether it is safe to avoid collision". Different scores are given according to the different performances of the VUT in the test scenario:

- For the test without interference, after completing the parking-in test, measure the distance between the outer contact points of the front and rear wheels of the VUT and the outer edge of the bordering vehicle. Judge whether the VUT is parked in the target area, and calculate the included angle β between the vehicle body and the parking slot boundary. See Fig. A.6 for the schematic diagram of measurement. The target area refers to the rectangular area in which the distance between the VUT and the bordering vehicle on each side is Δd, and the value of Δd is 0.1 m. If the VUT ends the test as listed in 5.2.1.4 of this document, no score will be given under this condition. The specific evaluation method is shown in Table A.4.

- For the interference test, if the VUT successfully detects the interfering object target and successfully avoids a collision or passively collides after stopping before the collision, 5 points will be given; otherwise, no points will be given.

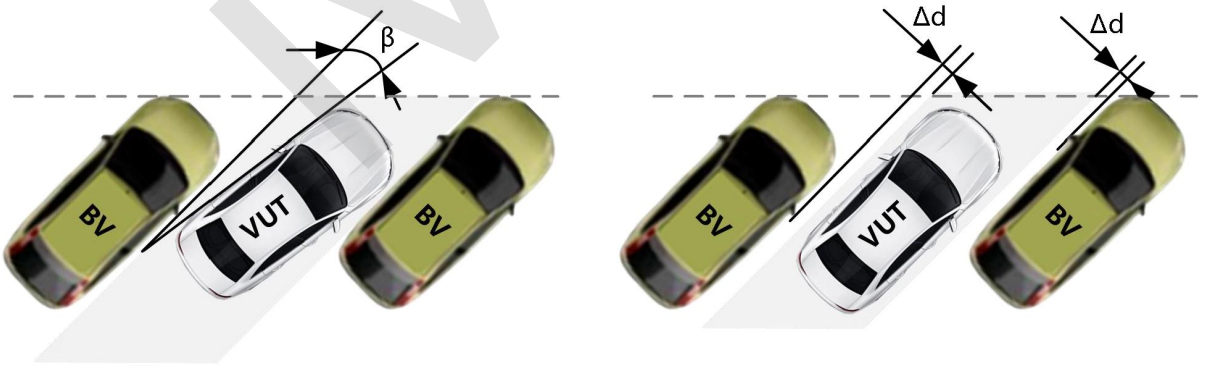


Fig. A.6 Schematic Diagram of Evaluation Method for Diagonal Parking Slot without Interference

Table A.6 Scenario Scoring

Rating Indicator	Rating Level	
Number of kneading, 3.0 points	Length of VUT < 5 m	≤ 3 times, 3.0 points
		= 4 times, 2.5 points
		= 5 times, 2.0 points
		= 6 times, 0.5 points
		> 6 times, 0.0 points
	Length of VUT ≥ 5 m	≤ 4 times, 3.0 points
		= 5 times, 2.5 points
		= 6 times, 2.0 points
		= 7 times, 1.5 points
		> 7 times, 0.0 points
Deflection angle, 0.5 points	Within -3°~3°, 0.5 points	
	Out of -3°~3°, 0.0 points	
Whether the vehicle is parked in the target area, 0.5 points	Yes, 0.5 points	
	No, 0.0 points	
Absolute value of maximum longitudinal acceleration, 1.0 points	[0.0 g, 0.1 g), 1.0 points	
	[0.1 g, 0.2 g), 0.5 points	
	[0.2 g, inf), 0.0 points	

Note 1: If it takes more than 50 s to park into a parking slot, the scoring indicator "absolute value of maximum longitudinal acceleration" is 0 points.

Note 2: "Time for parking into the parking slot" refers to the time from the moment the vehicle switches to reverse gear to the end of parking into the parking slot (e.g., when the vehicle switches to a non-driving gear or when the system issues a prompt indicating the end of parking into the parking slot).

A.2 Test and evaluation rules for parking into difficult parking slot

A.2.1 Test and evaluation rules for parking into sloped parking slot

A.2.1.1 Scenario description

This scenario is used to assess the parking performance and stability of the VUT in a parallel parking slot on a slope. The target parking space is formed by two stationary background vehicles (BVs) on a slope with an inclination angle of α, forming a parallel parking slot. The ground is marked with parking slot lines. The outer sides of the front and rear wheels of the background vehicle (BV) are close to the inner side of the parking slot line. The distance between the two background vehicles (BVs) is c.

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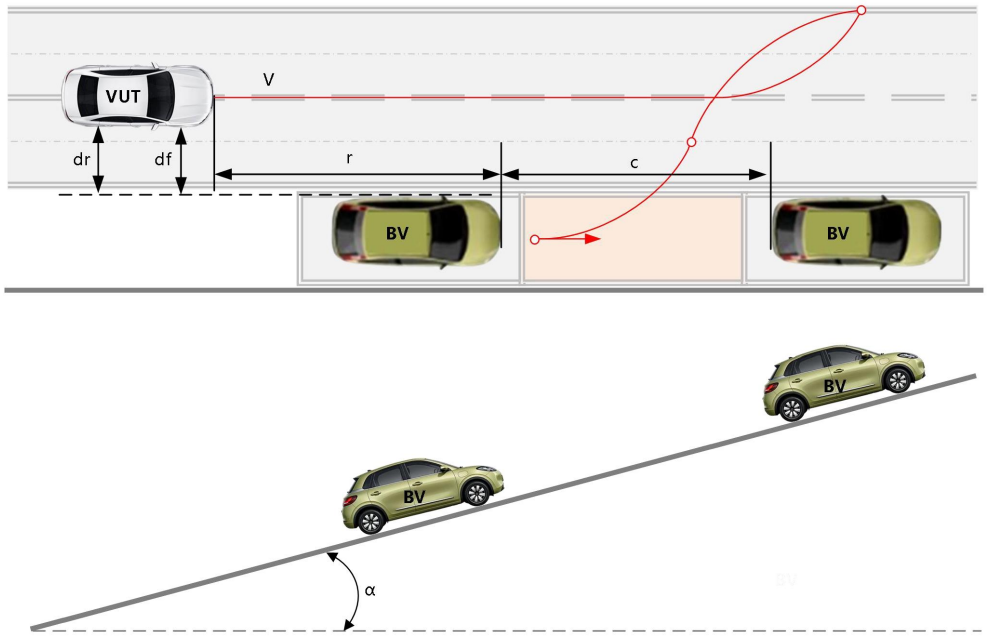


Fig. A.7 Top View (Upper) and Side View (Lower) of the Test and Evaluation for Parking into Sloped Parking Slot

Table A.7 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥20m
c	(H+1.0) m
df	(1.5±0.1) m
dr	(1.5±0.1) m
α	4%～5%

A.2.1.2 Evaluation methods

The full score for this scenario is 10 points, and the evaluation indicator is "Whether the vehicle is safely parked into the slot without collision". Different scores are given according to different performances of VUT in test scenarios:

- If the VUT successfully and safely parks into the target parking space and does not collide with obstacles such as bordering vehicles and curbs during the entire parking-in process, nor does it end any of the tests listed in 5.2.1.4 of this document (such as premature exit of system functions or sending a takeover request), 10 points will be given.

- If the VUT cannot complete parking-in, or any collision occurs during parking-in, or any test ends early, 0 points will be given.

A.2.2 Test and evaluation rules for parking-in with low light

A.2.2.1 Scenario description

This scenario is used to assess the parking performance and stability of the VUT in a parallel parking slot with low light. The target parking space is a parallel parking slot formed by two stationary background vehicles (BVs) under the illumination intensity of E. Parking slot lines are drawn on the ground, and the outer sides of the front and rear wheels of the

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background vehicle (BV) are closely attached to the inner side of the parking slot line. The distance between the two background vehicles (BVs) is c. The parking slot formed by the two background vehicles (BVs) is staggered from the parking slot by marking lines on the ground *is offset/misaligned relative to the painted ground markings*, and the distance between the tail of the front vehicle and the marking line of the marked parking slot is d.

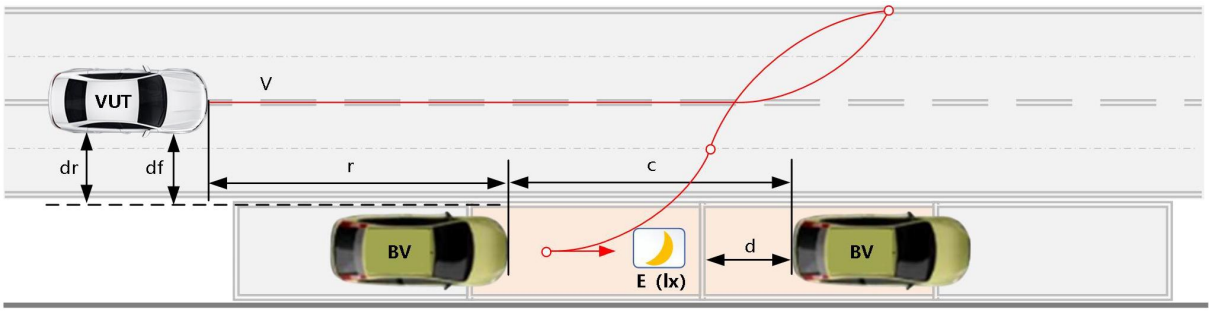


Fig. A.8 Scenario Diagram

Table A.8 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥20 m
df	(1.5±0.1) m
dr	(1.5±0.1) m
c	(H+1.0) m
d	(0.5±0.1) m
E	⩽30 lx

A.2.2.2 Evaluation methods

The full score is 10 points, and the evaluation indicator is "Whether the vehicle is safely parked into the slot without collision". Different scores are given according to different performances of VUT in test scenarios:

- If the VUT successfully and safely parks into the target parking space and does not collide with obstacles such as bordering vehicles and curbs during the entire parking-in process, nor does it end any of the tests listed in 5.2.1.4 of this document early (such as premature exit of system functions or sending a takeover request), 10 points will be given;

- If the VUT detects the target parking space but is unable to park in it, requiring the driver to park manually, it receives 5 points;

- If the VUT cannot complete parking-in, or any collision occurs during parking-in, or any test ends early, 0 points will be given.

A.2.3 Test and evaluation rules for parking into narrow parking slot

A.2.3.1 Scenario description

This scenario is used to assess the parking performance and stability of the VUT in the narrow perpendicular parking slot. The target parking space is a perpendicular space formed by a stationary background vehicle (BV) and the pillar to its left. Parking lines are marked on the ground, and the ground projection of the front of the background vehicle (BV) is flush with the inner edge of the parking lines. The distance between the background vehicle (BV)

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and the pillar to its left is c. During the test, the background vehicle's (BV) exterior rearview mirrors are folded.

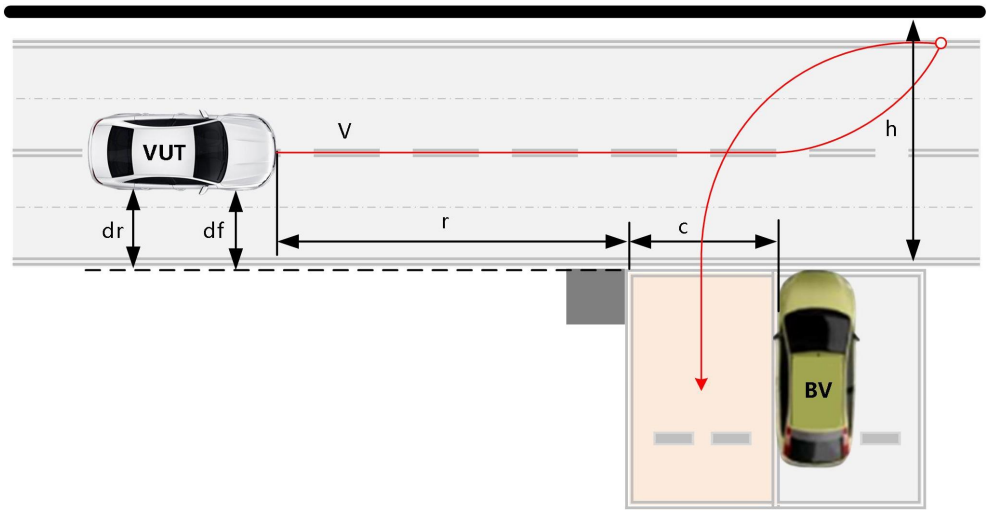


Fig. A.9 Scenario Diagram

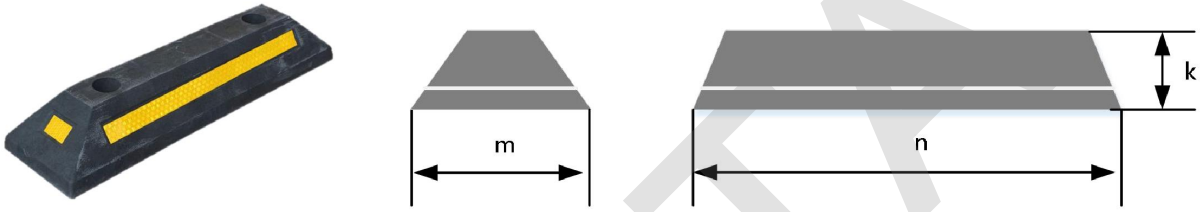


Fig. A.10: Photo of Wheel Stop Block and Parameter Marking Diagram

Table A.9 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥20m
df	(1.5±0.1) m
dr	(1.5±0.1) m
c	(B+0.6) m/(B+0.8) m/(B+1.0) m
h	(H+0.5) m
m	0.12m～0.16m
n	0.50m～0.60m
k	0.10m～0.12m

A.2.3.2 Evaluation methods

The full score is 10 points, and the evaluation indicator is "Whether the vehicle is safely parked into the slot without collision". Different scores are given according to different performances of VUT in test scenarios:

- If the VUT successfully and safely parks into the target parking space with a width of (B+0.6) m, 10 points will be given;

- If the VUT successfully and safely parks into the target parking space with a width

of (B+0.8) m, 7.5 points will be given;

- If the VUT successfully and safely parks into the target parking space with a width of (B+1.0) m, 5 points will be given;

- If the VUT cannot complete parking-in, or any collision occurs during parking-in, or any test ends early, 0 points will be given.

Note 1: Whether the VUT has parked within the target parking space is determined by whether the projection of the VUT's outline on the ground does not extend beyond the outer edges of the target parking space's ground markings after the VUT has come to a stop within the parking slot;

Note 2: If the vehicle is large, the VUT is considered to have successfully parked in the target parking space even if its tires come into contact with the wheel stop blocks after parking, provided that the VUT's outline does not extend beyond the outer edge of the side marking lines of the target parking space, and even if it extends beyond the front or rear marking lines of the target parking space.

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Appendix B

(Normative)

Test and Evaluation Rules for Real Garage Adaptability

B.1 Test and evaluation rules for scenario passability

B.1.1 Test and evaluation scenario setting

B.1.1.1 Overall layout of test and evaluation scenarios

The test route for the scenario passability test is set up with "function activation area" and "parking-in completion area", between which 5 test scenarios are arranged, as shown in Fig. B.1.

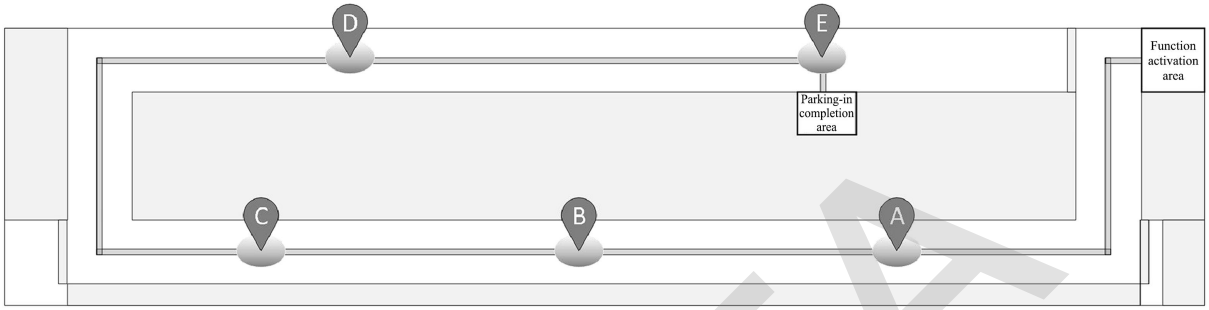


Fig. B.1 Schematic Diagram of Scenario Passability Layout

B.1.1.2 Scenario of "品"-shaped obstacle avoidance

This scenario aims to evaluate the path planning and detour capabilities of the VUT in a complex static obstacle environment. The scenario is set in a straight lane, where three stationary background vehicles (BVs) have all their lights turned off, their engines shut off, and are unoccupied, with their exterior rearview mirrors folded. They are arranged in a "品"-shaped formation, creating an asymmetrical lane. The VUT needs to drive from the starting point of the scenario to the end point. The system needs to independently identify the obstacle layout, plan a safe and efficient detour path, and pass smoothly without touching any obstacles. This scenario focuses on the system's perception accuracy of static obstacles, free-space estimation capability, and smooth, human-like trajectory planning and control capabilities.

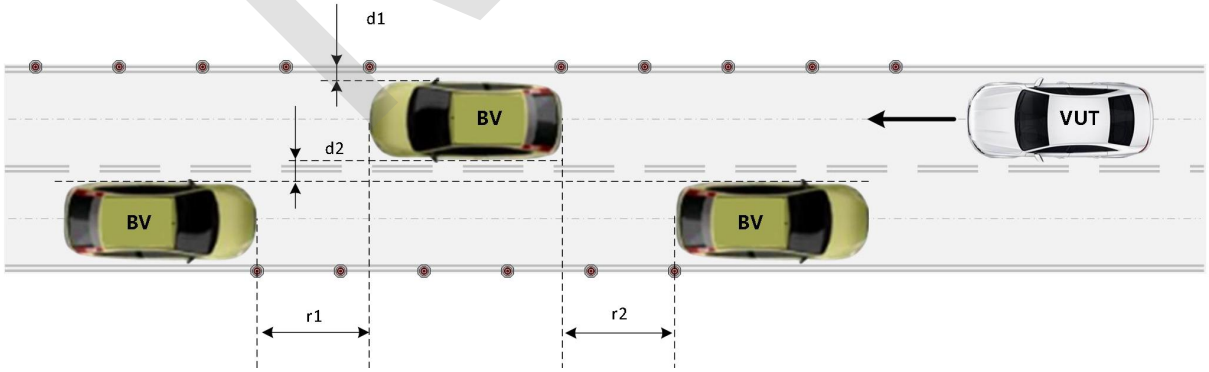


Fig. B.2 Schematic Diagram of "品"-shaped Obstacle Avoidance

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Table B.1 Scenario Parameters

Scenario Parameter	Parameter Range
d1	(0.2±0.01) m
d2	(B/2) m
r1	(H+1.0) m
r2	(H+1.0) m

B.1.1.3 Scenario of yielding to oncoming vehicles

This scenario simulates the decision-making and courtesy capabilities of the system when passing an oncoming vehicle in a narrow garage passage. The test is conducted in a straight lane with limited width. Before the test begins, both the background vehicle (BV) and the target vehicle (TV) must turn off all lights and shut off their engines; the background vehicle (BV) must be unoccupied, and its exterior mirrors must be folded. Once the test begins, when the VUT's body comes into contact with the J or L line, the oncoming target vehicle (TV) must turn on its low beams and start moving from position rt to block the VUT in the T zone. This scenario assesses the system's ability to understand and plan scenarios in a dynamic interactive environment, as well as whether it complies with safe and polite driving etiquette.

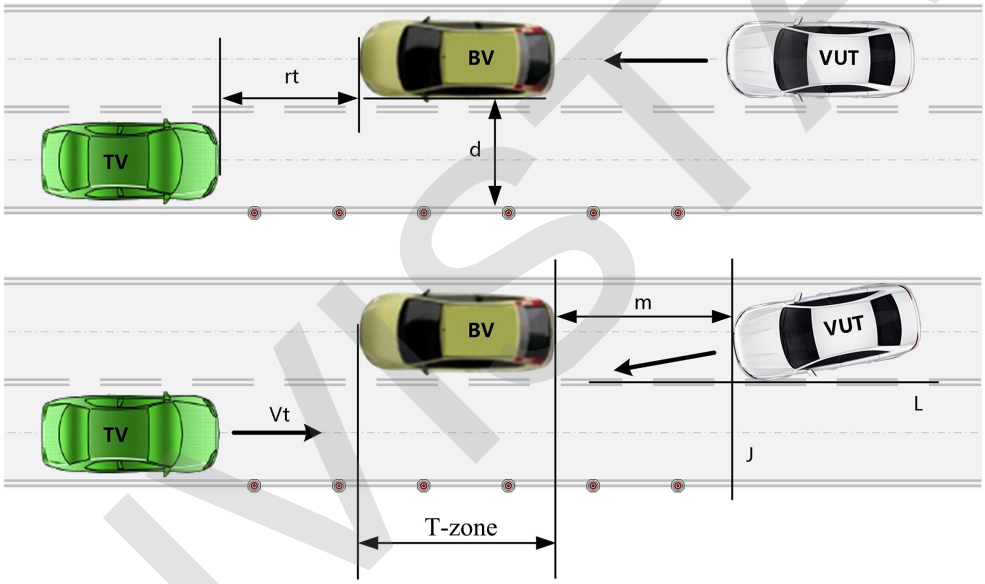


Fig. B.3 Scenario Diagram

Table B.2 Scenario Parameters

Scenario Parameter	Parameter Range
r	≥ 50 m
rt	(H+1.0) m
d	(3.0±0.1) m
Vt	(8.0±1.0) km/h

B.1.1.4 Scenario of passing through a narrow lane

As shown in Fig. B.4, the background vehicle (BV) is stationary in the oncoming lane with all lights off, the engine turned off, no occupants inside, and the exterior rearview

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mirrors folded. A traffic cone is positioned in front of the VUT in its lane; the distance between the traffic cone and the right edge of the road is d1, and the shortest distance between the traffic cone and the background vehicle (BV) is c. B represents the body width of the VUT (excluding the exterior rearview mirrors). This scenario evaluates the VUT's accuracy in detecting the driving space, as well as the human-machine cooperative driving assistance system's ability to alert and interact with the driver.

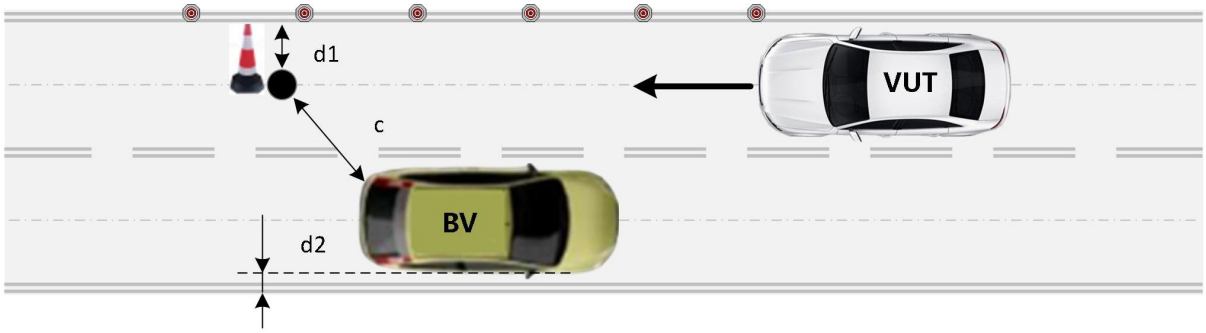


Fig. B.4 Schematic Diagram of Passing through a Narrow Lane

Table B.3 Scenario Parameters

Scenario Parameter	Parameter Range
d1	(1.0±0.1) m
d2	(0.5±0.01) m
c	(B-0.1) m

B.1.1.5 Scenario of temporary obstacle

As shown in Fig. B.5, there are random temporary obstacles in front of the lane of the VUT. The distance between the obstacle and the left edge line of the road is 3 m. The types of obstacles may be black traffic cones, plastic notice boards, metal notice boards, strollers, shopping carts, construction fences, etc. If the temporary obstacle consists of plastic fences, stainless steel isolation belts, or black traffic cones, ensure that the distance between any two posts does not exceed the width of the VUT.

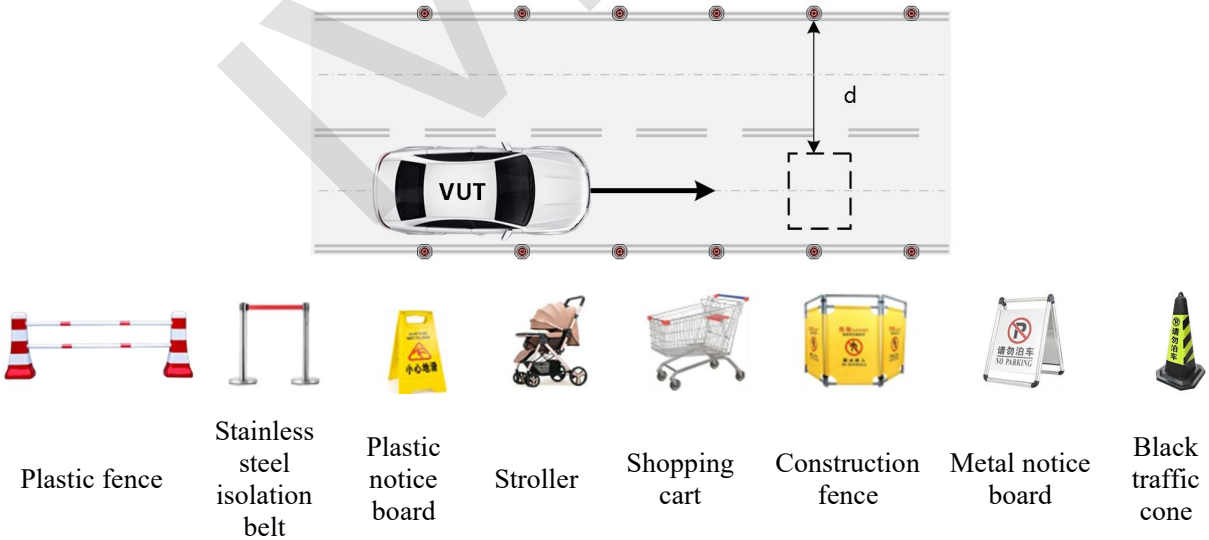


Fig. B.5 Scenario of Temporary Obstacle

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Table B.4 Scenario Parameters

Scenario Parameter	Parameter Range
d	(3.0±0.1) m

B.1.1.6 Scenario of parking slot occupied

This scenario examines the response strategy and alternative plan planning ability of the VUT when the target parking space is occupied. The VUT cruises to the preset target parking space along the route learned and mapped, but the parking slot has been occupied by other vehicles. The system needs to accurately identify the parking slot occupancy state and make reasonable decisions: it shall usually park safely in front of the parking slot, prompt the driver through the human-machine interaction interface, and provide suggestions or functions for finding other nearby vacant parking slots based on the system capabilities. This scenario evaluates the system's ability to perceive changes in target state, its handling mechanism for task failure, and the clarity of interaction with the driver, reflecting the intelligence and practicality of the system in actual use.

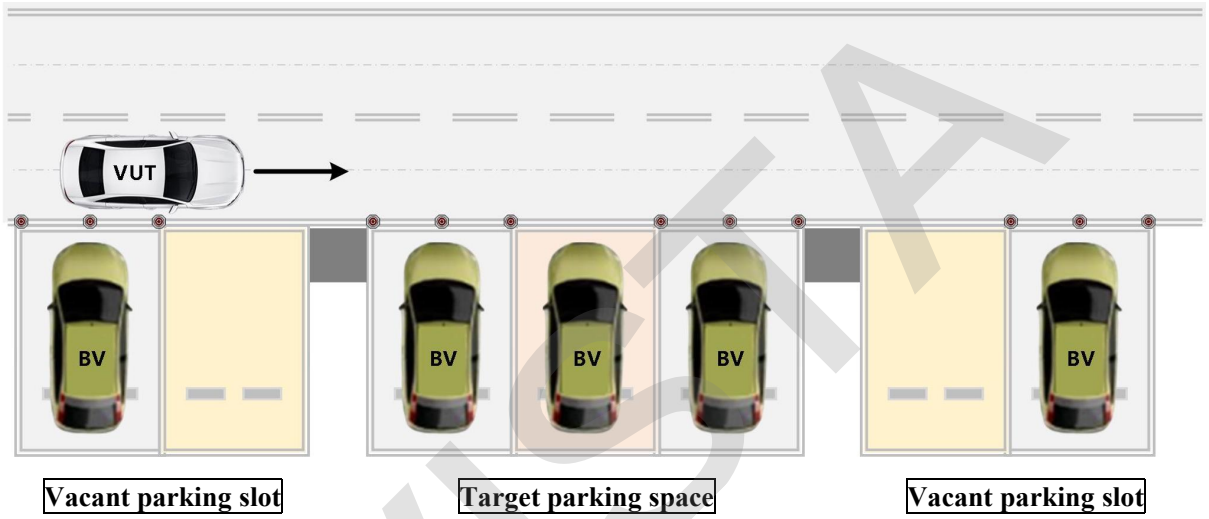


Fig. B.6 Schematic Diagram of Parking Slot Occupied

B.1.2 Scoring rules for response to test and evaluation scenarios

For the rating of "response to test scenarios", the full score is 5 points, and different scores are given according to the actual performance of the VUT in response to the test scenarios on the test route. The full score for each of the 5 scenarios on the test route is 1 point, and the scoring rules for different performances of the VUT in response to the test scenarios are shown below:

Table B.5 Scoring Rules for Response to Test Scenarios

Response to Individual Test Scenarios	Score
Safe and collision-free passage	1.0 points
Prompt to exit	0.5 points
Stopping in front of the scenario for a long time	0.2 points
Collision or active emergency intervention by tester to avoid collision	0.0 points

Note 1: "Stopping in front of the scenario for a long time" means that the vehicle stops in front of the scenario for more than 30 seconds when passage is allowed.

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Note 2: The driver's control of the buttons, screen and lever (excluding lever shifting) of the VUT is not considered "takeover".

Note 3: If the VUT responds to the "scenario of passing through a narrow lane" with a "prompt to exit," it may also receive a score of 1.0.

B.1.3 Scoring rules for performance on test route

B.1.3.1 The rating of "performance on test route" has a full score of 5 points and is determined based on the traffic efficiency indicator "average speed" and the driving and riding comfort indicator "absolute value of maximum longitudinal acceleration" of the VUT on the whole test route. The scoring rules for different interval ranges of the above two indicators are shown below:

Table B.6 Scoring Rules for Performance on Test Route

Rating Indicator	Score	Range of Indicator	Score
Average speed (V)	3 points	V ＞ 8 km/h	3.0 points
		8 km/h ≥ V ＞ 5 km/h	1.5 points
		5 km/h ≥ V ＞ 0 km/h	0.0 points
Absolute value of maximum longitudinal acceleration (a)	2 points	0.1 g ＞ a	2.0 points
		0.2 g ≥ a ＞ 0.1 g	1.0 points
		A ＞ 0.2 g	0.0 points

The calculation method of the traffic efficiency indicator "average speed" is as follows:

$$V = \frac{S}{T}$$

Where,

V- average speed of the VUT on the test road;

S- distance from the "function activation area" to the "parking-in completion area" of the test route;

T- time for the VUT to travel from the "function activation area" to the "parking-in completion area".

Note: The above time T does not include the time for parking the vehicle in the parking slot.

B.1.3.2 If the tester is required to remove or manually drive the VUT through the test scenario because the VUT cannot pass through it smoothly in the initial state of the test scenario, or if there is "intervention with safety reminder", "stopping in front of the scenario for a long time" or "collision or active emergency intervention by tester to avoid collision" when the VUT passes through the test scenario, the time taken by the VUT on the test route this time shall be temporarily stopped. The specific "timing pause moment" and "timing restart moment" are as follows:

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Table B.7 Timing Interruption Determination Moment

Response	Timing Pause Moment	Timing Restart Moment
Safe and collision-free passage (a scenario through which the vehicle cannot pass in the initial state of the scenario)	Moment when the VUT stops in front of the scenario	Moment when the scenario conditions allow passage
Prompt to exit	Moment when the VUT gives an intervention reminder	Moment when the VUT resumes the parking function
Stopping in front of the scenario for a long time when passage is allowed	10 seconds after parking	
Collision or active emergency intervention by tester to avoid collision	Moment when the driver intervenes or a collision occurs	

B.2 Test and evaluation rules for full-process passability

B.2.1 List of alternative test sites

Table B.8 List of Alternative Test Sites with Easy Difficulty

No.	Administrative District	Parking Lot Name	Detailed Address
01	Banan District	Banan District Kaisa Plaza Underground Parking Lot	Kaisa Plaza, Longzhou Avenue, Banan District, Chongqing
02	Liangjiang New Area	Liangjiang New Area SKLP Xinguangli Underground Parking Lot	Xinguangli SKLP, No. 89 Hongjin Avenue, Liangjiang New Area, Chongqing
03	Liangjiang New Area	Liangjiang New Area Darongcheng Parking Lot	No. 8, Guanyinqiao Pedestrian Street, Liangjiang New Area, Chongqing
04	Liangjiang New Area	Liangjiang New Area Dazhulin Jinke Lefang Shopping Center Indoor Parking Lot	Jinke Lefang Shopping Center, No. 556 Jintong Avenue, Dazhulin, Liangjiang New Area, Chongqing
05	Liangjiang New Area	Liangjiang New Area R&F Ocean Plaza Underground Parking Lot	No. 15, Beicheng Tianjie Street, Liangjiang New Area, Chongqing
06	Nan'an District	Nan'an District Wanda Plaza Underground Parking Lot	Wanda Plaza, No. 88 Jiangnan Avenue, Nan'an District, Chongqing
07	Nan'an District	Nan'an District Yuehua Xindu Underground Parking Lot	Yuehua Xindu, No. 2 Nanping West Road, Nan'an District, Chongqing
08	Nan'an District	Nan'an District Zeke Danzishi Xingzehui Underground Parking Lot	Danzishi Xingzehui, Nan'an District, Chongqing
09	Liangjiang New Area	Liangjiang New Area Lifan Center Underground Parking Lot	Lifan Center, No. 8, Juxianyan Plaza, Jiangbeizui, Liangjiang New Area, Chongqing
10	Liangjiang New Area	Liangjiang New Area Century Emperor Underground Parking Lot	No. 38, Jianxin North Road, Liangjiang New Area, Chongqing
11	Liangjiang New Area	Liangjiang New Area Wuyue Plaza Tongmao Avenue Store Hall A Underground Parking Lot	Hall A, Wuyue Plaza, No. 399 Tongmao Avenue, Liangjiang New Area, Chongqing
12	Shapingba District	Shapingba District Huangen New Era Shopping Plaza Underground	No. 6 Shuangxiangzi Street, Shapingba District, Chongqing

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		Parking Lot	

Table B.9 List of Alternative Test Sites with Moderate Difficulty

No.	Administrative District	Parking Lot Name	Detailed Address
01	Liangjiang New Area	Parking Lot of Tencent Cloud Digital Economy Industrial Base in Xiantao Big Data Valley, Liangjiang New Area	Tencent Cloud (Chongqing) Digital Economy Industrial Base, No. 107, Data Valley Middle Road, Xiantao Data Valley, Liangjiang New Area, Chongqing
02	Liangjiang New Area	Liangjiang New Area Xiexin Starlight World Underground Parking Lot	Xiexin Starlight World, No. 66 Jinkai Avenue, Liangjiang New Area, Chongqing
03	Liangjiang New Area	Liangjiang New Area Starlight 68 Plaza Yanghe First Road Store Area A Underground Parking Lot	Zone A, Starlight 68 Plaza, No. 68 Yanghe First Road, Guanyinqiao, Liangjiang New Area, Chongqing
04	Liangjiang New Area	Liangjiang New Area Yuehui Shopping Center Underground Parking Lot	Yuehui Shopping Center, No. 311 Hongshi Road, Dashiba, Liangjiang New Area, Chongqing
05	Liangjiang New Area	Chongqing IFS International Financial Square Mall Underground Parking Lot, Liangjiang New Area	No. 1 Qingyun Road, Liangjiang New Area, Chongqing
06	Liangjiang New Area	Liangjiang New Area Chongqing North Station North Square Underground Parking Lot	Chongqing North Station North Square, No. 51 Kunlun Avenue, Liangjiang New Area, Chongqing
07	Nan'an District	Nan'an District Xiexin Starlight Times Square Nanping Store Underground Parking Lot	Xiexin Starlight Times Square Nanping Store, No. 28 Jiangnan Avenue, Nan'an District, Chongqing
08	Nan'an District	Underground Parking Lot of Changjiahui Shopping Park, Nan'an District	Changjiahui Shopping Park, No. 69 Taichang Road, Danzishi Street, Nan'an District, Chongqing
09	Shapingba District	Longhu U City Tianjie Parking Lot, Shapingba District	No. 97, University Town North Road, Shapingba District, Chongqing
10	Yuzhong District	Underground Parking Lot of Guotai Youhuo City Plaza, Yuzhong District	B5, Guotai Youhuo City Plaza, No. 108 Zou Rong Road, Yuzhong District, Chongqing
11	Yuzhong District	Underground Parking Lot of Yingli Darongcheng (Daping Store), Yuzhong District	No. 19, Dapingzheng Street, Yuzhong District, Chongqing
12	Yuzhong District	Chongqing Raffles City Underground Parking Lot, Yuzhong District	No. 8, Jiesheng Street, Yuzhong District, Chongqing

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Table B.10 List of Alternative Test Sites with Challenging Difficulty

No.	Administrative District	Parking Lot Name	Detailed Address
01	Liangjiang New Area	Liangjiang New Area Evergrande Yulong Tianfeng Underground Parking Lot	Evergrande Yulong Tianfeng, No. 1889 Longhua Avenue, Longta Street, Liangjiang New Area, Chongqing
02	Liangjiang New Area	Liangjiang New Area Happy Valley Underground Parking Lot	Chongqing Happy Valley, No. 29 Jinyu Avenue, Lijia, Liangjiang New Area, Chongqing
03	Liangjiang New Area	Liangjiang New Area Jiangbei International Airport T3 Terminal Multi-story Parking Lot	Chongqing Jiangbei International Airport T3 Terminal, Liangjiang New Area, Chongqing
04	Liangjiang New Area	Liangjiang New Area Longhu Lijia Tianjie Hall B - Underground Parking Lot	No. 15, Lici Road, Liangjiang New Area, Chongqing
05	Yuzhong District	Underground Parking Lot of Crown Building, Yuzhong District	No. 107, Zhongshan Third Road, Yuzhong District, Chongqing
06	Yuzhong District	Yuzhong District Jiefangbei Westin Hotel Shenji Financial Plaza Branch Underground Parking Lot	The Westin Jiefangbei Shenji Financial Plaza, No. 222 Xinhua Road, Yuzhong District, Chongqing
07	Yuzhong District	Yuzhong District Kuixing Building Multi-story Parking Lot	Kuixing Building, No. 17 Datang Plaza, Linjiangmen, Yuzhong District, Chongqing
08	Yuzhong District	Multi-story Parking Lot of Liziba Historic Site Park of the War of Resistance, Yuzhong District	Liziba Historic Site Park of the War of Resistance, No. 66, Liziba Main Street, Yuzhong District, Chongqing
09	Yuzhong District	Yuzhong District Riyueguang Plaza Multi-story Parking Lot	Sun Moonlight Plaza, No. 86 Jiaochangkou, Yuzhong District, Chongqing
10	Yuzhong District	Yuzhong District World Trade Center Underground Parking Lot	World Trade Center, No. 131 Zou Rong Road, Yuzhong District, Chongqing
11	Yuzhong District	Underground Parking Lot inside Panda Mansion, Yuzhong District	Panda Mansion next to Deyi World, Jiaochangkou, Jiefangbei, Yuzhong District, Chongqing
12	Yuzhong District	Yuzhong District Zhongang Century Roundabout Underground Parking Lot	Zhongang Century Roundabout, No. 1-1 Shangqingsi Road (next to Station 401), Yuzhong District, Chongqing

B.2.2 Scoring method for full-process passability

B.2.2.1 Scoring method for learning and mapping test

The rating of learning and mapping in the public parking lot is scored based on the "success rate of learning and mapping" of VUT on the test route. For the same test route, the more times VUT learns, the lower its scoring rate of learning and mapping on this route will be. See Table B.11 for specific scoring rules.

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Table B.11 Scoring Rules for Learning and Mapping Test

Number of Tests	Success Rate	Scoring Rate		
		Easy	Moderate	Challenging
1st test	100 %	100 %	100 %	100 %
2nd test	50 %	0 %	50 %	50 %
3rd test	33 %	0 %	0 %	25 %
4th test	25 %	0 %	0 %	0 %
5th test	20 %	0 %	0 %	0 %

If the VUT is capable of downloading maps from the cloud or automatically obtaining test routes from other sources, thereby eliminating the need for map-learning capabilities, it may receive full marks for the map-learning component, provided that it can autonomously navigate from the test start point to the test end point without relying on map-learning capabilities.

B.2.2.2 Scoring method for parking application test

The rating of public parking lots is scored based on the intervention of parking applications by the VUT on the test route. Three tests shall be carried out for the test route, and the final score of the VUT on the test route is the average of the scores of the 3 tests. The calculation method for the "scoring rate" in a single test is as follows:

$$P = \frac{100 - (X + Y)}{100} \times 100\%$$

where,

P- reference indicator for scoring rate of parking application;

X- deduction weight determined by the "number of takeovers with reminders", as shown in Table B.12;

Y- deduction weight determined by the "number of takeovers without reminders", as shown in Table B.12.

Table B.12 Query Form of Scoring Rules for Different Takeover Conditions

Takeover Condition		Easy	Moderate	Challenging
Number of takeovers with reminders (M)	X	50*(M-1)	50*(M-2)	25*(M-3)
Number of takeovers without reminders (N)	Y	100*N	50*N	50*N

Note 1: In the process of the public parking lot test, if other movable traffic participants appear in front of the VUT abnormally in an emergency, causing the tester to take over the vehicle's driving urgently (for example, in case of a sudden object or pedestrian falling), this takeover will not be counted into the "number of takeovers with reminders" and "number of takeovers without reminders" counts.

Note 2: If the VUT fails to pass before a certain scenario, causing the parking function of parking assist to exit automatically, accompanied by a signal prompt indicating the exit of the function, this situation is considered "takeovers with reminders";

Note 3: The driver's control of the buttons, screen and lever (excluding lever shifting) of the VUT is not considered "takeover".

Table B.13 Calculation Rules for Scoring Rate of Parking Application

Calculated P Range	P ＜ 0 %	0 % ≤ P ≤ 100 %	P ＞ 100 %
Scoring Rate of Parking Application	0 %	P	100 %

In the evaluation of parking application in a public parking lot, if the VUT's parking assist function meets any of the following additional assessment items, extra points may be awarded. The bonus ratio of each assessment item to the full score of parking application evaluation for the test route is shown in Table B.14. The total score of all bonus items obtained by the VUT shall not exceed 20% of the full score of parking application evaluation for that test route.

Table B.14 Additional Bonus Assessment Items for Parking Application Evaluation in Public Parking Lots

NO.	Bonus Assessment Item	Bonus Ratio
1	Cruising from the target parking space to the entrance/exit of the parking garage	10 %
2	Global optimization of the learned and mapped route according to the driving task during parking application	5 %
3	Before activation of the parking application function, selection of any parking space within the map area for parking application	1 %

Note: The VUT may obtain the score for a bonus assessment item only when all occurrences of the same type of assessment item encountered on the same test route meet the bonus requirements.

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Appendix C

(Normative)

Test and Evaluation Rules for Special Items

C.1 Test and evaluation rules for parking in mechanical parking slot

C.1.1 Project description

This item is used to assess the ability of the VUT to identify and park in a mechanical parking slot. The target parking space is located in a double-layer lifting and lateral moving or flat mobile mechanical parking device that meets the national standard (GB/T 39980). The VUT needs to start from the designated area. The system automatically identifies the vehicle loading plate, centering device and boundary of the mechanical parking slot and controls the vehicle to park in.

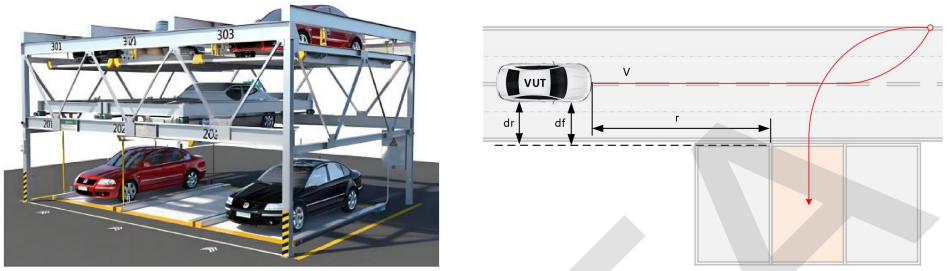


Fig. C.1 Mechanical Parking Slot Effect Diagram (Left) and Schematic Diagram (Right)

Table C.1 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥ 20 m
df	(1.5±0.1) m
dr	(1.5±0.1) m

C.1.2 Test Method

The test shall be carried out according to the following steps:

1) The VUT stops at a distance r from the target parking space and waits for the test to start;

2) The tester activates the parking assist system of the vehicle and then drives the vehicle to search for a parking slot according to the speed (V) and lateral distance (df, dr) required by the test scenario;

3) After the system prompts that the target parking space is identified, the tester confirms to start automatic parking-in according to the system prompt or operation requirements;

4) The tester monitors the vehicle state throughout the process and intervenes only when the system explicitly sends a takeover request or a safety risk occurs;

5) The test ends when the system prompts that parking is completed or the test ends ahead of schedule.

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C.1.3 Evaluation methods

The full score is 10 points. According to the performance of the VUT in this scenario, different scores are given according to the following different situations:

- Smooth and successful parking-in (10 points): The vehicle is fully automatically parked into the mechanical parking slot loading plate; one operation is completed (no midway pause or secondary adjustment); the final parking position completely complies with the specified area of the loading plate; and the body is flat.

- Successful parking-in with adjustment required (6 points): The vehicle is successfully parked in the specified area of the loading plate under system control, but there are gear shifting and kneading (no more than 2 times) or short pauses during the process.

- System intervention to complete parking-in (3 points): The vehicle fails to park in fully automatically, the system sends a takeover request, and the driver completes the parking-in after slight intervention (such as confirming to continue and gently controlling the direction).

- Failure (0 points): Any of the following occurs:

- The vehicle cannot identify the parking slot;
- The system collides (with actual equipment or boundaries);
- The driver takes over in an emergency;
- The total parking time exceeds 90 seconds.

C.2 Test and evaluation rules for back-to-back parking

C.2.1 Project description

This item assesses the intelligent collaboration ability of the VUT when parking with other vehicles at the same time. Set up three test scenarios where there is a trajectory conflict between the VUT and the TV during parking:

Scenario 1: The target parking space into which the VUT is to be parked is a double-boundary perpendicular parking slot with markings, and it is arranged back-to-back with the target parking space into which the TV will be parked. The TV is an off-road SUV with a spare tire. After being parked in the target parking space, its spare tire intrudes 0.2 m into the target parking space of the VUT.

Scenario 2: The target parking space into which the VUT and the TV are to be parked is a double-boundary perpendicular parking slot with markings, and the two parking slots are arranged face-to-face.

Scenario 3: The target parking space into which the VUT and the TV are to be parked is the same double-boundary perpendicular parking slot with markings.

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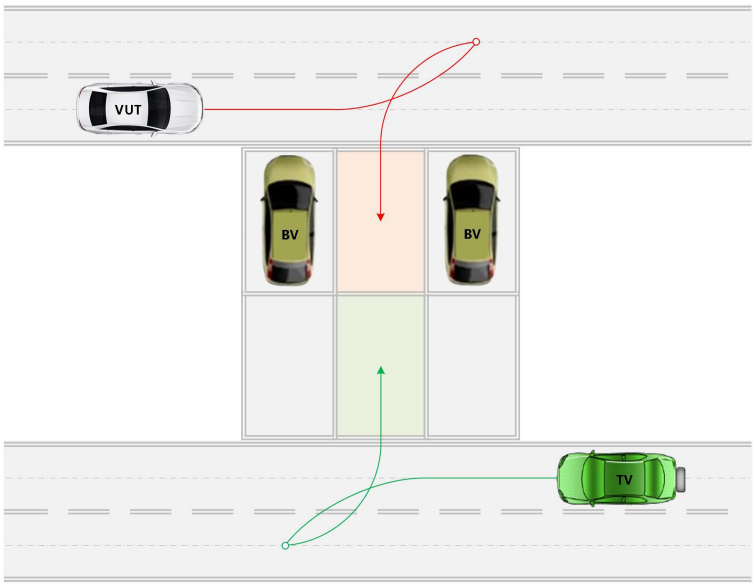


Fig. C.2 Schematic Diagram for Test and Evaluation Scenario 1 of Back-to-back Parking

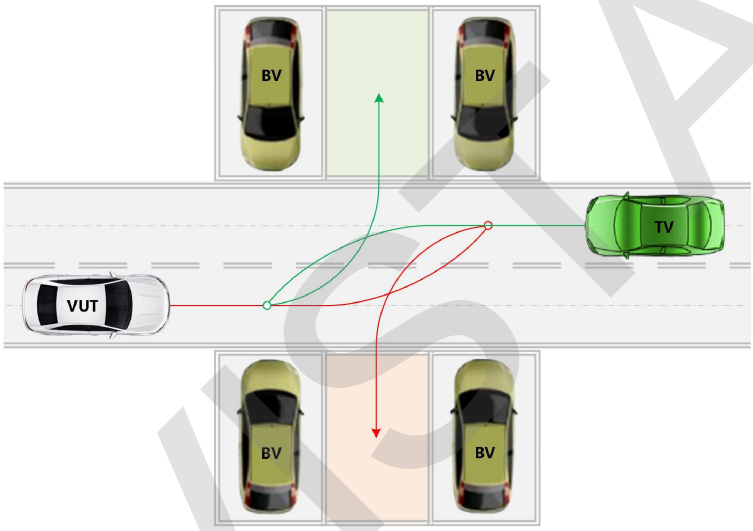


Fig. C.3 Schematic Diagram for Test and Evaluation Scenario 2 of Back-to-back Parking

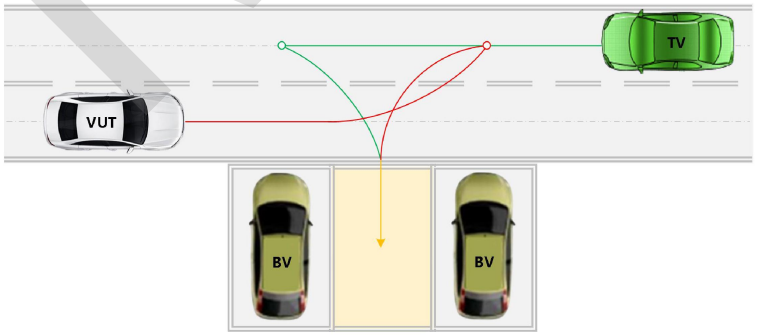


Fig. C.4 Schematic Diagram for Test and Evaluation Scenario 3 of Back-to-back Parking

C.2.2 Test Method

The test shall be carried out according to the following steps:

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1) Before the test starts, both the VUT and the TV are stationary in the middle of the lane at the same distance from the target parking space;

2) After the test starts, the driver drives the VUT forward at a constant speed in the slot search status with the parking assist system turned on. At the same time, the driver of the TV also starts and runs forward at the same speed;

3) During the test, both vehicles maintain communication. When the VUT searches for the target parking space and stops, the TV stops at the same time;

4) After the driver of the VUT confirms the target parking space, the VUT and the TV start to park in their confirmed target parking spaces at the same time;

5) Record the performance of the VUT during the test until it successfully parks into the target parking space or reminds the driver to take over or parking fails, and then end the test.

C.2.3 Evaluation methods

The full score is 10 points. According to the performance of the VUT in this scenario, different scores are given according to the following different situations:

- Successful parking-in (10 points): successful parking-in in scenarios 1 and 2, successful parking in scenario 3 or safe collision-free reminder for the driver to take over;

- Successful parking-in in some scenarios (5 points): Successful parking-in in scenarios 1 and 2, or successful parking-in in one of scenario 1 or scenario 2, plus successful parking-in in scenario 3 or a collision-free warning prompting the driver to take over;

- Successful parking-in with risk of conflict (3 points): The vehicle successfully parks in one scenario without emergency braking during the process, and its behavior is reasonable (such as yielding or cooperating); or there is a dangerous approach to the other vehicle during the parking process, requiring system emergency braking, and finally, successful parking in more than 2 scenarios;

- Failure or conflict (0 points): Parking-in is not completed, or manual takeover is required due to the risk of collision with the other vehicle caused by wrong decision-making or actual scratches occur.

C.3 Test and evaluation of the front of vehicle parking into the parking slot

C.3.1 Project description

This item is used to assess the ability of the VUT to park in a perpendicular parking slot with its head facing inward. The target parking space is a perpendicular parking slot at the end of the road with clear markings on the edge of the wall. The length and width of the parking slot meet the requirements of this document for the size of perpendicular parking slots with markings. There are traffic cones on the edge of the lane in front of the parking slot. The distance between the traffic cones on both sides is h, and the distance between the parking slot and the wall is d.

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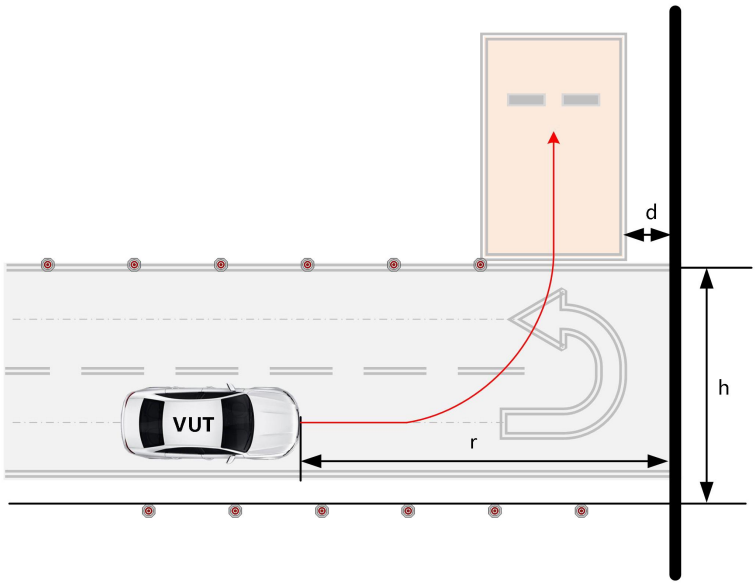


Fig. C.5 Schematic Diagram of Front Parking-in

Table C.2 Scenario Parameters

Scenario Parameter	Parameter Range
d	(0.5±0.1) m
h	(H+0.5) m
r	≥ 10 m

C.3.2 Test Method

The test shall be carried out according to the following steps:

1) Before the test starts, the VUT shall be parked and stationary at a distance r from the wall;

2) After the test starts, the tester drives forward along the lane centerline at the maximum speed allowed by the parking assist system of the VUT;

3) After the VUT detects the target parking space, the tester activates the APA function of the vehicle internally and selects "front parking-in" or corresponding parking-in mode according to the vehicle function design;

4) The tester shall monitor the vehicle state throughout the parking-in process of the VUT and intervene only when the system explicitly sends a takeover request or a safety risk occurs;

5) The test ends when the system prompts that parking is completed or the test ends ahead of schedule.

C.3.3 Evaluation methods

The full score is 5 points. According to the performance of the VUT under this item, different scores are given according to the following different situations:

- Successful parking-in (5 points): The system controls the vehicle to successfully complete front parking-in in one attempt without reversing. After parking in, the projection contour of the vehicle on the ground does not exceed the rear and side markings of the parking slot;

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- Successful parking-in with kneading (3 points): The front end of the vehicle is parked in, and the number of during parking-in is 2 to 3 times. After parking in, the projection contour of the vehicle on the ground does not exceed the rear marking and side marking of the parking slot;

- Successful parking-in with poor posture (1 point): The front end of the vehicle is parked in, but the number of is more than 3 times, or the number of kneading during parking-in is less than or equal to 3, and after parking-in, the projection contour of the vehicle on the ground exceeds the rear marking line or side marking line of the parking slot;

- Failure (0 points): Parking-in is not completed, a collision occurs, the system exits or the driver takes over.

C.4 Test and evaluation rules for parking out of parking slot

C.4.1 Project description

This item assesses the ability of the VUT to automatically park out of the parking slot. To ensure consistency, the starting state is the final position of the vehicle after parking in, or the standard position manually parked in the center of the parking slot. The parking slot is a parallel parking slot, and its length and width meet the requirements for dimensions of a parallel parking slot with markings in this document. It includes two test items: parking out of a horizontal parallel parking slot and parking out of a parallel parking slot on a slope.



Parking out of horizontal parallel parking slot **Parking out of parallel parking slot on slopes**

Fig. C.6 Schematic Diagram for Test and Evaluation Scenario of Parking out of Parking Slot

Table C.3 Scenario Parameters

Scenario Parameter	Parameter Range
c	(H+0.8) m
f	(H+1.0) m
α	4%～5%

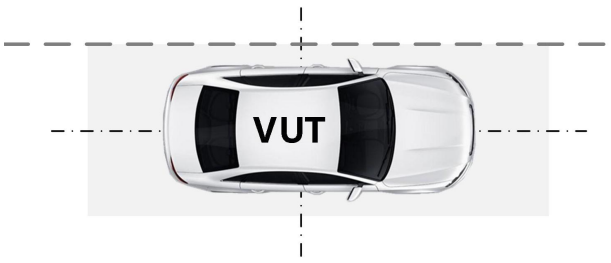


Fig. C.7 Starting State of VUT Parking-out Test for Parking Capability Test in Parallel Parking Slot

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C.4.2 Test Method

The test shall be carried out according to the following steps:

1) The VUT is parked at the designated starting position in the parking slot. The starting position shall be: if the vehicle model has completed the parking-in test in the corresponding parking slot, the final position after the parking-in test is completed shall be taken as the starting position; if not, the VUT shall be parked in the middle of the target parking space (the vehicle body is parallel to the parking slot boundary and the front and rear distances are uniform).

2) The tester starts the vehicle and activates its automatic parking-out function internally.

3) The tester confirms the start of automatic parking-out according to the system prompt or vehicle operation requirements.

4) During the test, the tester shall monitor the vehicle state throughout the process and intervene only when the system sends a clear takeover request or a safety risk occurs.

5) The test ends when the vehicle completely leaves the parking slot, the system prompts that the task is completed, or the test ends ahead of schedule.



Fig. C.8 Two Parking-out Forms in Parallel Parking Slot

C.4.3 Evaluation methods

The full score is 5 points. According to the performance of the VUT in this scenario, different scores are given according to the following different situations:

- Successful parking-out (5 points): The VUT successfully and safely exits the parking slot without collision (according to different product strategies of the VUT, both parking-out forms shown in Fig. C.8 are acceptable).

- Failure (0 points): Any of the following occurs:

- The vehicle fails to complete parking-out;
- The vehicle collides with bordering vehicles, curbs or other obstacles during parking-out;
- The function of PAS is disabled in advance;
- The system issues a takeover request when it cannot continue the task.

C.5 Rules for test and evaluation of offset parking

C.5.1 Project description

This item assesses the ability of the VUT to park close to one side in the target parking

space according to user needs. The target parking space is a double-boundary perpendicular parking slot with markings, and the length and width of the parking slot meet the requirements for the dimensions of perpendicular parking slots with markings in this document.

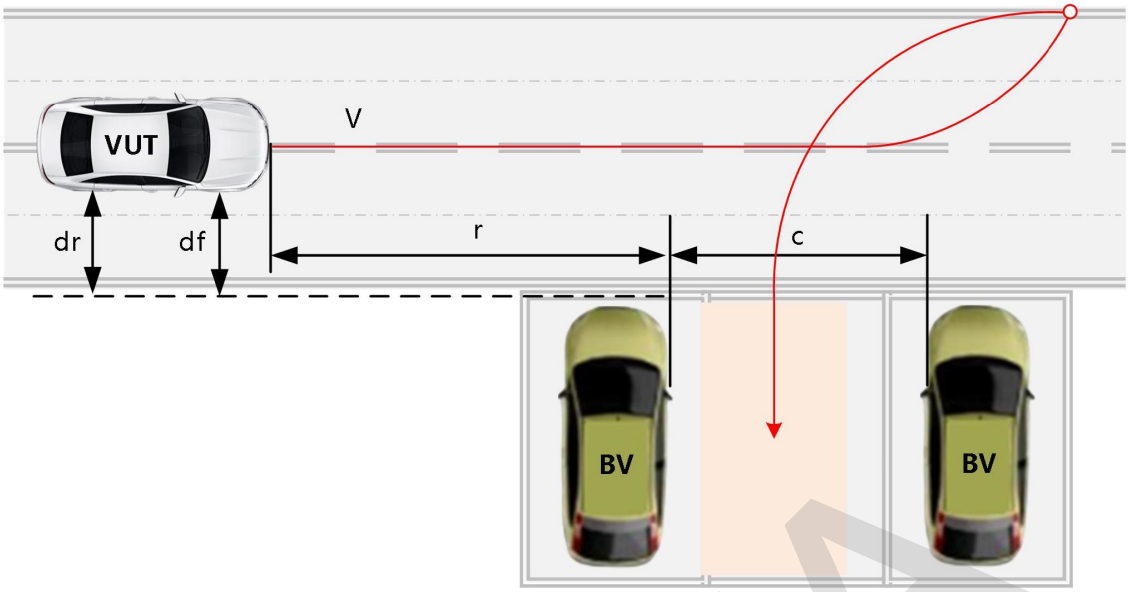


Fig. C.9 Schematic Diagram for Test and Evaluation Scenario of Offset Parking

Table C.4 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥20m
df	(1.5±0.1) m
dr	(1.5±0.1) m
c	(B+2.0) m

C.5.2 Test Method

The test shall be carried out according to the following steps:

1) Before the test starts, the VUT shall be stationary at a distance r from the target parking space.

2) After the test starts, the tester shall activate the parking assist system and start to drive forward at the specified speed V and lateral distances df and dr;

3) When the VUT detects the target parking space, the tester selects left or right to confirm and start parking in the parking slot according to the system prompt or vehicle operation requirements;

4) During the test, the tester shall monitor the vehicle state throughout the process and intervene only when the system sends a clear takeover request or a safety risk occurs;

5) The test ends when the vehicle is completely parked in the parking slot, the system prompts that the task is completed, or the test ends ahead of schedule.

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C.5.3 Scoring method

The full score is 3 points. According to the performance of the VUT in this scenario, different scores are given according to the following different situations:

- Successful parking-in with obvious offset (3 points): The VUT successfully parks into the target parking space, and the departure direction is consistent with that selected by the tester, and the difference between the left and right clearances of the VUT is ≥ 0.1 m.

- Successful parking-in with no obvious offset (1 point): The vehicle is successfully parked in, and the departure direction is consistent with that selected by the tester, and the difference between the left and right clearances of the VUT is less than 0.1 m, or the deviation direction is inconsistent with that selected by the tester.

- Parking-in failure (0 points): failure to park in, collision with obstacles during parking-in, or the system exits because it could not handle the situation.

C.6 Test and evaluation rules for lifting/lowering of parking lock

C.6.1 Project description

This item tests the ability of the VUT's parking assist system to identify and respond to the parking slot ground lock. The target parking space is a marked perpendicular parking slot, with a length and width that comply with the dimensions for perpendicular parking slots specified in this document. As shown in Fig. C.11, parking locks a~e are installed at one-third of the distance from the front edge of the target parking space (A), while parking lock f is installed at the center of the target parking space, near the right edge (B). During testing, one of the parking locks (the VUT's parking assist system must be compatible with all parking lock types shown in Fig. C.11) is selected at random to conduct the parking-in test with the parking lock unlocked and locked.

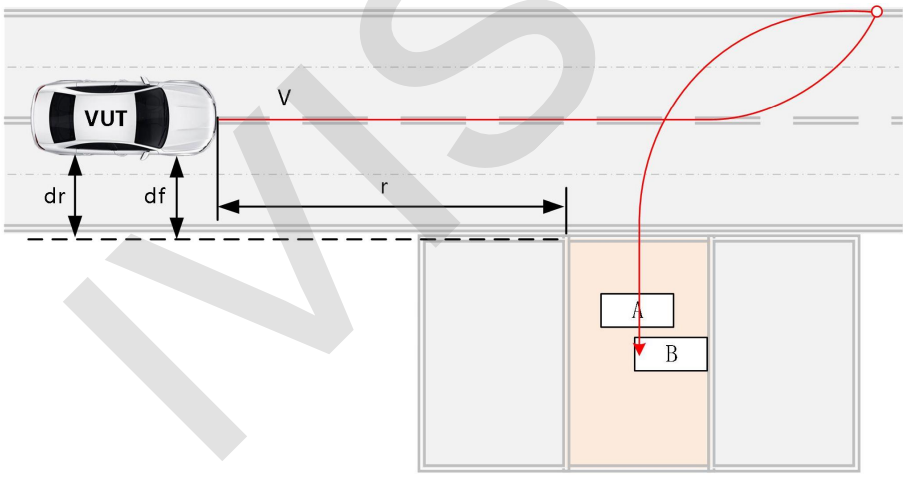


Fig. C.10 Schematic Diagram for Test and Evaluation Scenario of Parking Lock Lifting/Lowering

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Fig. C.11 Alternative Parking Lock Types

Table C.5 Scenario Parameters

Scenario Parameter	Parameter Range
V	(10±1) km/h
r	≥ 20 m
df	(1.5±0.1) m
dr	(1.5±0.1) m

C.6.2 Test Method

The test shall be carried out according to the following steps:

1) Install the selected parking lock in the target parking space and ensure that it is raised (blocked);

2) Before the test starts, the VUT shall be stationary at a distance r from the target parking space;

3) After the test starts, the tester shall activate the parking assist system of the VUT, control the vehicle to drive along the lane at speed V and specified lateral distance (df, dr), and start searching for a parking slot;

4) Record whether the parking assist system releases the target parking space when the VUT passes through it;

5) After completing the previous link, operate the parking lock to lower it (in a non-blocking state);

6) The VUT shall be driven back to the initial preparation position;

7) Repeat steps 1) to 3). When the VUT successfully releases the target parking space, the tester confirms the start of parking in the parking slot according to the system prompt or vehicle operation requirements;

8) During the test, the tester shall monitor the vehicle state throughout the process and intervene only when the system sends a clear takeover request or a safety risk occurs;

9) The test ends when the vehicle is completely parked in the parking slot, the system prompts that the task is completed, or the test ends ahead of schedule.

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C.6.3 Scoring method

The full score is 3 points. According to the performance of the VUT in this scenario, different scores are given according to the following different situations:

- Normal recognition of the opening and closing of the parking lock and successful parking-in (3 points): When the parking lock is opened, the VUT's parking assist system does not release the target parking space; when the parking lock is closed, the VUT successfully parks into the target parking space without exceeding the rear edge line and side edge line of the parking slot.

- Unable to identify the opening and closing of the parking lock but can park normally (1 point): The VUT cannot normally identify the opening and closing of the parking lock but can park in the target parking space normally.

- Function failure (0 points): The vehicle cannot normally identify the opening and closing of the parking lock, nor can it park into the target parking space normally.

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