Annex B.2

China Intelligent-connected Car Assessment Programme

China Intelligent-connected Car Assessment Programme (C-ICAP)

(Version 1.1)

Detailed Rules for Assessment of Memory Parking Assistance

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These Rules are applicable to the Memory Parking Assistance system.

Memory Parking Assistance system: means the parking assistance system which needs to set the path in advance and can complete the cruise, berthing-in or berthing-out according to the path.

For the vehicle to be tested, the manufacturer needs to state whether it has outdoor parking lot one-button calling ability, indoor parking lot one-button calling ability, outdoor parking lot one-button parking ability and indoor parking lot one-button parking ability:

1) If the outdoor parking lot one-button calling ability is provided, the test items 1, 2, 3, 4, 5, 6 and 7 in Table 1-1 shall be carried out;

2) If the indoor parking lot one-button calling ability is provided, the test items 8, 9, 10, 11 and 12 in Table 1-1 shall be carried out;

3) If the outdoor parking lot one-button parking ability is provided, the test items 13, 14, 15, 16 and 17 in Table 1-1 shall be carried out;

4) If the indoor parking lot one-button parking ability is provided, the test items 18, 19, 20, 21 and 21 in Table 1-1 shall be carried out; The tests hereunder may be carried out only when the score of B.1 "basic parking assistance" is ≥ 70 points.

1. Assessment Method

1.1. Indicator System

The indicator system for Memory Parking Assistance is as shown in Table 1-1.

Table 1- 1 Indicator System for Memory Parking Assistance

	level-1 indicator	level-2 indicator	No.	Level-3 indicator
Indicator System for Memory Parking Assistance	one-button calling ability	Outdoor parking lot berthing-out ability	1	Parallel parking space berthing-out ability
			2	Vertical parking space berthing-out ability
			3	Oblique parking space berthing-out ability
		Outdoor parking lot cruise ability	4	Static vehicle encountered during vehicle call process
			5	Slow walking pedestrian encountered during vehicle call process
			6	Child crossing encountered during vehicle call process
			7	Temporary obstacle encountered during vehicle call process
		Indoor parking lot berthing-out ability	8	Column Parking space berthing-out ability
			9	Wall-side parking space berthing-out ability
		Indoor parking lot cruise ability	10	Static vehicle encountered during indoor vehicle call process
			11	Static pedestrian encountered during indoor vehicle call process

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			12	Temporary obstacle encountered during indoor vehicle call process
	One-button parking ability	Outdoor parking lot cruise ability	13	Static vehicle encountered during parking space search
			14	Slow walking pedestrian encountered during parking space search
			15	Child crossing encountered during parking space search
			16	Temporary obstacle encountered during parking space search
			17	Parking space target occupied during parking space search with adjacent parking space unoccupied
		Indoor parking lot cruise ability	18	Static vehicle encountered during indoor parking space search
			19	Static pedestrian encountered during indoor parking space search
			20	Temporary obstacle encountered during indoor parking space search
			21	Parking space target occupied during indoor parking space search with adjacent parking space unoccupied

1.2. Allocation of Weight to Indicators

1.2.1. Allocation of Weight to Level-1 Indicators

For the Memory Parking Assistance, there are two level-1 indicators: one-button calling ability and one-button parking ability. The weight of each level-1 indicator is shown in Table 1-2.

Table 1 -2 Weights of Level-1 Indicators for Memory Parking Assistance

No.	level-1 indicator	Weight
1	one-button calling ability	20%
2	One-button parking ability	80%

1.2.2. Allocation of Weight to Level-Indicators

1.2.2.1. Allocation of Weight to Level-2 Indicators for one-button calling ability

For the one-button calling ability, there are four level-2 indicators: outdoor parking lot berthing-out ability, outdoor parking lot cruise ability, indoor parking lot berthing-out ability and indoor parking lot cruise ability.

The weight of each level-2 indicator is shown in Table 1-3.

Table 1- 3 Weights of Level-2 Indicators for one-button calling ability

level-1 indicator	No.	level-2 indicator	Weight
one-button calling ability	1	Outdoor parking lot berthing-out ability	15%

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	2	Outdoor parking lot cruise ability	15%
	3	Indoor parking lot berthing-out ability	35%
	4	Indoor parking lot cruise ability	35%

1.2.2.2. Allocation of Weight to Level-2 Indicators for One-button Parking Ability

For the one-button parking ability, there are two level-2 indicators: outdoor parking lot cruise ability and indoor parking lot cruise ability. The weight of each level-2 indicator is shown in Table 1-4.

Table 1- 4 Weights of Level-2 Indicators for One-button Parking Ability

level-1 indicator	No.	level-2 indicator	Weight
One-button parking ability	1	Outdoor parking lot cruise ability	30%
	2	Indoor parking lot cruise ability	70%

1.2.3. Allocation of Weight to Level-3 Indicators

1.2.3.1. Allocation of Weight to Level-3 Indicators for one-button calling ability

1.2.3.1.1. Allocation of Weight to Outdoor Parking Lot Berthing-out Ability

For the outdoor parking lot berthing-out ability, there are three level-3 indicators: parallel parking space berthing-out ability, vertical parking space berthing-out ability and oblique parking space berthing-out ability.

The weight of each level-3 indicator is shown in Table 1-3.

Table 1- 5 Weights of Level-3 Indicators for Outdoor Parking Lot Berthing-out Ability

level-2 indicator	No.	Level-3 indicator	Weight
Outdoor parking lot berthing-out ability	1	Parallel parking space berthing-out ability	50%
	2	Vertical parking space berthing-out ability	45%
	3	Oblique parking space berthing-out ability	5%

1.2.3.1.2. Allocation of Weight to Outdoor Parking Lot Cruise Ability

For the outdoor parking lot cruise ability, there are four level-3 indicators: static vehicle encountered during vehicle call process, slow walking pedestrian encountered during vehicle call process, child crossing encountered during vehicle call process, and temporary obstacle encountered during vehicle call process.

The weight of each level-6 indicator is shown in Table 1-3.

Table 1- 6 Weights of Level-3 Indicators for Outdoor Parking Lot Cruise Ability

level-2 indicator	No.	Level-3 indicator	Weight
Outdoor parking	1	Static vehicle encountered during	25%

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lot cruise ability		vehicle call process	
	2	Slow walking pedestrian encountered during vehicle call process	25%
	3	Child crossing encountered during vehicle call process	25%
	4	Temporary obstacle encountered during vehicle call process	25%

1.2.3.1.3. Allocation of Weight to Indoor Parking Lot Berthing-out Ability

For the indoor parking lot berthing-out ability, there are two level-3 indicators: column parking space berthing-out ability, and wall-side parking space berthing-out ability. The weight of each level-3 indicator is shown in Table 1-7.

Table 1- 7 Weights of Level-3 Indicators for Indoor Parking Lot Berthing-out Ability

level-2 indicator	No.	Level-3 indicator	Weight
Indoor parking lot berthing-out ability	1	Column Parking space berthing-out ability	50%
	2	Wall-side parking space berthing-out ability	50%

1.2.3.1.4. Allocation of Weight to Indoor Parking Lot Cruise Ability

For the indoor parking lot cruise ability, there are three level-3 indicators: static vehicle encountered during vehicle call process, static pedestrian encountered during vehicle call process, and temporary obstacle encountered during vehicle call process.

The weight of each level-8 indicator is shown in Table 1-3.

Table 1- 8 Weights of Level-3 Indicators for Indoor Parking Lot Cruise Ability

level-2 indicator	No.	Level-3 indicator	Weight
Indoor parking lot cruise ability	1	Static vehicle encountered during vehicle call process	30%
	2	Static pedestrian encountered during vehicle call process	40%
	3	Temporary obstacle encountered during vehicle call process	30%

1.2.3.2. Allocation of Weight to Level-3 Indicators for One-button Parking Ability

1.2.3.2.1. Allocation of Weight to Outdoor Parking Lot Cruise Ability

For the outdoor parking lot cruise ability, there are five level-3 indicators: static vehicle encountered during parking space search, slow walking pedestrian encountered during parking space search, child crossing encountered during parking space search, temporary obstacle encountered during parking space search, and parking space target occupied during parking space search with adjacent parking space unoccupied.

The weight of each level-9 indicator is shown in Table 1-3.

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Table 1- 9 Weights of Level-3 Indicators for Outdoor Parking Lot Cruise Ability

level-2 indicator	No.	Level-3 indicator	Weight
Outdoor parking lot cruise ability	1	Static vehicle encountered during parking space search	20%
	2	Slow walking pedestrian encountered during parking space search	20%
	3	Child crossing encountered during parking space search	20%
	4	Temporary obstacle encountered during parking space search	20%
	5	Parking space target occupied during parking space search with adjacent parking space unoccupied	20%

1.2.3.2.2. Allocation of Weight to Indoor Parking Lot Cruise Ability

For the indoor parking lot cruise ability, there are four level-3 indicators: static vehicle encountered during parking space search, static pedestrian encountered during parking space search, temporary obstacle encountered during parking space search, and parking space target occupied during parking space search with adjacent parking space unoccupied.

The weight of each level-10 indicator is shown in Table 1-3.

Table 1 -10 Weights of Level-3 Indicators for Indoor Parking Lot Cruise Ability

level-2 indicator	No.	Level-3 indicator	Weight
Indoor parking lot cruise ability	1	Static vehicle encountered during parking space search	25%
	2	Static Pedestrian Encountered during Parking Space Search	25%
	3	Temporary obstacle encountered during parking space search	25%
	4	Parking space target occupied during parking space search with adjacent parking space unoccupied	25%

1.2.4. Allocation of Weight to Level-4 Indicators

1.2.4.1. Allocation of Weight to Parallel Parking Space Berthing-out Ability

For the parallel parking space berthing-out ability, there are two level-4 indicators: static vehicles on both sides, and static vehicles on both sides with static upright child near parking space.

The weight of each level-4 indicator is shown in Table 1-11.

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Table 1- 11 Weights of Level-4 Indicators for Parallel Parking Space Berthing-out Ability

Level-3 indicator	No.	Level-4 indicator	Weight
Parallel parking space berthing-out ability	1	Static vehicles on both sides	50%
	2	Static vehicles on both sides with static upright child near parking space	50%

1.2.4.2. Allocation of Weight to Vertical Parking Space Berthing-out Ability

For the vertical parking space berthing-out ability, there are two level-4 indicators: static vehicles on both sides, and static vehicles on both sides with static upright child near parking space.

The weight of each level-4 indicator is shown in Table 1-12.

Table 1- 12 Weights of Level-4 Indicators for Vertical Parking Space Berthing-out Ability

Level-3 indicator	No.	Level-4 indicator	Weight
Vertical parking space berthing-out ability	1	Static vehicles on both sides	50%
	2	Static vehicles on both sides with static upright child near parking space	50%

1.2.4.3. Allocation of Weight to Oblique Parking Space Berthing-out Ability

For the oblique parking space berthing-out ability, there is one level-4 indicator: static vehicles on both sides. The weight of each level-4 indicator is shown in Table 1-13.

Table 1- 13 Weights of Level-4 Indicators for Oblique Parking Space Berthing-out Ability

Level-3 indicator	No.	Level-4 indicator	Weight
Oblique parking space berthing-out ability	1	Static vehicles on both sides	100%

1.2.4.4. Allocation of Weight to Static Vehicle Encountered during Vehicle Call Process

For the static vehicle encountered during vehicle call process, there is one level-4 indicator: static vehicle in running direction. The weight of each level-4 indicator is shown in Table 1-13.

Table 1- 14 Weights of Level-4 Indicators for Static Vehicle Encountered during Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Static vehicle encountered during vehicle call process	1	Static vehicle in running direction	100%

1.2.4.5. Allocation of Weight to Slow Walking Pedestrian during Vehicle Call Process

For the slow walking pedestrian during vehicle call process, there is one level-4 indicator: slow walking pedestrian in running direction. The weight of each level-4 indicator is shown in Table 1-15.

Table 1- 15 Weights of Level-4 Indicators for Slow Walking Pedestrian during Vehicle Call Process

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Level-3 indicator	No.	Level-4 indicator	Weight
Slow walking pedestrian encountered during vehicle call process	1	Slowing walking pedestrian in running direction	100%

1.2.4.6. Allocation of Weight to Child Crossing Encountered during Vehicle Call Process

For the child crossing encountered during vehicle call process, there is one level-4 indicator: sheltered child crossing in running direction.

The weight of each level-4 indicator is shown in Table 1-16.

Table 1- 16 Weights of Level-4 Indicators for Child Crossing Encountered during Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Child crossing encountered during vehicle call process	1	Sheltered child crossing in running direction	100%

1.2.4.7. Allocation of Weight to Temporary Obstacle Encountered during Vehicle Call Process

For the temporary obstacle encountered during vehicle call process, there is one level-4 indicator: temporary traffic obstacle in running direction. The weight of each level-4 indicator is shown in Table 1-17.

Table 1- 17 Weights of Level-4 Indicators for Temporary Obstacle Encountered during Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Temporary obstacle encountered during vehicle call process	1	Temporary obstacle encountered during vehicle call process	100%

1.2.4.8. Allocation of Weight to Column Parking Space Breathing-out Ability

For the column parking space berthing-out ability, there are two level-4 indicators: static vehicle on one side, and static vehicle on one side with static upright child during berthing-out process.

The weight of each level-4 indicator is shown in Table 1-18.

Table 1- 18 Weights of Level-4 Indicators for Column Parking Space Breathing-out Ability

Level-3 indicator	No.	Level-4 indicator	Weight
Column Parking space berthing-out ability	1	Static vehicle on one side	50%
	2	Static vehicle on one side with static upright child during berthing-out process	50%

1.2.4.9. Allocation of Weight to Wall-side Parking Space Breathing-out Ability

For the wall-side parking space berthing-out ability, there is one level-4 indicator: static vehicle on one side. The weight of each level-4 indicator is shown in Table 1-19.

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Table 1- 19 Weights of Level-4 Indicators for Wall-side Parking Space Breathing-out Ability

Level-3 indicator	No.	Level-4 indicator	Weight
Wall-side parking space berthing-out ability	1	Static vehicle on one side	100%

1.2.4.10. Allocation of Weight to Static Vehicle Encountered during Indoor Vehicle Call Process

For the static vehicle encountered during indoor vehicle call process, there is one level-4 indicator: static vehicle in running direction.

The weight of each level-4 indicator is shown in Table 1-20.

Table 1- 20 Weights of Level-4 Indicators for Static Vehicle Encountered during Indoor Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Static vehicle encountered during indoor vehicle call process	1	Static vehicle in running direction	100%

1.2.4.11. Allocation of Weight to Static Pedestrian Encountered during Indoor Vehicle Call Process

For the static pedestrian encountered during indoor vehicle call process, there is one level-4 indicator: static pedestrian in running direction.

The weight of each level-4 indicator is shown in Table 1-21.

Table 1 -21 Weights of Level-4 Indicators for Static Pedestrian Encountered during Indoor Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Static pedestrian encountered during indoor vehicle call process	1	Static pedestrian in running direction	100%

1.2.4.12. Allocation of Weight to Temporary Obstacle Encountered during Indoor Vehicle Call Process

For the temporary obstacle encountered during indoor vehicle call process, there is one level-4 indicator: temporary traffic obstacle in running direction.

The weight of each level-4 indicator is shown in Table 1-22.

Table 1 -22 Weights of Level-4 Indicators for Temporary Obstacle Encountered during Indoor Vehicle Call Process

Level-3 indicator	No.	Level-4 indicator	Weight
Temporary obstacle encountered during indoor vehicle call process	1	Temporary obstacle encountered during vehicle call process	100%

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1.2.4.13. Allocation of Weight to Static Vehicle Encountered during Parking Space Search

For the static vehicle encountered during parking space search, there is one level-4 indicator: static vehicle in running direction.

The weight of each level-4 indicator is shown in Table 1-23.

Table 1 -23 Weights of Level-4 Indicators for Static Vehicle Encountered during Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Static vehicle encountered during parking space search	1	Static vehicle in running direction	100%

1.2.4.14. Allocation of Weight to Slow Walking Pedestrian during Parking Space Search

For the slow walking pedestrian during parking space search, there is one level-4 indicator: slow walking pedestrian in running direction.

The weight of each level-4 indicator is shown in Table 1-24.

Table 1 -24 Weights of Level-4 Indicators for Slow Walking Pedestrian during Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Slow walking pedestrian encountered during parking space search	1	Slowing walking pedestrian in running direction	100%

1.2.4.15. Allocation of Weight to Child Crossing Encountered during Parking Space Search

For the child crossing encountered during parking space search, there is one level-4 indicator: sheltered child crossing in running direction.

The weight of each level-4 indicator is shown in Table 1-25.

Table 1 -25 Weights of Level-4 Indicators for Child Crossing Encountered during Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Child crossing encountered during parking space search	1	Sheltered child crossing in running direction	100%

1.2.4.16. Allocation of Weight to Temporary Obstacle Encountered during Parking Space Search

For the temporary obstacle encountered during parking space search, there is one level-4 indicator: temporary traffic obstacles in running direction.

The weight of each level-4 indicator is shown in Table 1-26.

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Table 1 -26 Weights of Level-4 Indicators for Temporary Obstacle Encountered during Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Temporary obstacle encountered during parking space search	1	Temporary obstacle encountered during vehicle call process	100%

1.2.4.17. Allocation of Weight to Parking Space Target Occupied during Parking Space Search with Adjacent Parking Space Unoccupied

For the parking space target occupied during parking space search with adjacent parking space unoccupied, there is one level-4 indicator: conical barrels in parking space target with adjacent parking space unoccupied.

The weight of each level-4 indicator is shown in Table 1-27.

Table 1 -27 Weights of Level-4 Indicators for Parking Space Target Occupied during Parking Space Search with Adjacent Parking Space Unoccupied

Level-3 indicator	No.	Level-4 indicator	Weigh t
Parking space target occupied during parking space search with adjacent parking space unoccupied	1	Conical barrel in parking space target with adjacent parking space unoccupied	100%

1.2.4.18. Allocation of Weight to Static Vehicle Encountered during Indoor Parking Space Search

For the static vehicle encountered during indoor parking space search, there is one level-4 indicator: static vehicle in running direction.

The weight of each level-4 indicator is shown in Table 1-28.

Table 1 -28 Weights of Level-4 Indicators for Static Vehicle Encountered during Indoor Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weigh t
Static vehicle encountered during indoor parking space search	1	Static vehicle in running direction	100%

1.2.4.19. Allocation of Weight to Static Pedestrian Encountered during Indoor Parking Space Search

For the static pedestrian encountered during indoor parking space search, there is one level-4 indicator: static pedestrian in running direction.

The weight of each level-4 indicator is shown in Table 1-29.

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Table 1 -29 Weights of Level-4 Indicators for Static Pedestrian Encountered during Indoor Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Static pedestrian encountered during indoor parking space search	1	Static pedestrian in running direction	100%

1.2.4.20. Allocation of Weight to Temporary Obstacle Encountered during Indoor Parking Space Search

For the temporary obstacle encountered during indoor parking space search, there is one level-4 indicator: temporary obstacles in running direction.

The weight of each level-4 indicator is shown in Table 1-30.

Table 1 -30 Weights of Level-4 Indicators for Temporary Obstacle Encountered during Indoor Parking Space Search

Level-3 indicator	No.	Level-4 indicator	Weight
Temporary obstacle encountered during indoor parking space search	1	Temporary obstacle encountered during vehicle call process	100%

1.2.4.21. Allocation of Weight to Parking Space Target Occupied during Indoor Parking Space Search with Adjacent Parking Space Unoccupied

For the parking space target occupied during parking space search with adjacent parking space unoccupied, there is one level-4 indicator: conical barrels in parking space target with adjacent parking space unoccupied.

The weight of each level-4 indicator is shown in Table 1-31.

Table 1 -31 Weights of Level-4 Indicators for Parking Space Target Occupied during Indoor Parking Space Search with Adjacent Parking Space Unoccupied

Level-3 indicator	No.	Level-4 indicator	Weight
Parking space target occupied during indoor parking space search with adjacent parking space unoccupied	1	Conical barrel in parking space target with adjacent parking space unoccupied	100%

1.3. Scoring Method

The total score of Memory Parking Assistance shall be calculated on the basis of the scores and weights of level-1 indicators, with two decimal places reserved. The calculation method is shown in Formula 1-1.

$$S = \sum_{i=1}^{4} S_i \times b_i \tag{1-1}$$

Where: S is the total score of Memory Parking Assistance, and i is the serial number of level-1 indicator. S_i and b_i are the score and weight of the level-1 indicator with the serial number of i.

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1.3.1 Scoring Method for Level-1 Indicators

The score of each level-1 indicator shall be calculated on the basis of the scores and weights of level-2 indicators, with two decimal places reserved. The calculation method is as shown in Formula 1-2.

$$S_i = \sum_{j=1}^{n_i} S_{ij} \times b_{ij} \tag{1-2}$$

Where: Si is the score of level-1 indicator, i is the serial number of level-1 indicator, j is the serial number of level-2 indicator, and n_i is the number of level-2 indicators. $S_{ij}$and b_{ij} are the score of level-2 indicator and the weight of the corresponding level-2 indicator respectively.

1.3.2 Scoring Method for Level-2 Indicators

The score of each level-2 indicator shall be calculated on the basis of the scores and weights of level-3 indicators, with two decimal places reserved. The calculation method is as shown in Formula 1-3.

$$S_{ij} = \sum_{z=1}^{n_{ij}} s_{ijz} \times b_{ijz} \tag{1-3}$$

Where: S_{ij} is the score of level-2 indicator. i is the serial number of level-1 indicator, j is the serial number of level-2 indicator, z is the serial number of level-3 indicator, and n_{ij} is the number of level-3 indicators. S_{ijz} and b_{ijz} are the score of level-3 indicator and the weight of the corresponding level-3 indicator respectively.

1.3.3 Scoring Method for Level-3Indicators

The score of each level-3 indicator shall be calculated on the basis of the scores and weights of level-4 indicators, with two decimal places reserved. The calculation method is as shown in Formula 1-4.

$$S_{ijz} = \sum_{q=1}^{n_{ijz}} S_{ijzq} \times b_{ijzq} \tag{1-4}$$

Where: S_{ijz} is the score of level-3 indicator. i is the serial number of level-1 indicator, j is the serial number of level-2 indicator, z is the serial number of level-3 indicator, q is the serial number of level-4 indicator, and n_{ijz} is the number of level-4 indicators. S_{ijzq} and b_{ijzq} are the score of level-4 indicator and the weight of corresponding level-4 indicator respectively.

1.3.4 Calculation Method for Score of Level-4 Indicators

The test shall be repeated for 3 times, and the worst one shall be taken as the final result.

1.3.4.1 Parallel parking space berthing-out ability

1.3.4.1.1 Static vehicles on both sides

Test results		Score	
		Safety (weight: 70%)	Efficiency (weight: 30%)
The VUT successfully	Average speed in cruise section≥ 10km/h	100	100

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goes out of the parking space and arrive at the destination	Average speed in cruise section < 10km/h		60
The system fails to be activated and a reminder message is given, or The VUT avoids the collision or gives the takeover request before collision		100	0
The VUT collides		0	0

1.3.4.1.2 Static vehicles on both sides with static upright child near parking space

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.2 Vertical parking space berthing-out ability

1.3.4.2.1 Static vehicles on both sides

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.2.2 Static vehicles on both sides with static upright child near parking space

The system fails to be activated and a reminder message is given, or the VUT avoids the collision orgives the takeover request before collision, 100 points.

1.3.4.3 Oblique parking space berthing-out ability

1.3.4.3.1 Static vehicles on both sides

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.4 Static vehicle encountered during vehicle call process

1.3.4.4.1 Static vehicle in running direction

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.5 Slow walking pedestrian encountered during vehicle call process

1.3.4.5.1 Slowing Walking Pedestrian in Running Direction

Test results		Score	
		Safety (weight: 70%)	Efficiency (weight: 30%)
The VUT successfully goes out of the parking space and arrive at the destination	The VUT arrives at the call position by detour	100	100
	The VUT follows the pedestrian and arrives at the call position		80
The system fails to be activated and a reminder message is given, or The VUT avoids the collision or gives the takeover request before collision		100	0
The VUT collides		0	0

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1.3.4.6 Child crossing encountered during vehicle call process

1.3.4.6.1 Sheltered child crossing in running direction

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.7 Temporary obstacle encountered during vehicle call process

1.3.4.7.1 Temporary obstacle encountered during vehicle call process

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.8 Column Parking space berthing-out ability

1.3.4.8.1 Static vehicle on one side

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.8.2 Static vehicle on one side with static upright child during berthing-out process

The system fails to be activated and a reminder message is given, or the VUT avoids the collision orgives the takeover request before collision, 100 points.

1.3.4.9 Wall-side parking space berthing-out ability

1.3.4.9.1 Static vehicle on one side

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.10 Static vehicle encountered during indoor vehicle call process

1.3.4.10.1 Static vehicle in running direction

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.11 Static pedestrian encountered during indoor vehicle call process

1.3.4.11.1 Static pedestrian in running direction

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.12 Temporary obstacle encountered during indoor vehicle call process

1.3.4.12.1 Temporary obstacle encountered during vehicle call process

Please refer to the explanation for calculation of score in 1.3.4.1.1.

1.3.4.13 Static vehicle encountered during parking space search

1.3.4.13.1 Static vehicle in running direction

<table>
<tr><td colspan="2" rowspan="2">Test results</td><td colspan="2">Score</td></tr>
<tr><td>Safety (weight: 70%)</td><td>Efficiency (weight: 30%)</td></tr>
<tr><td rowspan="2">The VUT successfully parks in the parking space</td><td>Average speed in cruise section≥ 10km/h</td><td rowspan="2">100</td><td>100</td></tr>
<tr><td>Average speed in cruise section < 10km/h</td><td>60</td></tr>
<tr><td colspan="2">The VUT avoids the collision or</td><td>100</td><td>0</td></tr>
</table>

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gives the takeover request before collision		
The VUT collides	0	0

1.3.4.14 Slow walking pedestrian encountered during parking space search

1.3.4.14.1 Slowing Walking Pedestrian in Running Direction

Test results		Score	
		Safety (weight: 70%)	Efficiency (weight: 30%)
The VUT successfully parks in the parking space	The VUT arrives at the call position by detour	100	100
	The VUT follows the pedestrian and arrives at the call position		80
The VUT avoids the collision or gives the takeover request before collision		100	0
The VUT collides		0	0

1.3.4.15 Child crossing encountered during parking space search

1.3.4.15.1 Sheltered child crossing in running direction

Please refer to the explanation for calculation of score in 1.3.4.13.1.

1.3.4.16 Temporary obstacle encountered during parking space search

1.3.4.16.1 Temporary obstacle encountered during vehicle call process

Please refer to the explanation for calculation of score in 1.3.4.13.1.

1.3.4.17 Parking space target occupied during parking space search with adjacent parking space unoccupied

1.3.4.17.1 Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

Test results		Score	
		Safety (weight: 70%)	Efficiency (weight: 30%)
The VUT parks in the adjacent parking space	Average speed in cruise section≥ 10km/h	100	100
	Average speed in cruise section < 10km/h		60
The VUT avoids the collision or gives the takeover request before collision		100	0
The VUT collides		0	0

1.3.4.18 Static vehicle encountered during indoor parking space search

1.3.4.18.1 Static vehicle in running direction

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Please refer to the explanation for calculation of score in 1.3.4.13.1.

1.3.4.19 Static pedestrian encountered during indoor parking space search

1.3.4.19.1 Static pedestrian in running direction

Please refer to the explanation for calculation of score in 1.3.4.13.1.

1.3.4.20 Temporary obstacle encountered during indoor parking space search

1.3.4.20.1 Temporary obstacle encountered during vehicle call process

Please refer to the explanation for calculation of score in 1.3.4.13.1.

1.3.4.21 Parking space target occupied during indoor parking space search with adjacent parking space unoccupied

1.3.4.21.1 Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

Please refer to the explanation for calculation of score in 1.3.4.17.1.

2. Test Method

2.1. Scope of Application

This Specification is applicable to M_1 passenger vehicles.

2.2. Normative References

The terms and conditions in the following documents constitute the terms and conditions of this Specification through reference in this Specification. For dated references, all subsequent amendments (excluding corrections) or revisions are not applicable to this Specification. For undated references, the latest edition is applicable to this Specification.

ISO 15622-2018 《Intelligent transport systems — Adaptive Cruise Control systems—Performance requirements and test procedures》

ISO 22178-2009《Intelligent transport systems — Low speed following (LSF) systems — Performance requirements and test procedures》

ISO 11270-2010 《Intelligent transport systems — Lane keeping assistance systems (LKAS) — Performance requirements and test procedures》

ECE R79 《Uniform provisions concerning the approval of vehicles with regard to steering equipment》

ECE R157 《Uniform provisions concerning the approval of vehicles with regard to Automated Lane Keeping Systems》

GB/T 20608-2006 Intelligent Transportation System - Adaptive Cruise Control System - Performance Requirements and Test Procedures

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

ISO 8855-1991 《Road vehicles - Vehicle dynamics and road-holding ability - Vocabulary》

ISO 16787《Intelligent transport systems - Assisted parking systems (APS）- Performance requirements and test procedures 》

JGJ 100 Code for Design of Parking Garage Building

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05MR404(GJBT-855) Urban Road - Curb

2.3. Definitions

Vehicle Under Test (VUT)

The vehicle that can continuously control both transversal and longitudinal movements and will be tested in accordance with these Rules.

Vehicle Target (VT)

Vehicle target specified in these Rules.

Time To Collision

The time required for the VUT to collide with VT, adult dummy target, bicycle target or pedal motorcycle target while maintaining the current motion state.

Time Gap

The time required for the VUT to arrive at the position of the target at the current speed.

Set Speed

The expected speed (meter-indicated speed) of the vehicle when the driving assistance system is activated.

Desired Speed

The maximum stable speed that the system can reach after setting the vehicle speed.

Number of parking

During the parking process, one parking will be counted when the shift to gear R is carried out and the vehicle moves. During the parking process, one parking will be counted when the shift from gear R to gear D or from gear D to gear R is carried out.

Average speed of cruising section

The average speed of the cruise section calculated based on the running time on a 30m long continuous road intercepted during the period after the vehicle runs stably on the traffic lane.

2.4. General Provisions

This section describes the test method of valet parking.

2.5. Test Conditions

2.5.1. Site Conditions

1) The test road surface shall be dry, flat and solid, without visible moisture;
2) The test road surface shall be compacted and free of irregularities (such as large inclination, cracks, well covers or reflective bolts) that may cause abnormal operation of the sensor;
3) The lane lines may be white solid lines, white dotted lines, yellow solid lines and yellow dotted lines, which shall meet the requirements of GB 5768.3. The outdoor parking lot of CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started) or the parking building of CATARC (indoor parking lot) shall be selected as the test site.

2.5.2. Weather Conditions

1) The weather shall be dry without precipitation and snowfall;

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2) The visibility in the horizontal direction of the outdoor parking lot shall not be less than 1km;

3) The wind speed shall not be greater than 10m/s;

4) For the test conducted under natural light conditions, the lighting conditions in the whole test area shall be consistent, and the light intensity shall not be less than 2000Lux. The test shall not be conducted in the direction towards or away from direct sunlight.

5) The illumination of the indoor parking lot shall not be less than 30 lux, the test road shall have no obvious shadow, and the parking space lines shall be clear.

2.5.3. Equipment Requirements

2.5.3.1. The test equipment shall meet the requirements of sampling and storage of dynamic data, and the sampling and storage frequency shall at least be 100Hz. The DGPS time shall be used for data synchronization between the VT and the VUT.

2.5.3.2. Data Acquisition and Target Control Accuracy

The data acquisition accuracy of the VT and the VUT during the test shall at least meet the following requirements:

1) Speed accuracy: 0.1km/h;

2) Accuracy of transversal and longitudinal position: 0.03m;

3) Accuracy of longitudinal acceleration: 0.1m/ s^2;

4) Accuracy of angular velocity of steering wheel: 1.0°/s

Target control accuracy:

1) Position accuracy: 0.1m;

2) Speed accuracy: 2km/h;

3) Acceleration accuracy: 0.25m/ s^2;

2.5.3.3. Filtering Requirements

2.5.3.3.1. The original data shall be used for position and speed, without filtering;

2.5.3.3.2. The acceleration shall be filtered by a 12-pole stepless Butterworth filter, with the cut-off frequency being 10Hz;

2.5.3.3.3. Requirements on VT

As shown in Figure 2-1, the VT shall be a M_1 passenger vehicle or a soft target used to replace the actual M_1 passenger vehicle. Such soft target shall be used to replace the real vehicle (including visual, radar, lidar and PMD attributes). For the requirements on specifications of soft target, please refer to ISO19206.

The obstacle vehicle located in the parking space shall be a mass-produced M_1 vehicle with a length of 4100-5000m, a width of 1700-1950mm and a height of 1300-1800mm.

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Figure 2-1 Appearance Diagram of Soft Vehicle Target

2.5.3.3.4. Requirements on Adult Dummy Target

As shown in Figure 2-2, the dummy target shall be used to replace the pedestrian target (including visual, radar, lidar and PMD attributes). For the requirements on specifications of dummy, please refer to ISO 19206.

Figure 2-2 Appearance Diagram of Pedestrian Target

2.5.3.3.5. Requirements on Child Dummy Target

As shown in Figure 2-3, the child dummy target shall be used to replace the child target (including visual, radar, lidar and PMD attributes). For the requirements on specifications of child dummy, please refer to ISO 19206.

Figure 2-3 Appearance Diagram of Child Dummy Target

2.5.4. Test Procedures

2.5.4.1. Preparation of VUT

2.5.4.1.1. Confirmation on Tyre Conditions

The test shall be conducted with the brand new and genuine tyres consistent with the tyre configuration (supplier, model, size, speed and load class) specified by the manufacturer. To the extent that the tyre

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configuration (supplier, model, size, speed and load grade) is consistent with that specified by the manufacturer, the replacement tyre provided by the manufacturer or the agent designated by the manufacturer may be used. The tyres shall be inflated to the standard cold air pressure recommended by the manufacturer, which shall be at least suitable for normal load conditions.

2.5.4.1.2. Confirmation on Vehicle Conditions

2.5.4.1.2.1. It shall be ensured that the spare wheel (if equipped) and on-board tools are loaded on the VUT. There shall be no other objects on the VUT.

2.5.4.1.2.2. It shall be ensured that all tyres are inflated to the manufacturer's recommended tyre pressures for the current load state.

2.5.4.1.2.3. Measure the front and rear axle loads of the vehicle, calculate the total vehicle mass, which shall be regarded as the curb weight of the vehicle and recorded.

2.5.4.1.3. Equipment Installation and Loading

2.5.4.1.3.1. Install the instruments and equipment for the test.

2.5.4.1.3.2. Load the vehicle according to the weight requirements (200kg minus the weight of test driver and test equipment), and fix the load securely.

2.5.4.1.3.3. With the driver included, measure the front and rear axle loads of the vehicle.

2.5.4.1.3.4. Compare it with the curb weight of the vehicle.

2.5.4.1.3.5. The difference between the total vehicle mass measured and the curb weight +200kg shall be within ±1%, and the difference between the front and rear axle load distribution and the axle load distribution of the vehicle with full oil and no load shall be less than 5%. If the actual situation of the vehicle fails to meet this requirement, the load shall be adjusted without affecting the performance of the vehicle, and shall be firmly fixed after the adjustment.

2.5.4.1.3.6 The operations in 2.5.4.1.3.3 through 2.5.4.1.3.5 shall be repeated until the front/rear axle load and the total mass of the vehicle can meet the requirements. The load shall be carefully adjusted until it is as close as possible to the original property of the vehicle, and the final axle load shall be recorded.

2.5.4.2. Preparation for Test

2.5.4.2.1. Function Setting

It shall be ensured that the valet parking function can be normally started.

2.5.4.2.2. Active hood system

If the failure of the vehicle's active hood system will not affect the normal operation of the system, the system shall be disabled before the test.

2.5.4.2.3. Airbag system

If the failure of the vehicle’s airbag system will not affect the normal operation of the system, the system shall be disabled before the test.

2.5.5. Test Items

2.5.5.1. Parallel parking space berthing-out ability

2.5.5.1.1. Static vehicles on both sides

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(1) Test Scenarios

As shown in Figure 2-4, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a parallel parking space target on one side of the road, and there shall be a static vehicle on each side of such parking space target. The requirements for placement of such static vehicle are shown in Figure 2-4 (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line).

If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

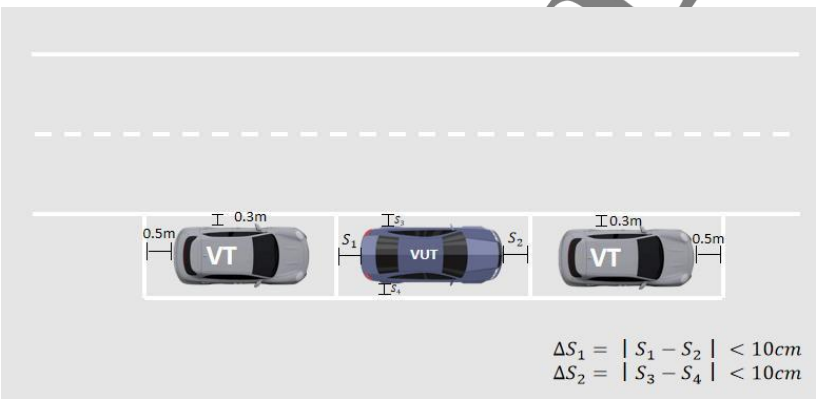

Figure 2-4 Schematic Diagram of Test Scenario for Static Vehicles on Both Sides

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with other vehicle;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT reaches the summoning position.

2.5.5.1.2. Static vehicles on both sides with static upright child near parking space

(1) Test Scenarios

As shown in Figure 2-5, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a parallel parking space target on one side of the road, and there shall be static vehicles and child dummies around

such parking space target. The requirements for placement of such static vehicle and child dummy are shown in Figure 2-5 (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line. The distance between the child and the outer edge of parking space line is 1m). If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

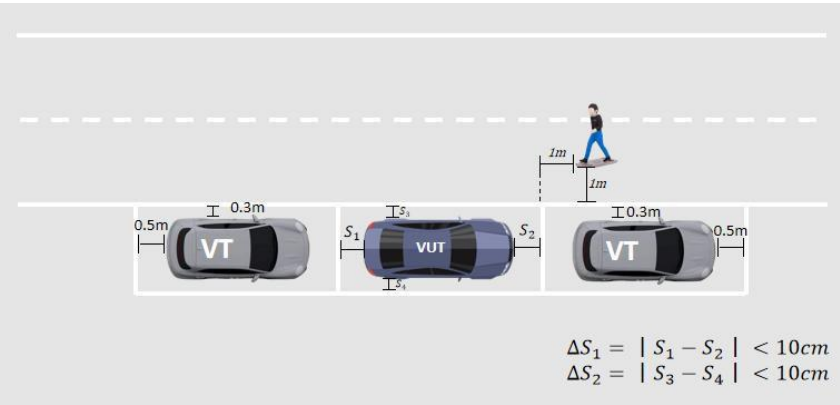

Figure 2-5 Schematic Diagram of Test Scenario for Static Vehicles on Both Sides with Static Upright Child near Parking Space

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with nearby vehicle or child;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT reaches the summoning position.

2.5.5.2. Vertical parking space berthing-out ability

2.5.5.2.1. Static vehicles on both sides

(1) Test Scenarios

As shown in Figure 2-6, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space target on one side of the road, and there shall be a static vehicle on each side of such parking space target. The requirements for placement of such static vehicle are shown in Figure 2-6 (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of

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tyre and the inner edge of parking space line). If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

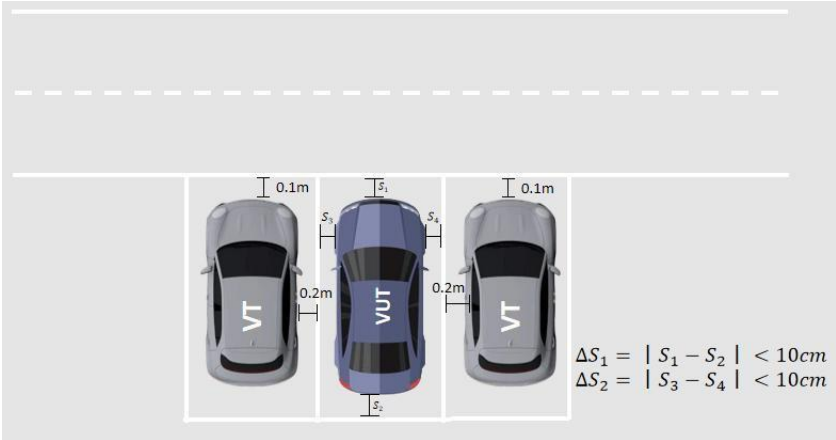

Figure 2-6 Schematic Diagram of Test Scenario for Static Vehicles on Both Sides

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with other vehicle;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT reaches the summoning position.

2.5.5.2.2. Static vehicles on both sides with static upright child near parking space

(1) Test Scenarios

As shown in Figure 2-7, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space target on one side of the road, and there shall be static vehicles and child dummies around such parking space target. The requirements for placement of such static vehicle are shown in Figure 2-7 (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line). The child dummy shall be located on the middle vertical line of points A and B and shall be 0.2m away from the parking space line. If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than

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10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

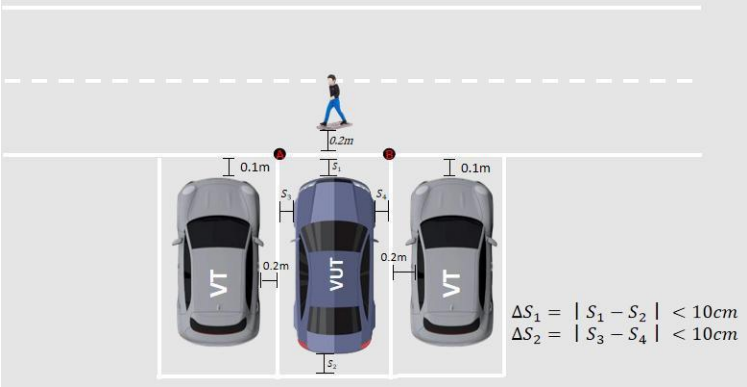

Figure 2-7 Schematic Diagram of Test Scenario for Static Vehicles on Both Sides with Static Upright Child near Parking Space

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with nearby vehicle or child;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT fails to start the valet parking function.

2.5.5.3. Oblique parking space berthing-out ability

2.5.5.3.1. Static vehicles on both sides

(1) Test Scenarios

As shown in Figure 2-8, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be an oblique parking space target on one side of the road, and there shall be a static vehicle on each side of such parking space target. The requirements for placement of such static vehicle are shown in Figure 2-8 (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line). If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

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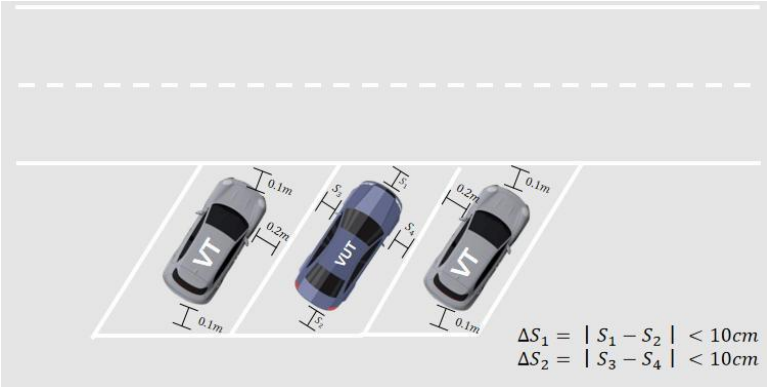

Figure 2-8 Schematic Diagram of Test Scenario for Static Vehicles on Both Sides

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with other vehicle;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT goes out of the parking space.

2.5.5.4. Static vehicle encountered during vehicle call process

2.5.5.4.1. Static vehicle in running direction

(1) Test Scenarios

As shown in Figure 2-9, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. A static obstacle vehicle shall be set in front of the straight running path of the VUT, and the obstacle vehicle shall be parked in the middle of the lane. The existence of vehicle on parking space is not mandatory.

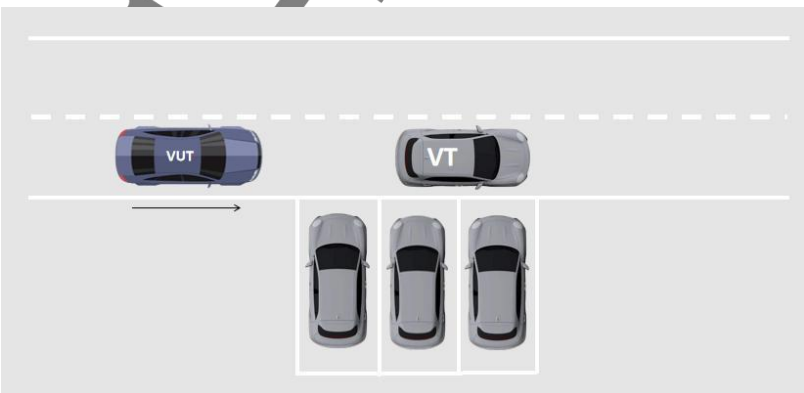

Figure 2-9 Schematic Diagram of Test Scenario for Static Vehicle in Running Direction

(2) Test Method

The driver turns on the VUT Memory Parking Assistance system, the VUT goes out of the parking

space, and the static obstacle vehicle is encountered in straight section during the call process.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with other vehicle;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT stops behind the VT or arrives at the call position

2.5.5.5. Slow walking pedestrian encountered during vehicle call process

2.5.5.5.1. Slowing Walking Pedestrian in Running Direction

(1) Test Scenarios

As shown in Figure 2-10, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. The VUT shall run in the straight lane, and the pedestrian target shall be located 0.5m to the right in the middle of the lane, walking in the same direction as the vehicle. The existence of vehicle on parking space is not mandatory.

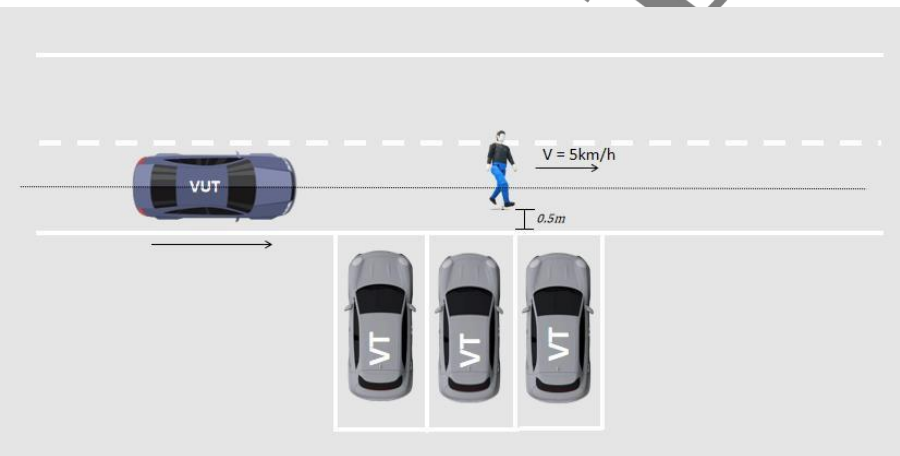

Figure 2-10 Schematic Diagram of Test Scenario for Slow Walking Pedestrian in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) A dummy traveling in the vehicle-running direction shall be set in front of the straight running path of the VUT. When the VUT is at least 5s THW away from the dummy, the adult dummy shall be accelerated 5km/h in 1m and keep moving at a constant speed. The motion track of the dummy shall be 0.5m to the right of the middle of the road.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT arrives at the call position

2.5.5.6. Child crossing encountered during vehicle call process

2.5.5.6.1. Sheltered child crossing in running direction

(1) Test Scenarios

As shown in Figure 2-11, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space on the right side of the lane. The VUT shall go straight along the path in the lane, the child dummy target shall cross between the two parking spaces, and the shelter vehicle shall be parked at least on the left side of the child dummy. The distance between the front end of shelter vehicle and the edge of road shall be 0.1m, and the distance between the pedestrian (child) target and the edge of road shall be 2m (The longitudinal distance of vehicle in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line).

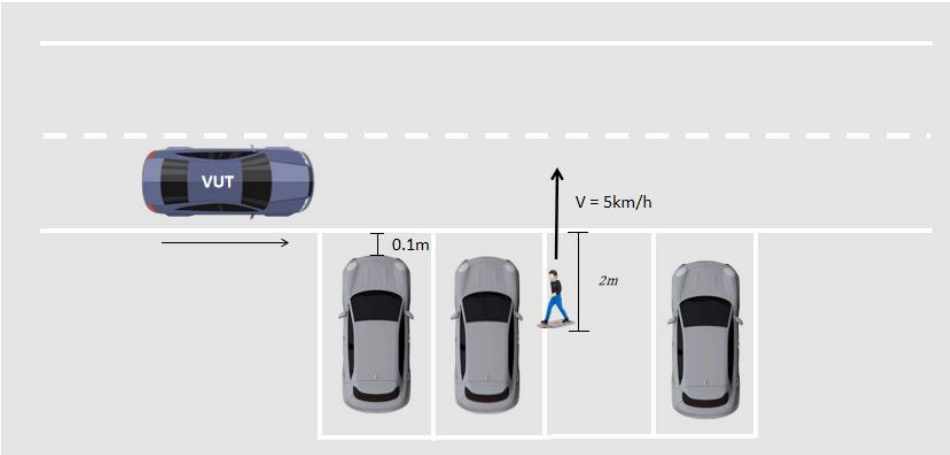

Figure 2-11 Schematic Diagram of Test Scenario for Sheltered Child Crossing in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) The child dummy target shall pass through the test lane at a constant speed of 5km/h after being accelerated to 5km/h from static state in 1m. The expected collision position shall be 50% in front of the vehicle.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT arrives at the call position

2.5.5.7. Temporary obstacle encountered during vehicle call process

2.5.5.7.1. Temporary obstacle encountered during vehicle call process

(1) Test Scenarios

As shown in Figure 2-12, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. The test road shall be two

straight roads with dotted lines in the parking lot. In the middle of the lane, five traffic cones (recommended size: 50cm * 35cm) inclined at an angle of 45 degrees in the road direction shall be placed as obstacles.

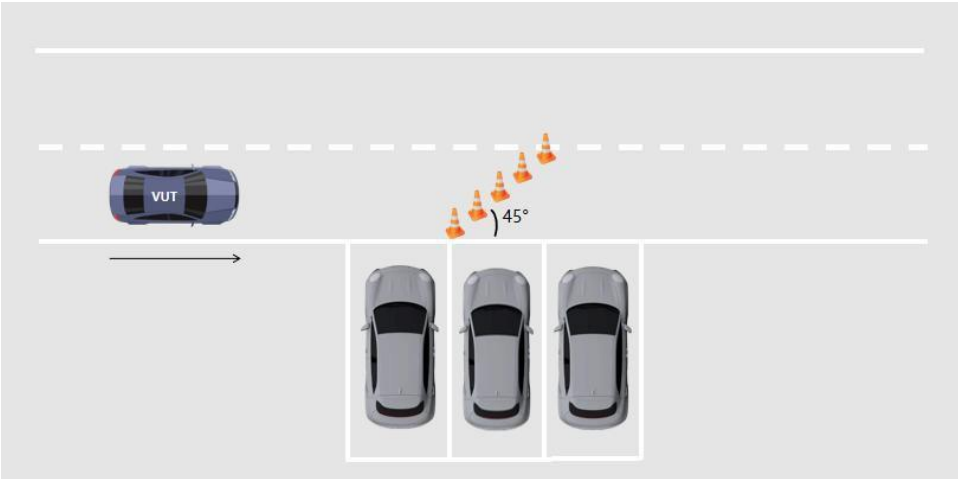

Figure 2-12 Schematic Diagram of Test Scenario for Temporary Traffic Obstacles in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) The VUT achieves a stable speed at least 20m away from the front of the cone barrels.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT arrives at the call position;

3) The Memory Parking Assistance system gives an abnormality prompt.

2.5.5.8. Column Parking space berthing-out ability

2.5.5.8.1. Static vehicle on one side

(1) Test Scenarios

As shown in Figure 2-13, the test shall be conducted in the parking building of CATARC. The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the straight lane. There shall be a column parking space target on one side of the road, a static child in front of the column parking space, a static vehicle on one side of such parking space target, and columns on the other side of such parking space target. The requirements for placement of such static vehicle are shown in Figure 2-15 (the longitudinal distance of vehicles in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of the tyre and the inner edge of the parking space line near the parking space target). If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking

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space line shall be less than 10cm.

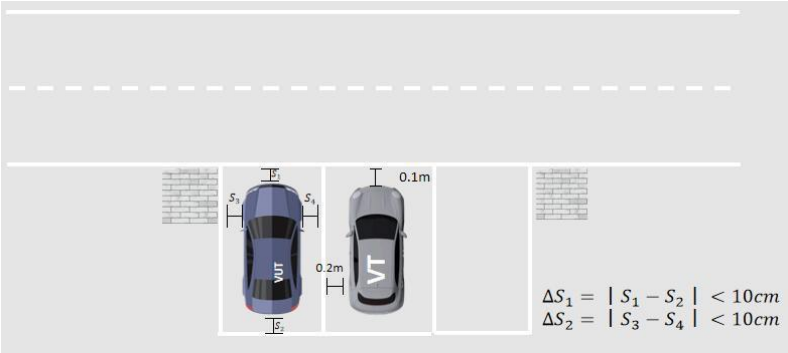

Figure 2-13 Schematic Diagram of Test Scenario for Static Vehicle on One Side

(2) Test Method

After the left or right column parking space is randomly selected, the driver turns on the Memory Parking Assistance system of the VUT, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails go out of the parking space, or collides with the boundary vehicle or column;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT reaches the summoning position.

2.5.5.8.2. Static vehicle on one side with static upright child during berthing-out process

(1) Test Scenarios

As shown in Figure 2-14, the test shall be conducted in the parking building of CATARC. The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the straight lane. There shall be a column parking space target on one side of the road, a static child in front of the column parking space, a static vehicle on one side of such parking space target, and columns on the other side of such parking space target. Taking the left column parking space as an example, the requirements for placement of such static vehicle are shown in Figure 2-16 (the longitudinal distance of vehicles in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of the tyre and the inner edge of the parking space line near the parking space target). The child dummy shall be located on the middle vertical line of points A and B and shall be 0.2m away from the parking space line. If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

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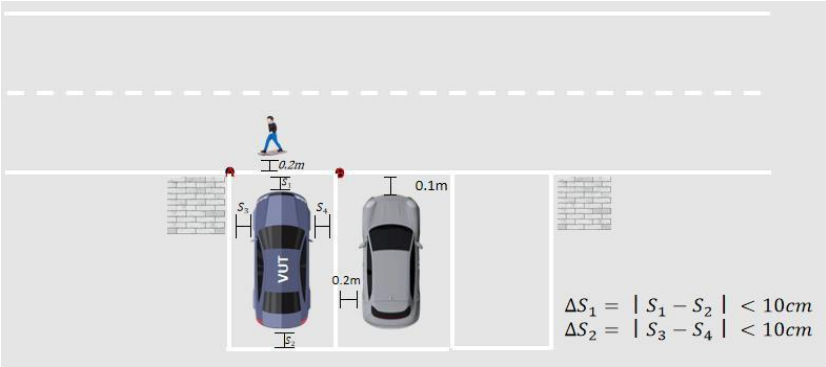

Figure 2-14 Schematic Diagram of Test Scenario for Static Vehicle on One Side with Static Upright Child during Berthing-out Process

(2) Test Method

After the left or right column parking space is randomly selected, the driver turns on the Memory Parking Assistance system of the VUT, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails go out of the parking space, or collides with the boundary vehicle, child dummy or column;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT fails to start the valet parking function.

2.5.5.9. Wall-side parking space berthing-out ability

2.5.5.9.1. Static vehicle on one side

(1) Test Scenarios

As shown in Figure 2-15, the test shall be conducted in the parking building of CATARC. The test road shall be composed of at least one straight lane and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the straight lane. There shall be a wall-side parking space target on one side of the road. If there is a parking space next to the parking space to be used by the VUT, a static vehicle shall be parked on such parking space. The other side shall be a wall. The requirements for placement of such static vehicle are shown in Figure 2-17 (the longitudinal distance of vehicles in the figure is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of the tyre and the inner edge of the parking space line near the parking space target). If the VUT can rely on the Memory Parking Assistance system to complete the berthing-in, the initial position of the VUT will be determined by the berthing-in function of the Memory Parking Assistance system; otherwise, the VUT shall be placed at the center of the parking space, the difference between the left/right side of the vehicle body (calculated by the tyre-grounding point) and the inner edge of the parking space line shall be less than 10cm, and the difference between the front/rear side of the vehicle body and the inner edge of the parking space line shall be less than 10cm.

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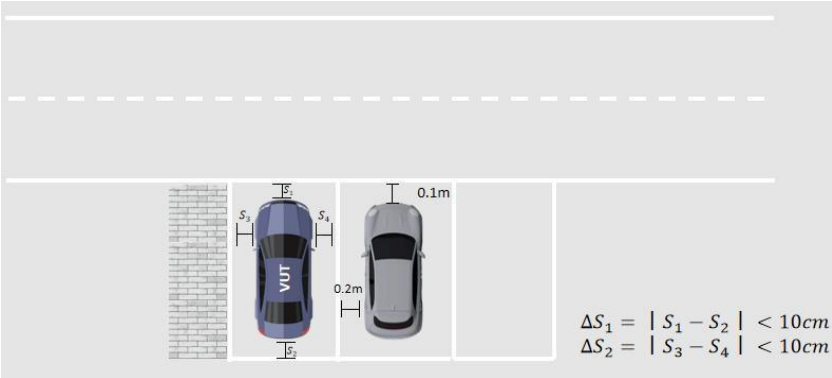

Figure 2-15 Schematic Diagram of Test Scenario for Static Vehicle on One Side

(2) Test Method

The driver turns on the Memory Parking Assistance system, and the VUT goes out of the parking space.

(3) Exit Conditions

1) The VUT fails go out of the parking space, or collides with the boundary vehicle or wall;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT reaches the summoning position.

2.5.5.10. Static vehicle encountered during indoor vehicle call process

2.5.5.10.1. Static vehicle in running direction

(1) Test Scenarios

As shown in Figure 2-16, the test shall be conducted in the parking building of CATARC, and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the test road. A static obstacle vehicle shall be set in front of the straight running path of the VUT. The parking position of the obstacle vehicle is shown in Figure 2-18. The existence of vehicle on parking space is not mandatory (there may be no parking space).

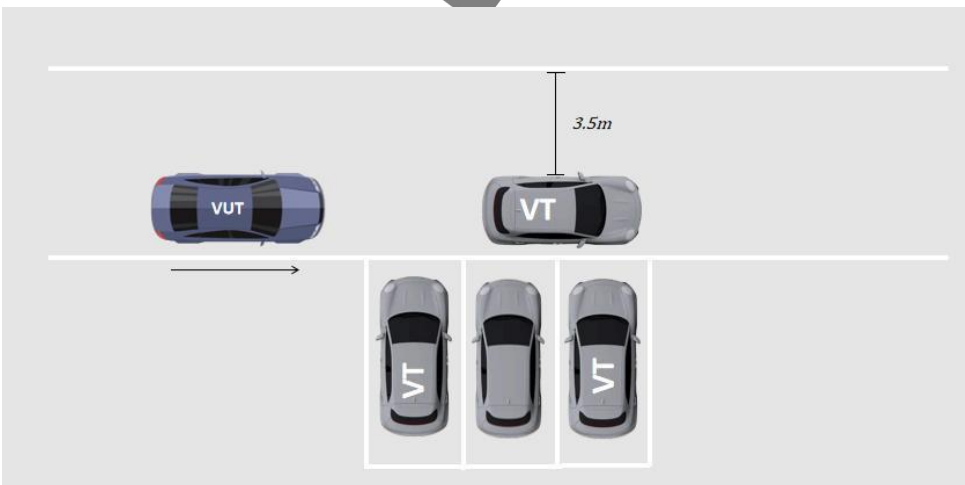

Figure 2-16 Schematic Diagram of Test Scenario for Static Vehicle in Running Direction

(2) Test Method

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The driver turns on the VUT Memory Parking Assistance system, the VUT goes out of the parking space, and the static obstacle vehicle is encountered in straight section during the call process.

(3) Exit Conditions

1) The VUT fails to go out of the parking space or collides with other vehicle;

2) The systems give the takeover request before the berthing-out operation is completed.

3) The VUT stops behind the VT or arrives at the call position

2.5.5.11. Static pedestrian encountered during indoor vehicle call process

2.5.5.11.1. Static pedestrian in running direction

(1) Test Scenarios

As shown in Figure 2-17, the test shall be conducted in the parking building of CATARC, and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the test road. The VUT shall run in the straight lane, and the pedestrian target shall be located on the running path of the VUT, with 3.5m space left on one side. The existence of vehicle on parking space is not mandatory (there may be no parking space).

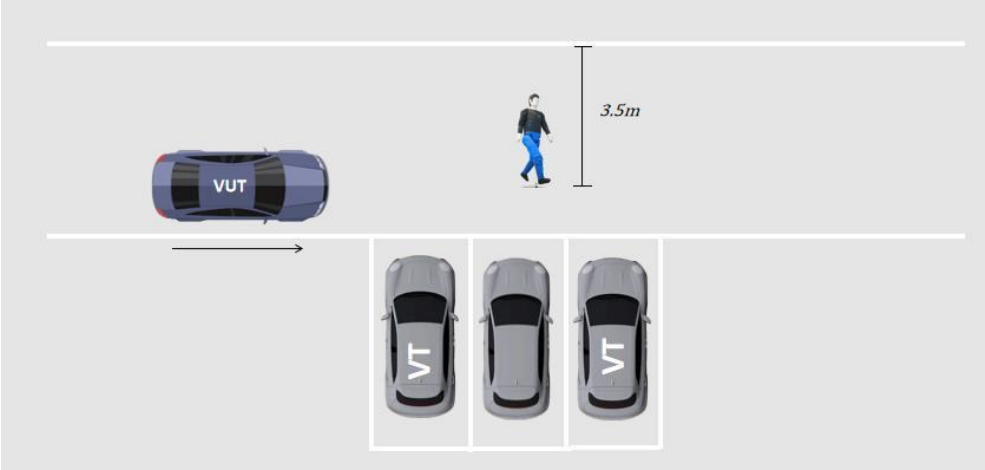

Figure 2-17 Schematic Diagram of Test Scenario for Static Pedestrian in Running Direction

(2) Test Method

The VUT starts the valet parking function and runs along the parking path;

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT arrives at the call position

2.5.5.12. Temporary obstacle encountered during indoor vehicle call process

2.5.5.12.1. Temporary obstacle encountered during vehicle call process

(1) Test Scenarios

As shown in Figure 2-18, the test shall be carried out in the parking building of CATARC. There shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system

on the test road. The VUT shall run in a straight lane. The conical barrel obstacle (recommended size: 50cm * 35cm) shall be located on the running path of the VUT and 3.5m space shall be left on one side. The existence of vehicle on parking space is not mandatory (there may be no parking space).

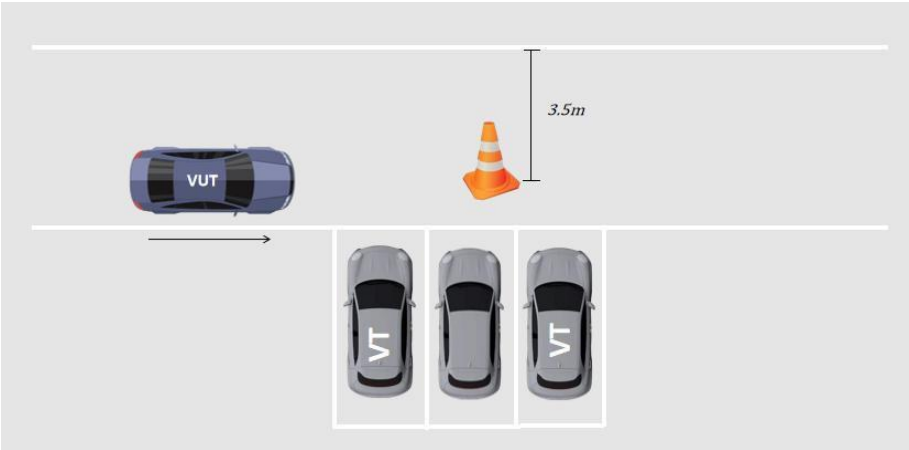

Figure 2-18 Schematic Diagram of Test Scenario for Temporary Traffic Obstacles in Running Direction

(2) Test Method

The VUT starts the valet parking function and runs along the parking path;

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT arrives at the call position;

3) The Memory Parking Assistance system gives an abnormality prompt.

2.5.5.13. Static vehicle encountered during parking space search

2.5.5.13.1. Static vehicle in running direction

(1) Test Scenarios

As shown in Figure 2-19, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. A static obstacle vehicle shall be set in front of the straight running path of the VUT, and the obstacle vehicle shall be parked in the middle of the lane. The existence of vehicle on parking space is not mandatory.

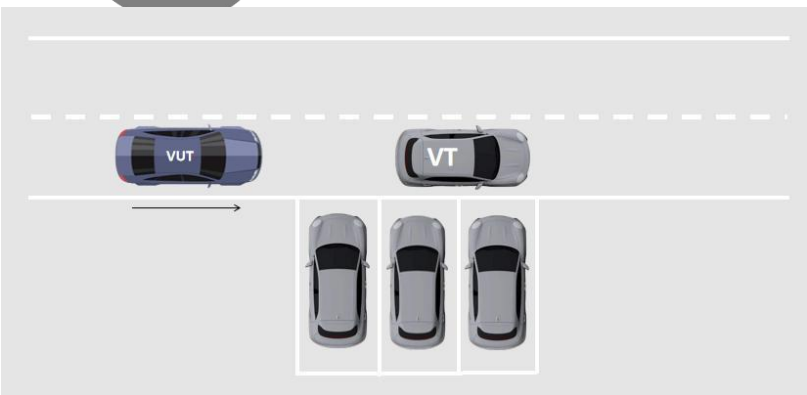

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Figure 2-19 Schematic Diagram of Test Scenario for Static Vehicle in Running Direction

(2) Test Method

The driver turns on the VUT Memory Parking Assistance system, the static obstacle vehicle is encountered in straight section.

(3) Exit Conditions

1) The VUT is not parked in the parking space or collides with other vehicles;

2) The system issues a takeover request before the parking is completed;

3) The test vehicle is parked behind the target vehicle or parked into the target parking space.

2.5.5.14. Slow walking pedestrian encountered during parking space search

2.5.5.14.1. Slowing Walking Pedestrian in Running Direction

(1) Test Scenarios

As shown in Figure 2-20, the test shall be conducted in the outdoor parking lot of CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. The VUT shall run in a straight lane. The pedestrian target shall be located 0.5m to the right in the middle of the lane, walking in the same direction as the VUT. The existence of vehicle on parking space is not mandatory.

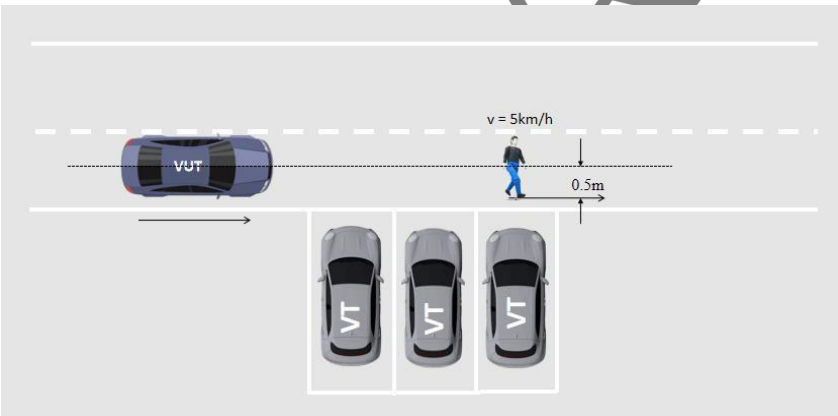

Figure 2-20 Schematic Diagram of Test Scenario for Slow Walking Pedestrian in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) A dummy traveling in the vehicle-running direction shall be set in front of the straight running path of the VUT. When the VUT is at least 5s THW away from the dummy, the adult dummy shall be accelerated 5km/h in 1m and keep moving at a constant speed. The motion track of the dummy shall be 0.5m to the right of the middle of the road.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT arrives at the call position

2.5.5.15. Child crossing encountered during parking space search

2.5.5.15.1. Sheltered child crossing in running direction

(1) Test Scenarios

As shown in Figure 2-21, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space on the right side of the lane. The VUT shall go straight along the path in the lane, the child dummy target shall cross between the two parking spaces, and the shelter vehicle shall be parked at least on the left side of the child dummy. The distance between the front end of shelter vehicle and the edge of road shall be 0.1m, and the distance between the pedestrian (child) target and the edge of road shall be 2m (The longitudinal distance of vehicle in the Figure 2-34 is the distance between the outermost edge of vehicle and the inner edge of parking space line, and the transverse distance is the distance between the grounding point of tyre and the inner edge of parking space line).

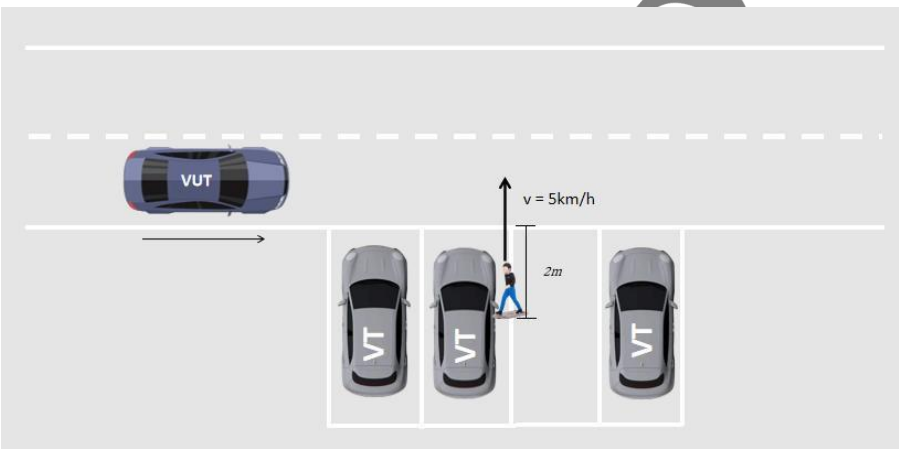

Figure 2-21 Schematic Diagram of Test Scenario for Sheltered Child Crossing in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) The child dummy target shall be accelerated from static state to 5km/h in 1m, and the expected collision position shall be 50% in front of the vehicle.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT arrives at the call position

2.5.5.16. Temporary obstacle encountered during parking space search

2.5.5.16.1. Temporary obstacle encountered during vehicle call process

(1) Test Scenarios

As shown in Figure 2-22, the test shall be conducted in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that

affect the operation of Memory Parking Assistance system on the straight lane. The test road shall be two straight roads with dotted lines in the parking lot. In the middle of the lane, five traffic cones (recommended size: 50cm * 35cm) inclined at an angle of 45 degrees in the road direction shall be placed as obstacles.

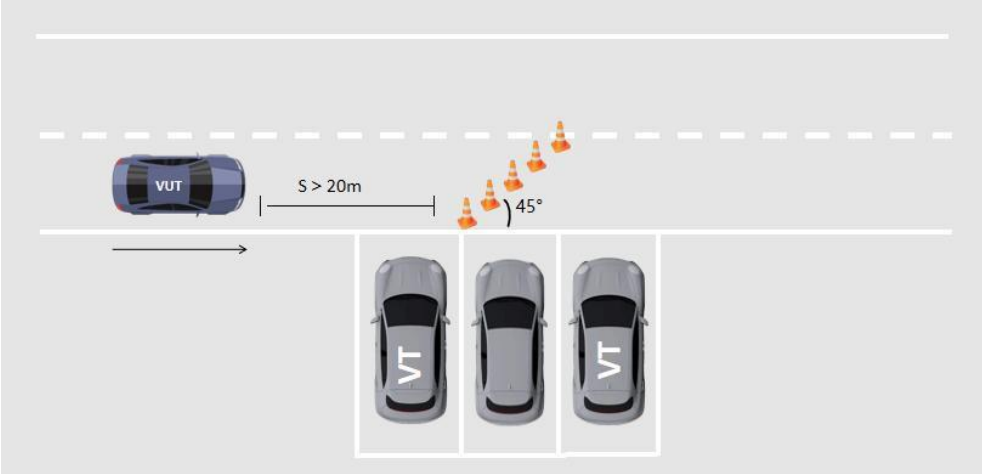

Figure 2-22 Schematic Diagram of Test Scenario for Temporary Traffic Obstacles in Running Direction

(2) Test Method

1) The VUT starts the valet parking function and runs along the parking path;

2) The VUT achieves a stable speed at least 20m away from the front of the cone barrels.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT arrives at the call position;

3) The Memory Parking Assistance system gives an abnormality prompt.

2.5.5.17. Parking space target occupied during parking space search with adjacent parking space unoccupied

2.5.5.17.1. Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

(1) Test Scenarios

As shown in Figure 2-23, the test shall be carried out in the outdoor parking lot CATARC (or other outdoor closed parking area where the Memory Parking Assistance function can be started). The test road shall be composed of at least one straight lane in the parking lot and there shall be no obstacles that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space target on one side of the road (i.e., the red-marked parking space in the figure), a conical barrel (recommended size: 50cm * 35cm) in the parking space target, and unoccupied parking spaces at least on two sides of the parking space target.

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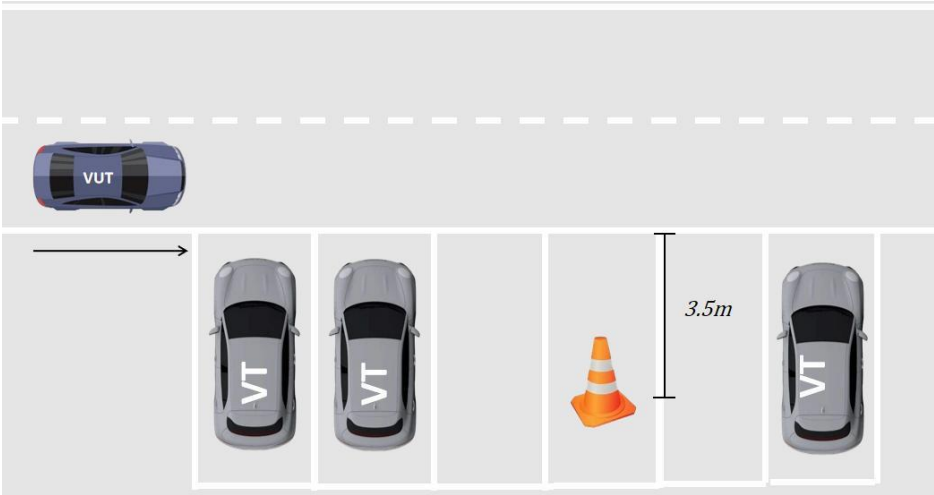

Figure 2-23 Schematic Diagram of Test Scenario for Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

(2) Test Method

The VUT starts the valet parking function and runs along the parking path.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT parks in the vacant parking space;

3) The Memory Parking Assistance system gives an abnormality prompt.

2.5.5.18. Static vehicle encountered during indoor parking space search

2.5.5.18.1. Static vehicle in running direction

(1) Test Scenarios

As shown in Figure 2-24, the test shall be conducted in the parking building of CATARC. The test road shall be composed of at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the operation of the Memory Parking Assistance system on the straight lane. A static obstacle vehicle shall be set in front of the straight running path of the VUT. The parking position of the obstacle vehicle is shown in the figure. The existence of vehicle on parking space is not mandatory (there may be no parking space).

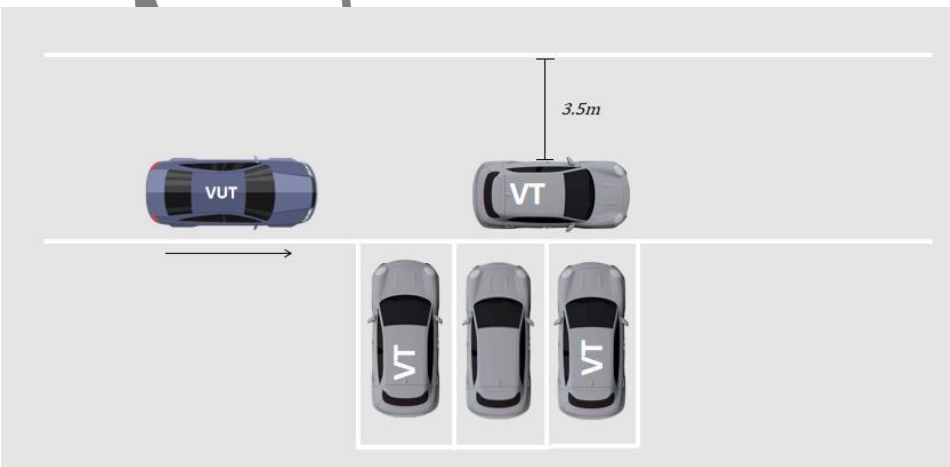

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Figure 2-24 Schematic Diagram of Test Scenario for Static Vehicle in Running Direction

(2) Test Method

The driver turns on the Memory Parking Assistance system of the VUT, and a static obstacle vehicle is encountered in the straight section during the parking process.

(3) Exit Conditions

1) The UVT fails to park in the parking space or collides with other vehicle;

2) Before the prompt of completion of berthing-in operation, the system gives a takeover request;

3) The VUT parks behind the VT or parks in the parking space target.

2.5.5.19. Static pedestrian encountered during indoor parking space search

2.5.5.19.1. Static pedestrian in running direction

(1) Test Scenarios

As shown in Figure 2-25, the test shall be conducted in parking building of CATARC. The test road shall include at least two straight lanes and there shall be no obstacles (except for the test obstacles) that affect the Memory Parking Assistance system on the straight lane. The VUT shall run in the straight lane. The pedestrian target shall be on the running path of the VUT and 3.5m space shall be left on one side. The existence of vehicle on parking space is not mandatory (there may be no parking space).

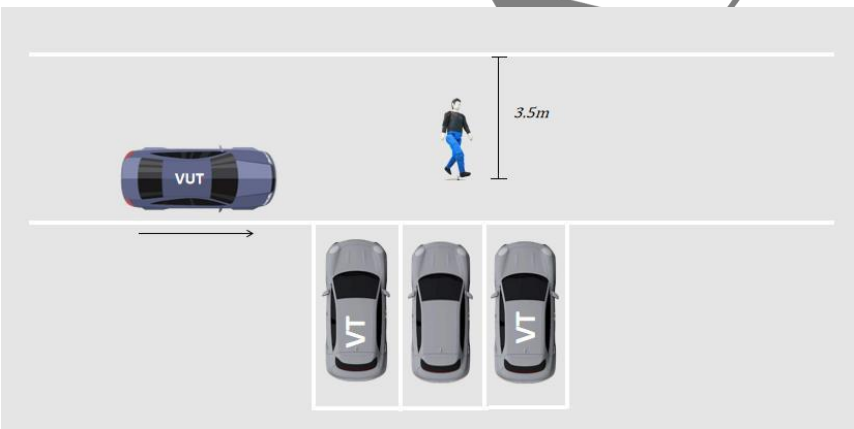

Figure 2-25 Schematic Diagram of Test Scenario for Static Pedestrian in Running Direction

(2) Test Method

The VUT starts the valet parking function and runs along the parking path;

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The Memory Parking Assistance system gives an abnormality prompt;

3) The VUT parks in the parking space target.

2.5.5.20. Temporary obstacle encountered during indoor parking space search

2.5.5.20.1. Temporary obstacle encountered during vehicle call process

(1) Test Scenarios

As shown in Figure 2-26, the test shall be carried out in the parking building of CATARC. There shall be

no obstacles (except for the test obstacles) that affect the operation of Memory Parking Assistance system on the test road. The VUT shall run in a straight lane. The conical barrel obstacle (recommended size: 50cm * 35cm) shall be located on the running path of the VUT and 3.5m space shall be left on one side. The existence of vehicle on parking space is not mandatory (there may be no parking space).

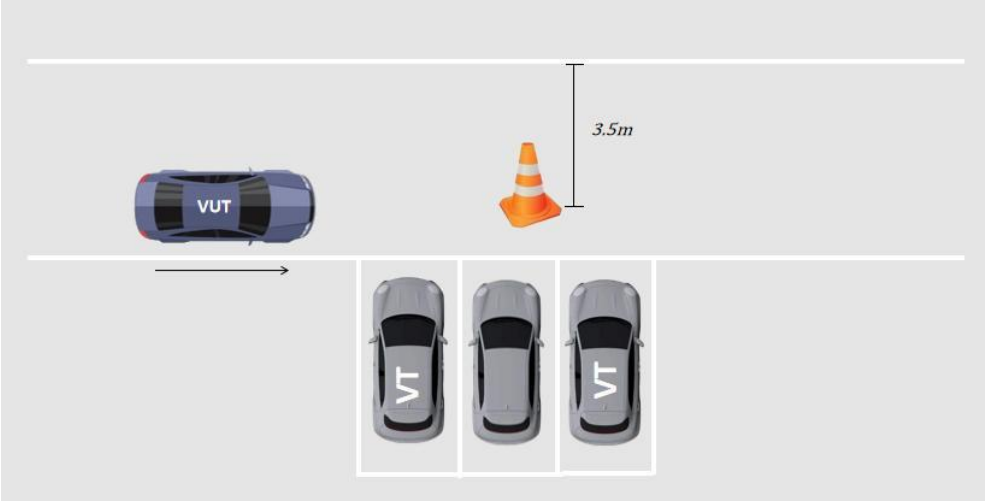

Figure 2-26 Schematic Diagram of Test Scenario for Temporary Traffic Obstacles in Running Direction

(2) Test Method

The VUT starts the valet parking function and runs along the parking path;

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT parks in the parking space target;

3) The Memory Parking Assistance system gives an abnormality prompt.

2.5.5.21. Parking space target occupied during indoor parking space search with adjacent parking space unoccupied

2.5.5.21.1. Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

(1) Test Scenarios

As shown in Figure 2-27, the test shall be carried out in the parking building of CATARC. The test road shall be composed of at least one straight lane in the parking lot and there shall be no obstacles that affect the operation of Memory Parking Assistance system on the straight lane. There shall be a vertical parking space target on one side of the road (i.e., the red-marked parking space in Figure 2-44). There shall be a conical barrel (recommended size: 50cm * 35cm) in the parking space target. At least there shall be unoccupied parking spaces on both sides of the parking space target.

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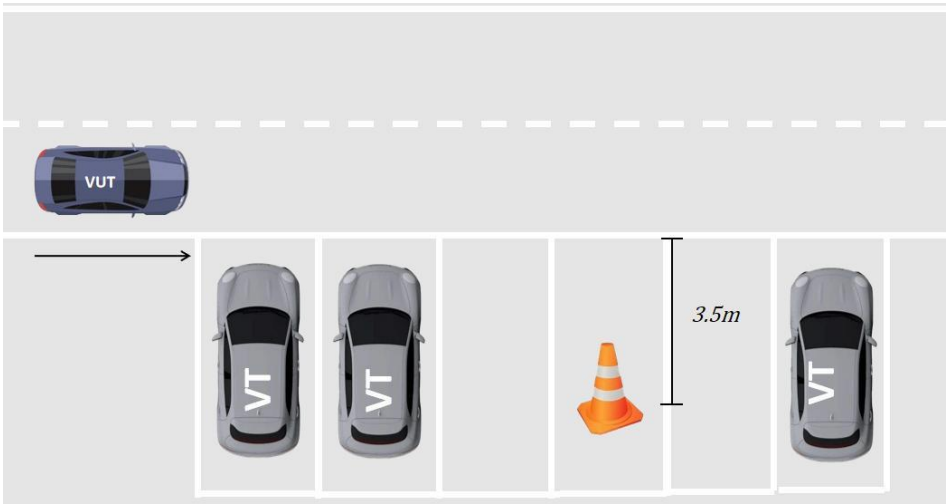

Figure 2-27 Schematic Diagram of Test Scenario for Conical Barrel in Parking Space Target with Adjacent Parking Space Unoccupied

(2) Test Method

The VUT starts the valet parking function and runs along the parking path.

(3) Exit Conditions

1) The VUT collides with other vehicle or object during driving;

2) The VUT parks in the vacant parking space;

3) The Memory Parking Assistance system gives an abnormality prompt.

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