



# Testing of autonomous/automated driving systems on proving grounds – OICA views

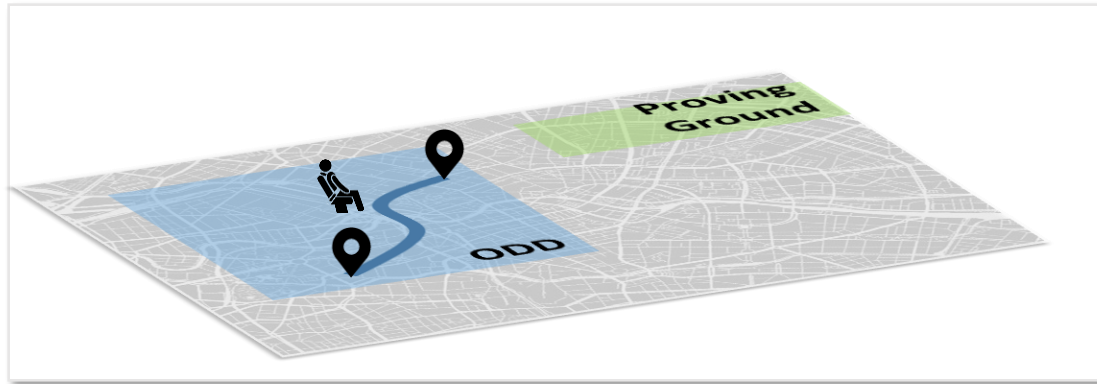
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Submitted by the experts of OICA

# Testability on proving grounds - Introduction

## Background:

- Especially L3-L5 features are linked to a dedicated ODD\* and can only be activated and operated within this ODD\*.
- This issue is a general and use-case independent, issue that even affects ACSF (e.g. CAT C, B2), but has not been resolved, yet.



*Example illustration*

## Proving grounds:

- Are typically not part of the geographic ODD\*
- Do typically not reflect other technical ODD\* requirements
- Are typically not included in high definition maps

**Consequence:** If dedicated ODD\* conditions/premises are not fulfilled, the automated driving system cannot be activated on proving grounds and therefore not be tested

# Testability on proving grounds - Options

Option	1	2	3	4	5
<b>Description</b>	Enable/adapt both proving ground infrastructure and high definition maps to allow for physical testing of ADS equipped vehicles	Test maneuvers with ADS equipped vehicles on public streets within the operational design domain	Limit physical testing of ADS equipped vehicles to OEM-specific proving grounds	Enable ADS equipped vehicles with a so called „test mode“ (that allows remote operation) for physical testing on any proving ground	Enable/adapt specific test vehicles by applying SW-modifications (e.g. activate SCN-coding) for physical testing on any proving ground
<b>Advantages</b>	<ul style="list-style-type: none"> <li>+ Authorities/agencies can independently from OEMs conduct compliance tests with any desired ADS equipped vehicle on specific proving grounds</li> <li>+ Testability of series systems → no modification to systems/software necessary</li> </ul>	<ul style="list-style-type: none"> <li>+ Authorities/agencies can independently from OEMs conduct compliance tests with any desired ADS equipped vehicle</li> <li>+ Testability of series systems → no modification to systems/software necessary</li> </ul>	<ul style="list-style-type: none"> <li>+ Reduced implementation efforts for OEMs</li> <li>+ Testability of series systems → no modification to systems/software necessary</li> <li>+ No difficulties with OEM-specific attributes in high definition maps as considered by OEM-proving grounds</li> </ul>	<ul style="list-style-type: none"> <li>+ Authorities/agencies can independently from OEMs conduct compliance tests with any desired ADS equipped vehicle on proving grounds</li> </ul>	<ul style="list-style-type: none"> <li>+ Reduced implementation efforts for OEMs</li> <li>+ Flexibility</li> </ul>
<b>Disadvantages/Challenges</b>	<ul style="list-style-type: none"> <li>- High implementation efforts for OEMs</li> <li>- Handling of OEM-specific attributes (IP-issue?) in high definition maps that need to be reflected by proving grounds</li> <li>- Handling of new proving grounds that were not existent at the time of production (map update of proving ground)</li> <li>- Maintenance issues</li> </ul>	<ul style="list-style-type: none"> <li>- Road blocking may be possible in individual cases, but not realistic/practical as general solution worldwide</li> <li>- Safety reasons in case of on road-tests and many other things likely not easy/practical to test on public roads</li> </ul>	<ul style="list-style-type: none"> <li>- Independent execution of certification tests not possible for authorities/agencies – causes problems for rating/compliance-Testing, CoP und market surveillance</li> <li>- Not realistic/practical as solution worldwide</li> </ul>	<ul style="list-style-type: none"> <li>-Risk of unauthorized access/manipulation and security threat due to external interface</li> <li>- No representative series systems/software</li> </ul>	<ul style="list-style-type: none"> <li>- No representative series systems/software</li> <li>- Independent execution of certification tests not possible for authorities/agencies – causes problems for rating/compliance-Testing, CoP und market surveillance</li> </ul>

**OICA's conclusion:** Simultaneous investigation of option 3 (short-term solution) and option 1 (long-term solution ) seems to be useful and reasonable approach

## Next steps

- What is the expectation of the Contracting Parties regarding testability on proving grounds?
- Can it be assumed that certification agencies/authorities etc. want to be able to independently test and assess vehicles/automated driving systems on certain proving grounds (e.g. relevant for certification-tests, in-use-compliance-tests, conformity of production, rating tests NCAP, etc.)?
- If yes, option 1 requires that proving ground infrastructure and attributes in proving ground maps fulfill certain harmonized criteria to enable testability of different kinds of systems of different manufacturers
- The discussion on standardization of such criteria/map attributes needs to start as soon as possible and is expected to take a longer time as several technical issues need to be properly resolved (e.g. handling of OEM specific attributes, handling and transferring of map data to the different kinds of systems, etc.)
- Would a combination of option 1 and 3 be an acceptable approach? E.g. Option 3 as a short- and midterm solution and option 1 as a long-term solution? → both options should be investigated and developed simultaneously