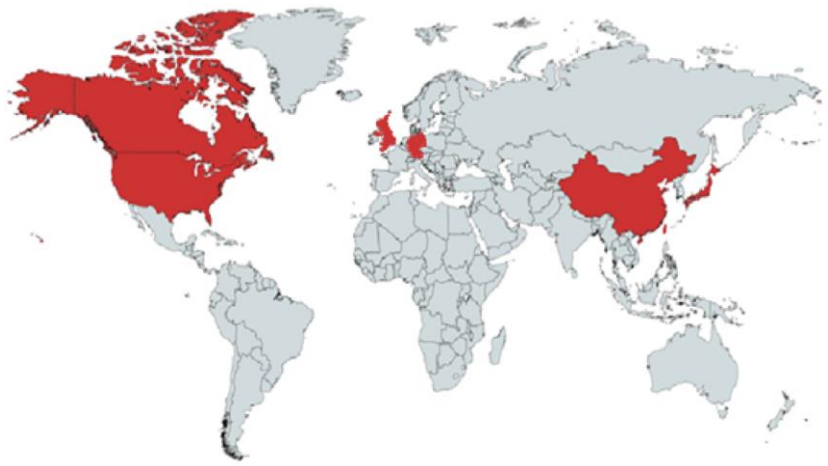
TF-ADAS Workshop on Hands-free

Hands-free level 2 in DCAS

26 July-2023

OICA/CLEPA

L2-Hands-free Driving - Introduction and Market Demand



System Introduction in different markets*:

US:	2018	Great Britain:	2023
Canada:	2018	Germany:	2023
China:	2018		
Japan:	2019		

(*usage depends on local traffic regulations)

Type of systems introduced:

Highway lanekeeping:	2018>
Highway lanekeeping and lanechange:	2022>

- Customers are widely using L2 Hands-free driving systems in major markets since 2018
- Hands-free: Driver is free choice to put hands either on or off the steering control, during hands-free operation
- Growing number of manufacturers are offering these systems and functionality is expanding
- ISO PAS 11585 (Conditional Hands Free Driving Systems) describes State of the Art, ready in August 2023
- Example Cadillac: “Over 34 million hands-free miles driven with Super Cruise” since market introduction*
- Example Ford: “System has enabled already 64 million hands-free miles (102 million km) driven in US and Canada” **

* https://www.cadillac.com/world-of-cadillac/innovation/super-cruise (status Nov 2022)
** Ford Brings Hands-Free Driving Technology to Motorways in Great Britain | Ford of Europe | Ford Media Center (status Apr 2023)

Level 2 Hands-free - Background

- **2018: The informal group ACSF (16th session) …**
  - started to develop provisions for Automated Lane Keeping Systems, **ALKS (ECE-R157)**
  - invited industry to start directly with GRVA the discussion on what needs to be changed /added to **ECE-R79** to allow for **Hands-Off/ Eyes On** Lane Keeping Systems under a **SAE Level 1-2** assumption.

- **2020: GRVA-07-23: OICA/CLEPA submitted a proposal to amend R79 ACSF B1** to allow Hands-Off in specific conditions**.**

- **2021: GRVA** established a **TF-ADAS** to develop a new UN-R with the focus on systems of Level 2 (DCAS)

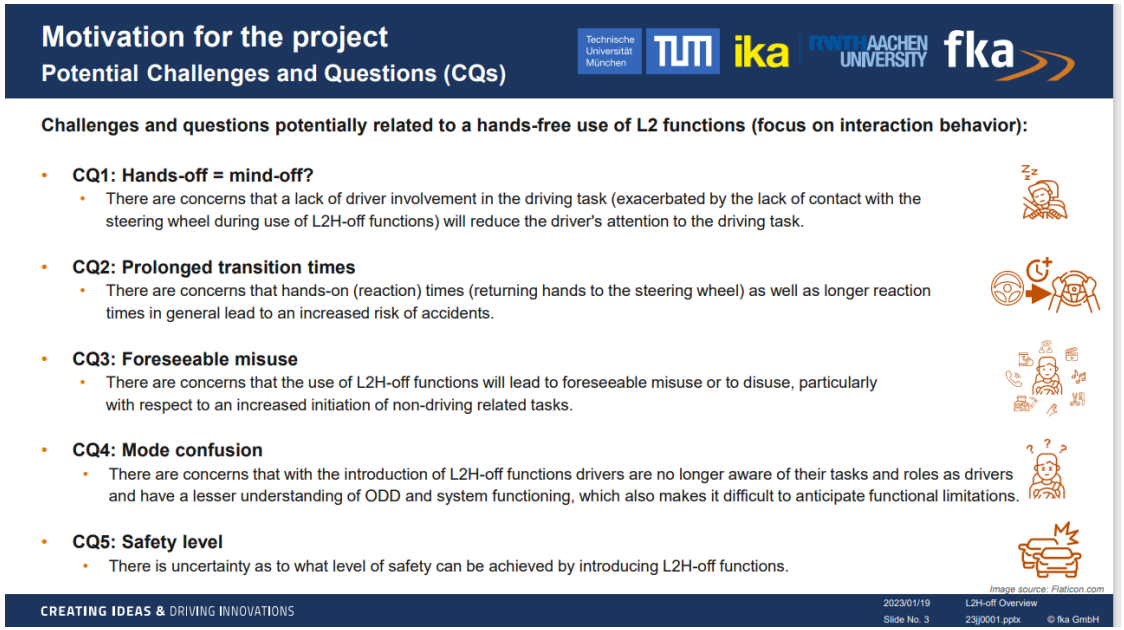
- **2021-Sept: TF-ADAS-07:** OICA/CLEPA announced an independent research project on level 2 Hands-Off in order to ...
  - answer the concerns and questions raised at GRVA and at TF-ADAS
  - enable a fact-based discussion in the TF-ADAS

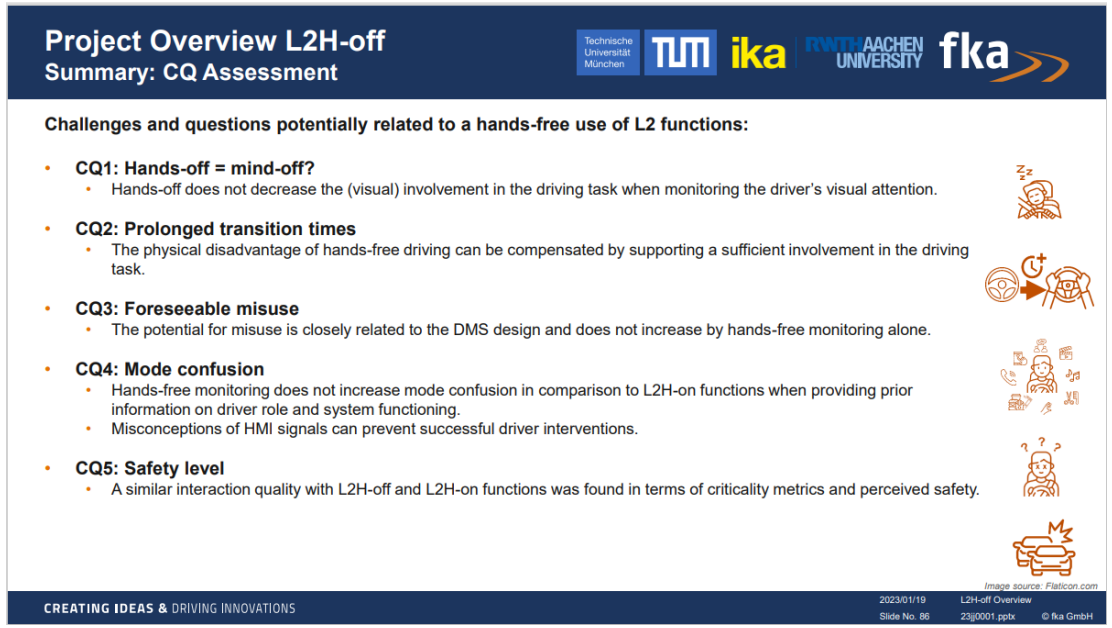
- **2023-Jan-19: GRVA-TF-ADAS -17**: Presentation of the study results & recommendations

- **2023-July 26**: OICA/CLEPA proposal for hands-free provisions in DCAS regulation (driver disengagement monitoring section)

Level 2 Hands-Free – FKA/TUM study results (ADAS-17-05)

- Study performed by Aachen University (FKA) and Munich (TUM), with scientific advisory board members from Sweden (Chalmers), Japan (AIST) and US (Virginia Tech). Within investigated scope are state-of-the-art hands-free lanekeeping systems for highways.
- The study addressed the 5 main concerns that were raised in GRVA trough a deep analysis of existing literature, customer surveys, simulator and on-road evaluations, field operational tests, based on state of the art systems





FKA/TUM addressed the main concerns related to hands-free operation

Level 2 Hands-Free – FKA/TUM study results (ADAS-17-05) + Final Report

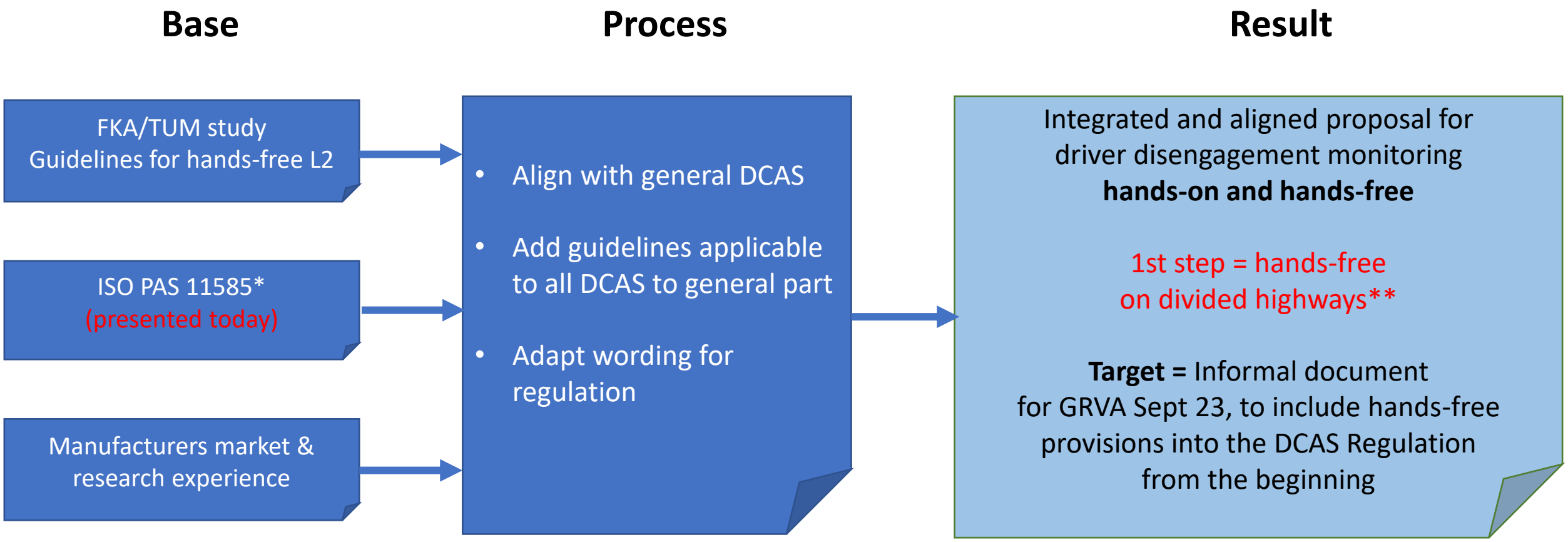
- Numerous questions were received on the research and answers were provided by FKA/TUM Universities, either during the live Q&A of TF-ADAS-17 meeting or afterwards with document ADAS-19-06

- The final detailed report (417 pages) has been released end of April
  https://www.vda.de/de/aktuelles/publikationen/publication/level-2-hands-o---recommendations-and-guidance

- Final report includes guidelines & recommendations for regulating L2 hands-free systems.
  These are based on discussions with project external scientists from the U.S., Japan, Sweden, and Germany and expert from the automotive industry.

Questions to FKA/TUM study were collected and answered

Level 2 Hands-Free – Development of the Proposal for DCAS



*ISO PAS 11585: Road vehicles --Partial driving automation — Technical characteristics of conditional hands-free driving systems

** Industry sees the limitation of such technology to highway driving as initial step.
Once enough evidence is gathered, a discussion on the application to other road types should be started.

Driver disengagement (Paragraph 5.5.4.2.)

- ❑ Supports the driver to remain engaged, provides warnings incl. escalation in case of disengagement
- ❑ Includes measures if no response to warnings (RMF) and for repeated disengagements
- ❑ Compliance demonstrated in audit (Annex 3) and tests (Annex 4)

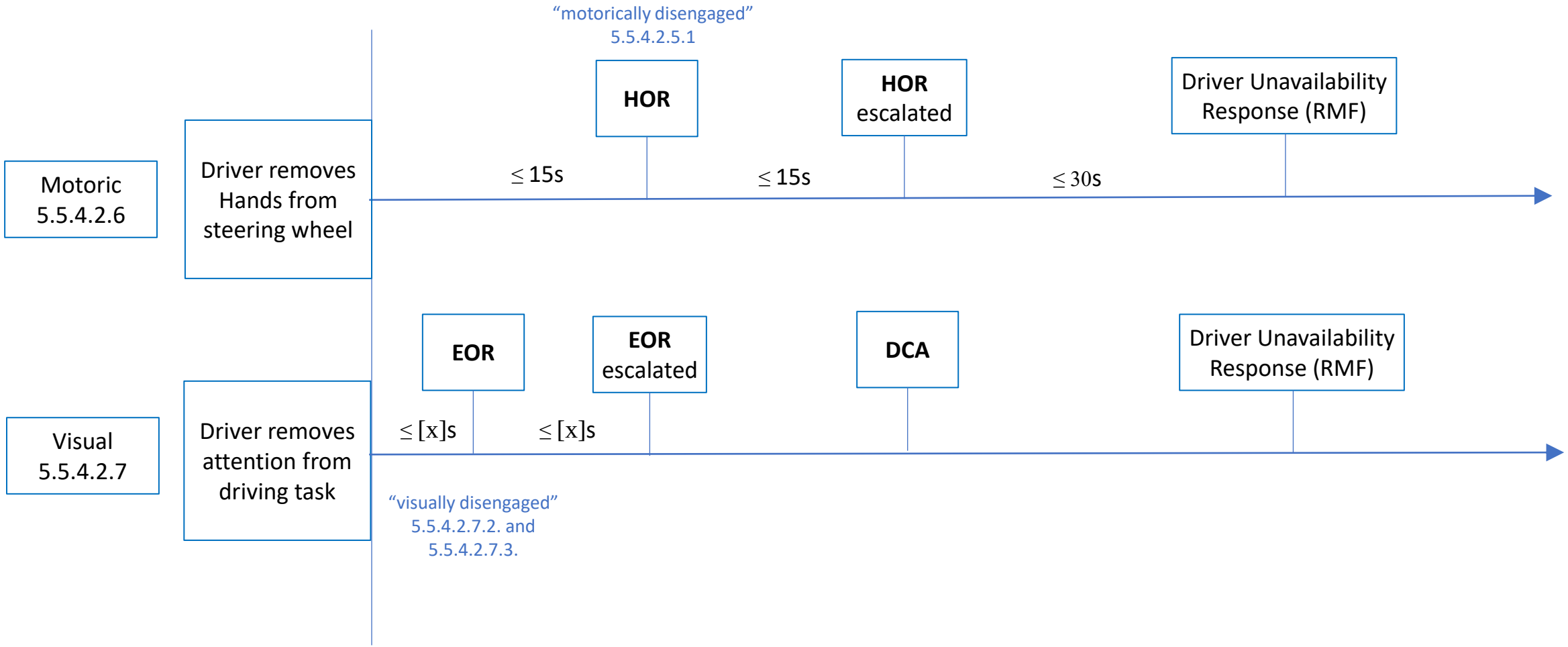
Overview of 3 proposed driver disengagement monitoring approaches for different DCAS modes: (5.5.4.2.1):

1) **Pure Motoric disengagement monitoring (i.e. Hands-on)**
   - ❑ For DCAS similar or close to R79 (having no feature from section 6)
   - ❑ Hands-on warning cascade in line with R79
   - ❑ Driver unavailibilty response as final escalation

2) **Pure Visual disengagement monitoring (i.e. Hands-free systems)**
   - ❑ Limited in ODD and functionality in a first step (no VRU, separation from oncoming traffic)
   - ❑ Requirements & warning cascade in line with FKA-TUM guidelines based on their hands-free research project

3) **Combined motoric disengagement AND general attentiveness monitoring**
   - ❑ For most DCAS, not part of 1) or 2)
   - ❑ General attentiveness confirmed by at least one of the following:
     - ❑ Eye gaze/head position towards driving task / not distracted (e.g. National/regional requirements)
     - ❑ Appropriate input to vehicle controls (e.g. Shared haptic control etc)
     - ❑ Alternative criteria to be approved by Technical Service (for technology neutrality)

Visualisation of the Driver Disengagement Warning Cascades (5.5.4.2.6 – 5.5.4.2.9)



HOR = Hands On Request = 5.5.4.2.3.1.
EOR = Eyes On Request = 5.5.4.2.3.2.
DCA = Direct Control Alert = 5.5.4.2.3.3