

# **How to proceed with Advanced Driver Assist Systems and continuous automation up to Level 2 within R 79**

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## Basics

- Systems within R 79 are described as driver assist systems
- a) On the one hand there are systems which are only deemed to work in **accident-prone situations** like CSF, ESF – these are similar to systems described in other Regulations like AEBS, ESC,...

This kind of assist systems have a concrete benefit for traffic safety since they can act in case the driver fails to do so or within the reaction time of the driver

## Basics

b) On the other hand there are systems which **continuously** support or carry out the lateral control of the vehicle

For these kind of system the well known SAE-Level do apply

Within R 79 we find the categories A, B1 or C:

- A for low speed manoeuvres
- B1 for hands-on lane keeping
- C for hands-on lane change

Systems within R79 do not go beyond Level 2



## **a) How to proceed with ADAS for accident-prone situations**

- Treat new systems as usual
- Enable systems with safety benefits
- Adapt R 79 wherever necessary to allow approval
- Set requirements that ensure that the expected safety gain comes true
- Set requirements to avoid negative side effects
  - For systems that need a lane change do not endanger other traffic

## **b) How to proceed with systems up to Level 2, which deliver continuous lateral support**

**Problem:** Some facts which hold for systems up to Level 2 have to be taken into account when rulemaking shall take place:

- The driver is still responsible for carrying out longitudinal and lateral control at all times
- The driver has to supervise all actions of the system
- The driver has to act immediately in case the system is not able to master the current driving task

## Problems

- There is always an interaction between driver and system



- Therefore the design of the system has a strong influence on how the driver carries out his driving task and thus on the capabilities of the driver (on vigilance, situation awareness, reaction times...)

## Problems

- The capabilities of a human being decrease if workload is too high or too low
- The human being is not good at only supervising a system
- Vigilance decreases in case the system carries out the driving task for longer periods without the need for the driver to interact
- Well performing Level 2 systems may encourage the driver to do other tasks than controlling the vehicle or supervising the system (overreliance)  
-> the driver cannot react appropriately in case the system is not able to handle a situation

## Problems

- Highly reliable system performance makes it difficult for drivers to develop an adequate mental model with regard to their tasks and responsibilities
  - Especially when system limits appear rarely and drivers get no warning or additional information, it is unlikely that they will respond immediately as required
- Vehicle automation in this case is not simply relieving drivers of routine tasks by replacing him or her with continuously automating functions but introducing also new tasks and responsibilities



## **The Level 2 system should**

- support self-explanatory learning of system performance and system limits
  - ensure correct understanding of driver's role and responsibility by means of system design
  - help drivers reacting adequately in case of system limits
  - prevent automation complacency and foreseeable misuse
- rulemaking should take requirements and assessment of driver behaviour and cognition into account when proceeding with systems up to Level 2

## Approaches for possible solutions

- 1) Keep the driver in the loop by ensuring that there is the continuous need for the driver to act  
or  
ensure the system will identify driver state and apply appropriate strategies
- 2) If this is not achieved
  - Do not allow such a Level 2 system  
or
  - Require technical means to ensure that the system can compensate the risks induced by overreliance, low vigilance, longer reaction times, missing situation awareness,...

## Approaches for possible solutions

- 1) Keep the driver in the loop by ensuring that there is the continuous need for the driver to act
  - During continuous normal driving situations the Level 2 system gives the driver only appropriate/balanced support
  - Clearly communicate system limits at all times
  - In critical situations give as much support as possible by other systems like AEB, CSF, ESF

## Approaches for possible solutions

### 2) If this is not achieved

- Do not allow such a Level 2 system  
or
  - Require technical means to ensure that the system can compensate the risks induced by overreliance, low vigilance, longer reaction times, missing situation awareness,...
- Technical requirements aim to reach a degree as if to address a Level 3 system  
(That is why we already have relatively strict requirements for B1 and C)

# Literature

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