



**中国汽车技术研究中心有限公司**  
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# **Open issues for Automated Driving Assessment & Test and Suggestions**

For the 14th meeting of WP.29/GRVA

Submitted by the experts from China  
2022/09/27

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**01 Problems with Automated Driving  
Assessment & Test in Practical Level**

**02 Questions & Answers**

**03 Exploration in Chinese National  
Intelligent Connected Vehicles Standard**

**04 Suggestions from China**

UN regulations

VMAD: New Assessment/Test Method for Automated Driving (NATM) Guidelines

FRAV: Guidelines and Recommendations concerning Safety Requirements for Automated Driving Systems

Reference and exploration



Problems found by the industry

**Question 1:** How to assess the robustness of the Validation & Verification? How to assess the boundary of the three test pillars?

**Question 2:** Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety? At present, the testing and certification scheme is negotiated between the manufacturer and the certification authority

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## Questions 1: Answers from NATM Guideline

Questions	Answers from NATM Guideline
<p><b>Questions 1:</b> How to assess the robustness of the Validation &amp; Verification? How to assess the boundary of the three test pillars?</p>	<p>Assessment of the Verification strategy (e.g. verification plan and matrix) that describe the validation strategy and the integrated use of the pillars to achieve <b>adequate coverage</b>.</p> <p>Produce an efficient, comprehensive, and cohesive process, considering their <b>strengths and limitations</b>. The methods should complement one another, avoiding excessive overlaps or redundancy to ensure an efficient and effective validation strategy.</p> <ul style="list-style-type: none"><li>■ <b>Track tests:</b> Assess the performance of an ADS in a discrete number of physical tests. It can also be used as additional data to validate the virtual tests.</li><li>■ <b>Real-world testing:</b> Scenarios may not be precisely represented virtually or on a track test. It can be used for virtual validation and/or track tests.</li><li>■ <b>Virtual testing:</b> A large number of tests for different parameters can be carried out.</li></ul>

## Questions 1: Answers from UN R157.01

Questions	Answers from UN R157.01																				
<p><b>Questions 1:</b> How to assess the robustness of the Validation &amp; Verification? How to assess the boundary of the three test pillars?</p>	<p>Results of validation and verification may be assessed by <b>analyzing coverage</b> of the different tests and setting <b>coverage minimal thresholds</b> for various metrics.</p> <table border="1"><thead><tr><th>Provisions</th><th>Assessment under Annex 4</th><th>Tested under Annex 5</th><th>Tested under Annex 6</th></tr></thead><tbody><tr><td>5. System Safety and Fail-safe Response</td><td>√</td><td>√</td><td>√</td></tr><tr><td>6. Human Machine Interface/operator information</td><td>√</td><td>√</td><td>√</td></tr><tr><td>7. Object and Event Detection and Response (OEDR)</td><td>√</td><td>√</td><td>√</td></tr><tr><td>8. Data Storage System for Automated Driving</td><td>√</td><td></td><td></td></tr></tbody></table> <ul style="list-style-type: none"><li>■ Verifying functions of "The System" under non-failure conditions by testing on <b>a track and real-world testing</b>.</li><li>■ <b>Simulation</b> tool and mathematical models for verification of the <b>safety concept</b>.(checked under the influence of faults)</li><li>■ Simulation <b>shall not be a substitute</b> for physical tests in Annex 5 and Annex 6 of this UN Regulation.</li><li>■ <b>Verify the accuracy</b> of simulation tools used by means of results from <b>track and/or real-world testing</b>.</li></ul>	Provisions	Assessment under Annex 4	Tested under Annex 5	Tested under Annex 6	5. System Safety and Fail-safe Response	√	√	√	6. Human Machine Interface/operator information	√	√	√	7. Object and Event Detection and Response (OEDR)	√	√	√	8. Data Storage System for Automated Driving	√		
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8. Data Storage System for Automated Driving	√																				

## Questions 2: Answers from NATM Guideline

Questions	Answers from NATM Guideline
<p><b>Questions 2:</b> Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety?</p>	<p>Annex II Functional Scenarios for divided highway application.</p> <p>It is recommended that <b>sampling techniques</b> be used when selecting parameters to be used in creating logical and concrete scenarios for ADS validation for a particular ADS and its ODD.</p>

## Questions 2: Answers from UN R157.01

Questions	Answers from UN R157.01
<p>Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety?</p>	<p>R157 Appendix V is about the third-party proving ground test. The third-party proving ground test is carried out from seven items: lane keeping, avoiding collision with road users or obstacles, following the vehicle in front, cutting in the vehicle in front, encountering static obstacles after the vehicle in front cutting out, FOV test, lane change, and avoiding emergency operation.</p> <p>However, the scenarios to be tested for each project are not given directly, but rather the scenario elements to be considered.</p> <p>The current understanding of the scheme is that this part of scenarios and test cases are determined by the certification authority and testing agency through joint consultation according to the product function of the enterprise.</p>

**4. Test scenarios to assess the performance of the system with regard to the dynamic driving task**

Test scenarios shall be selected depending on the Operational Design Domain (ODD)).

At the time of type approval, the type-approval authority shall conduct or shall witness at least the following tests to assess the behaviour of the ALKS:

4.1. Lane Keeping

4.1.1. The test shall demonstrate that the ALKS does not leave its lane and maintains a stable motion inside its ego lane across the speed range and different curvatures within its system boundaries.

4.1.2. The test shall be executed at least:

(a) With a minimum test duration of:

(i) 5 minutes for systems limited to 60 km/h operational speed; and

(ii) sufficient length to allow for an assessment of the lane keeping behaviour for systems with operational speeds above 60 km/h.

(b) With a passenger car target as well as a PTW target as the lead vehicle / other vehicle;

(c) With a lead vehicle swerving in the lane; and

(d) With another vehicle driving close beside in the adjacent lane.



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China has explored the allocation of ADS assessment & test methods in relevant standards. For the ADS general technical requirements, by consideration of the complementarity of simulation tests, track tests, road tests, audits, and other pillars, the assignment recommendation of pillars for relevant safety requirements is given. Concrete test cases for specific scenarios in the track & simulation test standard are listed as not exhausted. In the future, we will also actively contribute to the work of GRVA-related IWGs.

## GB/T General technical requirements for automat driving systems

序号	条款	审核	仿真试验	场地试验	道路试验
1	4.1	必要	可选	可选	可选
2	4.2	必要	必要	必要	必要
3	4.3	必要	必要	必要	可选
4	4.4	必要	可选	可选	可选
5	4.5	必要	必要	必要	可选
6	4.6	必要	必要	必要	可选

## GB/T Field test methods and requirements for automated driving function

### 6.1.1 限速标志

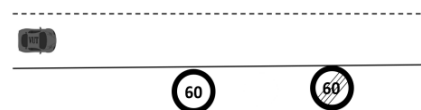
#### 6.1.1.1 试验场景

试验道路为至少包含一条车道的长直道，根据 $V_{max}$ 在表1中选取相对应的任一限速及解除限速标志牌数值，标志牌之间距离至少为100 m。如图1所示。

单位为千米每小时

表1 限速标志选取参照表

$V_{max}$	初始道路限速	限速标志数值	解除限速标志	恢复限速标志
$V_{max} \geq 80$	80	60	60	80
	60	40	40	60
	40	30	-	-
$60 \leq V_{max} < 80$	60	40	40	60
	40	30	-	-
$40 \leq V_{max} < 60$	40	30	-	-
$V_{max} \leq 40$	40	$V_{max}-10$	-	-



## GB/T Automated driving function simulation test methods and requirements

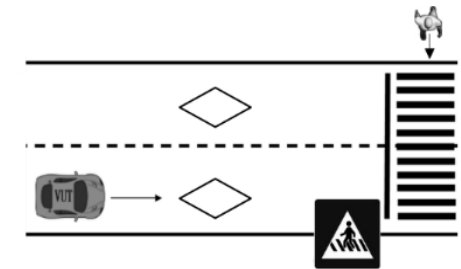
### 5.15.1 试验场景

试验道路：至少为具备双向车道的长直道，长度 1Km；

标志标线：路段设置人行横道线，人行横道预告标志线及人行横道标志等相关标志标线。路段中间车道线为虚线或实线，最外侧车道线为实线。

试验环境：

- 1) 路段限速 40km/h，试验车辆车道外侧存在行人，行人沿人行横道线横穿试验道路；
- 2) 车辆与行人之间无其他遮挡物；
- 3) 行人出发位置应位于道路边界以外；
- 4) 靠近人行横道线 10m为实线。



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During the following activities of **FRAV & VMAD**, two deliverables are suggested as supplements for guideline documents.

- (1) Assessment for Verification strategy including the methodology of integrated use of the pillars to achieve adequate coverage and the method to define coverage thresholds.
- (2) Examples of Verification strategy
- (3) Concrete test case catalog ( necessary bottom line of safety)

**Thank you for your attention!**

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