RUMBA

Achieving a positive user experience through user-friendly design of the vehicle interior for automated driving functions

Activities to improve understanding of comfort

Stefanie Horn, Dr. Hans-Joachim Bieg, Claus Marberger, Michael Schulz, Andreas Schultz, Erdi Kenar, Sabine Oßwalt, Dr. Andreas Korthauer (Robert Bosch GmbH)

Motivation

01
- Comfort is highly subjective, very versatile and varies greatly between people
- Objectification of comfort is essential for development of automated driving functions
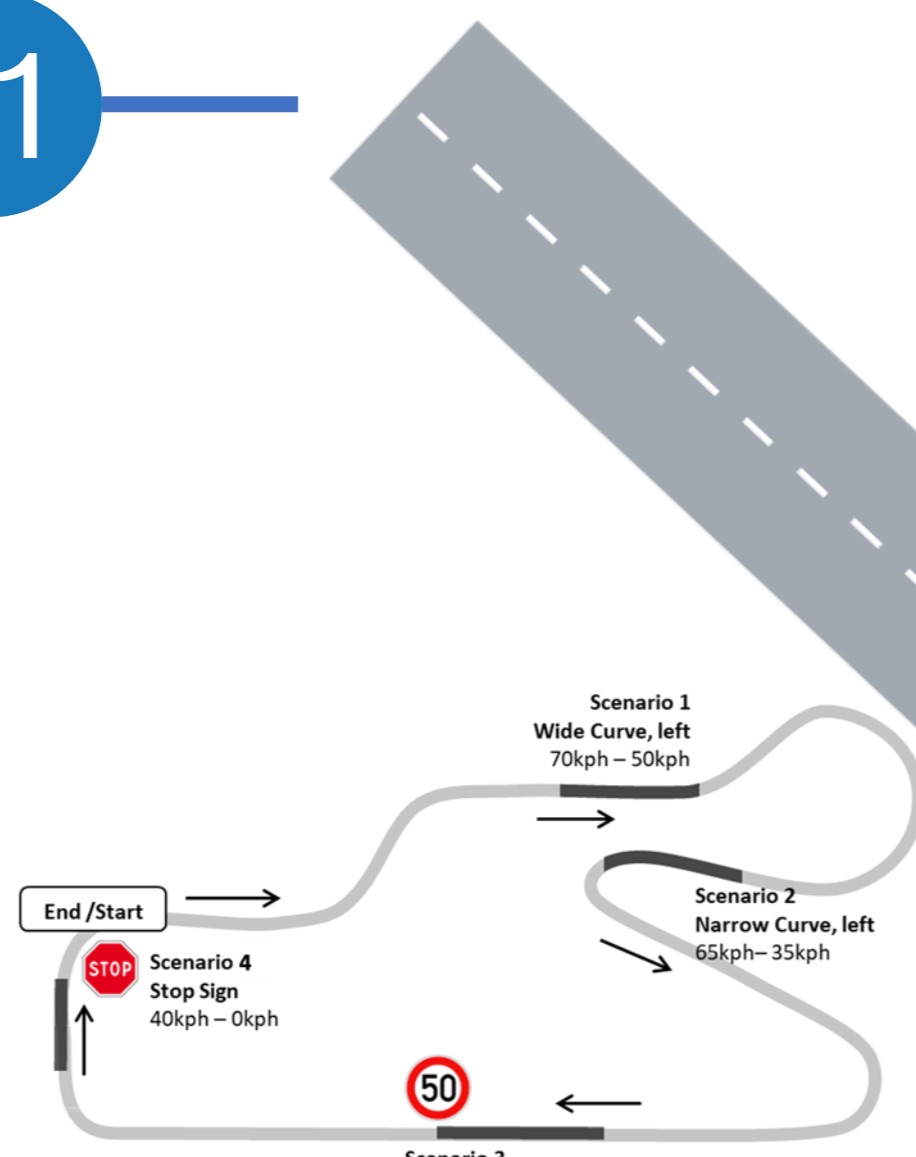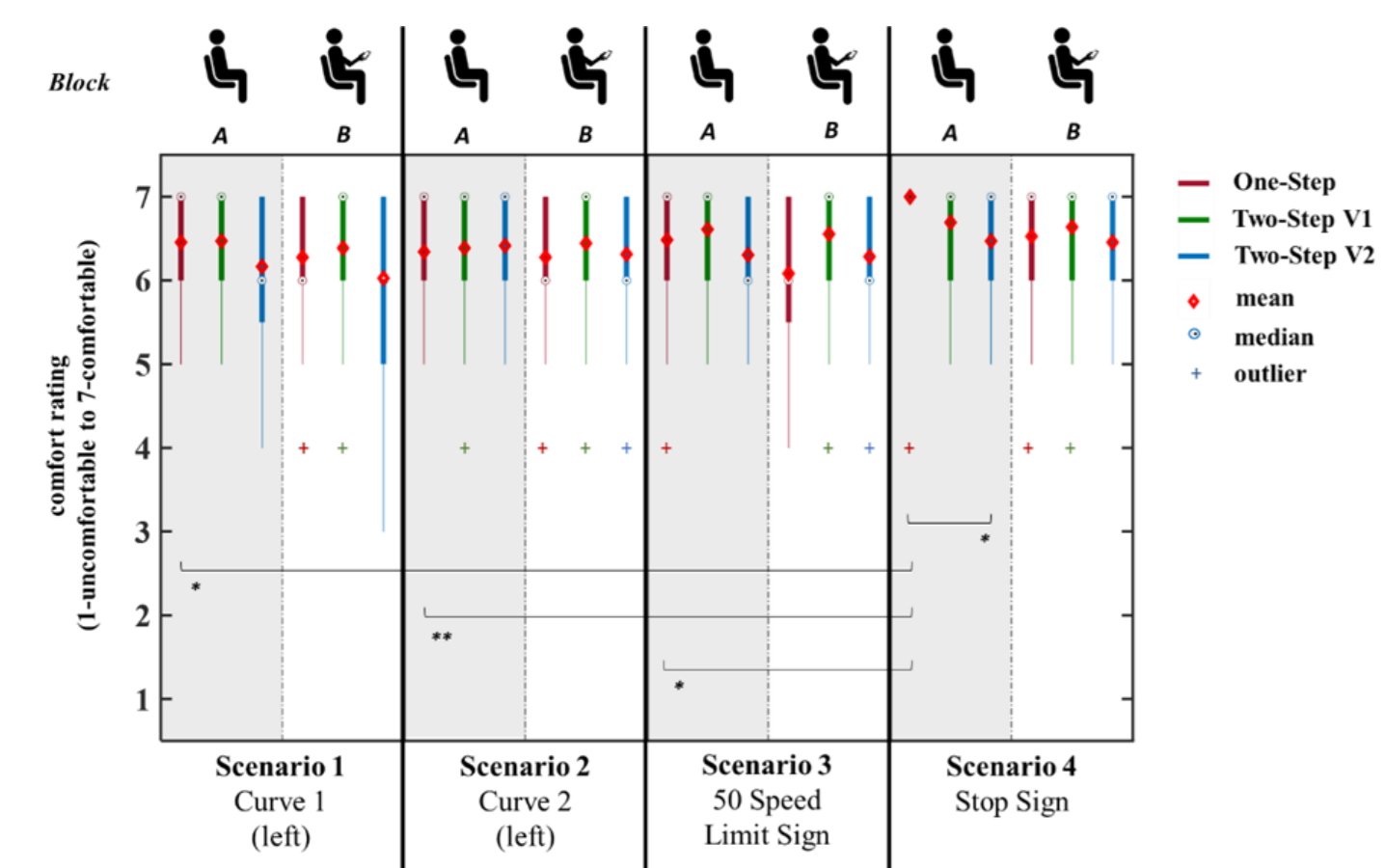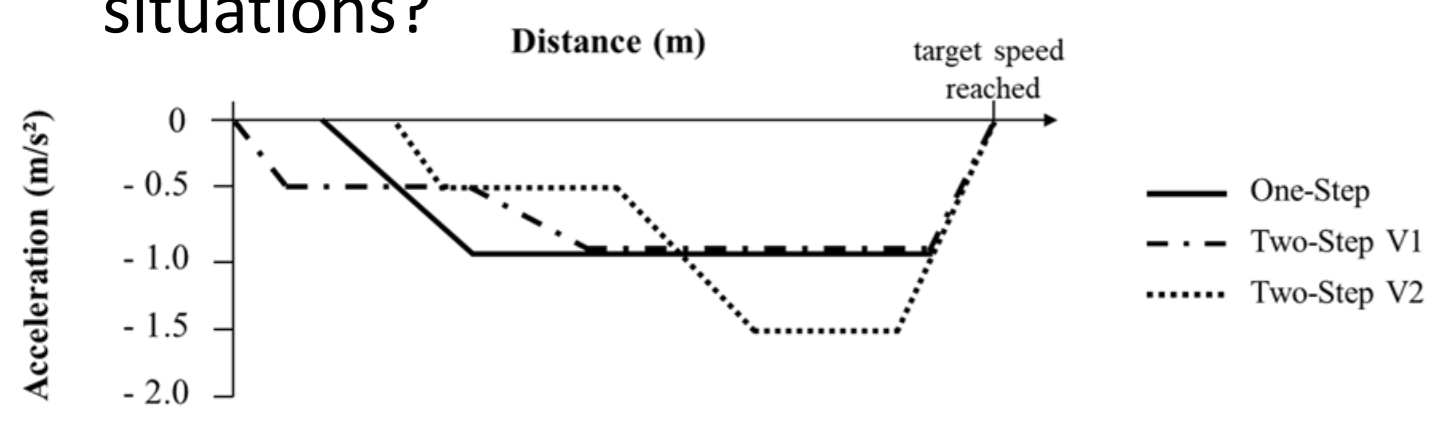
Chauffeurs as reference

02
The following hypotheses support the use of chauffeurs and their driving behavior as a comfort reference:
- Chauffeurs are trained in comfortable, speedy and safe driving.
- Chauffeurs enable secondary task (e.g. mobile working) for passenger.
- The driving style of chauffeurs reduced motion sickness effects.
- Passengers have high level of trust and feel safe.

Expert study with Chauffeurs (Bosch2020a)

03
- Observation + Online Interview
  - How does the chauffeur act in certain traffic situations?
  - What does the chauffeur observe during the ride?
  - What characterizes a chauffeur ride?
- Recording of vehicle data
  - Identify objective differences between chauffeur and automated system

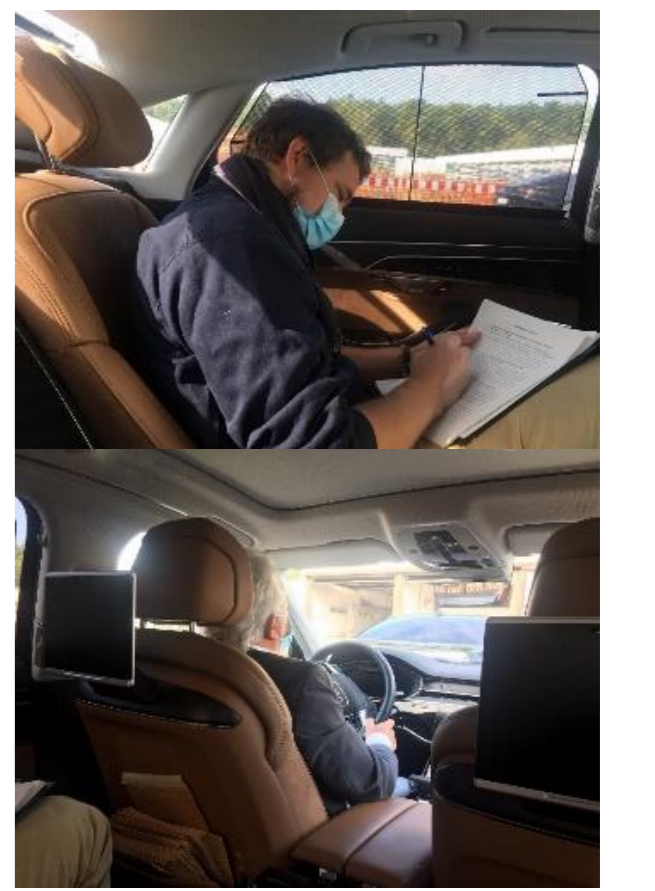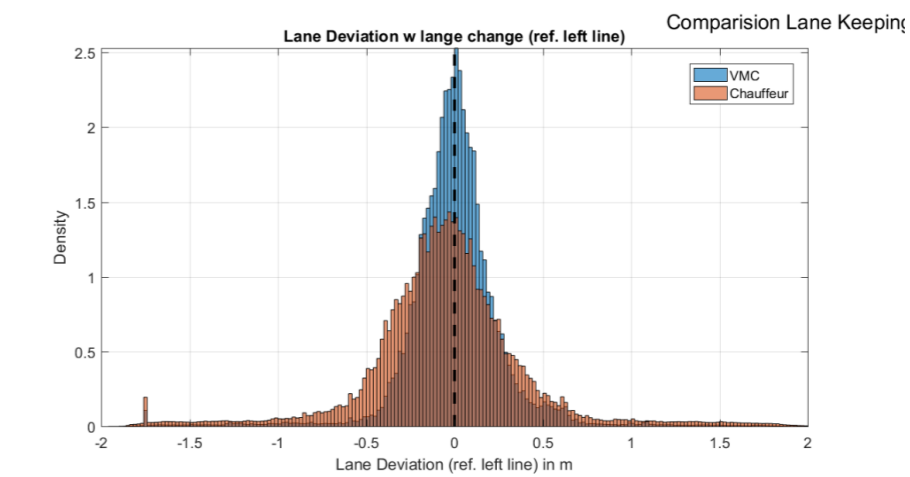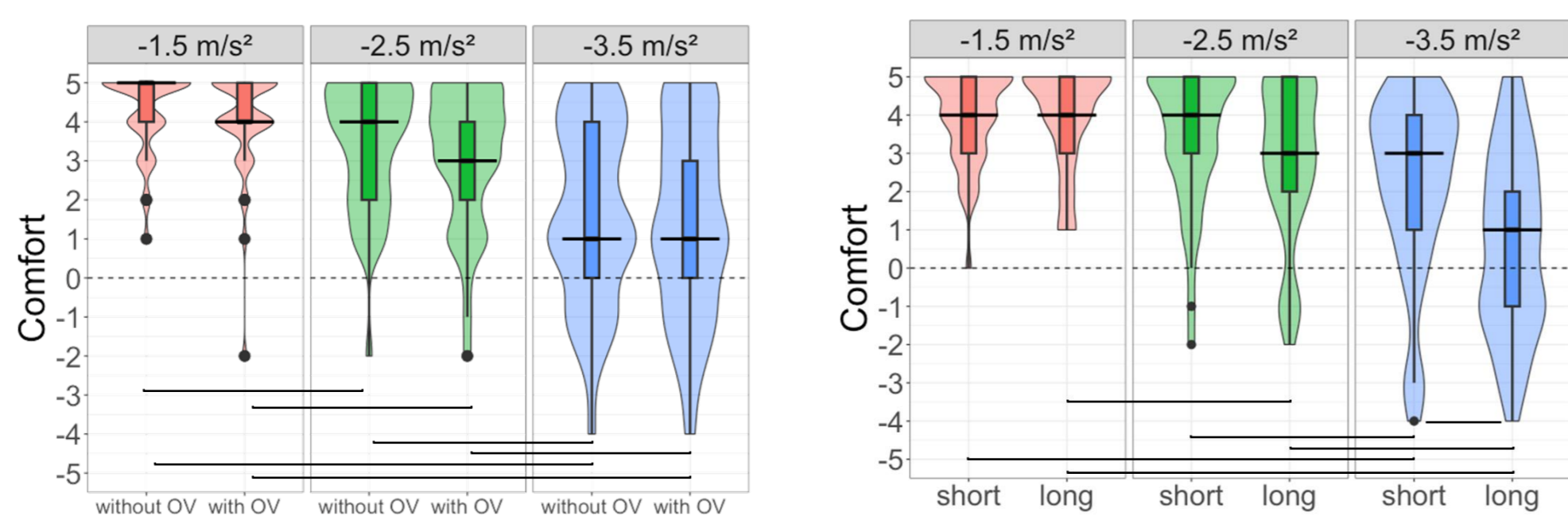## Impact of different deceleration profile (Bosch2022a)

06
- How must the individual deceleration profile components (parameters + change over time) be designed to be considered as comfortable?
- Development Two-Step deceleration Profile based on chauffeur inputs.
- Is an adaption of the driving parameters necessary for different traffic scenarios and different situations?

Method Development

04
- Automated Ride Comfort Assessment (ARCA)
- Discomfort controller

Automated Driving vs. Chauffeurs (Bosch2021a)

05
- Identification of discomfort events / scenarios on highway
- Analysis the effect of driver state (attentive / distracted) on ride comfort
- Analysis the effect of the sitting position (front / back) on ride comfort
- Comfort evaluation and comparison of VMC and Chauffeur

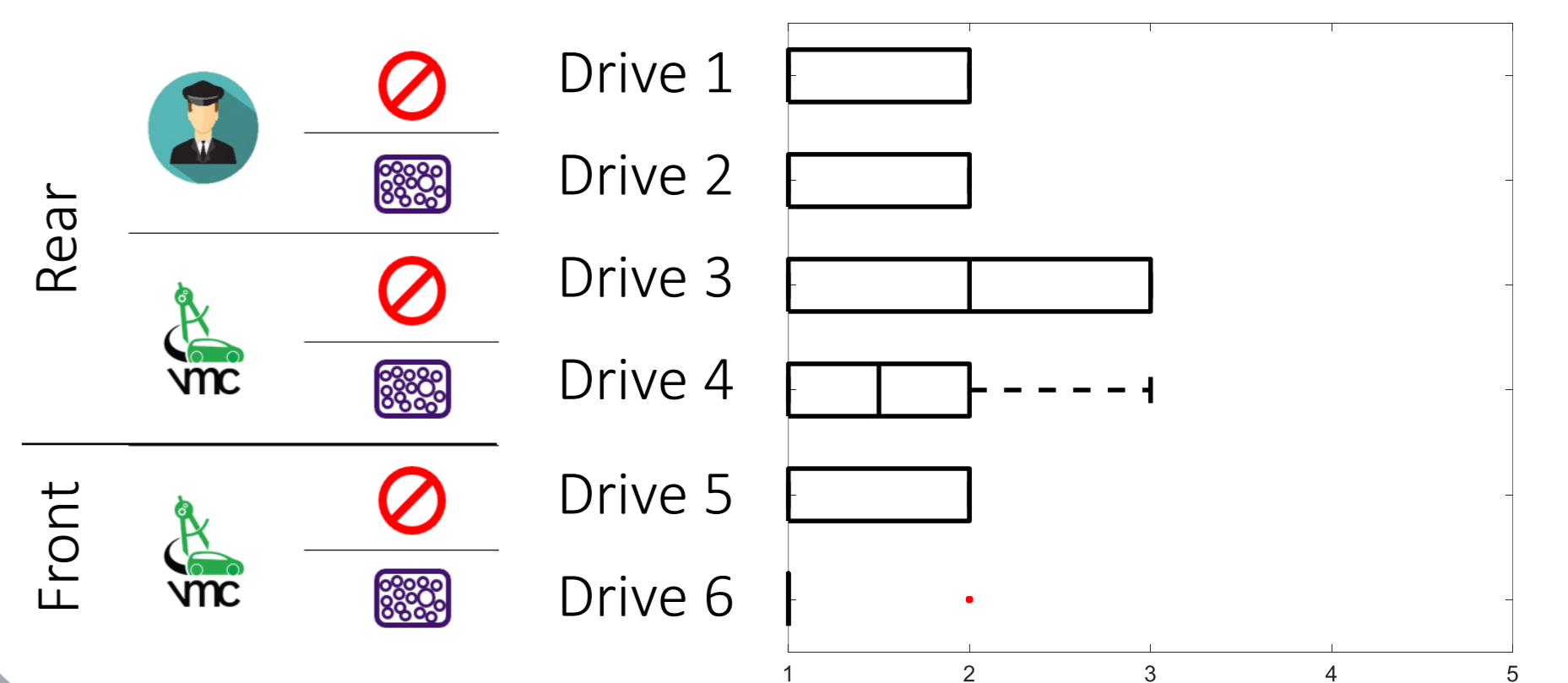## Comfortable and appropriate deceleration values (Bosch2023a)

07
- Blind Intersection and crosswalk
- Which deceleration values are comfortable and appropriate? $ax=[-1.5; -2.5; -3.5]m/s^2$, $jx=-1.0m/s^3$
- Investigating the influence of context on the perception of comfort.
  - What influence does the presence of crossing traffic have?
  - What influence does the Pedestrian Visibility Time (PVT) have?
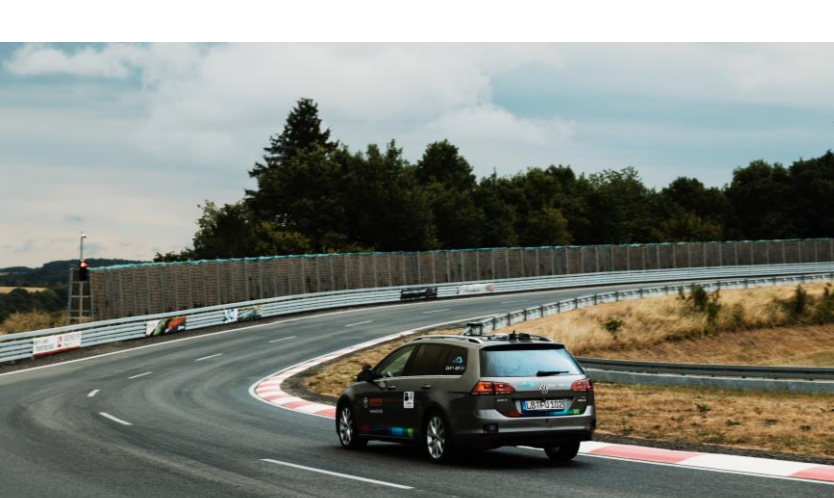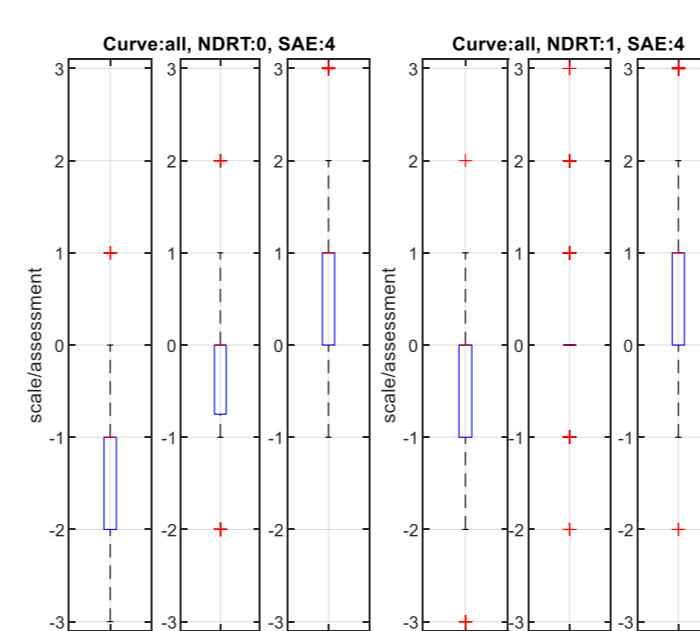- Results for scenario crosswalk:

Comfortable and appropriate deceleration values (Bosch2023c)

08
- What is the "Comfort Zone" (threshold towards discomfort) for lateral acceleration values in curve driving? $ay = [2.0, 3.0, 4.0]$ m/s^2
- Investigating the influence of SAE Level & NDRT on the perception of comfort:
  - Impact of SAE Level (L1 & L4) on preference of ay
  - Impact of Passenger State (w/wo NDRA) on preferences of ay

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